APPENDIX F: RAIL BASED MODES MEMORANDUM

MovingAhead

STREETS AND PLACES REIMAGINED

To: Dan Drais and Thomas Radmilovich, FTA Region X

From: John Evans, Sasha Luftig, and Dan Tutt, Lane Transit District

Date: September 23, 2015

Re: MovingAhead Project: Update on Documentation Eliminating Rail-Based Modes Alternatives

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1. Overview

This memorandum provides a summary and background regarding LTD's decision to eliminate rail-based modes from consideration in the MovingAhead project study and consider only bus-based modes. This memorandum further explains why LTD and its partners selected Bus Rapid Transit (BRT) as the appropriate form of high capacity transit over rail-based modes for the Eugene-Springfield metropolitan area.

2. Early Transit Mode Selection Process

Discussions about new transportation options in the Eugene-Springfield region began in the early 1990s as part of a regional transportation plan update. During the update process, several transit options were considered, analyzed, and discussed in public forums. Two key studies conducted during this period and sponsored by Lane Council of Governments (LCOG), the Eugene-Springfield regional Metropolitan Planning Organization (MPO), and LTD were the 1995 Urban Rail Feasibility Study and the 1999 Major Investment Study (see descriptions below in sections 3 and 4, respectively). From the analysis and the public and agency input, Bus Rapid Transit (BRT) emerged as the clearly preferred transit strategy. It was seen as a way to significantly enhance transit service and achieve many of the benefits of light rail without the high cost. As a result, BRT was approved in 2001 as a key element of the new Regional Transportation Plan (TransPlan) adopted by the MPO as well as the cities of Eugene and Springfield, Lane County, and LTD. A summary of the development of the BRT concept in the Regional Transportation Plan and onward is provided in Table 1.

Table 1. Summary of BRT Concept Development in Eugene-Springfield, Oregon Regional Transportation Plan

Timeline	Development of the Region's Transportation Plan	Development of BRT Concept in Eugene-Springfield Area	Public Outreach and Agency Coordination
1992	• Intermodal Surface Transportation Efficiency Act (ISTEA), new Air Quality Regulations, and Oregon's Transportation Planning Rule create new planning guidelines which lead the region to begin work on developing a regional transportation plan that more fully integrates land use and transportation • The Metropolitan Planning Organization (MPO), called Lane Council of Governments (LCOG), uses a triangle of land use, system improvements, and transportation demand management (TDM) strategies as foundation for a multi-agency coordinated plan	• LTD Board identifies need for improved transit to address planning for future growth in the region	• Multi-agency efforts (LCOG, LTD, Eugene, Springfield, Lane County, ODOT) include extensive public involvement and intensive policy-maker involvement
1993-1994	• Tool box of integrated land use, highway, transit and TDM strategies developed	• BRT included in tool box of strategies	• A diverse group of area stakeholders assembled to identify potential land use, transportation and TDM strategies that are appropriate for the region • Public workshops are held to introduce concepts to the public and get input • Updates given to policy officials
1995	• Six Alternative Plan Concepts (APC) developed as part of the regional transportation plan to incorporate various levels of tool box strategies	• Urban Rail Feasibility Study conducted, concluding that light rail is not appropriate for the region and rubber-tired high quality transit service (BRT) should be pursued • BRT System concept developed as part of APC development	• Newsletters and project updates used to keep public and policy officials informed
	• Technical evaluation conducted on Alternative Plan Concepts	• BRT evaluated as part of APC • Technical Evaluation Conclusion #8: BRT could significantly improve transit service	• Public review and stakeholder symposiums held • Community surveys made and focus groups held on APCs
1996	• Policy-Makers' Decision Package for Draft Plan Directions	• BRT (without 100% exclusive right-of-way) identified as preferred transit strategy by stakeholders	• Extensive public outreach conducted • Planning Commissions (Eugene, Springfield, Lane County) make

Timeline	Development of the Region's Transportation Plan	Development of BRT Concept in Eugene-Springfield Area	Public Outreach and Agency Coordination
		• Strategy #5: Focus resources for transit improvements on development of a BRT system • Strategy #14: Seek additional funding for transit improvements	formal recommendations to their respective policy bodies (including LCOG and LTD) • Policy bodies adopt a revised Decision Package as basis for drafting regional plan
1998	• Draft regional transportation plan, TransPlan, produced and released for public review	• BRT Policy and system map included in draft TransPlan	• Public outreach continues, workshops held, stakeholders involved, planning commissions formally review TransPlan • LTD conducts extensive public workshops to educate the public and partner agencies to begin planning the first segment of the regional BRT system
1999		• BRT concept Major Investment Study (MIS) prepared as part of the multi-agency staff team process engaged to discuss implementation of BRT • Participants included LTD, Eugene, Springfield, Lane County, LCOG (MPO), ODOT, and FHWA	• LTD continues to conduct extensive public workshops to educate the public and partner agencies about BRT • Public outreach continues, workshops held, stakeholders involved, Planning Commissions formally review TransPlan and make recommendations to policy bodies
2001	• TransPlan adopted by all agencies (LCOG, Eugene, Springfield, Lane County, and LTD) as the Regional Transportation Plan (RTP)	• BRT Policy and system map included in final RTP • LTD begins implementation of first segment of system	• LTD continues extensive public workshops to educate the public and partner agencies for the first segment, Franklin EmX (also called Green Line) • Specific conceptual designs are provided to the public
2002	• TransPlan amended		• LTD-FTA issue Notice of Intent (NOI) for North Eugene EmX (Coburg Road) • LTD-FTA issue NOI for North Springfield EmX (Pioneer Parkway) • LTD determines Coburg Road is not ready for EmX • LTD begins planning for the second segment of the regional BRT system, Pioneer Parkway EmX, now called Gateway EmX
2004	• RTP updated • TransPlan continues to serve as the Transportation System Plan (TSP) for Eugene and Springfield	• BRT Policy and system map in TransPlan included in updated 2004 RTP • Draft Environmental Assessment for Franklin EmX (Green Line) produced	• Public comment collected on Draft Environmental Assessment for the Franklin EmX (Green Line) • Franklin EmX (Green Line) approved by FTA

Timeline	Development of the Region's Transportation Plan	Development of BRT Concept in Eugene-Springfield Area	Public Outreach and Agency Coordination
2006		• Environmental Assessment for Pioneer Parkway EmX (Gateway EmX) produced	• Public comment collected on Draft Environmental Assessment for Pioneer Parkway EmX (Gateway EmX) EA • Pioneer Parkway EmX (Gateway EmX) EA is approved by FTA
2007	• RTP updated • TransPlan continues to serve as the Transportation System Plan (TSP) for Eugene and Springfield	• Franklin EmX begins service • Opening day ridership of 4,000 is nearly double the service it replaced • BRT Policy and system map included in updated 2007 RTP	• Designs begin for Pioneer Parkway EmX Extension (Gateway EmX) • LTD-FTA issue NOI for third segment of the regional system, West Eugene EmX Extension (WEEE)
2008		• Franklin EmX ridership exceeds 6,000 boardings per day	• LTD holds extensive public outreach and community design workshops for the WEEE project • LTD hosts Resource Agency meetings and distributes WEEE Coordination Plan
2009		• Pioneer Parkway EmX Extension ready for construction	• Pioneer Parkway EmX Extension completes designs and continues extensive coordination with Springfield City Council and staff
2011	• RTP updated	• Pioneer Parkway EmX Extension service begins • West Eugene EmX Extension Locally Preferred Alternative adopted by Eugene, LTD, and MPO	• Extensive community engagement continues on West Eugene EmX Extension alternatives, culminating with public hearings by LTD, Eugene, and MPO
2012		• Final Design begins on West Eugene EmX Extension	• Extensive community, property and business owner engagement continues on final design refinements for West Eugene EmX Extension
2013		• EmX ridership is 10,000 boardings per average weekday • LTD and City of Eugene awarded STIP Enhance funding (2016) and STP-U funding for Northwest Eugene-Lane Community College corridor planning	• Extensive community, property and business owner engagement continues on final design refinements for West Eugene EmX Extension
2014		• LTD determines that a programmatic, system-level approach to BRT planning is appropriate • MovingAhead project concept is developed with City of Eugene as project partner • LTD visits FTA Region X to share programmatic approach plan	• West Eugene EmX Extension 60 percent design complete and continues extensive coordination with Eugene and ODOT staff

Timeline	Development of the Region's Transportation Plan	Development of BRT Concept in Eugene-Springfield Area	Public Outreach and Agency Coordination
2015		• West Eugene EmX Extension construction begins • MovingAhead planning phase is launched • MovingAhead selects corridors to focus planning efforts on	• West Eugene EmX Extension 100 percent designs complete, reviewed and approved by City of Eugene and ODOT, construction permits issued, and construction begins • MovingAhead holds community workshops to understand needs along each corridor and develop initial design concepts
2016-17		• West Eugene EmX Construction continues, with revenue service expected to begin September 2017 • MovingAhead plans to select LPAs for corridors and launches corridor-specific NEPA work	• MovingAhead plans extensive public outreach in order to develop and refine locally preferred alternatives

3. *Urban Rail Feasibility Study*

LCOG prepared the *Urban Rail Feasibility Study Eugene-Springfield Area Final Report (July 1995)* in cooperation with the Oregon Department of Transportation (ODOT). The study incorporates three previously prepared draft reports into the final report: Alternative Urban Rail System Background Report; Potential Rail Corridor Screening; and Corridor Evaluation.

An Urban Rail Feasibility Committee was formed to guide the Urban Rail Feasibility Study. This study defined the type of rail system that could be constructed at a conceptual level, identified when a rail system for the Eugene-Springfield area would be feasible based on cost and ridership estimates, and identified actions that could be taken at that time to make rail a success in the future. Evaluation measures used in the study were:

- Increases transit ridership
- Reduces vehicle miles traveled
- Reinforces desired urban form, linking land use, transportation, economic development, and community livability
- Contributes to overall air quality improvement
- Minimizes traffic disruption
- Provides and improves access to major activities
- Creates intermodal transportation opportunities
- Minimizes private property takings

The study evaluated two concepts for the implementation of urban rail or high capacity transit, which were meant to capture the spectrum of modes available:

- Low-End Cost – generally, in-street operations with relatively limited transit reserved right-of-way and traffic signal modifications, with relatively few displacements and utility relocations and a limited communication (typical of streetcar or low-cost light rail); and,
- Mid-Range Cost – primarily reserved transit right-of-way and traffic signal modifications to provide for transit priority at key intersections, with a greater number of displacements and utility relocations and a train-to-wayside communication system (typical of light rail or heavy rail).

The study found that the Low-End Cost option did not adequately address the study's goals and objectives, key being: 1) improving transit travel times and reliability; 2) increasing transit ridership needed to reduce the region's reliance on automobiles (as measured in decreasing vehicle miles traveled); and, 3) providing for an economically-viable and financially stable transit system (as measured in reducing transit operating costs and competitiveness for Federal capital funds). The study also concluded that the Mid-Range Cost Option was not feasible because the costs exceeded the benefits and the project would not be fundable (see Section 4 below for additional discussion).

The Urban Rail Feasibility Study was incorporated as part of the BRT Major Investment Study (MIS) Phase II and Phase III (development and evaluation of alternatives, respectively). The Urban Rail Feasibility Study is attached as Appendix A.

4. *Federal Major Investment Study (MIS)*

The 1999 MIS was undertaken as part of the process to develop the *Eugene-Springfield Regional Transportation Plan (TransPlan),* which guides the comprehensive metropolitan transportation system planning process. The MIS informs decisions by the MPO, in cooperation with participating agencies, on the design concept and scope of major investments. The MIS scope of work, level of detail, schedule, and technical methods were based on local conditions through a collaborative, cooperative process involving partnership between local, state, and federal agencies. The key participating agencies were LCOG (Eugene-Springfield MPO), ODOT, LTD, City of Eugene, City of Springfield, Lane County, and the Federal Highway Administration (FHWA).

As noted above in Section 3, the 1999 MIS was one of two key studies conducted that provided the rationale for LTD's BRT system and ultimately for advancing BRT as the high capacity transit alternatives in the West Eugene EmX Extension project. The MIS study found that there are primarily two ways to implement the Mid-Range Cost Concept (described in Section 3 above): urban rail or BRT and that either would adequately address the project goals and objectives missed by the Low-End Cost concepts. However, the MIS also found that there would be a substantial capital cost difference between implementation of a Mid-Range Cost urban rail concept and a Mid-Range Cost BRT concept, with the urban rail costs being substantially greater than the BRT capital costs.

The study further concluded that both concepts would:

- Be implemented along the same corridors (with the same population and employment, resulting in the same level of transit demand);
- Generally result in the same reduction in dependency upon the automobile through similar transit travel time savings and improved reliability;
- Result in the same increases in transit ridership and transit user travel time savings; and,
- Require the use of Federal funding, which is most readily available for these types of projects in the form of Section 5309 discretionary funds.

The study ultimately concluded that projected 2015 ridership for an urban rail system was too low, that it could not meet FTA's threshold measure for cost-effectiveness, and would not be competitive with other cities seeking federal rail transit funding. The study recommended that the region act immediately to implement parking, land use, and transit policies that would help increase future ridership potential and improve the effectiveness of public transit on the region's major corridors.

Based on the MIS findings, BRT emerged as the preferred strategy for the 2001 Regional Transportation Plan.

The findings of the MIS still hold true today as current cost estimates for both light rail and BRT systems suggest that light rail capital costs are in a range of 5 to 10 times more in capital costs than a similarly configured BRT system.

The Federal Major Investment Study is attached as Appendix B.

5. LTD's BRT and Light Rail Comparison Update

In 2008, LTD published the West Eugene EmX Extension Project Scoping Screening and Evaluation Findings Report. The appendices to this report were a comparison of Characteristics of Streetcars and Light Rail Systems in the USA, and Applicability of Rail in the Eugene-Springfield Metropolitan Area (Attached as Appendix C).

Table 2 (below) is an updated version of the light rail table provided in the 2008 report. The 2008 report compared 21 light rail systems in the United States to LTD's BRT system. Table 2 compares 23 light rail systems to LTD's BRT system and uses 2013 data from the American Public Transportation Association's National Transit Database (available here: http://www.apta.com/resources/statistics/Pages/NTDDataTables.aspx).

The Streetcar table from the 2008 report was not updated. LTD determined that the streetcar mode is used as a tool to spur downtown economic development and, therefore, it would be more appropriate for streetcar to be implemented by the Eugene or Springfield Economic Development Departments. Additionally, because of the limited size of both Eugene and Springfield's downtown areas, it is unlikely that a streetcar would be a realistic investment to spur downtown economic development.

Table 2. System Comparison Between LTD's BRT and Light Rail

Name	Urbanized Area	UZA Population	Total Track Miles	Unlinked Passenger Trips FY	Operating Expenses FY	Average Cost per Trip FY	Annual Boardings per Mile
Niagara Frontier Transportation Authority	Buffalo, NY	935,906	14.1	6,308,928	$23,268,296	$3.69	447,442
Utah Transit Authority	Salt Lake City-West Valley City, UT	1,021,243	106.1	18,997,860	$45,452,097	$2.39	179,056
Charlotte Area Transit System	Charlotte, NC-SC	1,249,442	9.3	4,919,307	$13,084,582	$2.66	528,958
Hampton Roads Transit	Virginia Beach, VA	1,439,666	7.4	1,762,284	$12,374,424	$7.02	238,146
Santa Clara Valley Transportation Authority	San Jose, CA	1,664,496	79.6	10,742,292	$68,972,255	$6.42	134,953
Sacramento Regional Transit District	Sacramento, CA	1,723,634	75.1	13,513,471	$50,023,110	$3.70	179,940
Port Authority of Allegheny County	Pittsburgh, PA	1,733,853	51.2	8,032,051	$51,528,512	$6.42	156,876
The Greater Cleveland Regional Transit Authority	Cleveland, OH	1,780,673	33	2,897,940	$11,714,024	$4.04	87,816
TriMet	Portland, OR	1,849,898	104.1	39,174,406	$99,326,676	$2.54	376,315
St. Louis Metro	St. Louis, MO-IL	2,150,706	96.3	17,054,484	$64,814,600	$3.80	177,097
Maryland Transit Administration	Baltimore, MD	2,203,663	57.6	8,647,402	$37,766,098	$4.37	150,129
Denver Regional Transportation District	Denver-Aurora, CO	2,374,203	94	23,773,844	$87,140,504	$3.67	252,913
Metro Transit	Minneapolis-St. Paul, MN-WI	2,650,890	29.5	10,162,919	$32,424,866	$3.19	344,506
San Diego Metropolitan Transit System	San Diego, CA	2,956,746	102.6	29,699,366	$66,350,716	$2.23	289,468
Central Puget Sound Regional Transit Authority	Seattle, WA	3,059,393	38.5	9,730,027	$52,903,983	$5.44	252,728
San Francisco Municipal Railway	San Francisco-Oakland, CA	3,281,212	68.2	45,358,815	$182,399,900	$4.02	665,085
Valley Metro Rail, Inc.	Phoenix-Mesa, AZ	3,629,114	43	14,286,093	$28,711,628	$2.01	332,235
Massachusetts Bay Transportation Authority	Boston, MA-NH-RI	4,181,019	78	70,025,292	$151,775,706	$2.17	897,760
Metropolitan Transit Authority of Harris County, TX	Houston, TX	4,944,332	18.2	11,320,995	$18,385,544	$1.62	622,033
Dallas Area Rapid Transit	Dallas-Fort Worth-Arlington, TX	5,121,892	192	29,471,890	$151,020,981	$5.12	153,499
LA County Metropolitan Transportation Authority	Los Angeles-Long Beach-Anaheim,CA	12,150,996	135.8	63,652,197	$234,856,477	$3.69	468,720
New Jersey Transit Corporation	New York-Newark, NY-NJ-CT	18,351,295	13.9	5,303,914	$23,618,375	$4.45	381,577
New Jersey Transit Corporation	New York-Newark, NY-NJ-CT	18,351,295	36.5	12,865,393	$77,066,563	$5.99	352,477
Average for LRT Systems			*65*	*19,900,051*	*$68,912,170*	*$3.94*	*333,466*
Median for LRT Systems			*58*	*12,865,393*	*$51,528,512*	*$3.70*	*289,468*
Lane Transit District BRT	***Eugene-Springfield, OR***	***247,421***	***15.5****	***2,707,309***	***$5,583,993***	***$2.06***	***174,665***

*Average vehicle round-trip length
Source: APTA, NTD

Based on the updated comparison between light rail systems and LTD's BRT system the following information was updated from the 2008 WEEE report:

Light rail lines are typically corridor based and occur in larger communities. With the exception of a system in Buffalo, New York with an urbanized area population of 936,000 people, all metropolitan areas that have light rail have an urbanized area population of over 1,000,000 people. The data indicates that LTD's BRT system compares favorably with light rail systems. LTD's BRT system has a lower cost per boarding than the vast majority (92 percent) of the light rail systems listed in Table 2. LTD's cost per boarding is 52 percent of the average cost per boarding for the light rail systems listed in Table 2. LTD's BRT system is in the 24th percentile in terms of boardings per route mile, even though light rail systems generally have higher capacities. LTD's BRT system has lower operating costs as compared to the 23 light rail systems listed in Table 2.

The cost to construct BRT is a critical factor in implementing high capacity transit in the Eugene-Springfield area. Current data indicate that the costs to construct light rail systems range from $50 million to $100 million per mile. Bus rapid transit construction costs range from $3 million to $25 million per mile. Some data indicates that higher end bus rapid transit systems that more closely emulate light rail cost closer to $80 million per mile to construct. LTD's experience is that the cost to construct EmX averages nearly $13.5 million per mile. The average cost to construct LRT exceeds the financial capacity of the region.

In summary, key factors that make BRT a more appropriate high capacity transit mode than light rail for the Eugene-Springfield urbanized area are:

- The Eugene-Springfield urbanized area population is significantly smaller than any areas that have implemented light rail;
- The boardings per mile and average cost per boarding are competitive with the light rail systems listed in Table 2;
- The operating expenses for light rail would be cost prohibitive for LTD and the Eugene-Springfield area;
- The cost to construct light rail would exceed the financial capacity of the Eugene-Springfield area.

6. Conclusion

Based on the 1995 Urban Rail Feasibility Study and the 1999 Federal Major Investment Study, the Eugene-Springfield metropolitan region adopted a Regional Transportation Plan (RTP) in 2001, and updated the Plan in 2004 and 2007. The RTP identified BRT as the preferred transit strategy for the twenty-year plan horizon. The RTP identified a comprehensive 61-mile system comprised of 11 BRT corridors (attached as Appendix D). The general locations of the corridors, including the MovingAhead corridors, were identified in the approved plan.

LTD favored the BRT concept because it is appropriate in scale and cost for the Eugene-Springfield community size, it results in more efficient transit operation, and can be developed one line at a time, as warranted by community demand and as allowed by funding. This reasoning still holds true, as can be seen in Table 2, which compares LTD's BRT system to existing light rail systems throughout the country.

As Table 1 summarizes, the selection of BRT as the region's high capacity transit mode is the result of extensive analysis, public engagement, and policy maker discussion. This choice was a critical part of the region's intent to implement a transportation system that could effectively support its vision for future growth and development. Since the adoption of TransPlan in 2002, the region has continued to pursue the principles of compact urban growth along corridors supported with high-capacity transit, specifically BRT. During this time two BRT corridors have been successfully implemented and a third is under construction.

LTD's BRT service has been successful in increasing transit ridership along its corridors, and thus helping the region's communities achieve their visions for growth. With the City of Eugene's recently completed growth vision, "Envision Eugene," BRT is more fully integrated and identified as an essential tool for concentration of employment and residential growth along Eugene's key transit corridors. The MovingAhead project is a system-level approach to realizing BRT implementation in the region, building from the existing local and regional land use and transportation plans, including Envision Eugene.

Appendix A

Urban Rail Feasibility Study
Eugene/Springfield Area
Final Report

Prepared for:

Lane Council of Governments

This project is partially funded by a grant form the Transportation and Growth Management (TGM) Program, a joint program of the Oregon Department of Transportation and the Oregon Department of Land Conservation and Development. TGM grants rely on federal Intermodal Surface Transportation Efficiency Act and Oregon Lottery funds. The contents of this document do not necessarily reflect views or policies of the State of Oregon.

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Urban Rail Feasibility Study
Eugene/Springfield Area

Executive Summary

Introduction

The Urban Rail Feasibility Study, conducted by Lane Council of Governments (LCOG), in cooperation with the Oregon Department of Transportation (ODOT), defined the type of rail system that could be constructed at a conceptual level, identified when a rail system for Eugene/Springfield would be feasible based on cost and ridership estimates, and identified actions that could be taken now to make rail a success in the future. The results of this study are being incorporated into the update of the 2015 regional transportation plan, TransPlan.

A citizen advisory committee, formed as a subcommittee of the TransPlan public involvement effort, has directed this study by selecting the rail technology, evaluation criteria, and potential corridors for urban rail. The committee has also reviewed the analysis and recommendations for this study. This executive summary reviews the key assumptions that have been made in this feasibility study and presents the recommendations.

Rail Technology

Based on a review of the capacity, right-of-way requirements and costs of alternative rail technologies the Committee selected light rail transit (LRT) as the technology for consideration in this study. Some of the advantages of LRT over alternative technologies, such heavy rail or Automated Group Transit (AGT), for the Eugene/Springfield area are its flexibility to operate in lanes shared with traffic in different right-of-way configurations and its potential lower costs. It can also operate as a streetcar, serving local trips, or as a line-haul mode serving work and other regional trips. The Committee was also interested in considering diesel-electric vehicles, instead of electric vehicles, as another means to reduce capital costs.

Evaluation Criteria

To develop evaluation criteria, the Committee discussed financial feasibility, economic redevelopment, reducing congestion and other factors that were important to them in measuring the success of an urban rail system One of the key differences discussed was between the role of urban rail in addressing a regional transportation problem verses its role as a supplemental circulator for tourist and other non-work trip uses. Based on this discussion and considering the scope of the study, the committee selected eight criteria for use in evaluating urban rail. The consultant developed measures for use in applying the criteria in selecting the three corridors with the greatest potential for urban rail and in evaluating these corridors. The evaluation criteria used in the screening process and the corridor evaluation are:

- o Increases transit ridership
- o Reduces vehicle miles traveled.
- o Re-enforces desired urban form, linking land use, transportation, economic development and community livability
- o Contributes to overall air quality improvement
- o Minimizes traffic disruption
- o Provides and improves access to major activities
- o Creates intermodal transportation opportunities
- o Minimizes private property takings

Corridor Screening

The Committee identified 17 urban rail corridors, shown in Figure 1, and asked the consultant to identify the three corridors that meet most of the selection criteria and that represented a range of potential rail applications to the Eugene/Springfield metro area. Based on the results of the screening process, the committee identified the following three representative corridors for further evaluation:

- o Between Eugene and Springfield along Main/Franklin, with the understanding that further evaluation of the corridor could include analysis of Centennial Boulevard as an alternative alignment.

- o Some combination of the central Eugene corridor options with service to the edge of the U of O, Sacred Heart, downtown Eugene and an extension to serve nodes proposed by the TransPlan Land Use Measures (LUM) task force in the central area along either the Blair Line or Willamette.

- o Coburg Road, with the further development of services to increase the travel shed for this corridor.

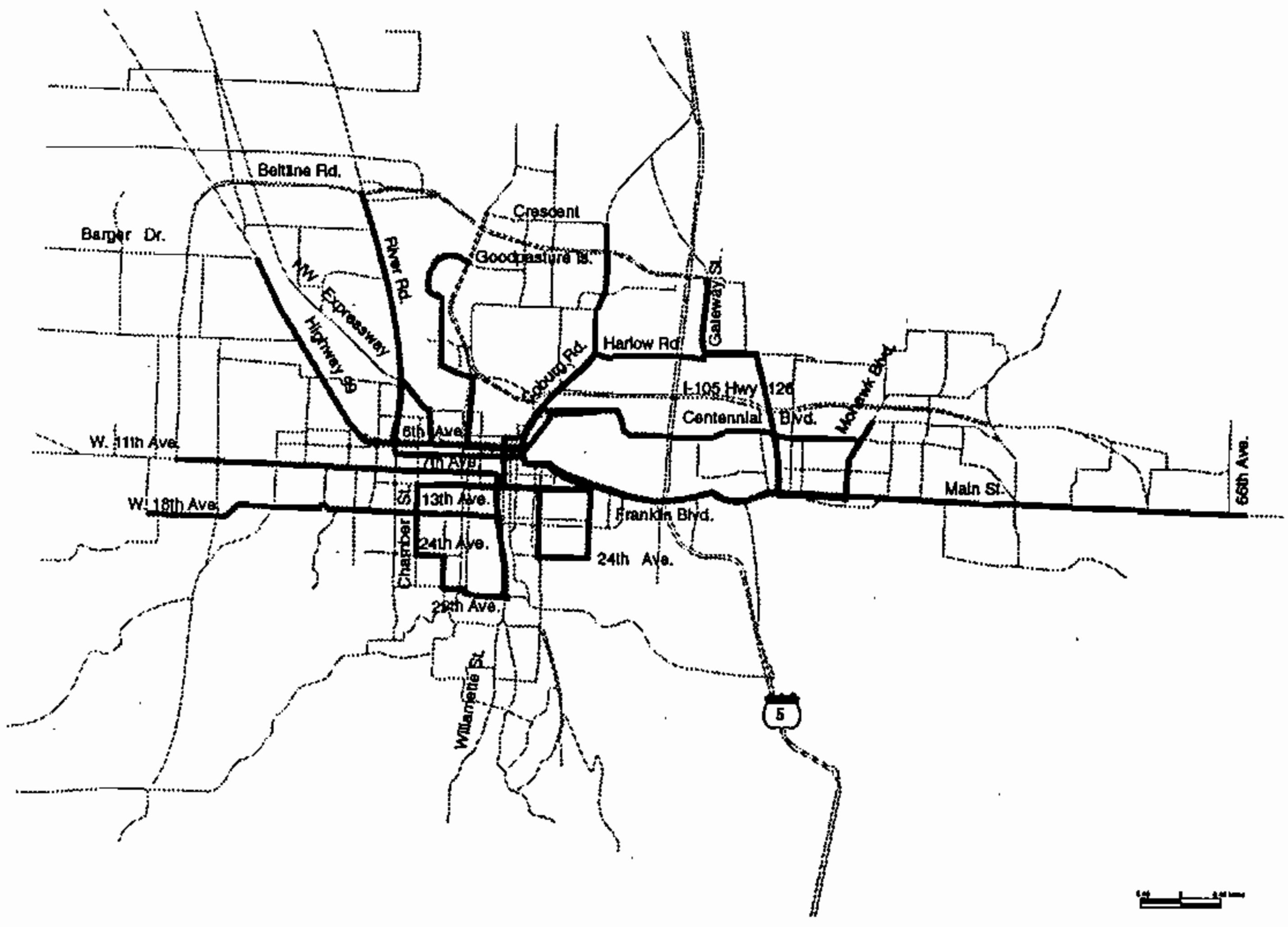
Based on this, the Committee further defined the corridors for use in estimating cost and ridership as follows:

- *o Downtown Loop (Figure 2),* serving the downtown employment and cultural areas, Sacred Heart Medical center, the U of O campus and established commercial and residential areas along 18th and Willamette. Beginning at the Amtrak station at 5th and Willamette, the route follows Willamette, East Broadway and Hilyard Streets to the U of O campus. Through the campus, the route follows on East 13th Street, University and East 15th right-of-way to Agate Street. The route continues on Agate Street, 18th Avenue and Willamette Street.

- *o Coburg Road (Figure 3),* serving the growing commercial and residential areas along Coburg Road as well as the downtown Eugene employment and cultural center along

Figure 1

Potential Corridor Alignments



Legend

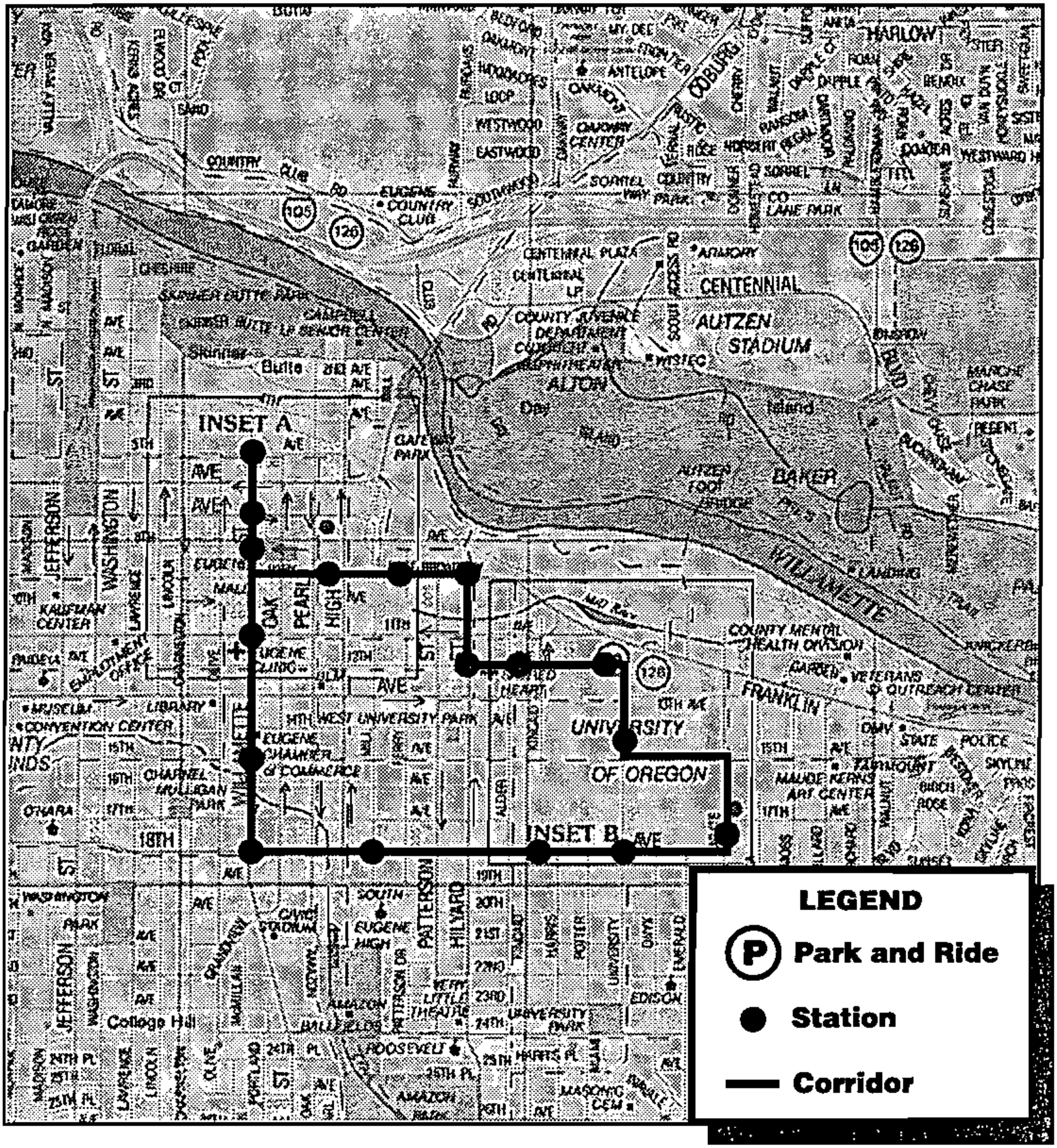
- Proposed Alignment
- Arterial Roads

BRW

LCOG Lane Council of Governments

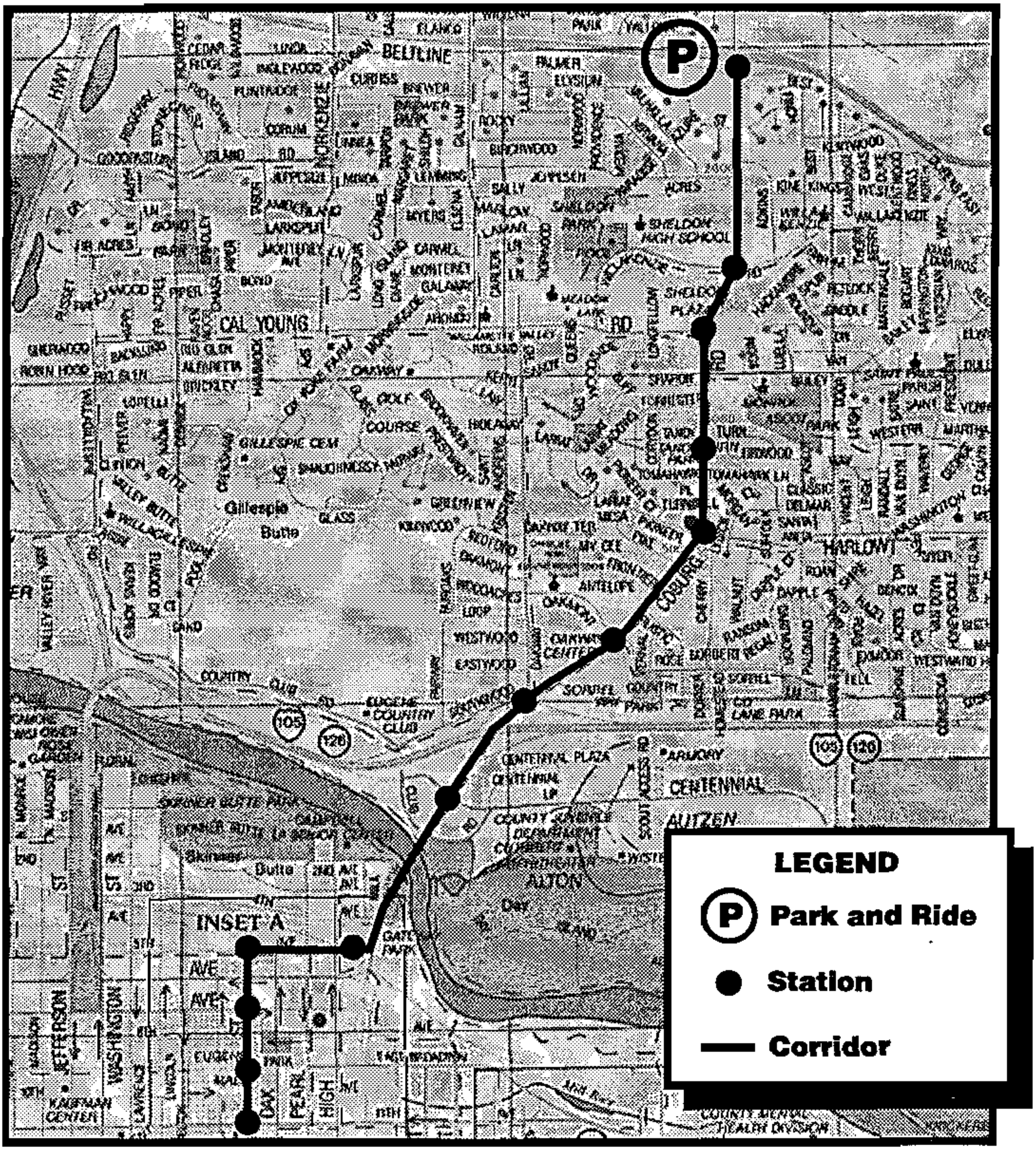
URBAN RAIL FEASIBILITY STUDY

Figure 2: Potential Corridor: Downtown Loop



URBAN RAIL FEASIBILITY STUDY

Figure 3: Potential Corridor: Coburg Road



Willamette Street. Beginning at Beltline Road, the corridor follows Coburg Road to the Amtrak station at 5th and Willamette and follows Willamette to East 11th Avenue past the LTD transit center. This corridor assumes use of a new bridge across the river in the vicinity of the existing Ferry Street Bridge.

- *Main/Franklin (Figure 4)*, connecting downtown Eugene with downtown Springfield with extensions to River Road to the west and to S. 58th Street at Main Street in Springfield to the east. Beginning at River Road near the intersection of the Northwest Expressway and the footbridge to Valley River Mall, the corridor follows 2nd Avenue and Blair Blvd., 5th Ave., Willamette Street, Broadway and Franklin Blvd in Eugene. In Springfield, the route follows Main Street and South A Street. It would serve the Amtrak station, the LTD transit center in downtown Eugene and be within a few blocks of the downtown Springfield transit center. A sub-corridor was also evaluated that ended at S. 14th Street in Springfield.

For all three corridors, the analysis assumes that stations would be located approximately every two blocks within downtown Eugene. Outside of downtown, stations would be located approximately every ½ mile. Park and rides lot, already being developed by LTD, would serve the ends of the corridors at River Road, Beltline Road and South 58th Street. Figures 2, 3 and 4 illustrate the three corridors, possible stations and park and ride locations.

The routings for each corridor are for evaluation purposes only as the basis for developing order of magnitude cost and ridership estimates. Any further consideration of LRT would need to include evaluation of alternative streets, right of way and terminus locations as well as operational configurations.

Corridor Evaluation

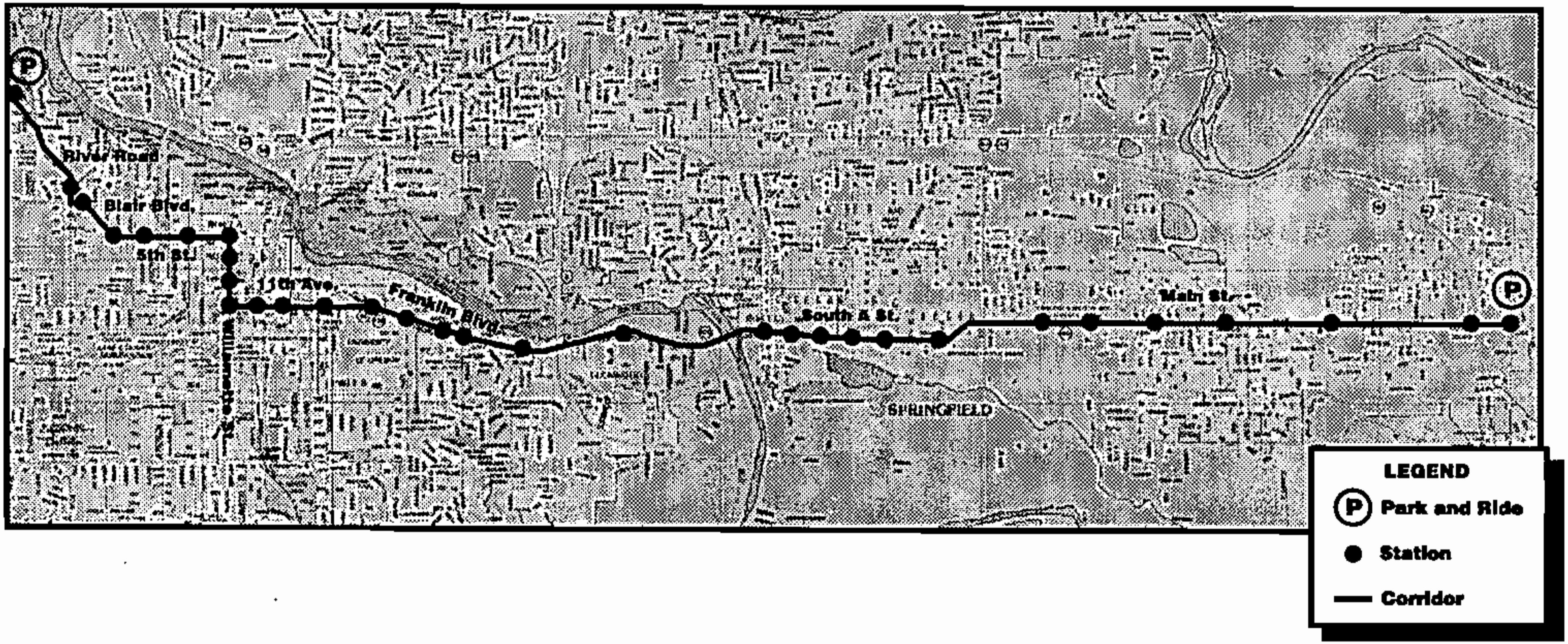
For these three corridors, the consultants developed conceptual capital, operations and maintenance cost estimates and potential ridership. For capital costs, the consultant developed two different types of estimates:

- *A Low-End Cost* that assumes single track and passing track, asphalt paving, limited traffic signal modifications, utility protection instead of relocation, used vehicles and a limited communications system.

- *A Mid-Range Cost* that assumes double track with pavers between tracks, traffic signal modifications for critical train movements and train pre-emption, utility relocation, new vehicles and a train-to-wayside communication system.

Though both systems were designed to operate at 10 minute peak headways, the use of a single track and passing track configuration would result in less reliability than a double-track system. In addition, because the low-end cost estimate does not include utility relocation, the system would be subject to closure for utility access. As a result, the mid-range system would be more

Figure 4: Potential Corridor: Main/Franklin and River Road



suitable for revenue-operation as part of the regional transportation system while the low-end system would be more suitable for a local or tourist-oriented system`. Based on these factors, the mid-range system is more likely to perform as a regional transportation solution than the low-end estimate. Both systems require modifications to existing traffic circulation patterns and on-street parking.

Using these assumptions, capital costs would range from $4.7 to $7.6 million per mile for the low end cost and $16.1 to $18.6 million per mile for the mid range cost, depending on the corridor. Table 1 summarizes these estimates.

Table 1: Low-End and Mid-Range Capital Cost Estimates (Includes construction, vehicles, contingency and project administration) (In Millions of 1995 dollars)

Corridor	Miles	No. of Stations	Low-End		Mid-Range	
			Cost	Cost/Mile	Cost	Cost/Mile
Downtown Loop	4.34	17	$29.5	$6.8	$74.2	$17.1
Coburg Road	3.34	13	$25.4	$7.6	$62.1	$18.6
Main/Franklin (S. 58th St.)	10.67	32	$49.5	$4.7	$171.8	$16.1
Main/Franklin (S. 14th St.)	6.56	24	$34.8	$5.3	$112.0	$17.1

Operations and maintenance costs, based on the experience with diesel-electric vehicles in Galveston, Texas, would range from $1.7 million for the Coburg Road line to $2.2 million for the downtown loop to $5.3 million for the Main/Franklin line annually. These costs assume that the urban rail would operate at roughly the same speeds as Lane Transit District buses today. Though operating costs would be lower if electric vehicles were used instead of diesel electric vehicles, capital costs, necessary for the catenary and substations, would be higher.

Ridership estimates were based on the number of trips with origins and destinations in the corridor and the potential for these trips to use transit, plus the additional ridership that could be expected from feeder bus and park and ride. A special factor, reflecting the attractiveness of transit was used in the ridership estimates to estimate a high end range. As a result, daily ridership in the range of 3,000 to 6,600 for the low end and 4,000 to 10,000 at the high end could be expected, as shown in Table 2. These estimates indicate that urban rail would not carry a significant share of traffic and would be much lower than the capacity that urban rail offers. The number of new riders, though not calculated specifically at this level of analysis, is likely to be low based on the limited reductions in travel time that are possible with LRT in shared traffic lanes.

Table 2: 2015 Low and High Estimated Daily Ridership			
Corridor	Length (miles)	Daily Ridership Low/High	Ridership/mile Low/High
Downtown Loop	4.34	3,300/4,900	760/1,130
Coburg Road	3.34	3,000/4,000	900/1,200
Main/Franklin (S. 58th St.)	10.67	6,600/10,100	620/950
Main/Franklin (S. 14th St.)	6.56	4,400/6,500	670/1,010

Conclusions and Recommendations
Frequent existing transit services in major corridors and planned nodal development are factors that support urban rail in the Eugene-Springfield area. If public right-of-way can be used, another favorable factor would be that rail could be constructed for less than $20 million per mile which is low compared to rail cost in other cities. However, projected 2015 ridership levels for the three corridors analyzed, assuming a continuation of current trends and development patterns, appear too low to be competitive with other cities seeking federal transit funding. A review of ridership in other cities that have successfully competed for federal funding indicates that ridership levels are roughly twice that projected for the Eugene/Springfield area.

As a tourist-oriented system, not intended to provide the frequent, reliable services that commuters require, lower cost urban rail could be developed but would still require major financial investments and modifications to the transportation system which may conflict with other transportation policies.

Based on these conclusions, this study recommends that the region act now to implement parking, land use and transit policies that will help increase future ridership potential and help ensure feasibility of urban rail in the future. These policies include:

- *Make long-term parking less available* by not increasing the supply and/or increasing the cost in downtown Eugene, Springfield, U of O campus, medical centers, Riverfront Research Park and other major employment areas. Parking alternatives, including peripheral or satellite parking and additional park and ride capacity, should be pursued. Higher parking costs and longer walking distances to parking are key factors that increase transit use.

- *Encourage trip-making activity along the major corridors and within the downtown region* by increasing densities in designated nodes, encouraging mixed-use commercial and residential development and encouraging in-fill development. Policies that help increase the number of trips made within a corridor and reduce the travel distances between these trip ends can lead to greater use of transit for trips to and within the corridor.

- *Adopt development design standards that support transit use*, including full street grids in residential neighborhoods that allow convenient and direct transit and pedestrian access and building orientation that makes access more convenient for transit and pedestrians than for auto. This will help make transit more attractive by reducing the total trip times for transit compared to auto.

- *Improve bus services to rapid transit standards in major corridors* by increasing service frequencies, improving bus speeds and offering convenient transfer connections between secondary level bus routes and the major bus corridor service. These improvements, which begin to replicate rail services, will help develop the corridor ridership that will eventually help justify the larger capital investment in rail.

- *Within central Eugene, where the ridership is not as easy to forecast as for the major commuter-oriented corridors, LTD should consider implementing a circulator service* that would replicate a potential streetcar route. The bus could be specially designated, such as a specially painted natural-gas operated bus. This would help indicate future ridership levels and help determine the most successful future rail route.

- *LTD should work with the Cities of Springfield and Eugene and the U of O to identify possible changes in traffic circulation and/or elimination of parking* to give transit priority, convenient access, and faster running times for service to the greatest concentration of employees. Much as the rail might utilize contra-flow lanes, the pedestrian mall, or travel through campus, these routings should be considered for bus. This will help give transit the priority over the auto that is necessary to attract new riders and qualify for federal funding.

- *A variety of other techniques that would increase the cost of using autos relative to the cost of using transit should be evaluated.* In addition to parking cost and availability, these could include increasing the gas tax, vehicle registration fees or even congestion pricing.

Urban Rail Feasibility Study
Eugene/Springfield Area

Introduction

Over the course of six months, Lane Council of Governments, in cooperation with Oregon Department of Transportation, has conducted a feasibility study of urban rail for the Eugene/Springfield area. The purpose of the study is to define when an urban rail system would be feasible for the area, the type of system that would be most appropriate for the area and actions that the community could take now to make the system more successful. Considered as part of TransPlan, the regional transportation plan for 2015, urban rail is intended to offer a viable transportation alternative to the auto.

This final report revises and incorporates previous draft reports into one document. These three reports are:

- **Alternative Urban Rail System Background Report**, describing alternative rail systems.
- **Potential Rail Corridor Screening**, describing the potential corridors that were considered for rail, the evaluation criteria, the screening process and the recommendations for three representative corridors for further evaluation.
- **Corridor Evaluation**, describing the three representative corridors in more detail, the methodologies and results of the cost and ridership estimates, suggested policies that would make rail more feasible and findings, conclusions and recommendations.

Each report is reproduced here in its entirety, including appendices.

A citizen committee, formed as a subcommittee of the TransPlan public involvement effort, has been responsible for reviewing study methods and results and guiding the study by selecting, for the purposes of this study:

- Rail technology,
- Evaluation criteria,
- Potential urban rail corridors
- Three representative corridors for further evaluation.

This final report documents these key decisions.

I. Background Report

Alternative Urban Rail System Background Report

Introduction

Lane Council of Governments (LCOG), in cooperation with Oregon Department of Transportation, is conducting a feasibility study of urban rail for the Eugene/Springfield area. This study will identify when a rail system for Eugene/Springfield would be feasible, define the type of rail system that could be constructed at a conceptual level and identify actions that can be taken now to make rail a success in the future. LCOG will include the results of this study in the update of the regional transportation plan, TransPlan, which is currently underway. A citizen committee, formed as a subcommittee of the TransPlan public involvement effort, is responsible for reviewing study results and making recommendations for the urban rail feasibility study.

This report presents background information on alternative urban rail systems for use by the Citizen Advisory Committee in selecting an appropriate rail technology for evaluation in the Eugene/Springfield Urban Rail Feasibility Study. It also reviews typical costs and financing mechanisms that have been used in construction and operation of rail systems in the United States. Descriptions of both urban rail technologies and financing mechanisms are based on information available from the U.S. Department of Transportation (USDOT), rail manufacturers and transit agencies.

This report is organized into two sections:

- o Urban Rail Technologies, and
- o Financing Mechanisms.

The focus of the urban rail technology section is on the general technologies that have been constructed in urban areas and not on details of vehicle designs, propulsion and control systems. Such details can be evaluated more thoroughly after the Advisory Committee selects the location and timing of the rail system.

The focus of the financing mechanisms section is on describing existing federal and local funding sources, local matching requirements and on examples of successful private funding contributions. It does not identify the potential for financing a Eugene/Springfield urban rail system.

Urban Rail Technologies

This section presents information on the operating environment, vehicle characteristics, system performance and costs for the following urban rail technologies:

- o Automated Guideway Transit (AGT), which can function as a circulator or line-haul system.
- o Light rail transit (LRT), including both urban streetcars and long-haul transit services.
- o Heavy rail systems that operate in their own right-of-way without traffic conflicts.

This section does not include commuter rail systems because they operate outside of the urban area focus of this study. These systems operate on existing railroad track shared with freight rail and typically connect suburban areas to the regional center.

The photos on the following page illustrate alternative LRT, AGT and streetcar systems.

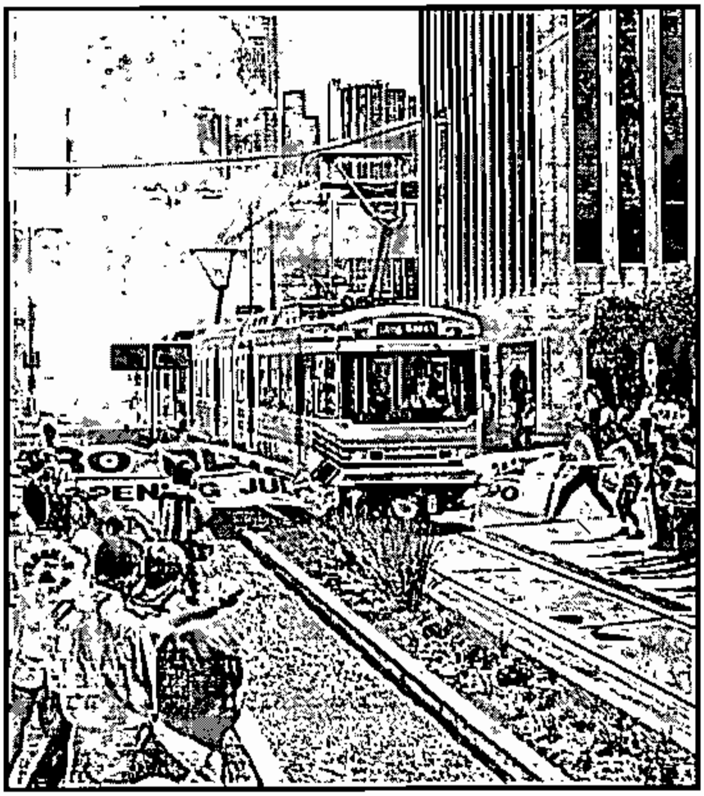
Automated Guideway Transit (AGT)

AGT is typically a grade-separated, automatically operated (driverless) rail mode. AGT systems can be designed to utilize small vehicles which accommodate only a few passengers or larger vehicles which are more comparable to light rail vehicles. Vehicles can be connected into trains for additional capacity. AGT operated with small vehicles serves as a people mover. Using larger vehicles, AGT serves as line-haul comparable to light or heavy rail.

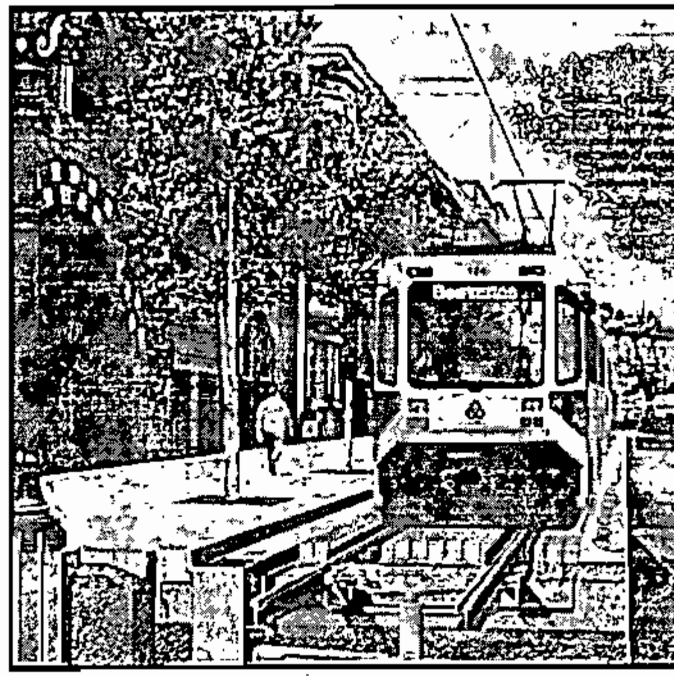
AGT technology is proprietary. Clients purchase a complete system from the manufacturer that includes guideway, stations, vehicles and control systems. Major manufacturers of AGT systems include MATRA, UTDC and Westinghouse. Examples of the UTDC system include Skytrain in Vancouver B.C. and the Scarborough Line in Toronto, which both operate in a line-haul capacity; and the Detroit system, which operates on a single track loop as a downtown circulator. The most recent MATRA example is the double track, 3.5 mile system at Chicago O'Hare Airport, which circulates between terminals and parking. Westinghouse operates the circulator systems at SeaTac Airport, in Las Vegas and in downtown Miami.

Operating Environment/Alignment

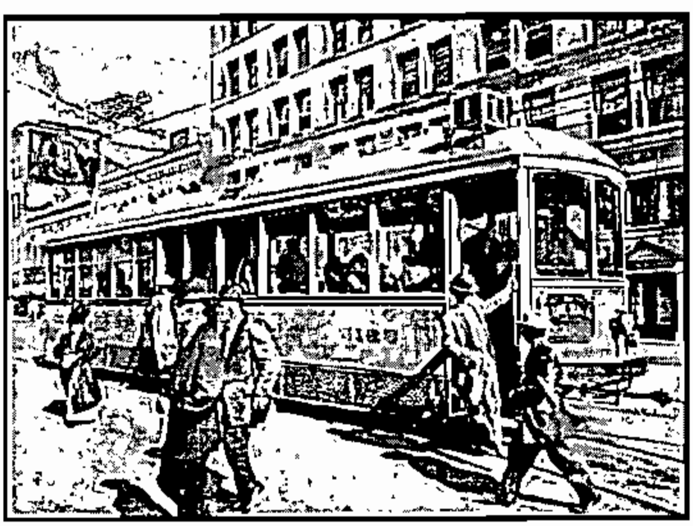
Because of the smaller vehicles, AGT guideways can be lighter weight and stations can be smaller, which allows the system to integrate with buildings and other urban areas. AGT systems operate in a variety of environments including within buildings, such as airports, at-grade, in tunnel, or on an elevated structure.



The Blue Line is the Los Angeles to Long Beach LRT with semi-exclusive right-of-way.



Portland's MAX LRT with shared street right-of-way.



A historic streetcar in San Diego, with center street boarding.

Automated Guideway Transit (AGT) circulating within Chicago's O'Hare Airport terminals and parking.

The AGT guideway is typically concrete and/or steel, shaped to accommodate the guidance system of the vehicle. Examples include the "straddle beam" monorail in Seattle and "Skytrain" in Vancouver, British Columbia. Guideways must be exclusive, totally separated from other traffic. AGT can operate as a one-lane or two-lane system. For a one-lane system, AGT must operate in a shuttle mode or have passing sidings at terminals or along the alignment.

AGT stations can be on or-off line. On-line stations are located adjacent to the guideway. Off-line stations are located on a spur from the main guideway to provide more direct access to a particular activity center, building or other destination. Most AGT stations are on-line.

Typical right-of-way and alignment requirements, based on currently operating AGT systems, are:

Right-of-Way	
Single lane guideway	8 - 16 feet
Double lane guideway	16 - 35 feet
Station	33 - 60 feet
Minimum horizontal curvature:	16 - 180 feet
Maximum grade:	5 - 10 %

Vehicle Characteristics

AGT vehicles are typically smaller than LRT vehicles but can offer comparable passenger capacity. Differences in the size and capacity of vehicles, by different manufactures, are shown below:

	MATRA	UTDC	Westinghouse
Width	7.2 - 8.4 feet	8.2 feet	5.7 - 9.2 feet
Height	10.7 - 11.5 feet	10.3 feet	7.7 - 11.2 feet
Length	45.3 - 84.8 feet	41.7 feet	11.8 - 38.7 feet
Weight	41,100 - 65,240 lb	34,030 lb	2,940 - 32,450 lb
Capacity			
- Seated	8 - 68	30	0 - 34
- Standing	49 - 164	70	6 - 103
- Normal load	57 - 124	100	12 - 137
- Maximum load	85 - 208	140	18 - 171

These systems are designed with vehicle and station platform floors at the same height, making the system fully accessible to wheelchairs.

System Performance

Minimum headways in practice are currently 1 to 6 minutes for AGT systems.

System Cost

Capital and operating costs can vary significantly between systems and depend on the amount of at-grade, tunnel or elevated structure. Capital costs are comparable to other rail systems for similar guideway structures and stations. Average system costs for guideway and stations can range between $20 million to $80 million per mile.

Operating costs benefit from the driverless vehicles, which reduces labor costs. However, the automated system has been known for requiring more skilled labor for maintenance and additional labor for station and vehicle security.

Light Rail Transit (LRT)

LRT is typically an at-grade rail mode with an overhead electric power source. LRT can operate in a lane shared with other traffic, in a lane adjacent to traffic or in an exclusive right-of-way. Short segments of a light rail alignment may be grade separated, either in tunnel or elevated. Passenger capacity of a single light rail vehicle ranges from one to three times that of a standard bus. Vehicles can operate singly or be connected into trains of up to four vehicles for additional capacity.

Light rail is a flexible technology since it can be adapted to a variety of operating environments and passenger capabilities. With station spacing 1/4 mile or less, LRT functions as a streetcar, particularly in downtown areas. With station spacing of up to 1 mile or more along a corridor, LRT functions in a line-haul mode. With three or four car trains, LRT can function as a high capacity system comparable to a heavy rail or other completely grade separated technology.

The Portland area's LRT illustrates LRT flexibility. MAX operates in shared street right-of-way in downtown Portland, in exclusive right-of-way along I-84 and in semi-exclusive right-of-way along Burnside Street. With a replica of a historic trolley, the same track and catenary are used for a vintage trolley system between downtown Portland and Lloyd Center.

The following describes the operating environment and alignment requirements, vehicle characteristics, system performance and average system costs for LRT.

Operating Environment/Alignment

Right-of-way requirements depend on whether the system is single track or double track and if the alignment is exclusive or shared with traffic. Light rail typically operates on a two-track alignment, although in locations where higher capacity is not needed, single track segments with passing sidings are sometimes used. The distance between tracks varies depending on vehicle width and location of electrification poles. Additional right-of-way is needed for stations and other facilities such as signals and substations. Additional right-of-way may be required for maintenance of way equipment if access from an adjacent roadway is not possible.

Typical LRT right-of-way requirements are:

Single track	16 - 25 feet
Double track	24 - 35 feet
Station with single track	25 - 30 feet
Station with double track	36 - 60 feet

Established guidelines for minimum horizontal and vertical curvature and maximum percent of grade determine the light rail alignment. Vehicle type must be coordinated with these physical requirements such as curvature and grade to ensure comfortable ride quality and efficient operation. Established guidelines are:

Minimum horizontal curvature:	40 - 100 feet
Maximum Grade:	4% - 10%

Vehicle Characteristics

LRT vehicles typically run on electric power with an overhead catenary system although the vehicles can be fitted to run on diesel engines as the streetcar system in Galveston Texas does. By using diesel engines, the streetcar system avoids the capital investments of overhead wires or other external power sources. Depending on the level of service provided, localized air quality may be worse with diesel engines than with traditional electrical power. Diesel engine vehicles could likely be further improved with fittings to run on compressed natural gas (CNG) or other alternative fuels. With the exception of costs, factors affecting the development of diesel or electric system would be the same.

LRT vehicles have the flexibility to operate in a variety of urban environments. Different vehicle types include single-unit or articulated vehicles, single or double-ended vehicles, and offer low or high platform boarding. These characteristics are described below.

Single-unit and Articulated Vehicles: Single unit vehicles typically have four axles, while articulated vehicles typically have six axles, or, with double articulated vehicles, eight axles. Articulated vehicles provide greater capacity and since they bend at the articulation point, they can negotiate tighter horizontal curves. Single unit vehicles tend to be narrower and shorter than articulated vehicles and lighter weight. Typical ranges and vehicle dimensions are listed below:

	Single Unit Vehicles	Articulated Vehicles
Width	8.5 - 8.7 feet	7.5 - 10 feet
Height	10.8 - 12.2 feet	10.4 - 12.5 feet
Length	50 - 70 feet	75 - 96 feet
Weight	57,000 - 70,000 lbs.	71,800 - 98,000 lbs.

A streetcar system could use any light rail vehicle or a narrower vehicle which is common in European systems. These vehicles, 7.5 to 8.0 feet in width, can provide comparable passenger capacities as wider vehicles and may be more appropriate in areas where right-of-way and turn movements are restricted.

Single and Double-ended: LRT vehicles are either single or double ended. Single ended vehicles can be operated from one end only and require a terminal loop track or reversing wye. Double ended vehicles can be operated from either end and can operate from a stub-end track terminal, giving flexibility for operating in a constrained environment.

Boarding and Alighting Options: Recent federal legislation requires that vehicles be accessible to mobility impaired individuals. To avoid steps which preclude access to individuals who are mobility impaired, LRT systems use high station platforms, low platforms with lift equipment to raise the passenger to the level of the vehicle, or low platform vehicles.

High platforms are at the same level as the vehicle entrance. In addition to improving access for the mobility impaired, they also improve the speed and convenience of boarding for all passengers although high platforms, including the access ramp to the platform, can present an obstacle to the station area given their height and size.

Two types of low floor vehicles that are currently in operation are the partial low floor vehicle and the full low floor vehicle. Both vehicles can be boarded at the same level as the sidewalk. Partial low floor vehicles provide a low floor section in the vehicle and leave other areas accessible via steps. The disadvantage with this design is that the mobility impaired individual must board and alight at one location and is limited to one section of the vehicle. Also accommodation of wheelchairs or strollers can be limited. Full low floor vehicles provide a continuous low floor which better accommodates mobility impaired individuals and those in wheelchairs. This technology is currently advancing and several models have been produced.

Vehicle Performance

Performance characteristics vary according to physical characteristics and light rail vehicle design. Horizontal and vertical curvature, grade, vehicle weight and traction power all govern speed. The speeds of traffic adjacent to LRT also affect LRT speed. Specific performance characteristics can be specified for cases where typical vehicle operating characteristics do not adequately meet local requirements. Examples of vehicles developed with special performance characteristics include the Philadelphia "City" light rail vehicles, which have a higher than typical maximum braking rate, and vehicles built for operation in Pittsburgh and Stuttgart which can operate on longer and steeper than average grades. Examples of average vehicle performance characteristics are:

Maximum Speed	34 - 60 mph
Nominal Voltage	600, 650, 750 Vdc
Acceleration	3.28 - 4.40 ft/sec^2
Deceleration	
- Service	3.94 - 5.87 ft/sec^2
- Maximum	6.10 - 9.84 ft/sec^2

Average System Cost Data

A typical range, presented below, reflects recently constructed LRT systems and costs that could be expected for new construction:

Item	Typical Range
Guideway/station ($ million/mile)	25 - 45
Station, surface ($ million each)	.7 - 2
Operating/Maintenance ($/ per vehicle hour)	65 - 165

The guideway/station category includes guideway, station and other civil construction costs. The variance in guideway costs is primarily due to right-of-way cost and the amount of grade separation. Systems implemented in excess street or railroad right-of-way, such as San Diego or Sacramento, usually exhibit lower guideway capital costs. For elevated alignments, typical costs can be twice that of at-grade alignment costs while typical tunnel alignments costs can be three to five times that of at-grade costs.

Station costs are for at-grade stations. Elevated or below grade stations are significantly more expensive. Provision of access for the mobility impaired to grade separated stations, with elevators, further adds to construction costs.

Operating and maintenance costs vary depending on ridership demands and local expenses. A range in operating cost of $65 to $165 per vehicle hour is typical for newer at-grade light rail systems.

Other examples of LRT system costs are shown on the following page.

Data for Selected US LRT Systems

City	Year of Opening	Length (miles)	Capital Cost ($ million)	Daily Patronage	Capital Cost/Daily Passenger	Capital Cost Per Mile ($ million)
Baltimore	1992	22.5	$ 484[2]	19,000	$25,500	$ 21.5
Buffalo	1985	6.5	729	29,900	24,400	112.2
Dallas[1]	1996	20.0	840	35,000[3]	24,100	42.0
Denver	1994	5.3	116.5	14,000[3]	8,300	22.0
Los Angeles (Blue Line)	1990	21.6	935[2]	38,000	24,600	43.2
Minneapolis-St. Paul[1]	1998	11.0	474	33,700[3]	14,100	43.1
Newark-Elizabeth[1]	1999	8.8	571	23,400[3]	24,400	64.9
Pittsburgh	1985	25	709[2]	29,000	24,500	28.4
Portland, OR (Stage 1)	1986	15.1	278[2]	25,000	11,100	18.4
Sacramento	1987	18.1	218[2]	22,400	9,700	12.0
San Diego (South Line)	1981	15.9	180[2]	45,000	4,000	11.3
San Jose	1987	19.5	622[2]	19,700	31,600	31.0
St. Louis	1993	17	350	26,000	13,500	20.6

(1) Planned system
(2) Adjusted to 1993 dollars with Federal Reserve Board and National Average C.P.I. Annual Rates of Inflation
(3) Forecast

DATA SOURCE: TRANSIT OPERATING AGENCIES AND BRW.

Heavy Rail

Heavy rail (rail rapid transit) serves as a significant peak hour travel mode for trips to the regional center in large cities of one million people or more. It provides higher capacity than other transit modes, with increased costs and implementation difficulty. Speed, service reliability, and the ability to alleviate street congestion make heavy rail desirable. The start-up costs and equally high expansion costs prohibit heavy rail from being feasible in smaller cities.

Heavy rail requires a larger investment, since it is necessary to build a fully grade-separated guideway. Thus, heavy rail routes are typically built to serve corridors with very high demand. To effectively operate heavy rail, grade separations must occur at all crossings; grade separation facilitates the higher speeds and better service necessary to justify the larger investment. Heavy rail often operates partially underground, particularly in the CBD. However, this increases the costs from three to five times that of at-grade. Elevated construction is an option with heavy rail, though this also increases the costs over at-grade.

The differences between light rail and heavy rail have been becoming less noticeable, as light rail systems have begun to have underground routes, high platforms and fully separated rights-of-way, and heavy rail has employed an overhead catenary power collection in place of a third rail. The difference that has continued to distinguish heavy from light rail is capacity. Typical heavy rail trains consist of 8 to 10 car trains, with a total of about 500 seats and a maximum capacity of about 1,800 people per train. Power for heavy rail is collected through a third rail or overhead catenary.

Examples of heavy rail systems include BART in the San Francisco Bay area and the Washington D.C. Metro.

Summary of Alternative Urban Rail Technologies

Advantages and disadvantages for AGT, LRT and Heavy Rail technologies include:

AGT Advantages:

- o High service levels with frequencies of 1 to 6 minutes
- o Changes in demand can be easily accommodated
- o Smaller stations can be constructed
- o Small lightweight guideway
- o Lower labor costs
- o Can circulate in congested activity centers or areas where walking is difficult or unattractive

- o Clean, quiet and non-polluting operation

AGT Disadvantages:

- o High capital cost of vehicles, guideway and control system
- o Perception of decreased passenger security
- o Long system restart time if a vehicle component fails
- o Higher guideway maintenance costs
- o Requires specialized labor skills
- o Availability of electric power may be a constraint in remote areas
- o Proprietary system restricts options for system expansion to original supplier

LRT Advantages:

- o Offers range of capacity, depending on system design
- o Guideway and vehicle flexibility allow system to be designed to fit urban environment
- o At-grade visibility allows easily recognizable route and boarding points
- o Quiet, non-polluting
- o Easy boarding and alighting possible
- o Adapts to increased demand with marginal increase in operating and capital costs

LRT Disadvantages:

- o Requires specialized maintenance for vehicles and infrastructure for transit agencies
- o Fixed route cannot easily be changed
- o Requires power supply and substations
- o Overhead wires and support poles may be perceived as visually intrusive

Heavy Rail Advantages:

- o Offers high capacity

- Operates at faster speeds

Heavy Rail Disadvantages:

- Third rail (electric) eliminates flexibility to share right-of-way
- High cost

Financing Mechanisms

The focus on the review of finance mechanisms is on those that have been successfully used for other urban rail systems and that are still available under current laws. What has worked in the past should only be seen as a guide to financing possibilities in the future. Depending on when the urban rail system in Eugene/Springfield were constructed, a different set of conditions and requirements may be in place.

This section describes financing that is available and has been used successfully from the federal and local levels, private financing and farebox revenues. It also describes a successful planning and programming process for achieving federal funding, as identified by USDOT. The descriptions include some examples of projects that have been funded with each financing mechanism.

Federal Financing

Most rail projects in the United States currently being developed receive some federal funding. The share of federal financing for rail projects is negotiated between the local lead agency and Federal Transit Administration (FTA). Tri-Met's Westside project, for example has received 75% federal financing with a 25% local match. Tri-Met is seeking a 50% federal match on the south/north LRT.

Under the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, three general categories of financing for rail projects are available:

- o Section 3 Discretionary and Formula Capital Program (Title III) which funds "new start" rail systems,
- o Surface Transportation Program (Title I) funds, which can be transferred for use on transit projects, and,
- o Congestion Mitigation and Air Quality Improvement Program (CMAQ).

The following describes these programs and examples of projects recently funded through these sources.

New Starts Program: For the 6 year period which ends in 1997, Congress authorized $5 billion for the new starts program. The matching ratio for transit capital projects is legally up to 80% Federal to be consistent with highway projects funded through the Federal Highway Adminstration (FHWA), however, most agencies seek about 50%. According to USDOT, new starts projects must meet criteria that they are:

- o Based on the results of alternatives analysis and preliminary engineering;

- o Justified based on mobility improvement, environmental benefit, cost effectiveness and operating efficiency; and

- o Supported by an acceptable degree of local financial commitment.

Most rail construction projects receive some new start funds. Examples in Oregon include Tri-Met's Westside Light Rail Project and Hillsboro Extension, both of which received federal funding through the New Starts Program.

Surface Transportation Program: STP funds can be transferred from FHWA to FTA for transit projects at state and local discretion. The USDOT distributes Surface Transportation Program funds according to a formula with 80% for general purpose projects, 10% to safety projects and 10% to transportation enhancement projects. Distribution of general purpose funds follows a formula for allocation by population.

According to guidelines published by USDOT, opportunities for using STP flexible funds include:

- o Purchases of vehicles and other transit equipment
- o Construction, rehabilitation, and/or improvements of fixed rail systems and other transit facilities
- o Programs for improved public transit and most other transportation control measures
- o Transit and transit-related planning, research and development activities
- o Transit safety improvements and programs
- o Car/vanpool projects
- o Construction of pedestrian walkways and bicycle transportation (though not recreation) facilities

Expenditure of Transportation Enhancement funds is limited to enhancements to new or existing transit facilities, such as landscaping or the improvement of pedestrian access, and any type of preservation, rehabilitation and operation of legitimate historic transit facilities.

The limited size of funding available and the competition for use of flexible STP funds has resulted in greater use of these funds as supplements to other transit projects rather than rail construction. An example is the use of $555,000 in Transportation Enhancement funds in Michigan for the renovation of the Historic Union Station Intermodal Facility.

Congestion Mitigation and Air Quality Improvement (CMAQ) Program: The purpose of the CMAQ program is to help states meet Federal air quality standards for ozone and carbon monoxide. The funds must be spent in a State's non-attainment areas. The Eugene/Springfield area is in the process of becoming an attainment area and, as such, would no longer be eligible for CMAQ funds.

Based on guidelines developed jointly by FTA and FHWA, CMAQ funds could be used for projects that reduce emissions such as:

- o Transit system expansions and improvements which are projected to increase ridership
- o Operation costs for new transit services up to a maximum of two years
- o Project planning or development of facilities that will improve air quality
- o Projects required to develop and establish management systems for public transportation facilities and equipment

Examples of projects that were funded using CMAQ funds include the design and construction of a busway ($17.3 million), project development/environmental analysis of east/west rail line and intermodal center ($8.5 million) and the Metrorail extension to the Palmetto Expressway ($33 million). These three projects were in the Miami area.

Local Match

Even with federal funding, the local match for rail construction projects can be 50% or more. Rail projects have relied on a variety of sources for achieving the local match, including:

- o Sales tax increases dedicated to transportation at the County level as enabled by California State legislation.
- o Bonding based on property tax increases as in the Portland Metro area.
- o Local sales tax increases for transit within a transit district, as enabled by Washington State legislation
- o State contributions, as was made by Oregon for Westside light rail.
- o Local contributions in kind, such as publicly owned right of way. St. Louis donated an abandoned railway tunnel as a local match.

In these cases, securing the local match has required state budget approval, changes in state legislation and/or a public vote.

Few examples exist of financing rail construction entirely with local dollars. The best known case is probably in San Diego, where the City's first light rail line, between downtown San Diego and the Mexican border, was constructed with non-federal funds. For extensions to the system, San Diego has successfully applied for New Starts Program funding.

Private Financing

Over the past 20 years, many examples of private sector involvement in financing rail stations and operations have emerged. Much of this financing has come in the form of joint development, with private sector sharing in the capital costs with the public sector in recognition of the enhanced real estate development or market potential created by the siting of the transit facility. Examples of private sector participation include:

- o Contributing revenues to the transit agency by:

  - leasing space in a station,
  - leasing space along rights-of-way, maintenance, parking, yards and other non-station

sites;

- purchasing or leasing the right to connect to a commercial building directly into a station; or,
- special assessments against properties within a station area.

o Sharing in the cost of the station by contributing to the renovation, construction or upgrading of the transit facility in exchange for some form of development bonus, such as higher allowable densities or variances on permitted land uses.

Studies have shown that the value of capital contributions, while significant if examined on a one-time basis, have ranged from .5% to 3% of on-going capital expenditures. Annual income payments have tended to be smaller than capital contributions and have typically accounted for less than 1% of annual operating expenses. Most of the examples of involvement by the private sector have occurred in major cities around heavy rail projects such as New York City, Washington D.C. and Philadelphia.

More local examples of private sector financing include:

o The Vintage Trolley Project in Portland, where downtown merchants contributed financially to a trust fund for operation of a vintage trolley system over existing light rail tracks between downtown Portland and the Lloyd center area.

o The Downtown Seattle Tunnel Project, where adjacent businesses formed a Local Improvement District (LID) to help fund the capital cost of the tunnel.

o The MAX project in downtown Portland developed an LID to enhance the light rail with art and other higher quality finishes.

Successful Planning and Programming

Though not a federal funding requirement, USDOT indicates that successful transit agencies who received flexible STP funds used successful planning and programming processes which:

o showed that their projects were based on a transportation plan and were included in a transportation improvement program

o developed a cooperative relationship with other transportation service providers and decision-makers,

o were active in the Metropolitan Planning Organization (MPO) planning and programming process.

Farebox Revenue

It is common for transit systems to subsidize the rail operating costs. Though higher fares can be collected on rail systems that provide faster and more reliable service, these fares are still unlikely to cover operating costs entirely. As a percentage of operating costs, farebox revenues vary widely. Recovering 30% to 50% is common, with 80% to 100% in rare cases.

Summary of Financing Mechanisms

- Urban rail systems that have been successfully funded in the past have relied on a variety of funding sources.
- Local match requirements by the federal government and the strong competition for federal funds means that financing programs increase the importance of securing solid local support.
- States and transit districts have employed a variety of techniques to raise taxes for rail construction, which have required changes in state legislation and/or a public vote.
- Creative private financing has been used to help fund rail systems but is not significant enough of a contribution to be more than one of many sources.
- Being part of the regional and local planning and programming process is important.
- Farebox revenue will not cover operating costs.

II. Potential Rail Corridor Screening

Potential Rail Corridor Screening

Introduction

Lane Council of Governments (LCOG), in cooperation with Oregon Department of Transportation, is conducting a feasibility study of urban rail for the Eugene/Springfield area. This study will identify when a rail system for Eugene/Springfield would be feasible, define the type of rail system that could be constructed at a conceptual level and identify actions that can be taken now to make rail a success in the future. LCOG will include the results of this study in the update of the regional transportation plan, TransPlan, which is currently underway. A citizen committee, formed as a subcommittee of the TransPlan public involvement effort, is responsible for reviewing study results and making recommendations for the urban rail feasibility study.

In three meetings, the Citizen Advisory Committee has made several critical decisions affecting the course of the feasibility study. They have selected:

- o Light Rail Transit (LRT) as the rail technology for this evaluation.
- o 17 potential corridors for evaluation.
- o Evaluation criteria.

Using the results of the potential corridor screening process, the Committee will select three potential corridors for further evaluation of rail feasibility.

This report documents the LRT technology, criteria and potential corridors identified by the Committee, presents the results of the screening process and identifies three possible corridors for further evaluation. The report is organized to describe:

- o LRT assumptions for use in this study.
- o Evaluation criteria and measures.
- o Potential corridors and corridor definitions.
- o Results of the screening process.
- o Conclusions and recommendations for further corridor evaluation.

Rail Technology Assumptions

Light rail transit, selected by the Committee for use in the evaluation of urban rail feasibility, has several key characteristics which make it attractive for the Eugene/Springfield area. LRT can:

- o Function in a streetcar mode, serving people within an urban area with frequent

- o Function in a streetcar mode, serving people within an urban area with frequent stops, or in a line haul mode, connecting activity centers with less frequent stops.
- o Operate in existing rights-of-way either in a semi-exclusive or shared traffic lane as well as in exclusive right-of-way.
- o Provide low to high capacity, depending on vehicle size, train length and speed.
- o Offer an opportunity to use self-propelled, diesel-powered LRT vehicles, which could reduce system costs by not requiring electrical substations, catenary and poles.
- o Offer an opportunity, by using shared right-of-way, modest stations and platforms and one or two car trains, to have lower capital costs than other rail systems.

Based on LRT's flexibility and ability to integrate with the urban environment, the screening process has assumed that LRT could be designed to work in any of the potential corridors. Though assumptions for the screening process do not include specific LRT service frequency, station stop spacing, transit routing revisions, or other operational features, the Committee will develop such assumptions for the evaluation of the three corridors in the next evaluation phase.

Evaluation Criteria and Measures

The Committee selected eight criteria for use in the evaluation of potential rail corridors. Based on data availability, the consultant, working with LCOG and LTD staff, developed measures to apply to the criteria for the screening process and for the evaluation of the three corridors. To the extent possible, the screening and evaluation process use the same measures. Measures that the screening process did not consider, due to limited data availability and the large number of corridors, are transit ridership projections and right-of-way evaluations. These measures will be considered during the evaluation of the three corridors. Table 1 defines the criteria and measures with the measures that were used in the screening process shown in bold.

Table 1: Evaluation Criteria and Measures	
Criteria	Measures
1. Increases transit ridership	1a. **Travel demand along the corridor.** 1b. Potential new transit riders.
2. Reduces vehicle miles traveled	2a. **Travel demand along the corridor.** 2b. Potential new transit riders and trip length.
3. Re-enforces desired urban form, linking land use, transportation, economic development and community livability	3a. **Population along the corridor.** 3b. **Employment along the corridor.** 3c. **Potential disruptions to neighborhoods.** 3d. **Connections to proposed activity nodes.**
4. Contributes to overall air quality improvement	4a. Potential new transit riders. 4b. **Potential to offer alternative modes in congested traffic areas.**
5. Minimizes traffic disruption	5a. Availability of LRT right-of-way.
6. Provides and improves access to major activities	6a. **Number of major activity centers served.**
7. Creates intermodal transportation opportunities	7a. **Number of intermodal facilities served.**
8. Minimizes private property takings	8. Availability of publicly-owned right-of-way.

Corridor Definitions

A corridor is a travel shed, usually pie-shaped, that captures trip-making activity from the travel shed to the regional center. A corridor can include several alternative LRT alignments and the travel shed can become larger with connecting bus services and park and ride development.

The Committee identified 17 potential corridors, as described below, including specific streets, beginning and ending points. These descriptions, though more detailed than needed at the corridor level, allow the evaluation to address the ability of the corridor to meet specific criteria, such as service to major activity centers. By selecting one of these corridors for urban rail, evaluation of alternative alignments and combinations of fixed guideway, bus service and park and ride locations that can effectively serve a travel shed will be important prior to making major capital investments.

The corridors are summarized in Table 2 and illustrated in Figure 1. The appendix includes the full descriptions of the corridors that the Committee prepared.

Results of the Screening Process

This section summarizes the results of the screening process for each criteria, including a description of the screening methodology and the results for each corridor. Data analysis summaries are grouped together at the end of this section.

Increases Transit Ridership

For the screening process, total travel demand along the corridor was used to estimate the potential for increasing transit ridership based on the assumption that corridors with more travel demand have a greater potential to attract more transit riders than corridors with less travel demand. Actual increases in transit ridership would depend on relative attractiveness of LRT to auto trips and on how well the trip origins and destinations match the LRT location.

Travel demand along the corridor was determined by estimating the number of daily person-trips within 1/4 of a mile of the corridor using LCOG's production and attraction trip tables for projected 2015 travel demand activity. To help keep the analysis between corridors comparable, and, since specific alignments within the downtown are not defined, this analysis assumes that all of the travel demand in downtown Eugene would be accessible to LRT.

Table 3 presents the estimated daily travel demand along each corridor alignment for year 2015. The analysis indicates that the four corridors with the greatest travel demand activity are:

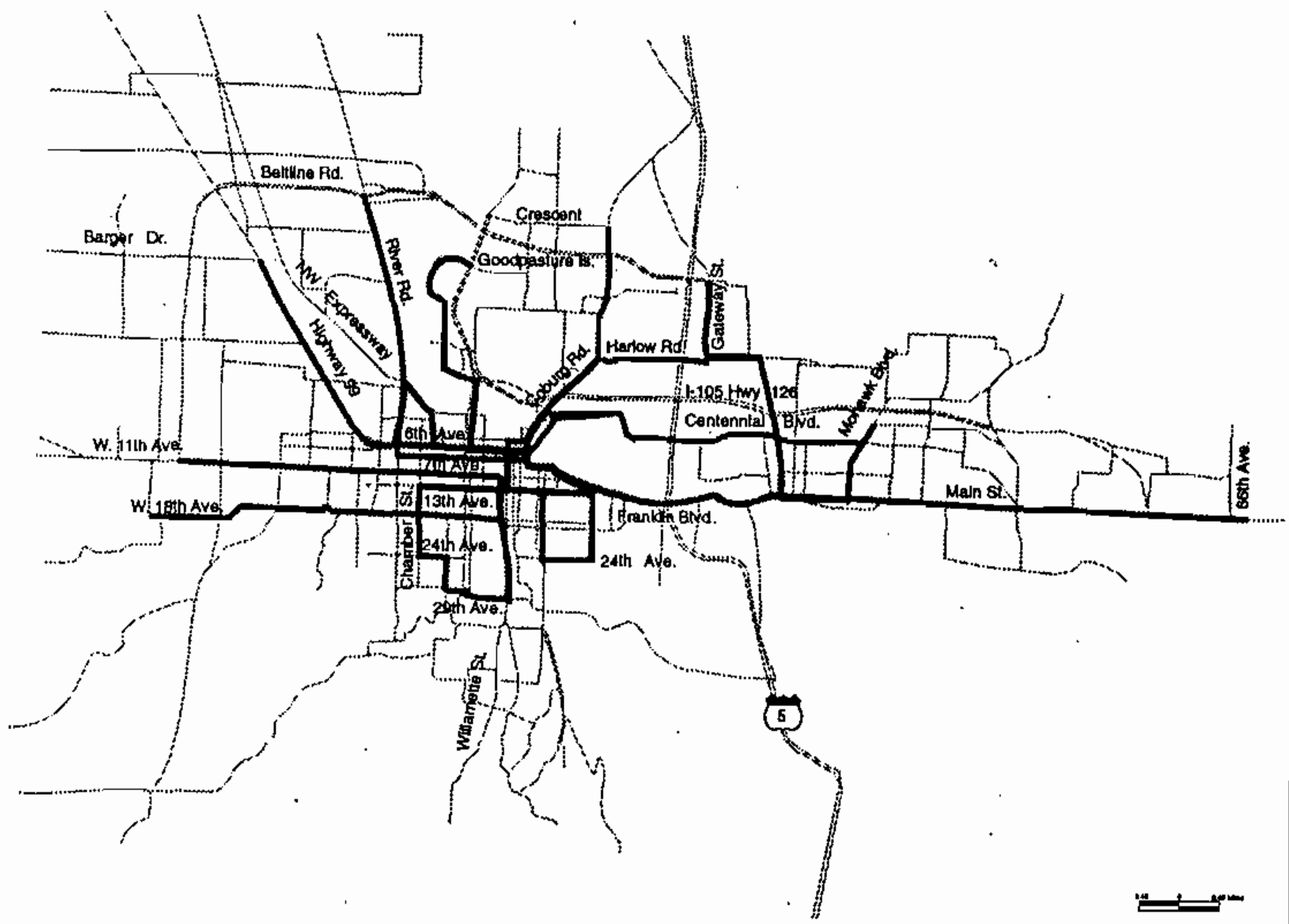
- Emerald RR Loop (51,400 trips)
- Main/Franklin (46,600 trips)
- UO Loop and College Crest Loop (each with 34,800 trips)

On a per mile basis, the following corridors rank highest:

- Downtown Line (15,000 trips/corridor mile)
- Willamette and UO Loop (9400 trips/corridor mile, each)

Figure 1

Potential Corridor Alignments



Legend

Proposed Alignment

Arterial Roads

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Table 2
Potential Corridors

Corridor Name		From	To	Via
1	West 18th	Willow Creek	Downtown Eugene	West 18th; Willamette
2	West 11th	Beltline	Downtown Eugene	West 11th
3	Highway 99	Barger Drive	Downtown Eugene	Hwy 99; 6th/7th
4	River Road	Santa Clara Square	Downtown Eugene	River Road; Division; 6th/7th
5	Goodpasture Island	Goodpasture Island	Downtown Eugene	Goodpasture Island Road; New bridge or Washington/Jefferson Street Bridge
6	Coburg Road	Cresent	Downtown Eugene	Coburg Road; New bridge
7	Gateway/Harlow	Gateway	Downtown Eugene	Harlow Road; Coburg Road; Ferry Street Bridge Corridor
8	Centennial	Mohawk Blvd	Downtown Eugene	Centennial; Ferry Street Bridge Corridor
9	Main/Franklin	69th/Main St	Downtown Eugene	Main Street, Franklin Blvd
10	Willamette	29th Avenue	Downtown Eugene	Willamette Street
11	UO Loop	U of O	Downtown Eugene	Willamette; 13th; Agate; 24th; Hilyard; 13th; Willamette
12	College Crest Loop	29th Avenue	Downtown Eugene	Willamette; 29th; Friendly; 24th; Chambers; 13th; Willamette
13	Blair line	River Road	Agate/Franklin	Chambers; 2nd; Blair; 8th Street; Riverfront to Agate/Franklin
14	Springfield Loop	Olympic/Mohawk	Gateway	Mohawk; 14th; Main; Pioneer Parkway; Hayden Bridge; Gateway
15	Emerald RR Loop	Autzen Stadium	Fairgrounds	Riverfront Research Park; UO; Sacred Heart Hospital; Downtown Eugene; Two river crossings; Gateway, Autzen station, Fairgrounds
16	Autzen Loop	Autzen Stadium	5th Avenue Rail Station	New Bridge
17	Downtown line	UO	5th Street Market	5th/Pearl; 5th; Willamette; 13th; Kincaid

Reduces VMT

For the screening process, the estimates of travel demand also estimate potential reductions in VMT, based on the assumption that corridors with greater travel demand have a higher potential to reduce VMT than corridors with less travel demand. Reductions in VMT, as with increases in transit ridership, would depend on relative attractiveness of LRT to auto trips and on how well the trip origins and destinations match the LRT location. In addition to the number of transit riders, reductions in VMT is determined by trip length. VMT reductions will be evaluated in the next stage of evaluation.

Re-enforces Desired Urban Form, linking land use, transportation, economic development, and community livability.

The screening process used several measures to assess the ability of the corridors to re-enforce desired urban form including the extent to which the corridor connects population and employment areas, the potential disruption to neighborhoods and access to activity nodes defined by the TransPlan Land Use Measures (LUM) Task Force.

Population and Employment

Projections of population and employment that would be connected within 1/4 mile of the corridor are used as measures of linking land use and economic development. Data used in this analysis are based on LCOG's projections for year 2015, at the traffic analysis zone (TAZ) level, of population and employment. Figure 2 illustrates the TAZ boundaries used in this analysis. For analysis purposes, downtown Eugene is assumed to be included in one zone that could be accessible to all corridors that serve downtown. Based on this analysis, the corridors with the highest population and employment, as shown on Table 4, are:

- Emerald RR Loop (91,700 population and employment).
- Main/Franklin (90,700 population and employment).
- River Road (59,300 population and employment).

Other corridors are comparable to the River Road corridor, with between 55,000 to 60,000 combined population and employment along the corridor, including Highway 99, Coburg Road, Gateway/Harlow and Blair Line.

Given the long length of the Emerald RR loop and the Main/Franklin corridors, on a per mile

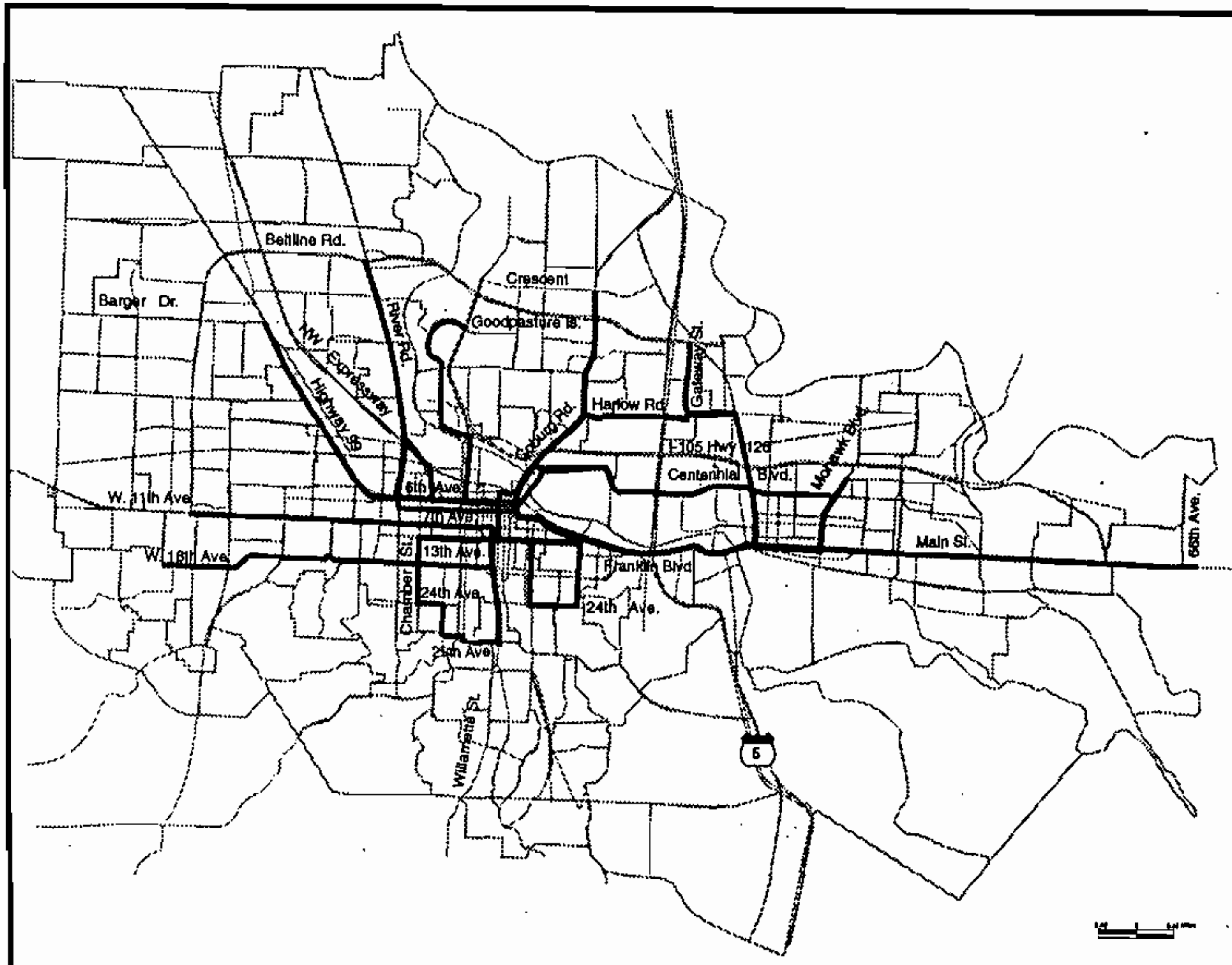

Figure 2

TAZ Boundaries and Potential Corridor Alignments

Legend

- Proposed Alignment
- TAZ Boundaries

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basis, these corridors do not rank in the top three for population and employment. The top three corridors, on a per mile basis, are:

- o Downtown line (24,000 population and employment per corridor mile).
- o Blair Line (16,400 population and employment per corridor mile).
- o Coburg Road (16,000) population and employment per corridor mile).

Neighborhood Compatibility

Because of the adaptability of LRT, it is difficult to screen corridors from further analysis based on potential disruption to residential neighborhoods prior to LRT design. Some corridors are more residential in character than others, though, and the increased investment in the LRT may be viewed by residents as either supportive of greater mobility or disruptive to the neighborhood character. Corridors where the alignment would be located within residential neighborhoods include:

- o West 18th (portions)
- o College Crest Loop (on 29th, Friendly, 24th and Chambers)
- o Gateway/Harlow (on Harlow Road)
- o Centennial (portions)

Two of the corridors, the U of O Loop and the Emerald RR Loop, would penetrate the U of O campus. A cross-campus route would violate development policies adopted by the U of O in their Long Range Campus Development Plan (June 1991) which define the campus as primarily a pedestrian and bicycle zone. The plan discourages the use of internal campus streets for through traffic.

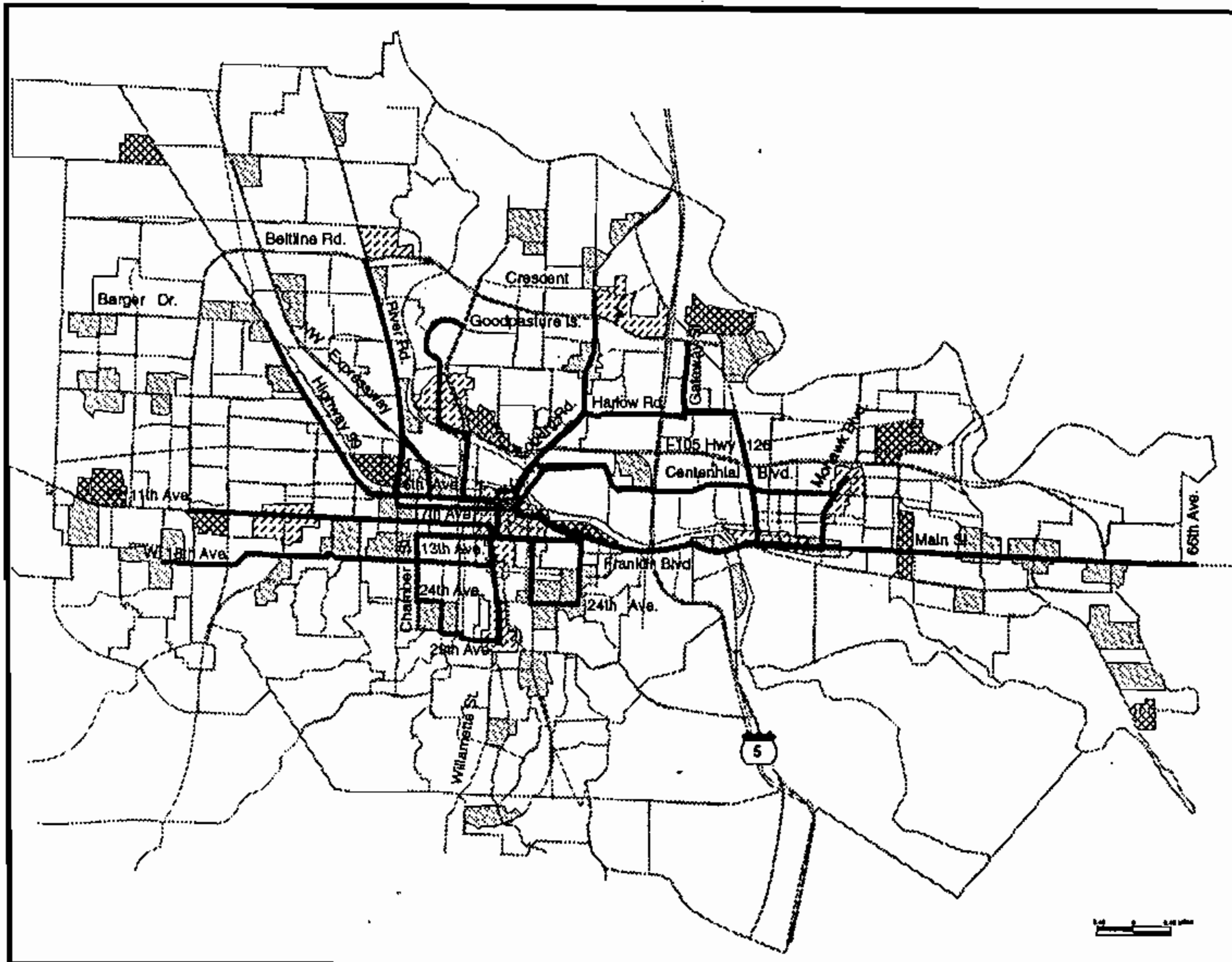
Activity Nodes (LUM Task Force)

The LUM Task Force has identified a development pattern that includes new neighborhood center, special purpose, and community center nodes as a desired urban form for 2015. These nodes are located throughout the urban area and would be served directly by many of the potential LRT corridors, as illustrated on Figure 3. To determine the extent to which different corridors support this desired urban form, the analysis counted the number of nodes that would be directly served by, or would be served within a short distance by, the LRT corridor. These counts are summarized, by type of node, in Table 5. The corridors that serve the greatest number of nodes are:

- o Main/Franklin (10)
- o West 18th (8)
- o River Road and Coburg Road (7 each)

Figure 3

Proposed Activity Nodes and Potential Corridor Alignments



Legend

- Proposed Alignment
- TAZ Boundaries

Activity Nodes

- Special Purpose
- Neighborhood Center
- Community Center

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Considering corridor lengths, the Coburg Road corridor, at 3.4 miles, has an average of 2 nodes per mile which is a greater number per corridor mile than the other corridors.

Contributes to Overall Air Quality

One of the sources of air quality problems is idling traffic at locations of traffic congestion. LCOG has developed estimates of traffic congestion locations for year 2015 by comparing projected traffic volumes with the road system as currently funded. Though this estimate of congestion may be conservative because it does not include proposed, but not funded, road projects, it does present an indication of future traffic congestion levels where the volume exceeds capacity (V/C). Using these projections, the following locations are projected to have traffic congestion with V/C greater than 1:

- Ferry Street Bridge
- Washington/Jefferson Street Bridge
- 6th/Chambers
- Coburg Road at Beltline Road
- Franklin Blvd at Agate
- Main Street at Pioneer Parkway, 28th, 58th and 69th
- West 18th at Willow Creek.

As summarized in Table 6, several corridors would offer an alternative mode through these congested areas. The corridors which would serve more than one of these locations are:

- Main/Franklin
- Coburg Road

Minimize Traffic Disruption

The screening process does not consider this criterion because analysis of traffic disruption requires a level of LRT design that is not developed.

Provides and Improves Access to Major Activities

The urban area has several major commercial, educational and medical centers that are major areas of activity. The screening process identified the extent to which the corridors would provide access to these activities by identifying how many would be served by each corridor, as shown on Table 7. The major activity centers defined for this analysis are:

- Downtown Eugene
- U of O

- Sacred Heart Medical Center
- Gateway Mall
- Downtown Springfield
- Valley River area
- McKenzie/Willamette Medical area.

All corridors, except the Springfield loop, serve downtown Eugene while the Main/Franklin, UO Loop, Blair line, Emerald RR Loop and Downtown Line serve the U of O as well. The corridors that serve the greatest number of major centers are:

- Emerald RR loop (5)
- Main/Franklin (4)
- UO Loop and Downtown Line (3 each).

Creates Intermodal Transportation Opportunities

Intermodal transportation opportunities are defined as direct service between the LRT corridor and the AMTRAK station in downtown Eugene, and the LTD stations in downtown Eugene and Springfield. Several park and ride locations, currently in LTD's plans, could also offer intermodal connections. Connections to intercity bus services, though important intermodal opportunities, are not included in this analysis because this analysis assumes that the station could relocate to a LRT or other intermodal station. The intermodal stations and the corridors that would offer direct transfer opportunities are shown in Table 8. The analysis assumes that all corridors that serve downtown Eugene would be designed to serve the AMTRAK station and the LTD bus station. The corridors that offer the most intermodal service connections are:

- Main/Franklin (4 locations)
- Coburg Road, West 11th and Highway 99 (3 locations, including park and rides).

Minimizes Private Property Taking

The screening process does not consider this criterion because analysis of private-property taking requires a level of LRT design that is not developed.

Conclusions and Recommendations of Corridors for Further Evaluation

The screening process leads to several conclusions:

1. The Main/Franklin corridor ranks as one of the strongest in terms of:

    - Potential ridership based on travel demand along the corridor,

- Re-enforcing desired urban form based on population and employment along the corridor and the number of LUM Task Force Activity Nodes it would serve,
- Contributing to overall air quality based on service to congested areas,
- Providing access to major activities based on the number of existing activity areas served,
- Creating intermodal transportation opportunities based on service to AMTRAK and LTD facilities.

The Main/Franklin corridor is, by serving Springfield, part of the same corridor as the Centennial corridor. Alternative alignments for consideration in the future could include Centennial Blvd and the Ferry Street bridge instead of Franklin Blvd.

2. The corridors that serve downtown Eugene and the close-in residential and activity centers serve a relatively high travel demand, population and employment area, especially considering trips, population and employment served per corridor mile. By extending a short distance from the downtown area, these corridors also serve LUM activity nodes, though not as many as the more regional corridors serve. The corridors that serve this central area are:

   - Willamette
   - UO Loop
   - College Crest Loop
   - Blair Line
   - Emerald RR Loop (portions)
   - Autzen loop
   - Downtown line.

   Because these corridors serve many of the same destinations using the same or slightly different alignments, it is difficult to determine which one would perform the best. The Emerald RR loop corridor, which serves several major activity centers within this central area, may perform best in the evaluation. To comply with U of O policy, routing through the U of O campus, as proposed in some of these corridors, should be avoided.

3. Of the remaining corridors, the Coburg Road corridor holds promise for further evaluation because of its relatively high ranking in terms of population and employment along the corridor and service to the high number of LUM activity nodes. In addition to this potential growth with the activity node development, the corridor is also well positioned to capture other trips in the corridor with bus service connections to the Gateway area, projected increases in traffic congestion on Coburg Road and the planned park and ride at Beltline Road. On a per mile basis, the corridor performs well in terms of population and employment and number of nodes served.

Based on this analysis, the three recommended corridors for further evaluation are:

1. Main/Franklin, with the understanding that further evaluation of the corridor could include analysis of Centennial Blvd as an alternative alignment.

2. Some combination of the central Eugene corridor options with service to the edge of the U of O, Sacred Heart, downtown Eugene and an extension to serve LUM nodes in the central area along either the Blair Line or Willamette.

3. Coburg Road, with the further development of services to increase the travel shed for this corridor.

Table 3
Travel Demand Along Alignments
for year 2015

	Corridor Alignment	Alignment Length (miles)	Travel Demand	Travel Demand per Alignment mile
1	West 18th	5.1	26,900	5,270
2	West 11th	4.4	19,400	4,400
3	Highway 99	5.8	17,200	2,970
4	River Road	5.1	17,400	3,410
5	Goodpasture Island	4.2	10,200	2,430
6	Coburg Road	3.4	9,000	2,650
7	Gateway/Harlow	4.0	11,500	2,300
8	Centennial	5.0	14,200	2,840
9	Main/Franklin	9.5	46,600	4,900
10	Willamette	2.4	22,600	9,420
11	UO Loop	3.7	34,800	9,400
12	College Crest Loop	4.9	34,800	7,100
13	Blair line	3.4	18,100	5,320
14	Springfield Loop	5.2	12,800	2,460
15	Emerald RR Loop	9.8	51,400	5,290
16	Autzen Loop	1.3	9,800	7,540
17	Downtown line	1.4	21,000	15,000

Table 4
Population and Employment Along Alignment for year 2015

	Corridor Alignment	Alignment Length (miles)	Employment	Population	Population & Employment	Population & Employment per Alignment mile
1	West 18th	5.1	27,700	26,600	54,300	10,600
2	West 11th	4.4	34,300	19,000	53,300	12,100
3	Highway 99	5.8	34,700	23,400	58,100	10,000
4	River Road	5.1	31,000	28,300	59,300	11,600
5	Goodpasture Island	4.2	32,000	20,800	52,800	12,600
6	Coburg Road	3.4	32,600	22,700	55,300	16,300
7	Gateway/Harlow	4.0	36,500	21,600	58,100	14,500
8	Centennial	5.0	27,700	22,200	49,900	10,000
9	Main/Franklin	9.5	43,400	48,300	91,700	9,700
10	Willamette	2.4	23,000	15,600	38,600	16,000
11	UO Loop	3.7	31,700	15,700	47,400	12,800
12	College Crest Loop	4.9	25,000	23,200	48,200	9,800
13	Blair line	3.4	38,000	17,700	55,700	16,400
14	Springfield Loop	5.2	17,000	23,800	40,800	7,800
15	Emerald RR Loop	9.8	51,700	39,000	90,700	9,300
16	Autzen Loop	1.3	24,400	13,500	37,900	2,900
17	Downtown line	1.4	26,500	7,200	33,700	24,000

Table 5
Service to Activity Nodes
(Land Use Measures Task Force)

	Corridor Alignment	Alignment Length (miles)	Community Center Node	Special Purpose Node	Neighborhood Center Node	Total Nodes	Nodes per Alignment mile
1	West 18th	5.1	2	2	4	8	1.5
2	West 11th	4.4	2	1	3	6	1.4
3	Highway 99	5.8	1	1	4	6	1.0
4	River Road	5.1	2	1	4	7	1.4
5	Goodpasture Island	4.2	2	1	2	5	1.2
6	Coburg Road	3.4	3	2	2	7	2.0
7	Gateway/Harlow	4.0	2	2	0	4	1.0
8	Centennial	5.0	2	0	1	3	0.6
9	Main/Franklin	9.5	2	2	6	10	1.0
10	Willamette	2.4	2	0	0	2	0.8
11	UO Loop	3.7	1	1	1	3	1.2
12	College Crest Loop	4.9	2	0	2	4	0.8
13	Blair line	3.4	1	2	2	5	1.5
14	Springfield Loop	5.2	2	1	1	4	0.8
15	Emerald RR Loop	9.8	2	2	1	5	0.5
16	Autzen Loop	1.3	1	0	0	1	0.8
17	Downtown line	1.4	1	0	0	1	0.7

Table 6
Service to Traffic Congestion Areas
for year 2015

Corridor Alignment	Ferry St. Bridge	Washington/ Jefferson Bridge	6th/ Chambers	Coburg Rd./ Beltline	Franklin/ Agate	Main/ Pioneer Pkwy	Main/ 28th	Main/ 58th	Main/ 69th	W. 18th/ Willow Creek
1 West 18th										✓
2 West 11th										
3 Highway 99			✓							
4 River Road			✓							
5 Goodpasture Island		✓								
6 Coburg Road	✓			✓						
7 Gateway/Harlow	✓									
8 Centennial	✓									
9 Main/Franklin					✓	✓	✓	✓	✓	
10 Willamette										
11 UO Loop										
12 College Crest Loop										
13 Blair line										
14 Springfield Loop										
15 Emerald RR Loop	✓									
16 Autzen Loop										
17 Downtown line										

Table 7
Service to Major Activity Centers

	Major Activity Centers						
Corridor Alignment	Downtown Eugene	U of O	Sacred Heart	Gateway Mall	Downtown Springfield	Valley River	McKenzie/ Willamette
1 West 18th	✓						
2 West 11th	✓						
3 Highway 99	✓						
4 River Road	✓						
5 Goodpasture Island	✓					✓	
6 Coburg Road	✓						
7 Gateway/Harlow	✓			✓			
8 Centennial	✓						✓
9 Main/Franklin	✓	✓	✓		✓		
10 Willamette	✓						
11 UO Loop	✓	✓	✓				
12 College Crest Loop	✓						
13 Blair line	✓	✓					
14 Springfield Loop					✓		
15 Emerald RR Loop	✓	✓	✓	✓	✓		
16 Autzen Loop	✓						
17 Downtown line	✓	✓	✓				

Table 8
Intermodal Service Connections

Corridor Alignment	AMTRAK Station	Downtown Eugene LTD Station	Downtown Springfield LTD Station	Coburg Rd./ Beltline P&R	W. 11th P&R	Highway 99 P&R	Main St. P&R
1 West 18th	✓	✓					
2 West 11th	✓	✓			✓		
3 Highway 99	✓	✓				✓	
4 River Road	✓	✓					
5 Goodpasture Island	✓	✓					
6 Coburg Road	✓	✓		✓			
7 Gateway/Harlow	✓	✓					
8 Centennial	✓	✓					
9 Main/Franklin	✓	✓	✓				✓
10 Willamette	✓	✓					
11 UO Loop	✓	✓					
12 College Crest Loop	✓	✓					
13 Blair line	✓	✓					
14 Springfield Loop			✓				
15 Emerald RR Loop	✓	✓					
16 Autzen Loop	✓	✓					
17 Downtown line	✓	✓					

Appendix A
Description of Corridors

1. **West 18th:**
   This corridor would extend from Willow Creek to downtown Eugene along West 18th and Willamette. The rail line would serve the planned development node at Willow Creek (which includes high-density housing and employment), residential development along 18th, Churchill High School, the Chambers and 18th node, and retail areas along Willamette between 18th and downtown Eugene.

2. **West 11th:**
   This corridor extends from 11th and Beltline to downtown Eugene along West 11th Avenue. The corridor serves the West 11th development (including three planned nodes). A park and ride is planned for West 11th near Bertelsen or Bailey Hill.

3. **Highway 99:**
   This corridor would serve Highway 99 (from Barger Drive) and the 6th/7th corridor. This corridor includes retail development and employment, with residential development located on adjacent streets. Development nodes are planned along Highway 99 at Barger, Royal, and Garfield. A park and ride is planned for Highway 99 near Barger.

4. **River Road:**
   The River Road corridor extends are far as Santa Clara Square shopping area at River Road and Division. The corridor serves the shopping area at Division, the existing park and ride at Beltline, and businesses and residences along and adjacent to River Road. The line could travel on 6th/7th Avenue.

5. **Goodpasture Island:**
   This route would serve the residential, employment, and retail development along Goodpasture Island Road west of Delta Highway. This includes the Valley River area. The corridor would extend to downtown Eugene via a new bridge or, perhaps, on the Washington/Jefferson Bridge.

6. **Coburg Road:**
   This line would operate on Coburg Road from Crescent to downtown Eugene, with a river crossing somewhere in the Ferry Street Bridge corridor. The line serves one of the fastest developing areas of the community, including planned nodes at Crescent, Wilakenzie, and Oakway. It would also provide service in proximity to Sheldon High School and Monroe Middle School. A park and ride is planned for Coburg Road near Beltline.

7. **Gateway/Harlow:**
   This line would connect the Gateway (Beltline and Gateway) area with downtown Eugene via Harlow and Coburg Road, crossing the river in the Ferry Street Bridge corridor. The Gateway

area is a developing employment center that includes a regional shopping mall. Harlow Road is primarily residential.

8. Centennial:
This route would extend from Centennial and Mohawk to downtown Eugene via Centennial and the Ferry Street Bridge. The route serves a mix of residential and retail areas, including a large, medium-density residential development just west of I-5.

9. Main/Franklin:
This long rail line would extend from 69th and Main in east Springfield to downtown Eugene. The route would serve the University of Oregon/Sacred Heart area (could be realigned south of Franklin in that area) downtown Springfield, and a planned park and ride at 58th and Main. Several nodes are planned for Main Street.

10. Willamette:
This route would travel on Willamette between downtown Eugene and 29th Avenue. The area includes retail development, with residential development on adjacent streets. A node is planned for 29th at Willamette.

11. UO Loop:
This loop route would start in downtown Eugene, travel on Willamette to 14th, 13th through the University, right on Agate, right on 24th, right on Hilyard, then 13th and Willamtte, back to downtown. The rail service would operate in both directions on the loop. Service would be provided to South Eugene High School, Roosevelt Middle School, and a planned node at 19th and Hilyard.

12. College Crest Loop:
This loop would depart from downtown, travel on Willamette, turn right on 29th, right on Friendly, left on 24th, right on Chambers, and right on 13th to Willamette and downtown Eugene. The service would operate in both directions on the loop. Nodes served by the line are at 29th and Willamette and 18th and Chambers.

13. Blair Line:
This line would start at River Road and Chambers and travel on Chambers, 2nd, Blair, and 8th Street. It would cross downtown and travel along the river to Agate and Franklin. The line would operate in both directions. The route would serve the RiverFront Research Park. It would travel through the heart of downtown, and would also serve the north part of the University campus.

14. Springfield Loop:
Starting at Mohawk and Olympic, the route would travel on Mohawk, 14th, Main, Pioneer Parkway, Hayden Bridge and Gateway (to Beltline and Gateway), and back. This route would connect some of the major development in Springfield, including the Gateway area, Pioneer

Plaza, downtown Springfield, McKenzie Willamette Hospital, and the Mohawk area. In addition, many residences are located within walking distance of the route. It serves several planned nodes.

15. Emerald RR Loop:
This loop connects Autzen Stadium with the RiverFront Research Park, University, Sacred Heart Hospital, downtown Eugene, and the Fairgrounds. The rail service would operate in both directions on the loop. Two river crossings are necessary. A spur from the route travels to Springfield and up Pioneer Plaza to the Gateway area. This is the Emerald Empire Railroad.

16. Autzen Loop:
This short route would connect Autzen and the 5th Avenue/Rail Station via a new bridge.

17. Downtown Line:
This is another short loop that would connect the University, downtown, and the 5th Street Market area. Starting at 5th and Pearl, the route would travel on 5th to Willamette. Willamette to 13th, 13th to Kincaid, and back.

III. Corridor Evaluation

Corridor Evaluation

Introduction

Lane Council of Governments (LCOG), in cooperation with the Oregon Department of Transportation (ODOT), is conducting a feasibility study of urban rail for the Eugene/Springfield area. This study will identify when a rail system for Eugene/Springfield would be feasible, define the type of rail system that could be constructed at a conceptual level and identify actions that can be taken now to make rail a success in the future. LCOG will include the results of this study in the update of the regional transportation plan, TransPlan, which is currently underway. A citizen committee, formed as a subcommittee of the TransPlan public involvement effort, is responsible for reviewing study results and making recommendations for the urban rail feasibility study.

To guide the Urban Rail Feasibility Study, the Steering Committee selected Light Rail Transit (LRT) as the technology for the study and defined 17 potential LRT corridors. Based on a screening of the potential corridors, the Steering Committee selected three representative corridors for cost and ridership analysis. The Committee intends the system to be a low capital cost system complete with frequent service and stops.

This report presents the evaluation for the three corridors beginning with a description of the corridors. Following sections describe the approach and results for capital costs, operating and maintenance costs, ridership and actions that the community could take to improve implementation feasibility. A section on findings, conclusions and recommendations concludes this report.

Corridor Descriptions

The three corridors selected by the committee for further analysis are 1) in downtown Eugene; 2) along Coburg Road and; 3) along Main Street and Franklin Blvd to Springfield. The following describes the corridors and the routing used for costing and testing:

> **Downtown Loop (Figure 1).** This corridor serves the downtown employment and cultural areas, Sacred Heart Medical Center, the U of O campus and established commercial and residential areas along 18th and Willamette. Beginning at the Amtrak station at 5th and Willamette, the route follows Willamette, East Broadway and Hilyard Streets to the U of O campus. Through the campus, the route follows on East 13th Street, University and East 15th right-of-way to Agate Street. The route continues on Agate Street, 18th Avenue and Willamette Street.
>
> **Coburg Road (Figure 2).** This corridor serves the growing commercial and residential areas along Coburg Road as well as the downtown Eugene employment and cultural center along Willamette Street. Beginning at Beltline Road, the corridor follows Coburg Road to the Amtrak station at 5th and Willamette and follows Willamette to East 11th Avenue past the LTD transit center. This corridor assumes use of a new bridge across the river in the vicinity of the existing Ferry Street Bridge.
>
> **Main/Franklin (Figure 3).** This corridor connects downtown Eugene with downtown Springfield with extensions to River Road to the west and to S. 58th Street at Main Street in Springfield to the east. Beginning at River Road near the intersection of the Northwest Expressway and the footbridge to Valley River Mall, the corridor follows 2nd Avenue and Blair Blvd., 5th Ave., Willamette Street, Broadway and Franklin Blvd in Eugene. In Springfield, the route follows Main Street and South A Street. It would serve the Amtrak station, the LTD transit center in downtown Eugene and be within a few blocks of the downtown Springfield transit center. A sub-corridor was also evaluated that ended at S. 14th Street in Springfield.

For all three corridors, stations would be located approximately every two blocks within downtown Eugene. Outside of downtown, stations would be located approximately every ½ mile. Park and ride lots, already being developed by LTD, would serve the ends of the corridors at River Road, Beltline Road and South 58th Street. Figures 1, 2 and 3 illustrate the three corridors, possible stations and park and ride locations.

The routings for each corridor are for evaluation purposes only as the basis for developing order of magnitude cost and ridership estimates. Any further consideration of LRT would need to include evaluation of alternative streets, right of way and terminus locations as well as operational configurations.

URBAN RAIL FEASIBILITY STUDY

Figure 1: Potential Corridor: Downtown Loop

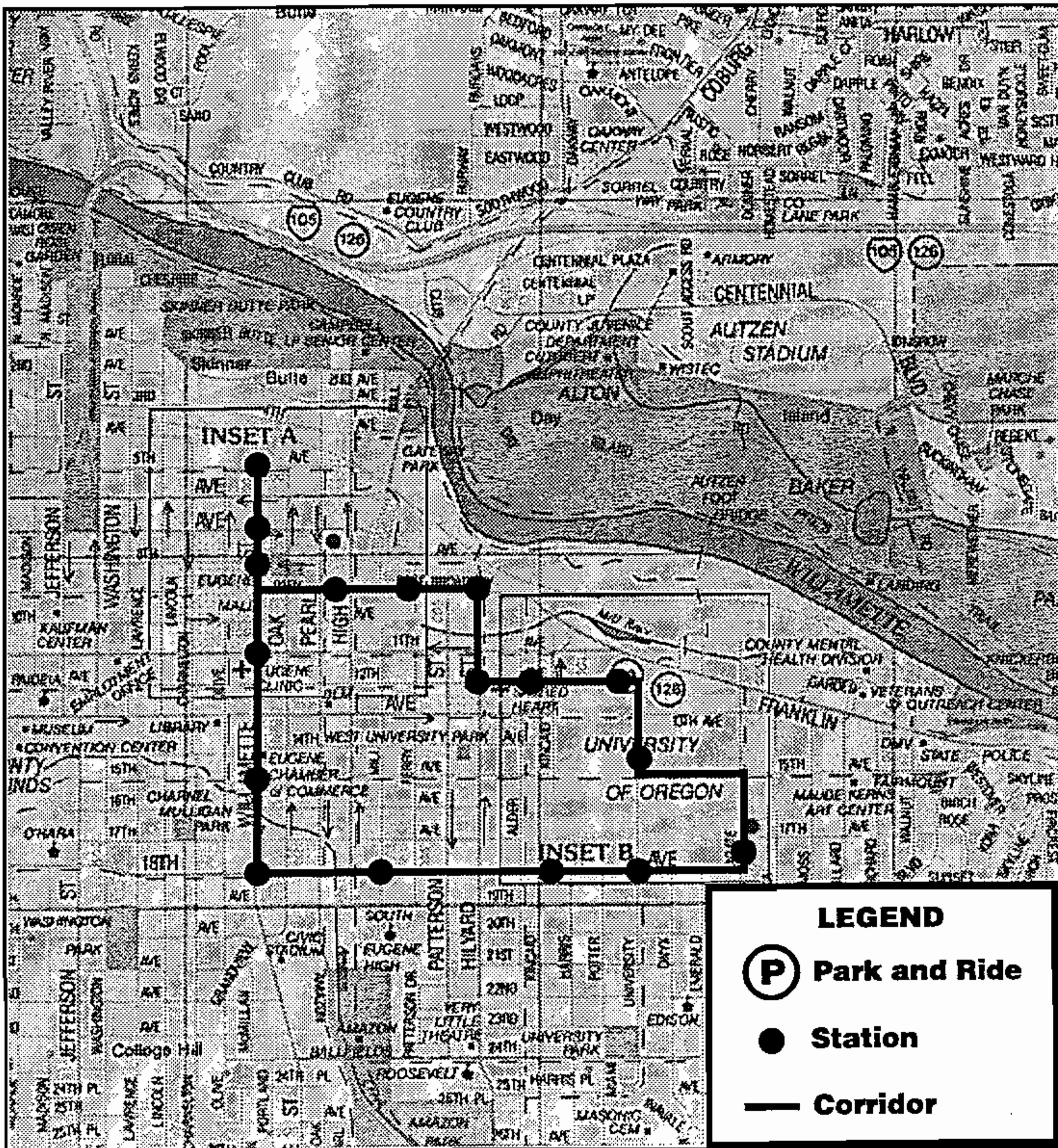


Figure 2: Potential Corridor: Coburg Road

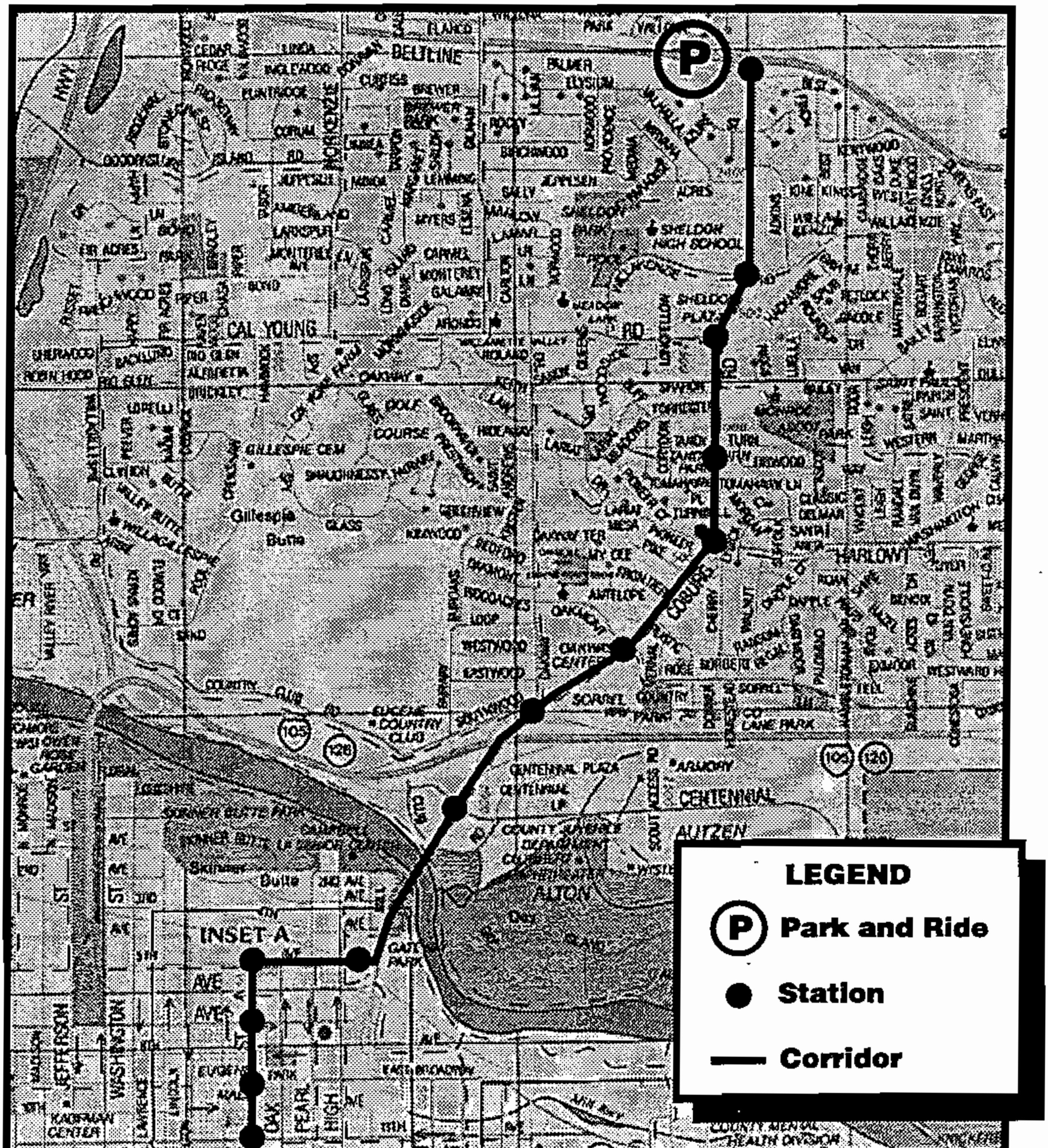
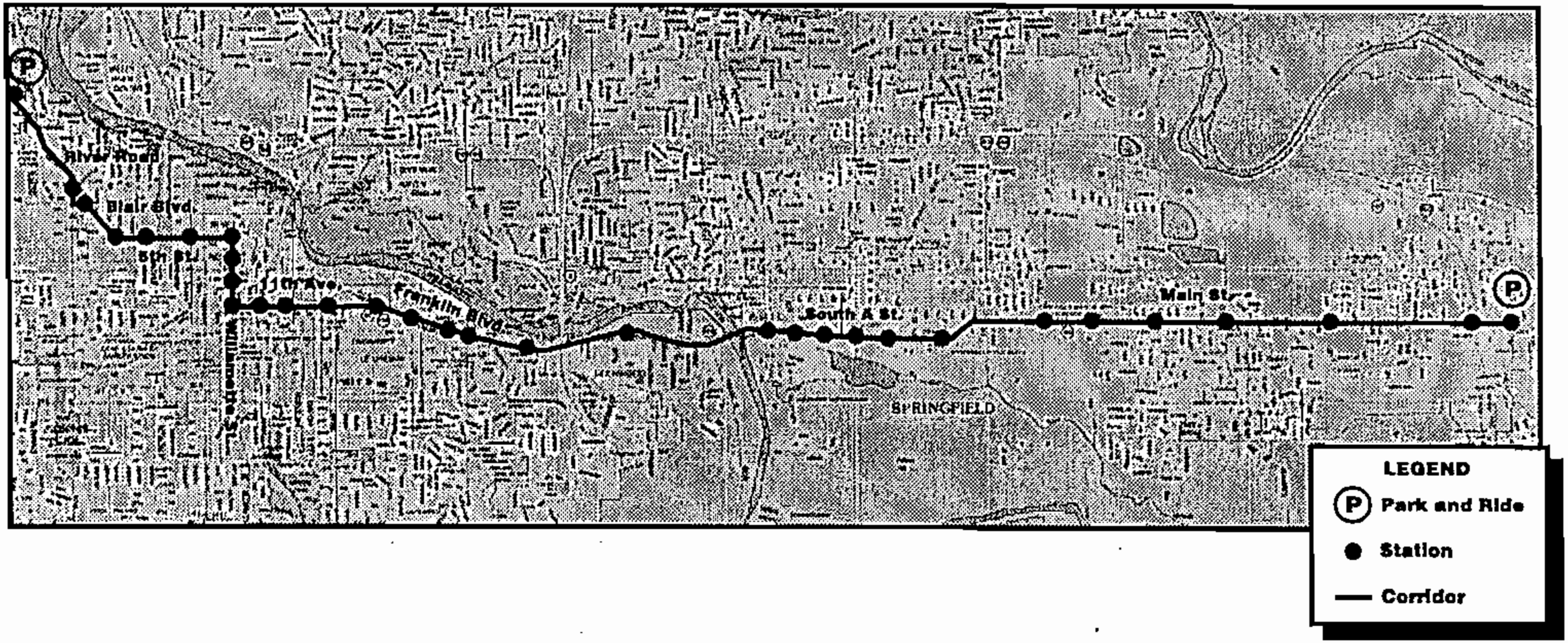


Figure 3: Potential Corridor: Main/Franklin and River Road



All three corridors serve some of the most densely developed areas in the Eugene/Springfield area. LCOG's 2015 projections of population and employment in transportation analysis zones (TAZs) adjacent to the corridor indicate roughly the number of jobs and residents within each corridor. Transit routes, redesigned to connect with LRT, would further expand the population and employment served by the corridor. In addition to the major commercial activity in downtown Eugene, the corridors would also serve several of the neighborhood centers, community centers and special purpose activity nodes proposed by the TransPlan Land Use Measures (LUM) Task Force. Table 1 summarizes the lengths, projected population and employment and number of proposed nodes along each corridor.

Table 1: Projected 2015 Corridor Population, Employment and LUM Activity Nodes

Corridor	Length (miles)	Population	Employment	Number of LUM Activity Nodes
Downtown Loop	4.34	36,900	17,100	5
Coburg Road	3.34	41,900	19,600	7
Main/Franklin	10.67	40,400	26,500	15

Source: LCOG

Capital Cost Estimates

In response to the Steering Committee's interest in keeping capital costs low, this evaluation includes order of magnitude costs for two different types of low cost systems. One is a low end cost suitable for a system with more of a tourist orientation than as a revenue operation intended to provide regular daily service. Called the "Low-End" cost, this system assumes a single track configuration with occasional passing tracks and asphalt paving between tracks. To provide service at least as fast and reliable as bus service, it would share LTD's radio communication and use signal preemption planned or in use now for bus operations. The second cost estimate, called "Mid-Range", reflects low cost assumptions for a system with a revenue orientation. Key features include double track with pavers between the tracks, signal preemptions and modifications with separate train control and communications.

One of the key differences between the two system types is in reliability. Though both systems are designed to operate on a 10 minute headway, the use of a single track and passing track configuration would result in less reliability than a double track system. In addition, because the low-end cost estimate does not include utility relocation, the system would be subject to closure for utility access. Table 2 defines key cost assumption differences for the tourist oriented "low-end" and the revenue-service oriented "mid-range" estimates. The cost estimates include other assumptions that would keep capital costs low including:

- o Use of diesel electric vehicles which would avoid additional cost of catenary, substations and stray current protection.
- o Simple stations
- o Limited strict reconstruction and improvements
- o Minimal maintenance and storage facility

The cost estimates include project contingencies at 35% and project engineering and administration at 30%, which are typical levels at this early stage of project development. At railroad crossings, the cost estimates assume grade separation at mainline tracks near the Amtrak station and grade crossing, with new signals, at the industrial spur tracks in Springfield. All track crossings require review and approval by Oregon Public Utilities Commission (OPUC).

Appendix A includes a complete definition of cost assumptions, units and unit costs. These costs are based on experiences in other cities and do not reflect local labor or manufacturing opportunities.

Table 2: Low-End and Mid-Range Capital Cost Assumption Differences		
Units	**Low-End**	**Mid-Range**
Trackwork	Single track with passing track; asphalt paving	Double track; pavers
Traffic Signals	Modifications for critical train movements	Modifications for critical train movements and train pre-emptions
Utilities	Utility protection	Utility relocation
Diesel-Electric Vehicles	Used	New
Communications	Public address system at stations	Public address system at stations and train-to-wayside communications

Traffic patterns and capacity would be significantly affected by either the single track or double track configurations. This analysis uses several key traffic assumptions including:

- Single track would not be shared with vehicular traffic.
- Passing tracks could be shared with traffic in one direction.
- Double track would be shared with vehicular traffic.

Further analysis is needed on these operational impacts and alternatives need to be evaluated, including changes to the one-way and two-way traffic circulation, the pedestrian mall, bike lanes, turning movements and pedestrian conflicts plus railroad track crossing issues. Cross-sections, illustrating how the single track, single track with passing track and double track could fit within the existing typical street right-of-way, are shown in Appendix B.

The capital cost estimates, including construction costs, contingency (at 35%), vehicles, and project administration (at 30%) range from $4.7 million to $7.6 million /mile for the low-end costs and from $16.1 million to $18.6 million /mile for the mid-range cost. Differences within these ranges reflect the number of stations and traffic signal modifications. Table 3 summarizes capital cost estimates, including vehicles, contingency and project administration costs. Appendix A presents costs, by *unit for each corridor*. Another opportunity to reduce costs could be to construct vehicles locally.

Table 3: Low-End and Mid-Range Capital Cost Estimates (Includes construction, vehicles, contingency and project administration) (In Millions of 1995 dollars)						
Corridor	Miles	No. of Stations	Low-End		Mid-Range	
			Cost	Cost/Mile	Cost	Cost/Mile
Downtown Loop	4.34	17	$29.5	$6.8	$74.2	$17.1
Coburg Road	3.34	13	$25.4	$7.6	$62.1	$18.6
Main/Franklin (S. 58th St.)	10.67	32	$49.5	$4.7	$171.8	$16.1
Main/Franklin (S. 14th St.)	6.56	24	$34.8	$5.3	$112.0	$17.1

If all three corridors were built, the capital cost would be less than the sum of the three individual corridors because some items, including the maintenance and train storage facility and the track along Willamette, would be shared.

In addition to assuming use of diesel-electric vehicles, the evaluation developed costs for electric vehicles. Capital costs for an electric system, using electric vehicles instead of diesel-electric, would be approximately $280 per track foot higher for the low-end system and $585 per track foot for the mid-range system. This does not include vehicle costs. This includes additional cost for track work and catenary with project contingencies and administration. Based on these unit costs for the low-end system, an electric system would cost an additional $6.4 million for the downtown loop, an additional $5.1 million for Coburg Road and $15.8 million for Main/Franklin. For the mid-range system, an electric system would cost an additional $13.4 million for the downtown loop, $10.8 million for Coburg Road and $33 million for Main/Franklin.

Operating Cost Estimates

Operations and maintenance (O&M) cost estimates are based on projections of the number of vehicle miles and vehicle hours for each corridor and average O&M cost/vehicle mile or hour as reported by other transit agencies to the Federal Transit Administration (FTA). This analysis assumes that the LRT would operate between 5:00 am and midnight every day with 10 minute peak headways between 7:00 am and 7:00 pm and 20 minute headways at other times. East of 14th Street in Springfield, service headways would be 20 minutes during peak and 40 minutes during off peak hours. The analysis assumes trains would operate at an average speed of 14 mph and a with 10% of the total transit route time for use to assure schedule reliability. Table 4 summarizes the key input values for the calculation of annual vehicle miles and hours.

Table 4: Annual Vehicle Mile and Hour Input Values	
Peak Hours	12
Peak Headways	10 min.
Off Peak Hours	9
Off Peak Headways	20 min.
No. of Trips/Day	93
Average Speed (MPH)	14
Recovery Time Factor	.1
Annualization Factor	365

For operating and maintenance costs, this analysis assumes a $14.59 per vehicle mile cost for diesel-electric vehicles and $10.00 per vehicle mile for electric vehicles. The diesel-electric cost is based on data reported to the FTA from Galveston, Texas, one of the few examples of diesel-electric light rail operation and the electric costs are based on a range of newer LRT systems. Neither cost reflects local labor rates.

For diesel-electric vehicles, the annual O&M cost ranges from $1.6 million for Coburg Road, $2.2 million for the Downtown Loop and $5.3 million for the Main/Franklin line. Table 5 summarizes these costs and the annual vehicle revenue miles upon which they are based. With electric vehicles, O&M costs would be roughly 1/3 less. In comparison, LTD's operating expense per vehicle mile, for an annual 3.2 million vehicle miles of bus service per year, is $3.5 million for a total operating expense of $11.3 million.

Table 5: Operating & Maintenance Cost and Service Information (Based on Diesel-Electric Vehicles)			
Corridor	Route Length (miles)	Annual Vehicle Revenue Miles	Annual Costs
Downtown Loop	4.34	147,342	$2,149,000
Coburg Road	3.34	113,376	$1,654,000
Main/Franklin	10.67	362,193	$5,284,000

Ridership Estimates

Ridership estimates were developed using a methodology that considered the projected 2015 person trips in the corridor, the potential rail transit shares by trip purpose (home-based work, home-based other and non-home based) and mode of access (walk, bus and park and ride). Based on available data and factors, these estimates are intended to provide a preliminary estimate of ridership levels with urban rail. Future steps in analysis of urban rail ridership should include using a mode-choice model for projections.

Key assumptions used in these projections for each mode of access are:

Walk access: Estimates of the number of trips that would access urban rail by walking are based on:

- o Projected number of person trips within, having both an origin and destination within the corridor and located within ½ mile of the corridor, assuming continuation of existing plans and policies.
- o Existing transit share for LTD services in the corridor which range from 4.5% to 5.8% of all person trips, depending on the corridor.
- o Increases in ridership based on the additional attractiveness of rail compared to bus using factors from the Portland area which may increase the transit mode share to as much as 7.0% to 8.6%, depending on the corridor.

Table 6 presents the projected person trips in the corridor, existing and projected transit mode share for walk access trips.

Table 6: Walk Access Mode Shares with Urban Rail with and without Rail Attractiveness Factor			
Corridor	2015 Person trips in Corridor	Existing transit mode share (%) without attractiveness factor	Projected transit mode share with rail (%) with attractiveness factor
Downtown Loop	37,400	5.1	7.5
Coburg Road	28,600	4.9	7.0
Main/Franklin	78,200	4.5	7.0
Main/Franklin to S. 14th Street	42,800	5.8	8.6

Bus Access: Though not completed at this preliminary analysis level, with urban rail, bus services would be restructured to offer convenient transfers to rail services. An estimate of the amount of ridership that could be expected from bus transfers assumes that approximately 75% of the walk access trips would use bus, based on experience from the Portland area light rail. Rail attractiveness factors could also increase the number of riders who transfer from bus.

Park and Ride Access: With a typical draw area of five miles, park and ride lots can greatly increase the size of the rail market area. The ridership estimates assume two park and ride lots, one on the Coburg Road line at Beltline Road and one on the Main/Franklin line at S. 58th, with 400 spaces each.

Based on these assumptions daily ridership estimates in the range of 3,000 to 6,600 assuming existing transit shares and 4,000 to 10,100 assuming additional transit share with a rail attractiveness factor, could be expected for the three representative urban rail corridors in year 2015. On a per mile basis, daily ridership would range from 620 to 900 per mile at the low end to 950 per mile to 1,200 at the high end per mile. While not exceedingly low, these ridership ranges are at the low end of systems that have been successful at competing for federal transit funding for rail. For comparison, Appendix C presents existing rail ridership for other systems. Table 7 and 8 summarize these estimates.

Table 7: Daily Rail Ridership Projections by Access Mode (2015)

Corridor	Walk Access	Bus Access	Park and Ride Access	Total
	Low/High	Low/High	Low/High	Low/High
Downtown Loop	1,900/2,800	1,400/2,100	0/0	3,300/4,900
Coburg Road	1,400/2,000	1,100/1,500	500/500	3,000/4,000
Main/Franklin	3,500/5,500	2,600/4,100	500/500	6,600/10,100
Main/Franklin to S. 14th St.	2,500/3,700	1,900/2,800	0/0	4,400/6,500

Table 8: Daily Ridership per Corridor Mile (2015)			
Corridor	Corridor length (miles)	Daily Ridership Low/High	Daily Ridership/mile Low/High
Downtown Loop	4.34	3,300/4,900	760/1130
Coburg Road	3.34	3,000/4,000	900/1200
Main/Franklin	10.67	6,600/10,100	620/950
Main/Franklin to S. 14th St.	6.56	4,400/6,500	670/1010

Potential Actions to Improve LRT Feasibility

The Eugene/Springfield community can take actions now that would improve the feasibility of LRT in the future. These actions, aimed at increasing ridership and easing implementation, would make LRT more competitive for federal funding and help to establish local support for rail. While not a comprehensive list, key actions that can increase ridership and ease implementation are:

Parking Policies

- Reduce parking ratio in downtown Eugene, Springfield, Sacred Heart, U of O and other major employment destinations. As an alternative to increasing the supply of parking, consider investing in satellite parking or park and ride capacity.
- Increase the availability of short term parking compared to long term parking and alter the pricing structure to support use of short term parking. Supportive short term parking policies for off-street parking can help mitigate the loss of on-street parking.
- For publicly controlled parking, increase the price of parking.

Land Use

- Target growth areas, already defined as nodes, for higher densities.
- Adopt policies to support focused growth in these nodes, such as priorities for infrastructure improvements.
- Encourage infill development along the corridors, through policies ranging from exemptions from on-site parking requirements to siting of public housing.
- Encourage mixed-use development along the corridor, leading to a greater number of trip origins and destinations within the corridor that could be convenient for transit use.
- Require that new residential development, particularly in Springfield and along Coburg Road, develop a full street grid that allows convenient transit and pedestrian access.
- Adopt development design standards that support transit use, including building orientation that makes access more convenient for transit and pedestrians than autos.

Transit Services

- o Increase service frequency along corridors so that the bus operations resemble rail services.

- o Improve bus travel times along the corridor using bus only lanes or pre-emptions, among other options.

- o Develop feeder bus networks that connect to the corridors, complete with convenient transfer opportunities.

- o Consider developing transit routes that would operate along potential rail corridors, including the downtown line, to help develop ridership and test potential rail alignments.

Transportation and Circulation Policies

- o Begin discussions with U of O to allow possible motorized access on campus or to define priority locations for peripheral access. Current campus polices oppose motorized vehicular access on campus. Discussions should also help ensure that transit access is a priority for new development such as the Riverfront Research Park.

- o Begin to review traffic circulation and capacity alternatives that would permit single or double track operation to minimize vehicular traffic disruption and maximize bike lanes and sidewalk areas while simplifying routing and circulation.

Findings, Conclusions and Recommendations

This section concludes the urban rail feasibility study with a summary of key findings and a presentation of conclusions and recommendations.

Findings

1. This study reviewed alternative urban rail technologies and found that light rail transit, with streetcar-like operation in particular, would be most consistent with population, employment and right-of-way opportunities in the Eugene/Springfield area.

2. After reviewing 17 potential corridors, the Committee selected three representative corridors for urban rail which were intended to represent different types of potential rail service:

    - Between Eugene and Springfield along Main/Franklin, representing a linear corridor with established ridership.
    - Along Coburg Road between Beltline and downtown Eugene, representing a linear growth corridor.
    - Within central Eugene representing a circulating loop with potential connections between established commercial, employment and residential neighborhoods in downtown and the U of O.

    Specific alignments within each corridor were identified for costing and testing purposes.

3. Conceptual engineering analysis found that it would be possible to construct a streetcar or LRT within public right of way for a cost of $4.7 to $7.6 million per mile for a single-track system and $16.1 to $18.6 million per mile for a double-track system. This includes construction costs, diesel-electric vehicles, contingencies and project engineering and administration. The double-track system would be needed to provide a reliable, competitive transportation alternative to the auto while the single-track system would offer a more tourist-oriented service that would not compete effectively as a transportation alternative. These costs are based on experiences in other cities and do not reflect local labor rates or manufacturing opportunities.

4. Based on average rail travel speeds of 14 mph, peak services of 10 minute headways, and diesel electric vehicles, operations and maintenance costs would range from $1.7 million to $5.3 million annually. Passenger fares could be expected to cover 20% to 40% of these costs.

5. With electric vehicles, instead of diesel-electric, capital costs would be higher but operating and maintenance costs would be lower.

6. Daily rail ridership would range from a low of 3,000 to 6,600 to a high of 4,000 to 10,100 depending on the corridor, based on a sketch-level analysis of 2015 population and employment projections and assumptions of transit shares, feeder bus service and park and ride lots. This 2015 daily ridership, at 620 to 900 per mile at the low end and 950 to 1200 per mile at the high end, would be lower than for other existing rail systems and would utilize a small portion of the available rail capacity.

7. This study did not identify the feasibility of rail funding or determine the depth of local support for modifying traffic and parking to accommodate rail.

8. Urban rail would support the nodal development pattern, proposed by the Land Use Measures Task Force, by providing improved transit services for business, shopping, work and other trip purposes along the major corridors.

Conclusions and Recommendations

Frequent existing transit services in major corridors and planned nodal development are factors that support urban rail in the Eugene-Springfield area. If public right-of-way can be used, another favorable factor would be that rail could be constructed for less than $20 million per mile which is low compared to rail cost in other cities. However, projected 2015 ridership levels for the three corridors, assuming a continuation of current trends and development patterns, appear too low to be competitive with other cities seeking federal transit funding. A review of ridership in other cities that have successfully competed for federal funding indicates that ridership levels are roughly twice that projected for the Eugene/Springfield area.

As a tourist-oriented system, not intended to provide the frequent, reliable services that commuters require, lower cost urban rail could be developed but would still require major financial investments and modifications to the transportation system which may conflict with other transportation policies.

Based on these conclusions, this study recommends that the region act now to implement parking, land use and transit policies that will help increase future ridership potential and help ensure feasibility of urban rail in the future. These policies include:

- *Make long-term parking less available* by not increasing the supply and/or increasing the cost in downtown Eugene, Springfield, U of O campus, medical centers, Riverfront Research Park and other major employment areas. Parking alternatives, including peripheral or satellite parking and additional park and ride capacity, should be pursued. Higher parking costs and longer walking distances to parking are key factors that increase transit use.

- *Encourage trip-making activity along the major corridors and within the downtown area* by increasing densities in designated nodes, encouraging mixed-use commercial and residential development and encouraging in-fill development. Policies that help increase the number of trips made within a corridor and reduce the travel distances between these trip ends can lead to greater use of transit for trips to and within the corridor.

- *Adopt development design standards that support transit use*, including full street grids in residential neighborhoods that allow convenient and direct transit and pedestrian access and building orientation that makes access more convenient for transit and pedestrians than for auto. This will help make transit more attractive by reducing the total trip times for transit compared to auto.

- *Improve bus services to rapid transit standards in major corridors* by increasing service frequencies, improving bus speeds and offering convenient transfer connections between secondary level bus routes and the major bus corridor service. These improvements, which begin to replicate rail services, will help develop the corridor ridership that will eventually help justify the larger capital investment in rail.

- *Within central Eugene, where the ridership is not as easy to forecast as for the major commuter-oriented corridors, LTD should consider implementing a circulator service* that would replicate a potential streetcar route. The bus could be specially designated, such as a specially painted natural-gas operated bus. This would help indicate future ridership levels and help determine the most successful future rail route.

- *LTD should work with the Cities of Springfield and Eugene and the U of O to identify possible changes in traffic circulation and/or elimination of parking* to give transit priority, convenient access, and faster running times for service to the greatest concentration of employees. Much as the rail might utilize contra-flow lanes, the pedestrian mall, or travel through campus, these routings should be considered for bus. This will help give transit the priority over the auto that is necessary to attract new riders and qualify for federal funding.

- *A variety of other techniques that would increase the cost of using autos relative to the cost of using transit should be evaluated.* In addition to parking cost and availability, these could include increasing the gas tax, vehicle registration fees or even congestion pricing.

Appendix A
Capital Costs

Construction Unit Cost

Item	Unit	Unit Cost Low	Unit Cost Middle Cost	Assumptions
Track work				
Single Track	Track Foot	$150		Includes light grading, subballast, ballast, trackwork in street and asphalt.
Passing Track	Each	$200,000		Includes turnouts and single track work for approximately 400 feet.
Double Track	Track Foot		$700	Includes light grading, subballast, ballast, trackwork in street and pavers.
Earthwork	Cubic Yard	$20	$20	Includes subgrade removal to a depth of 2-1/2 ft. within existing street.
Improvements	Square Foot	$20	$20	Improvement to roadway and sidewalk required for construction, including sidewalk curb & gutter and street paving.
Stations	Each	$25,000	$50,000	Concrete slab and canopy for the low-end cost and two stations or central station for the mid-cost estimate.
Bridge Crossings	Track Foot	$500	$1,000	Track installation over bridge crossing, no bridge construction included.
Railroad Crossings	Each	$100,000	$100,000	Installation of signals and PUC permits for crossing existing industrial spur.
Traffic Signal				
New	Each	$100,000	$100,000	Complete traffic signal.
Modifications	Each	$25,000	$30,000	Assumes no preemption for the low end and preemption for the mid-cost estimate.
Utilities	Track Foot	$100	$300	Assumes protection of utilities for the low-end and protection and relocation at the mid-cost.
Maintenance Facility	Each	$2,000,000	$2,000,000	Includes small building and supplies. Does not include right-of-way.
Communications	Each Station	$10,000	$20,000	Includes a PA system at each station for low end and a PA system and Train-to wayside Communications at the mid-cost.
Vehicles	Each	$500,000	$1,000,000	Diesel - Electric vehicle cost could vary from $500,000 to $1,500,000. Assume used vehicles for low end and new vehicles for mid cost estimate. Vehicles include radio communication, fare collection and wheel chair lifts. Assume 10% spare ratio.
Contingency		35%	35%	Contingencies include any project unknowns, construction only.
Project Administration		30%	30%	Includes design engineering, contract administration and construction management. 30% only on construction cost.

Low End Cost Estimate for Downtown Line

	Unit of Work	Unit Cost	Units	Cost
CONSTRUCTION				
Trackwork				
Single Track	Track Foot	$150	22,900	$3,435,000
Passing Track	Each	$200,000	3	$600,000
Earthwork	Cubic Yard	$20	25,444	$508,889
Improvements	Square Foot	$20	274,800	$5,496,000
Stations	Each	$25,000	17	$425,000
Traffic Signal				
New	Each	$100,000	2	$200,000
Modification	Each	$25,000	7	$175,000
Utilities	Track Foot	$100	22,900	$2,290,000
Maintenance	Each	$2,000,000	1	$2,000,000
Communications	Station	$10,000	17	$170,000
Subtotal Construction Cost				$15,299,889
Contingency (35%)				$5,354,961
CONSTRUCTION TOTAL				$20,654,850
PROJECT ADMINISTRATION (30%)				$6,196,455
VEHICLES	Each	$500,000	5	$2,500,000
Total				**$29,521,305**

Mid - Cost Estimate for Downtown Line

	Unit of Work	Unit Cost	Units	Cost
CONSTRUCTION				
Trackwork				
Double Track	Track Foot	$700	22,900	$16,030,000
Earthwork	Cubic Yard	$20	50,889	$1,017,778
Improvements	Square Foot	$20	549,600	$10,992,000
Stations	Each	$50,000	17	$850,000
Traffic Signal				
New	Each	$100,000	2	$200,000
Modification	Each	$30,000	32	$960,000
Utilities	Track Foot	$300	22,900	$6,870,000
Maintenance	Each	$2,000,000	1	$2,000,000
Communications	Station	$20,000	17	$340,000
Subtotal Construction Cost				$39,259,778
Contingency (35%)				$13,740,922
CONSTRUCTION TOTAL				$53,000,700
PROJECT ADMINISTRATION (30%)				$15,900,210
VEHICLES	Each	$1,000,000	5	$5,000,000
Total				**$74,240,910**

Low End Cost Estimate for Coburg Road Line

	Unit of Work	Unit Cost	Units	Cost
CONSTRUCTION				
Trackwork				
Single Track	Track Foot	$150	18,150	$2,722,500
Passing Track	Each	$200,000	2	$400,000
Earthwork	Cubic Yard	$20	20,167	$403,340
Improvements	Square Foot	$20	217,800	$4,356,000
Stations	Each	$25,000	13	$325,000
Bridge Crossing	Track Foot	$500	1,250	$625,000
Traffic Signal				
New	Each	$100,000	2	$200,000
Modification	Each	$25,000	0	$0
Utilities	Track Foot	$100	18,150	$1,815,000
Maintenance	Each	$2,000,000	1	$2,000,000
Communications	Station	$10,000	13	$130,000
Subtotal Construction Cost				$12,976,840
Contingency (35%)				$4,541,894
CONSTRUCTION TOTAL				$17,518,734
PROJECT ADMINISTRATION (30%)				$5,255,620
VEHICLES	Each	$500,000	5	$2,500,000
Total				**$25,404,354**

Mid - Cost Estimate for Coburg Road Line

	Unit of Work	Unit Cost	Units	Cost
CONSTRUCTION				
Trackwork				
Double Track	Track Foot	$700	18,150	$12,705,000
Earthwork	Cubic Yard	$20	40,333	$806,660
Improvements	Square Foot	$20	435,600	$8,712,000
Stations	Each	$50,000	13	$650,000
Bridge Crossing	Track Foot	$1,000	1,250	$1,250,000
Traffic Signal				
New	Each	$100,000	2	$200,000
Modification	Each	$30,000	12	$360,000
Utilities	Track Foot	$300	18,150	$5,445,000
Maintenance	Each	$2,000,000	1	$2,000,000
Communications	Station	$20,000	13	$260,000
Subtotal Construction Cost				$32,388,660
Contingency (35%)				$11,336,031
CONSTRUCTION TOTAL				$43,724,691
PROJECT ADMINISTRATION (30%)				$13,117,407
VEHICLES	Each	$1,000,000	5	$5,000,000
Total				**$62,102,098**

Low End Cost Estimate for Main Franklin Line

	Unit of Work	Unit Cost	Units	Cost
CONSTRUCTION				
Trackwork				
Single Track	Track Foot	$150	56,350	$8,452,500
Passing Track	Each	$200,000	4	$800,000
Earthwork	Cubic Yard	$20	62,611	$1,252,220
Improvements	Square Foot	$20	676,320	$13,526,400
Stations	Each	$25,000	32	$800,000
Bridge Crossing	Track Foot	$500	2,500	$1,250,000
Railroad Crossing	Each	$100,000	1	$100,000
Traffic Signal				
New	Each	$100,000	2	$200,000
Modification	Each	$25,000	5	$125,000
Utilities	Track Foot	$100	56,350	$5,635,000
Maintenance	Each	$2,000,000	1	$2,000,000
Communications	Station	$10,000	32	$320,000
Subtotal Construction Cost				$26,008,620
Contingency (35%)				$9,103,017
CONSTRUCTION TOTAL				$35,111,637
PROJECT ADMINISTRATION (30%)				$10,533,491
VEHICLES	Each	$500,000	7	$3,500,000
Total				**$49,465,128**

Mid - Cost Estimate for Main Franklin Line

	Unit of Work	Unit Cost	Units	Cost
CONSTRUCTION				
Trackwork				
Double Track	Track Foot	$700	56,350	$39,445,000
Earthwork	Cubic Yard	$20	125,222	$2,504,440
Improvements	Square Foot	$20	1,352,640	$27,052,800
Stations	Each	$50,000	32	$1,600,000
Bridge Crossing	Track Foot	$1,000	2,500	$2,500,000
Railroad Crossing	Each	$100,000	1	$100,000
Traffic Signal				
New	Each	$100,000	2	$200,000
Modification	Each	$30,000	20	$600,000
Utilities	Track Foot	$300	56,350	$16,905,000
Maintenance	Each	$2,000,000	1	$2,000,000
Communications	Station	$20,000	32	$640,000
Subtotal Construction Cost				$93,547,240
Contingency (35%)				$32,741,534
CONSTRUCTION TOTAL				$126,288,774
PROJECT ADMINISTRATION (30%)				$37,886,632
VEHICLES	Each	$1,000,000	7	$7,000,000
Total				**$171,815,406**

Low End Cost Estimate for Main Franklin Line

TO 14TH STREET

	Unit of Work	Unit Cost	Units	Cost
CONSTRUCTION				
Trackwork				
Single Track	Track Foot	$150	34,650	$5,197,500
Passing Track	Each	$200,000	4	$800,000
Earthwork	Cubic Yard	$20	38,500	$770,000
Improvements	Square Foot	$20	415,800	$8,316,000
Stations	Each	$25,000	24	$600,000
Bridge Crossing	Track Foot	$500	2,500	$1,250,000
Traffic Signal				
New	Each	$100,000	2	$200,000
Modification	Each	$25,000	2	$50,000
Utilities	Track Foot	$100	34,650	$3,465,000
Maintenance	Each	$2,000,000	1	$2,000,000
Communications	Station	$10,000	24	$240,000
Subtotal Construction Cost				$17,691,000
Contingency (35%)				$6,191,850
CONSTRUCTION TOTAL				$23,882,850
PROJECT ADMINISTRATION (30%)				$7,164,855
VEHICLES	Each	$500,000	7	$3,500,000
Total				**$34,787,705**

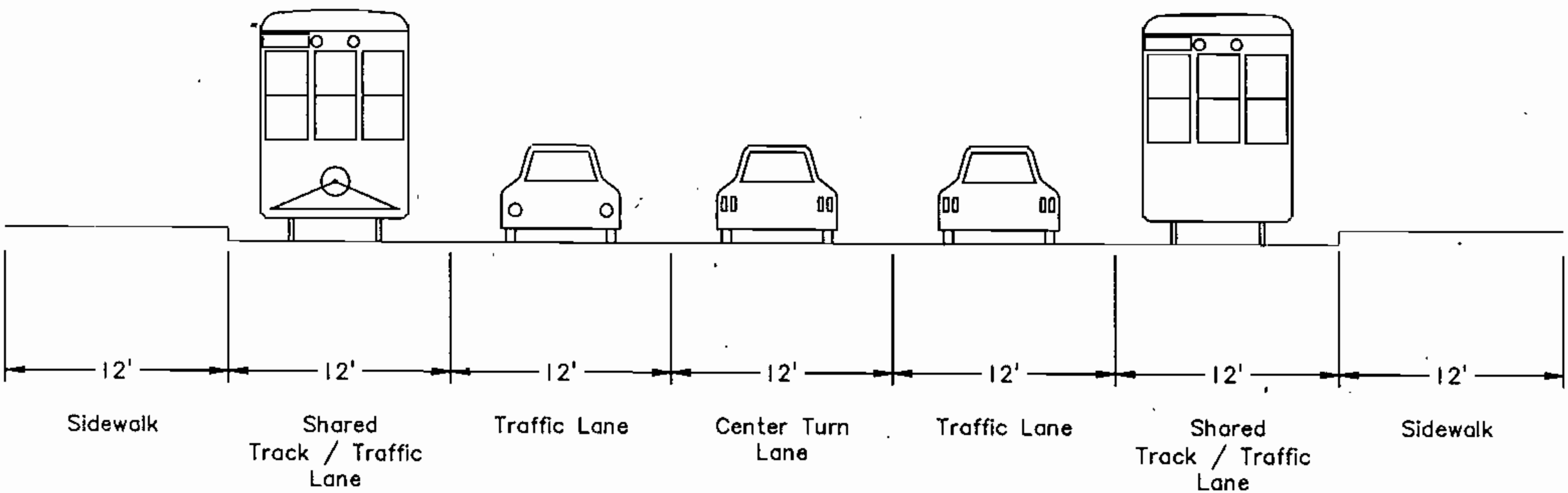
Mid - Cost Estimate for Main Franklin Line

TO 14TH STREET

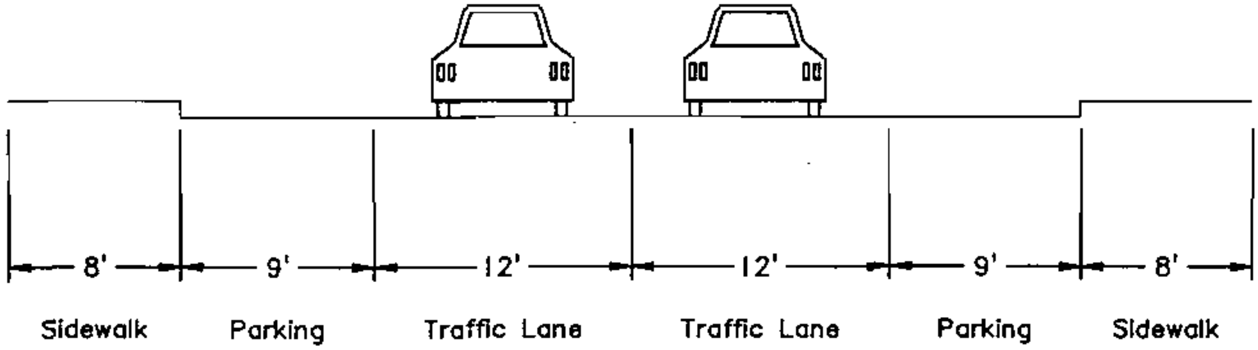
	Unit of Work	Unit Cost	Units	Cost
CONSTRUCTION				
Trackwork				
Double Track	Track Foot	$700	34,650	$24,255,000
Earthwork	Cubic Yard	$20	77,000	$1,540,000
Improvements	Square Foot	$20	831,600	$16,632,000
Stations	Each	$50,000	24	$1,200,000
Bridge Crossing	Track Foot	$1,000	2,500	$2,500,000
Traffic Signal				
New	Each	$100,000	2	$200,000
Modification	Each	$30,000	12	$360,000
Utilities	Track Foot	$300	34,650	$10,395,000
Maintenance	Each	$2,000,000	1	$2,000,000
Communications	Station	$20,000	24	$480,000
Subtotal Construction Cost				$59,562,000
Contingency (35%)				$20,846,700
CONSTRUCTION TOTAL				$80,408,700
PROJECT ADMINISTRATION (30%)				$24,122,610
VEHICLES	Each	$1,000,000	7	$7,000,000
Total				**$112,011,310**

Appendix B

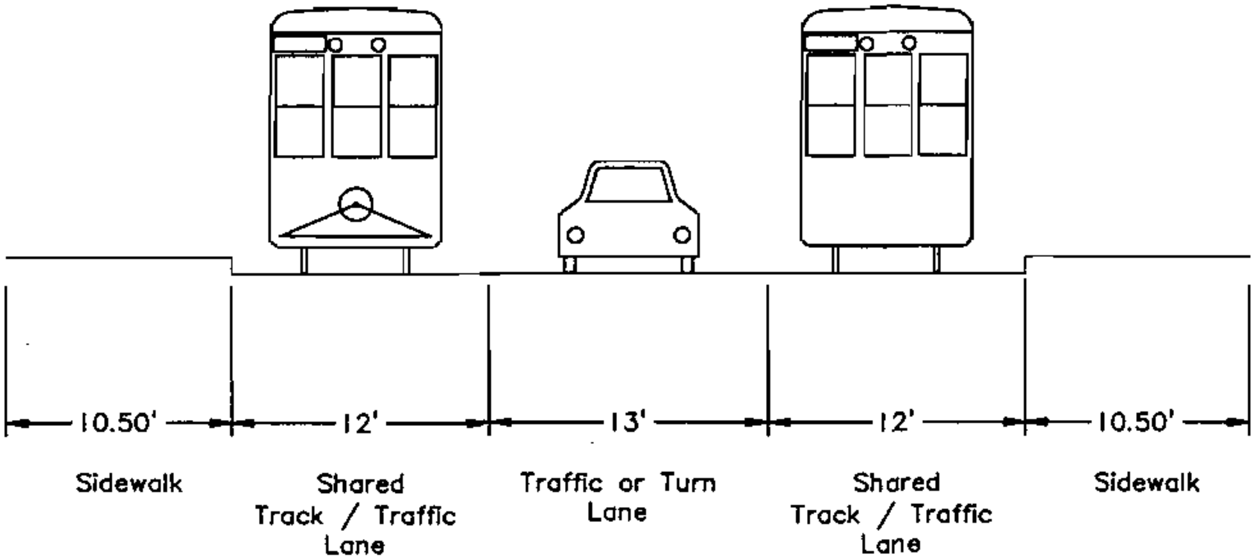
Typical Lane Configurations with Single Track and Double Track



TYPICAL LANE CONFIGURATION WITH DOUBLE TRACK
COBURG ROAD, MAIN STREET, AND FRANKLIN BLVD.

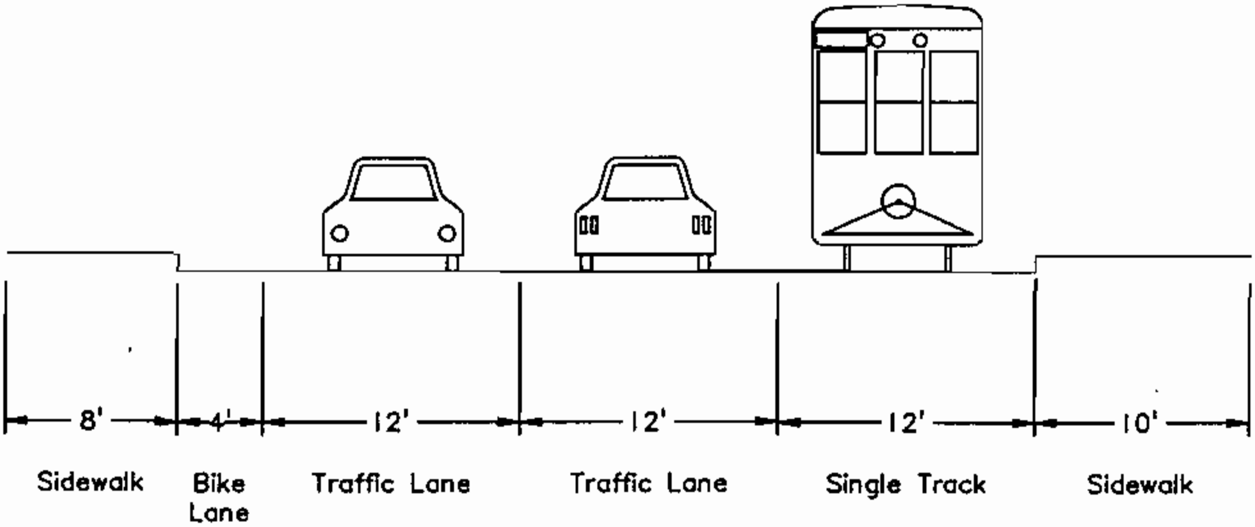


EXISTING

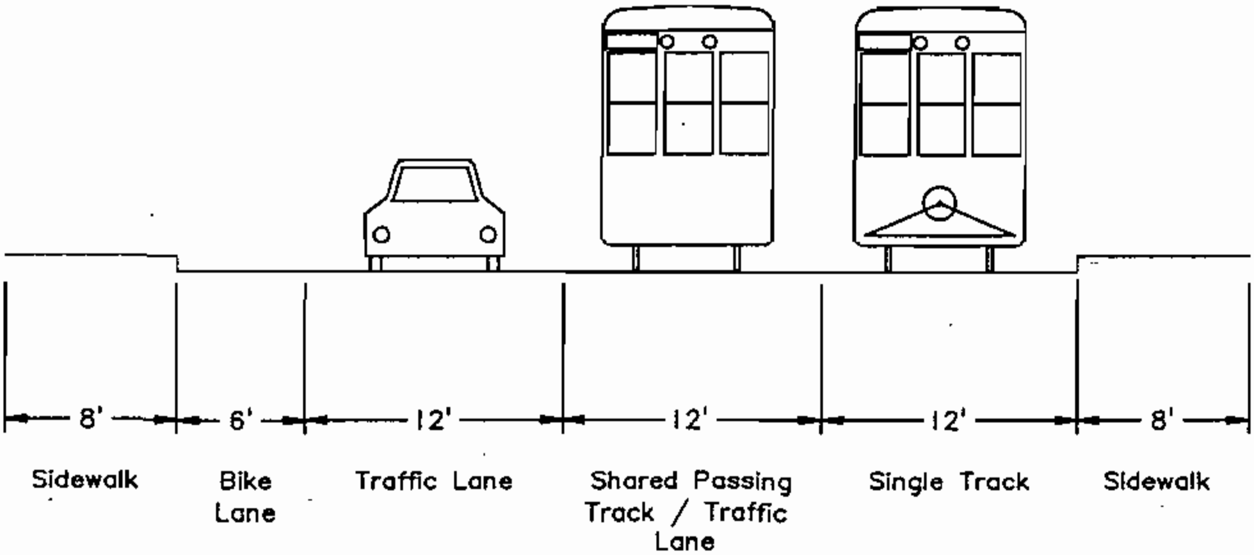


WITH DOUBLE TRACK

TYPICAL DOWNTOWN EUGENE LANE CONFIGURATION

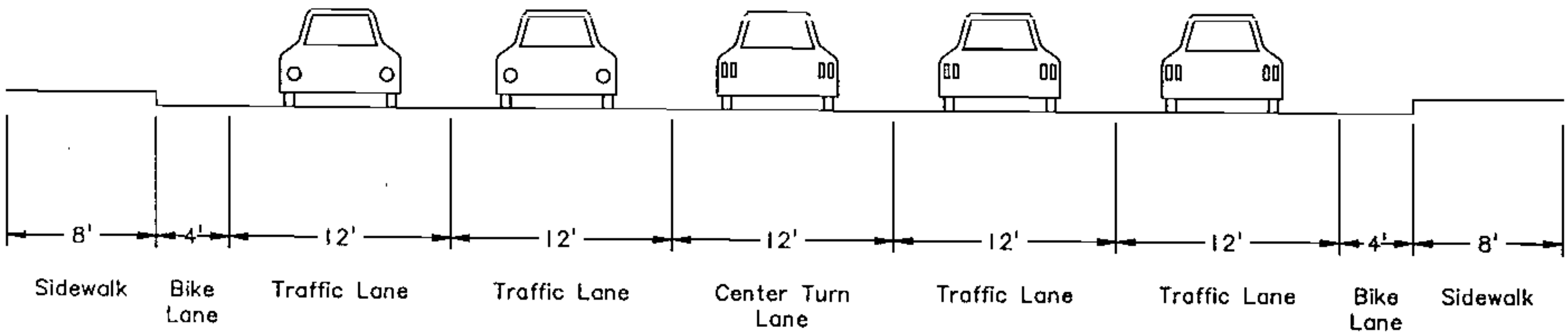


WITH SINGLE TRACK

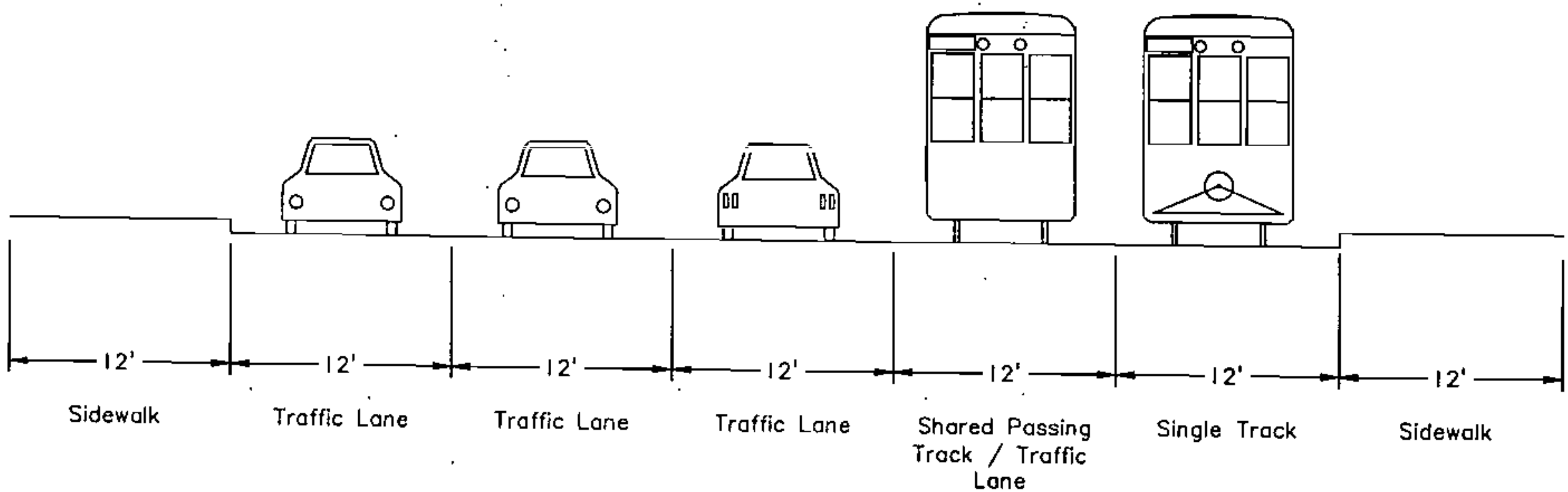


WITH SINGLE TRACK AND PASSING TRACK

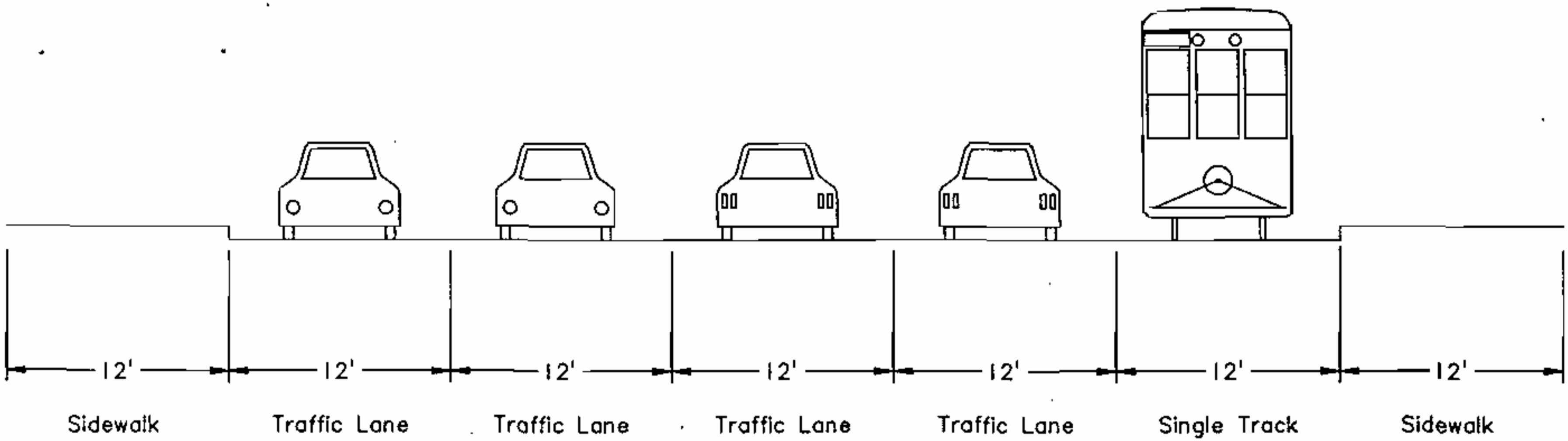
TYPICAL DOWNTOWN EUGENE LANE CONFIGURATION



TYPICAL EXISTING LANE CONFIGURATION
COBURG ROAD, MAIN STREET, AND FRANKLIN BLVD.



TYPICAL LANE CONFIGURATION WITH SINGLE TRACK AND PASSING TRACK
COBURG ROAD, MAIN STREET, AND FRANKLIN BLVD.



TYPICAL LANE CONFIGURATION WITH SINGLE TRACK
COBURG ROAD, MAIN STREET, AND FRANKLIN BLVD.

Appendix C

LRT Ridership at Selected U.S. Cities

SELECT-CITY LRT RIDERSHIP COMPARISON DATA					
SYSTEM	**AREA POP.**	**AREA SQUARE MILES**	**LRT ROUTE MILES**	**AVERAGE DAILY RIDERSHIP**	**DAILY RIDERSHIP per MILE**
Buffalo (Light Rail)	954,332	286	6.5	28,000	4,300
Cleveland (Light Rail)	1,677,492	636	13	14,300	1,100
Philadelphia (Light Rail)	4,222,211	1,164	30	124,000	4,100
Pittsburgh	1,678,745	778	25	30,400	1,200
Portland	1,172,158	388	15	23,700	1,580
San Diego	2,348,417	690	16	47,000	2,900
Sacramento	1,097,005	334	18	22,300	1,200
Santa Clara	1,435,019	338	19.5	20,200	1000
Galveston	58,263	30	4.7	260	55

Source: Federal Transit Administration, 1993

Appendix B

Bus Rapid Transit (BRT) Concept

Major Investment Study (MIS)

Final Report

1999

Produced by:

Lane Council of Governments
125 E. 8th Avenue
Eugene OR 97401
541-682-4283

BRT Concept MIS Report Contents

Preface

The Bus Rapid Transit (BRT) concept is the preferred transit strategy for the Eugene-Springfield metropolitan area. BRT emerged as the preferred strategy through a Major Investment Study (MIS) undertaken as part of the *Eugene-Springfield Regional Transportation Plan (TransPlan)* update. *TransPlan* guides the comprehensive metropolitan transportation system planning process and the MIS is a subset of this process. The *TransPlan* update process was the decision making process for the BRT concept. The MIS informs decisions by the Metropolitan Planning Organization (MPO), in cooperation with participating agencies, on the design concept and scope of major investments. The MIS scope of work, level of detail, schedule, and technical methods were based on local conditions through a collaborative, cooperative process involving partnership between local, state, and federal agencies. The key participating agencies were Lane Council of Governments (Metropolitan Planning Organization), Oregon Department of Transportation (ODOT), Lane Transit District, City of Eugene, City of Springfield, Lane County and the Federal Highway Administration (FHWA).

TransPlan Update/BRT Concept MIS Overview

The *Eugene-Springfield Regional Transportation Plan (TransPlan)* establishes the framework upon which participating public agencies can make consistent and coordinated planning decisions regarding inter- and intrajurisdictional transportation. Since 1992, *TransPlan* has been undergoing a comprehensive update process encompassing extensive public involvement, a broad range of technical analyses and studies, and the expertise of staff, consultants, public officials, and stakeholders. The updated plan is scheduled for adoption in 1999.

Purpose and Need

The necessity for the BRT MIS was established at the beginning of the *TransPlan* update process as needs, trends and issues were identified. Some of the key trends and issues are listed below and are discussed in detail on page 4:

- Rapid population and employment growth
- Vehicle miles traveled outpacing population growth
- Traffic congestion increasing and forecasted to increase further
- Forecasted air quality degradation
- Reduced transit travel times as buses are caught in growing congestion

The purpose of the *TransPlan* update/BRT Concept MIS is set forth through the goals and objectives that were established and are presented on page 6. An alternatives evaluation process was developed that conformed to the goals and objectives and additional needs. The evaluation process is described beginning on page 12. Draft *TransPlan* policies that address the community's needs are presented on page 13.

Alternatives Development and Analysis

The *TransPlan* update/BRT Concept MIS process included consideration of a range of alternatives, including urban rail. This report describes the public process and technical analysis by which the alternatives were developed and evaluated. The rationale for narrowing the alternatives was based on the *TransPlan* update goals and objectives and evaluation criteria. Public and agency input was obtained to refine the alternatives and selected a preferred alternative. The alternative plan concepts are described on page 11. The Bus Rapid Transit alternatives are described on page 38.

Public and Agency Involvement

Throughout the *TransPlan* update/BRT MIS process, citizens and agencies have had numerous opportunities to comment on the process and products. Through public involvement techniques such as the stakeholder process, open houses, surveys and focus groups, citizens participated in the development and review of needs and issues, goals and objectives, strategies and alternative plan concepts. Descriptions of citizen and agency involvement are included in Chapter 1: Overview of *TransPlan* Update/BRT MIS Process, Chapter 2: Urban Rail Study, and Chapter 4: Transit Market Analysis and Transit System Analysis .

TransPlan Update/BRT Concept MIS Guidance

The *TransPlan* update/BRT MIS process was guided by several bodies of elected and appointed officials and staff, including:

1. **The Lane Council of Governments Board of Directors** established policy except in specific cases where that responsibility was delegated to the Metropolitan Policy Committee. As the Metropolitan Planning Organization (MPO), LCOG has responsibility for conducting the continuing, comprehensive and cooperative transportation planning process in the Eugene-Springfield metropolitan area. The LCOG Board retains responsibility for endorsement of the transportation plan and amendments and for adoption of the work program.

2. **The Metropolitan Policy Committee (MPC)** is comprised of two elected officials each from Lane County, Eugene and Springfield, two appointed board members from Lane Transit District and as ex-officio members, the chief administrative officers of Lane County, Eugene, Springfield and Lane Transit District and the Region 2 Manager for the Oregon Department of Transportation. MPC provides policy guidance related to the conduct of the transportation planning process, for adoption of the annual Transportation Improvement Program, and for advising the LCOG Board on its action related to the transportation plan and the annual review process and other transportation issues.

3. **The Transportation Planning Committee (TPC)** conducts the technical portions of the process and public participation. It is composed of staff planners and engineers from all participating jurisdictions.

4. **The Joint Planning Commission Committee (JPCC)** is composed of two members from the planning commissions of Lane County, Eugene and Springfield. It provides general guidance and input into the region's transportation public involvement process.

Major Investment Study Definition and Requirements

A Major Investment Study (MIS) is a planning tool to provide the regional multimodal transportation planning effort with in-depth technical analyses of various subarea or corridor options, allowing for better decisions about improving transportation in metropolitan areas. An MIS for a corridor or subarea is undertaken when the need for a major metropolitan transportation investment has been identified in the metropolitan planning process and where federal funds are potentially involved. A *major investment* is officially defined as a "high-type highway or transit improvement of substantial cost that is expected to have a significant effect on capacity, traffic flow, level of service, or mode share at the transportation corridor or subarea scale." Where major investments are contemplated, it is necessary to address transportation needs on a corridor or subarea scale, using more focused analyses to help decision makers understand the options for addressing corridor or subarea level transportation problems **-- Major Investment Studies (MISs)** meet this need.

MIS requirements include the following:

- Provide a focused analysis and evaluation of the mobility needs and related problems of a corridor or subarea within the region
- Identify a multimodal set of mobility investment and policy options to address those needs and problems
- Develop measures of benefits, costs, and impacts
- Conduct comprehensive analysis and evaluation of the options
- Inform decisions on the design concept and scope for corridor/subarea major investments and policies to be incorporated into the regional transportation plan

If the Eugene-Springfield metropolitan area decides to advance the Bus Rapid Transit concept that emerged from the *TransPlan* update/BRT MIS process, the next steps involve project development – including preliminary engineering – which defines major design features in greater detail, and completion of the National Environmental Policy ACT (NEPA) process. The BRT Concept MIS follows the principles of the NEPA process, including public involvement and the consideration of alternatives and their environmental effects. The MIS process and documentation will serve as input to subsequent NEPA documentation. Following completion of the NEPA environmental review process, transportation improvements could be advanced to final design and implementation.

Organization of This Report

This MIS report is organized around the key components of the BRT Concept MIS process.

- The first chapter provides a general overview of the *TransPlan* update process. The *TransPlan* update process provided the decision making framework for the BRT MIS. A thorough understanding of the *TransPlan* update process facilitates understanding the BRT MIS decision-making process.
- The second chapter describes in detail the Urban Rail Study conducted in 1995 during Phase II of the *TransPlan* update process. This study provided important conclusions regarding rail and resulted in recommendations that informed the BRT MIS process.
- The third chapter describes in detail the alternative plan concepts that were developed and evaluated as part of the *TransPlan* update process. This chapter documents results of the technical evaluation of the various combinations of transportation demand management and land use strategies and transit and roadway networks.
- The fourth chapter describes transit market analysis, and transit system analysis.
- The fifth chapter provides a summary and conclusions to the study and a description of the proposed BRT system.

Chapter 1: Overview of *TransPlan* Update/BRT MIS Process

The *TransPlan* update/BRT MIS process consisted of four phases:

- Phase I: Needs/Issues and Goals/Objectives (June 1992 – June 1993)
- Phase II: Alternatives Development (July 1993 – October 1995)
- Phase III: Alternatives Evaluation and Draft Plan Direction (November 1995 – April 1997)
- Phase IV: Draft Plan Development, Review, and Adoption (May 1997 – 1999)

Phase I: Needs/Issues and Goals/Objectives (June 1992 – June 1993)

The first phase focused on developing a comprehensive understanding of transportation-related existing and projected needs and issues and on defining the mobility deficiencies that the *TransPlan* update/MIS process would address. Phase I public involvement efforts, including two open houses, presentations, a survey and newsletters, focused on publicizing the kickoff of the *TransPlan* update and identifying the issues, needs, and concerns of community residents about transportation and land use planning.

Key Trends and Issues

Phase I included trends analysis and forecasts of future need based on population, employment and land use assumptions. Trends that affect the regional transportation planning environment include the following:

Trend #1: The regional population is growing.

Over the last 20 years, the region's population increased by 30 percent. By 2015, the population is expected to grow an additional 44 percent to approximately 296,000 people.

	1995	2015	Percentage Increase
Population	224,100	301,400	34%
Employment	106,900	153,000	43%

Trend #2: The number of automobiles is growing even faster.

Between 1970 and 1990, the number of vehicles in Lane County increased by 83 percent, while the number of households only increased by 62 percent.

Trend #3: The number of miles traveled by automobile is growing still faster.

Residents are taking increased numbers of vehicle trips more frequently and over greater distances. Between 1980 and 1990, vehicle miles traveled (VMT) grew at a rate seven times that of the population growth. The U.S. Department of Transportation forecasted that the VMT rate would double by the year 2020.

Insert TransPlan Trek Timeline

Trend #4: Reliance on the automobile is increasing while the use of alternatives is decreasing.

More people drive alone to work and use their cars for almost all business, social, and recreational activities. Between 1983 and 1990, the percentage of single-occupant vehicle commuters rose from 64 percent to 73 percent. The percentage who used bikes, buses, or who walked as a primary means of transportation continued to decline: bus commuters dropped from 4.5% to 3%, bike commuters from 5% to 4%, and walking commuters from 6% to 5%.

Trend #5: Existing land use patterns encourage automobile use.

Most residents live in single-family residential neighborhoods, some distance from jobs and shopping. These land use patterns make it easier to get to these places by car rather than by bus, bike, or walking. New office and retail developments are dispersed throughout the cities in areas away from downtowns and along arterial streets lined with commercial developments.

Trend #6: Transportation costs are rising while revenues are shrinking.

Investments in transportation facilities have not kept pace with the growing demands on the system. This trend is expected to continue. The State of Oregon estimates total road and bridge needs in the next 20 years of about $49 billion, but projects revenues of only about $23.7 billion. All regions of the state can expect less help to resolve transportation problems.

Transportation-related **issues** that affect the region's quality of life include the following:

Issue #1: Some Eugene-Springfield roads are already congested and this will increase as the region grows.

Increased VMT and growth in daily traffic on major streets is creating congestion that will worsen as more vehicles use the system. Average daily traffic on many major streets is growing by 3-6 percent or more per year. Congestion in Eugene-Springfield is no longer limited to rush hours. At least half of the local residents find roads are congested at various times of the day. The vast majority finds roads are congested during morning and evening rush hours. Lane Transit District has also felt the effects of increased traffic congestion. To maintain its current level of service, LTD added buses to several routes.

Issue #2: Traffic growth affects air and water quality and the livability of neighborhoods.

New automobile technology has markedly reduced automobile emissions, but air quality is still being degraded. Motor vehicles emitted 60,000 tons of carbon monoxide into the region's air annually in the early 1990s, causing 50 percent of all air pollution. Water quality is also affected as automobile emissions, oil, grease, and metals are washed into local rivers and wetlands by urban stormwater.

Issue #3: Auto-dependent land use patterns limit mobility.

Policies that encourage the separation of land uses limit residents' mobility and transportation choices. These conditions also diminish mobility for those who rely exclusively on the automobile because the conditions lead to increased congestion, travel distances, and travel times.

Those who do not drive have limited choices as well. The 1990 U.S. Census reported that approximately 10 percent of all households in the Eugene-Springfield metro area did not own a vehicle.

Issue #4: Growing demands on the transportation system raise questions about the ability to pay for needed improvements.

At both the state and local levels, the ability to finance new transportation projects and to maintain and operate existing facilities is not keeping pace with growing demand. Transportation and land use systems designed predominantly for the automobile are expensive to build and maintain.

Preservation of the transportation system is important. Maintaining streets and meeting legal requirements is expensive and may divert funding from other transportation system improvements. Preservation is generally given higher priority than building new facilities because failure to perform timely maintenance results in even greater expense.

Issue #5: State and federal environmental standards are stricter and stronger.

While new environmental standards for water and air quality will help to reduce the environmental impacts of transportation projects, the standards also are likely to increase project costs. Current revenue sources, such as gas tax and timber receipts, cannot keep pace. New revenue sources will be needed to address increased demand and new regulations, as well as to meet new policy direction.

Issue #6: For the first time, federal and state policies emphasize reducing reliance on the automobile and federal funds support investment in alternatives.

A major shift in policy has occurred at both the federal and state levels. New policies that require coordinated land use and transportation planning also provide increased and more flexible funding for alternatives, require removal of barriers to transportation access, and require plans that will increase opportunities to use other transportation methods and to improve transportation choices.

Goals and Objectives

The Draft *TransPlan* goals and objectives development process included the following steps:

- The **federal and state regulatory frameworks** for transportation planning were evaluated for their implications in the Eugene-Springfield area. Legislation such as the *Intermodal Surface Transportation Efficiency Act (ISTEA), 1991 and the Transportation Planning Rule (TPR), 1991*, was reviewed. *(Trends, Issues and Opportunities, November 1993)*

- **Existing local transportation and land use planning policies** (*Metro Area General Plan, 1987 Update; TransPlan 1986*) were reviewed in the context of federal and state regulations. The existing local policies were found to be generally consistent with federal and state direction, yet it was clear that the policy framework needed to be updated to close gaps due to new federal and state mandates to integrate transportation and land use planning, to reduce congestion and vehicle miles of travel per person, and to reduce reliance on the auto.

- **Interim goals and objectives** were proposed to guide the plan update process and serve as the first step toward development of plan policies. When developing the interim goals and objectives, staff took into account the existing local policy framework and the federal and state regulatory framework for transportation planning in the Eugene-Springfield metro area. Some goal language was derived from goal language set forth in the *Oregon Transportation Plan (1992)*.

- A **Goals and Objectives Committee** was formed in 1995. The committee consisted of ten stakeholders, including planning commissioners and the chairpersons and co-chairpersons from the three strategy task forces. During the first series of meetings (between January 1995 and March 1995), the committee reviewed and refined the *TransPlan* interim goals and objectives, taking into account the comments and suggestions from stakeholders at the first symposium. The Interim Goals and Objectives were reviewed by planning commissioners and elected officials from each of the three metropolitan jurisdictions. In December 1995, the **Metropolitan Policy Committee** approved the interim goals and objectives as the guiding framework for the *TransPlan* update. *(MPC Meeting Minutes, December 14, 1995)*

The Draft *TransPlan* goals and objectives follow:

Goal #1: Integrated Transportation and Land Use System

Provide an integrated transportation and land use system that supports choices in modes of travel and development patterns that will reduce reliance on the auto and enhance livability, economic opportunity, and the quality of life.

Goal #2: Transportation System Characteristics

Enhance the Eugene-Springfield metropolitan area's quality of life and economic opportunity by providing a transportation system that is:

a) Balanced,
b) Accessible,
c) Efficient,
d) Safe,
e) Interconnected,
f) Environmentally responsible,
g) Supportive of responsible and sustainable development,
h) Responsive to community needs and neighborhood impacts, and
i) Economically viable and financially stable.

Objective #1: Accessibility and Mobility

Provide adequate levels of accessibility and mobility for the efficient movement of people, goods, and services within the region.

Objective #2: Safety

Improve transportation system safety through design, operations and maintenance, system improvements, support facilities, public information, and law enforcement efforts.

Objective #3: Environment

Provide transportation systems that are environmentally responsible.

Objective #4: Economic Vitality

Support transportation strategies that improve the economic vitality of the region and enhance economic opportunity.

Objective #5: Public Involvement

Provide citizens with information to increase their awareness of transportation issues, encourage their involvement in resolving the issues, and assist them in making informed transportation choices.

Objective #6: Coordination/Efficiency

Coordinate among agencies to facilitate efficient planning, design, operation, and maintenance of transportation facilities and programs.

Objective #7: Policy Implementation

Implement a range of actions as determined by local governments, including land use, demand management, and system improvement strategies, to carry out transportation policies.

Phase II: Alternatives Development (July 1993 – October 1995)

The second phase focused on identifying a range of strategies to address existing and projected needs and issues and to meet goals and objectives. As opportunities for addressing the transportation-related issues were identified and categorized, three sets of strategies were developed:

1. Land Use Measures (LUM),
2. Transportation Demand Management (TDM) strategies, and
3. Transportation System Improvements (TSI).

Land use measures
focus on the relationship between land use and transportation by encouraging development patterns that reduce the need for autos, reduce trip lengths, and support the use of alternative modes. Balanced land use patterns allow future growth to occur without the congestion and deteriorating road conditions experienced in many metropolitan regions.

Demand management strategies
focus on reducing the demand placed upon the transportation system by redistributing or eliminating vehicle trips and encouraging use of alternative modes. Demand management strategies provide opportunities to lower capital costs while recognizing that there will be a need for expanding capacity for all users of the system: bus riders, pedestrians, bicyclists, and drivers.

System improvements
focus on increasing efficiency and adding capacity or new facilities to the existing highway, transit, bicycle, and pedestrian systems. System improvements address that streets and highways are of vital importance to supporting all modes of transportation, the region's development, and quality of life.

Public involvement work in Phase II was centered on the stakeholder process. The stakeholder process constituted the core of the public involvement program and was the primary method of achieving sustained public involvement. Symposiums and task forces were key components of the stakeholder process. A main objective of the stakeholder process was to involve groups representing a comprehensive cross section of the community, who have a vital interest in the outcome of the transportation planning process. Stakeholders committed to participating in all the symposiums and a majority of stakeholders served on one of the three task forces. In addition, many stakeholders served on focus committees.

The concept of integrated transportation planning requiring three types of strategies – land use, transportation demand management, and transportation system improvements -- was presented to stakeholders at the first *TransPlan* update symposium in November 1993. Stakeholders reviewed a preliminary "tool box" containing the three types of strategies. Three stakeholder task forces were established to study the categories of strategies for achieving the transportation goals and objectives. The objective of the task forces was to obtain stakeholder input on identifying and evaluating strategies and opportunities for achieving *TransPlan* update goals and objectives. While each task force had a different approach, the conceptual framework was the same:

- Which strategies work?
- Where would be the best application of those strategies?
- How do the strategies fit together?
- What is the best time frame in which strategies should be implemented?

Land Use Measures

The LUM task force looked at strategies which create urban development patterns that reduce the need to rely on the automobile for most trips. Land use measures have the greatest potential to influence the *causes*, rather than the *symptoms* of congestion. Land use changes are long-term solutions that can take from 10 to 20 years, or more, to effectively employ. Examples of land use measures include mixed use development, higher density transit corridors, infill development, residential design guidelines, and transit oriented development (TOD) standards. Twenty-four stakeholders and six jurisdictional staff members served on the LUM task force. The TSI Task Force final report included ten strategies and nine categories of implementation techniques. Highlights of the multi-modal corridor strategy description follow:

- The multi-modal corridor strategy involves identification of a network of multi-modal corridors within which a high level of transit service is provided, transit supportive land uses can be developed, and bicycle and pedestrian circulation systems, amenities and safety features can be provided.
- Multi-modal corridors are typically oriented along major arterials within the urban area.
- Although it is expected that the multi-modal corridor will be served by rubber-tired buses operating on the street with cars and bicycles, the major corridors could be served equally well with an on-street light rail system.
- Multi-modal corridors would be expected to provide a relatively high level of transit amenities and safety features such as passenger shelters, lighting and bus pullouts.
- The effectiveness of multi-modal corridors may be increased if bus priority systems are implemented along the corridor and the frequency of transit service is high.
- The multi-modal corridor strategy has the potential to work well in our community. LTD has already established a goal of peak-hour 10 minute service on many major arterials.

Transportation Demand Management

The Transportation Demand Management (TDM) task force focused on ways to eliminate or redistribute vehicle trips to reduce demand on the transportation system. Examples of TDM strategies include ridesharing, preferential parking for carpool and vanpool vehicles, telecommuting and flexible work hours. Twenty-one stakeholders and six jurisdictional staff members served on the TDM task force. The TDM Task Force final report presented 22 different TDM strategies that the task force considered.

Transportation System Improvements

The TSI task force examined ways to increase efficiency and capacity of existing facilities, and evaluated needs for construction of new facilities. Examples of TSI strategies include changing street patterns and design standards, building new roads, bridges and bikeways, and improving connections between different travel modes. Twenty-four stakeholders and six jurisdictional staff members served on the TSI task force. The TSI Task Force final report presented at least 17 different categories of TSI strategies. The TSI Task Force final report included the following policies specific to transit:

1. Implement priority treatment for carpools and transit where appropriate. Implementation strategies include:
   - Providing carpool/transit-only lanes on streets during the peak hour;
   - Giving preferential turning movements at appropriate intersections for carpools or buses;
   - Providing traffic priority at key traffic signals for buses through the use of electronic signal pre-emption devices; and
   - Giving priority to transit/carpools during the peak hour at appropriate ramps to limited access facilities.

2. Study the feasibility of an urban rail/street car system for the metro area. Implement a system if it is found to be appropriate.
3. Provide for bus turnouts, passenger shelters and passenger loading improvements in construction or reconstruction of all collector or arterial streets, unless they are determined unnecessary.
4. Provide frequent transit service in corridors which connect major nodes, such as Valley River Center, downtown Eugene, downtown Springfield, the University of Oregon, and other corridors between nodes where appropriate.

The TSI Task Force final report included discussion of the following strategies specific to transit:

1. HOV Lanes and Exclusive Busways
   a) Freeway lanes reserved for buses/other HOVs
   b) Arterial street lanes reserved for express bus/other HOVs
2. Transit Improvements
   a) Bus transfer stations
   b) Park and ride lots along transit routes
3. Transit Service Management
   a) Radial design
   b) Grid design
   c) Expanded regular route bus service
   d) Limited and skip stop bus routes
   e) Shuttle buses

Urban Rail Feasibility Study

An Urban Rail Feasibility Committee consisting of stakeholders was formed to guide the Urban Rail Feasibility Study. This study defined the type of rail system that could be constructed at a conceptual level, identified when a rail system for the Eugene-Springfield area would be feasible based on cost and ridership estimates, and identified actions that could be taken now to make rail a success in the future. The study concluded that projected 2015 ridership for an urban rail system was too low to be competitive with other cities seeking federal rail transit funding. The study recommended that the region act now to implement parking, land use, and transit policies that would help increase future ridership potential and improve the effectiveness of public transit on the region's major corridors. *(Urban Rail Feasibility Study Eugene-Springfield Area Final Report, July 1995)*

The Urban Rail Study is described in detail in Chapter 2: Urban Rail Study on page 18.

Preliminary Plan Concepts

The *TransPlan* update/MIS process provided a framework through which roadway, transit, and integrated multimodal alternatives could be developed. An effort was made to consider all reasonable alternatives and develop alternatives that respond directly to the transportation problems.

Approximately two dozen **preliminary plan concepts**, combining one of six different land use alternatives, three different transit system alternatives, three roadway network alternatives, and numerous TDM options were developed and evaluated using the computer model. The preliminary plan concepts underwent an iterative evaluation, review, and refinement process, which was shaped by input from citizens, stakeholders, public officials, staff, and results of technical studies and the travel forecasting model. Through consideration of the stakeholder task forces' recommendations and input from citizens and public officials, plan concepts were developed based on the three sets of alternative strategies. In fall 1994, a strategies survey was mailed to over 90,000 households to collect citizen input on the types of strategies that were considered by the stakeholder task forces. The preliminary plan concepts were reviewed with stakeholders at the second symposium in April 1995. The Transportation Planning Committee decided to refine six of these alternative plan concepts for public review through open houses and the third stakeholder symposium. *(TransPlan Update Third Symposium Materials, August 1996).*

Phase III: Alternatives Evaluation and Draft Plan Direction (November 1995 – April 1997)

Phase III focused on developing and evaluating alternative plan concepts and obtaining direction on the policy framework for the draft plan.

Alternative Plan Concepts

The alternative plan concepts resulting from the preliminary plan concept refinement process represented staff's efforts to develop a range of plan concepts containing all three types of strategies that respond to the stated preferences of citizens, stakeholders, and public officials; address legislative requirements; and make progress towards achieving the *TransPlan Update Interim Goals and Objective*s. The six alternative plan concepts are summarized below.

Plan Concept #1: The ***Base Case*** contained strategies that were essentially an extension of current transportation and land use conditions and trends. The concept served as a point of reference from which to gauge the effectiveness of the other plan concepts.

Plan Concept #2: The ***Demand Management Emphasis*** plan concept contained higher levels of demand management strategies and lower levels of land use and system improvement strategies.

Plan Concept #3: The ***Land Use Emphasis*** plan concept contained higher levels of land use strategies and lower levels of demand management and system improvement strategies.

Plan Concept #4: The ***System Changes Emphasis*** plan concept contained higher levels of system improvement strategies and lower levels of land use and demand management strategies.

Plan Concept #5: The ***Equal Emphasis*** plan concept attempted to strike a balance between the three strategy categories.

Plan Concept #6: The ***Transportation Planning Rule Vehicle Miles Traveled Goal Compliance*** plan concept emphasized demand management and system improvement strategies to meet the Transportation Planning Rule goal of reducing vehicle miles traveled by 10 percent over current conditions by the year 2015.

Alternative Plan Concept Technical Analysis

Phase III technical analysis efforts provided timely and complete information on the options for addressing identified transportation problems before investment decisions were made and included in *TransPlan.* The purpose of the technical analysis was three-fold:

1. First, it provided a process for determining the relative significance of the alternatives and the desirability of one alternative over another.
2. Second, it provided decision-makers with an evaluation of the impacts of each proposed alternative, tradeoffs and areas of uncertainty.
3. Finally, the evaluation served to identify areas for further refinement. The evaluation process provided the basis for the development of a draft plan.

The alternative plan concept evaluation was structured around a framework which included:

1. A set of **key questions** designed to address major policy areas; and
2. A set of specific **performance measures**, designed to provide useful information on differences among the alternatives and respond to the key questions

The technical evaluation process, findings and conclusions are described in detail in Chapter 3: Alternative Plan Concepts.

Selection of Preferred Plan Concept

The public process for selection of the preferred plan concept is described below:

- A series of focus groups were conducted with community members and business representatives in December 1995 and May 1996 to obtain feedback on the alternative plan concepts. (TransPlan Focus Groups with Area Residents, February 1996; Exploratory Research on TransPlan with Area Business Owners/Managers, June 1996)
- In May 1996, public opinion on system improvements for all modes was obtained through a statistically valid survey of 429 residents. (TransPlan Community Survey Report, June 1996)
- In May 1996, two community workshops provided citizens with additional opportunities to review and comment on the alternative plan concepts.
- Stakeholders reviewed the alternative plan concept strategies and provided their recommendations on preferred strategies to include in a plan concept at the third symposium in August 1996. In summary, stakeholders recommended the following strategies:
  - ⇒ Encourage nodal development in all potential areas,
  - ⇒ Expand voluntary demand management measures,
  - ⇒ Increase the statewide gas tax to both raise revenues and influence demand,
  - ⇒ Increase parking fees and apply them region-wide,
  - ⇒ Reduce transit fares (contingent upon replacement revenue),
  - ⇒ Build the existing and committed projects network, and
  - ⇒ Build a Bus Rapid Transit system (without wholly exclusive right-of-way).
- Staff developed conclusions regarding the relative merits of each alternative and findings were presented to the public and appointed and elected officials. Based on public input, technical analysis, and expert knowledge, staff developed a set of 14 strategies describing a preferred alternative. These strategies were outlined in the Policy-Makers' Decision Package (November 1996).

- In April 1997, elected officials directed staff to use the Decision Package strategies, with some modification, as the guiding policy framework for development of the Draft TransPlan. (TransPlan Update Improving Our Transportation Choices Newsletter, Summer 1997)

Phase IV: Draft Plan Development, Review, and Adoption (May 1997 – 1999)

Phase IV focused on developing and reviewing the draft plan and producing and adopting the final plan. The policy development process is described below:

- Once policy direction was received from elected officials in April 1997, the Transportation Planning Committee designated a **policy development subcommittee**. The committee developed a work program for policy development. The committee determined that existing *Metro Plan* definitions for goals, objectives, policies, and implementation actions should be adhered to.
- The first committee task was to **inventory existing *Metro Plan* Transportation Element and *TransPlan* policies** and identify policies that were consistent with and supportive of *Decision Package* strategies. Next, staff reviewed plan elements within *Metro Plan* for inconsistencies or conflicts with the *Decision Package* strategies.
- The committee reviewed the **federal and state regulatory framework** to identify what types of policy direction were necessary to ensure compliance. This was an important step since the Transportation Planning Rule had been amended (1995) since the last regulatory framework review was conducted in 1993.
- Based on the policy inventories for *Decision Package* strategies, **gaps/conflicts** were identified where additional policy direction was needed.
- The **policy development subcommittee** developed policies that were consistent with *Decision Package* strategies and Interim Goals and Objectives and that filled gaps in the existing policy framework. A key objective that the committee strove for was to eliminate redundancy and overlapping policies, thereby reducing the overall number of policies. The committee determined that many policies comprising the existing policy framework (*Metro Plan, TransPlan*) were actually implementation actions.
- The **policy development subcommittee** proposed policies and implementation actions in the following categories: Land Use, Transportation Demand Management, Transportation System Improvements, and Finance. The Transportation System Improvements category was further subdivided into System-Wide, Roadway, Transit, Bicycle, Pedestrian, Goods Movement, and Other Modes Policies. **Preliminary policies** were published in the *Local Jurisdiction Review Edition, Draft TransPlan, November 1997*.
- The **preliminary policies** underwent an iterative review process involving planners, engineers and attorneys from each of the local jurisdictions.
- The committee reviewed the **Interim Goals and Objectives** and made revisions to maintain consistency with the proposed policies.
- Based on the strategies approved by elected officials, staff developed a set of 21 **transportation system improvement policies** and developed **planning and program actions** for inclusion in the Draft *TransPlan*. The system improvements policy categories are: system-wide (4), roadways (3), transit (4), bicycles (3), pedestrians (3), goods movement (1), and other modes (3). *(Draft TransPlan, February 1998)*

Draft TransPlan Policies

The Draft *TransPlan* transit policies follow:

TSI Transit Policy #1: Transit Improvements
Improve transit service and facilities to increase the system's accessibility, attractiveness, and convenience for users.

TSI Transit Policy #2: Bus Rapid Transit
Establish a Bus Rapid Transit (BRT) system that provides frequent, fast transit service along major corridors and neighborhood services that connects with the corridor service and with activity centers, if the

system is shown to materially reduce existing or projected traffic congestion, if local governments demonstrate support, and if financing for the system is feasible.

TSI Transit Policy #3: Transit/High-Occupancy Vehicle (HOV) Priority
Implement traffic management strategies and other actions, where appropriate and practical, that give priority to transit and other HOVs.

TSI Transit Policy #4: Park-and-Ride Facilities
Expand the Park-and-Ride system within the metropolitan area and nearby communities.

Other Draft *TransPlan* policies that support transit include the following:

Land Use Policy #1: Nodal Development
Apply the nodal development strategy, which consists of neighborhood centers, commercial centers, and employment centers, in areas selected by each jurisdiction that have identified potential for this type of transportation-efficient land use pattern.

Land Use Policy #3: Transit-Supportive Land Use Patterns
Provide for transit-supportive land use patterns and development, including higher intensity, transit-oriented development along major transit corridors and near transit stations; medium- and high-density residential development within ¼ mile of transit stations, major transit corridors, employment centers, and downtown areas; and development and redevelopment in designated areas that are or could be well served by existing or planned transit.

Land Use Policy #4: Multi-Modal Improvements in New Development
Require improvements that accommodate transit, bicycles, and pedestrians in new commercial, public, mixed-use, and multi-unit residential development.

TSI System-Wide Policy #2: Intermodal Connectivity
Develop or promote intermodal linkages for connectivity and ease of transfer among all transportation modes.

Draft TransPlan Transit Capital Investment Actions

Capital Investment Actions are transportation system improvement projects for motor vehicles, transit, bicycles, pedestrians, goods movement, and other modes that require significant capital investment. The projects selected for inclusion as Capital Investment Actions establish a network of facilities that meet overall transportation needs for the 20-year planning period. *The draft TransPlan Capital Investment Actions are fiscally unconstrained, meaning that more projects are proposed for construction within the 20-year planning period than revenue has been identified.* During draft *TransPlan* review, decisions must be made to delete projects or identify new revenue sources to meet the fiscal constraint requirement under ISTEA. The Capital Investment Action project lists will be adopted, making them legislatively binding.

The following types of projects are included in the Capital Investment Action Transit Projects list:

1. **Park-and-Ride lots:** These projects are the construction or establishment of a formal Park-and-Ride lot.
2. **Passenger boarding improvements:** These types of projects consist of improvements that accommodate the transit passenger, such as benches and shelters.

The Capital Investment Action Transit Projects are integrated with the Planning and Program Actions for transit that implement the proposed Bus Rapid Transit system.

Summary of Capital Investment Actions	
Transit Projects	
Implementation Phase	*Total Estimated Cost*
Short Range	$43,355,000
Medium Range	$17,900,000
Long Range	$22,400,000
Total Transit Projects	**$83,655,000**

Draft TransPlan Transit Planning and Program Actions

The **Planning and Program Actions** represent a range of regionally significant planning, administrative, and support actions that might be used to implement *TransPlan* policies. Local jurisdictions will use their discretion to evaluate and prioritize Planning and Program Action implementation. The Planning and Program Actions are not adopted, meaning they are not binding or limiting to any implementing jurisdiction. Some Planning and Program Actions will lead to additional capital expenditures, others are examples of capital expenditures that might be implemented after further study. For example, a corridor study could lead to system improvements along the corridor. Planning and Program Actions are not subject to the same fiscal constraint requirements as the Capital Investment Actions. However, ongoing funding will be necessary to continue to implement actions such as the region's transportation demand management program. The Draft *TransPlan* planning and program actions specific to transit follow:

1. Transit Service Improvements

- 1.1. Provide service every ten minutes along major corridors. (*TransPlan* 1986, Policy AM1.)
- 1.2. Implement a shuttle that connects the downtown Eugene area with the University of Oregon, Sacred Heart Hospital, and other nearby activity centers.
- 1.3. Conduct feasibility studies on expanding transit service operations to nearby communities.
- 1.4. Implement operating procedures and monitor design guidelines to minimize security and safety concerns at transit stops/stations and on vehicles.
- 1.5. Acquire low-floor buses to improve and speed access by riders.
- 1.6. Acquire smaller buses to serve neighborhoods on local streets and connect the neighborhood service with the corridor service at nearby land use nodes.
- 1.7. Establish a prepaid fare system along the BRT corridors to speed rider boarding

2. Transit Facility Improvements

- 2.1. Construct transit stations in newly developed areas in the Eugene-Springfield area and in nearby communities. (Based on *Metro Plan* 1987 Transportation Policy 3.)
- 2.2. Implement a transit signal priority system along major transit corridors. (Based on *TransPlan* 1986 Policy TSM3, AM2.)
- 2.3. Support transit use through provision of bus stops, pullouts and shelters, optimum road geometrics, on-road parking restrictions and similar facilities, as appropriate. (TPR 660-12-045(4)(a))

2.4. Implement transit priority techniques, such as exclusive bus lanes, restricted turn movements at appropriate intersections for all vehicles except buses, queue-jumpers, and separate access ramps, along major transit corridors. (Based on *TransPlan* 1986 Policy TSM3, AM2.) Give priority to transit/carpools during the peak hour at appropriate ramps to limited access facilities. (*TransPlan* 1986 Policy TSM3, AM2.)

2.5. Provide transit facility improvements, such as shelters, benches, lighting, and transit schedule information, at major bus stops.

2.6. Provide transit schedule information at all transit shelters.

3. Park-and-Ride Facilities

3.1. Provide multiple Park-and-Ride facilities along major corridors.

3.2. Establish Park-and-Ride facilities in nearby communities for commuters into the metro area. (*TransPlan* 1986, Policy IC2.)

3.3. Develop Park-and-Ride facilities that make use of existing public and private parking lots, where use by Park-and-Ride commuters does not conflict with existing parking use (e.g., churches or retail establishments with evening or weekend peak demand) (*TransPlan* 1986 Policy AM5.)

3.4. Consider establishment of a Park-and-Ride facility at Autzen Stadium with a direct link to the University/Sacred Heart/Riverfront Research Park area.

Draft TransPlan Transit System Finance

Transit system finances are largely independent of other transportation systems, and are therefore analyzed separately. Revenues and expenses are consistent with LTD's long-range financial plan. The capital costs and revenues are consistent with the long-range capital plan. Assumptions about grant revenue amounts are significantly different than they are in the Capital Plan as they have been reduced to cover only the first phase of the BRT project.

Transit System Costs

Transit capital cost estimates are based on the assumptions that the BRT project will proceed with primary focus on the development of an east-west pilot corridor, that Park-and-Ride facilities will be added on major corridors as the need is identified and suitable sites are selected, and that fleet expansion and vehicle replacement will continue at a rate determined by service level needs. BRT project implementation could begin as early as FY 2001.

Transit costs include the first phase of the BRT project, which is currently estimated to cost between $20 and $30 million. BRT includes many potential elements that will need to be carefully reviewed and evaluated. Until this engineering work is completed and decisions are made on the extent and timing of the long-term development of the BRT corridors, it is very difficult to provide a more accurate cost estimate for the BRT system.

Transit System Revenues

Transit revenue estimates are based on assumptions that overall federal grant funds in support of capital projects will decline, that fare revenue will continue to increase as it has over the last two years, and that payroll tax receipts will increase due to growth in employment and wages.

It is anticipated that discretionary federal grant funds will pay for up to 80 percent of the capital cost of the BRT system. This expectation is consistent with the District's previous success in obtaining federal funds. During the past ten years, the District has been awarded discretionary federal funds for a new operating facility ($7 million), a new central station, ($10 million), buses

($3 million), and supporting equipment ($2 million). In addition, there is considerable enthusiasm at the federal level for LTD's BRT project, as it is seen as a low-cost and effective alternative to light-rail. This enthusiasm should translate into funding support. Therefore this revenue source meets the legal requirement that it is reasonably expected to exist.

Table 1: Transit Funding Summary 1998-2017 (1997 $millions)

Costs		Revenues	
O&M	$374.2	Local Revenue	$484.3
Preservation	$40.9	Misc. Grant Revenue	$14.2
System Improvements	$53.7	TEA 21 Grant	$8.8
Misc. Capital Expenses	$7.6	BRT Planning Grant	$1.0
BRT	$30.0		
TDM	$2.0		
Total Transit Costs	***$508.4***	***Total Transit Revenues***	***$5083***

Chapter 2: Urban Rail Study

The Urban Rail Feasibility Study, conducted by Lane council of Governments (LCOG), in cooperation with the Oregon Department of Transportation (ODOT), defined the type of rail system that could be constructed at a conceptual level, identified when a rail system for Eugene/Springfield would be feasible based on cost and ridership estimates, and identified actions that could be taken now to make rail a success in the future.

A citizen advisory committee, formed as a subcommittee of the *TransPlan* update public involvement effort, directed this study by selecting the rail technology, evaluation criteria, and potential corridors for urban rail. The committee has also reviewed the analysis and recommendations for this study. This summary reviews the key assumptions that have been made in this feasibility study and presents the recommendations.

Rail Technology

Based on a review of the capacity, right-of-way requirements and costs of alternative rail technologies the Committee selected light rail transit (LRT) as the technology for consideration this study. Some of the advantages of LRT over alternative technologies, such heavy rail or automated Group Transit (AGT), for the Eugene/Springfield area are its flexibility to operate in lanes shared with traffic in different right-of-way configurations and its potential lower costs. It can also operate as a streetcar, serving local trips, or as a line-haul mode serving work and other regional trips. The Committee was also interested in considering diesel-electric vehicles, instead of electric vehicles, as another means to reduce capital costs.

Evaluation Criteria

To develop evaluation criteria, the Committee discussed financial feasibility, economic redevelopment, reducing congestion and other factors that were important to them in measuring the success of an urban rail system. One of the key differences discussed was between the role of urban rail in addressing a regional transportation problem verses its role as a supplemental circulator for tourist and other non-work trip uses. Based on this discussion and considering the scope of the study, the committee selected eight criteria for use in evaluating urban rail. The consultant developed measures for use in applying the criteria in selecting the three corridors with the greatest potential for urban rail and in evaluating these corridors. The evaluation criteria used in the screening process and the corridor evaluation are:

- Increases transit ridership
- Reduces vehicle miles traveled
- Re-enforces desires urban form, linking land use, transportation, economic development and community livability
- Contributes to overall air quality improvement
- Minimizes traffic disruption
- Provides and improves access to major activities
- Creates intermodel transportation opportunities
- Minimizes private property takings

Corridor Screening

The Committee identified 17 urban rail corridors and asked the consultant to identify the three corridors that meet most of the selection criteria and that represented a range of potential rail applications to the Eugene/Springfield metro area. Based on the results of the screening process, the committee identified the following three representative corridors for further evaluation:

1. Between Eugene and Springfield along Main/Franklin, with the understanding that further evaluation of the corridor could include analysis of Centennial Boulevard as an alternative alignment

2. Some combination of the central Eugene corridor options with service to the edge of the U of O, Sacred Heart, downtown Eugene and an extension to serve nodes proposed by the *TransPlan* Land Use Measures (LUM) task force in the central area along either the Blair Line or Willamette.

3. Coburg Road, with the further development of services to increase the travel shed for this corridor.

Based on this, the Committee further defined the corridors for use in estimating cost and ridership as follows:

- *Downtown Loop*, serving the downtown employment and cultural areas, Sacred Heart Medical center, the U of O campus and established commercial and residential areas along 18th and Willamette. Beginning at the Amtrak station at 5th and Willamette, the route follows Willamette, East Broadway and Hilyard Streets to the U of O campus. Through the campus, the route follows on East 13th Street, University and East 15th right-of-way to Agate Street. The route continues on Agate Street, 18th Avenue and Willamette Street.

- *Coburg Road*, serving the growing commercial and residential areas along Coburg Road as well as the downtown Eugene employment and cultural center along Willamette Street. Beginning at Beltline Road, the corridor follows Coburg Road to the Amtrak station at 5th and Willamette and follows Willamette to East 11th Avenue past the LTD transit center. This corridor assumes use of a new bridge across the river in the vicinity of the existing Ferry Street Bridge.

- *Main/Franklin*, connecting downtown Eugene with downtown Springfield with extensions to River Road to the west and to S. 58th Street at Main Street in Springfield to the east. Beginning at River Road near the intersection of the Northwest Expressway and the footbridge to Valley River Mall, the corridor follows 2nd Avenue and Blair Blvd., 5th Ave., Willamette Street, Broadway and Franklin Blvd in Eugene. In Springfield, the route follows Main Street and South A Street. It would serve the Amtrak station, the LTD transit center in downtown Eugene and be within a few blocks of the downtown Springfield transit center. A sub-corridor was also evaluated that ended at S. 14th Street in Springfield.

For all three corridors, the analysis assumes that stations would be located approximately every two blocks within downtown Eugene. Outside of downtown, stations would be located approximately every ½ mile. Park and ride lots, already being developed by LTD, would serve the ends of the corridors at River Road, Beltline Road and South 58th Street.

The routings for each corridor are for evaluation purposes only as the basis for developing order of magnitude cost and ridership estimates. Any further consideration of LRT would need to include evaluation of alternative streets, right of way and terminus locations as well as operational configurations.

Corridor Evaluation

For these three corridors, the consultants developed conceptual capital, operations and maintenance cost estimates and potential ridership. For capital costs, the consultant developed two different types of estimates:

1. *A Low-End Cost* that assumes single track and passing track, asphalt paving, limited traffic signal modifications, utility protection instead of relocation, used vehicles and a limited communications system.

2. *A Mid-Range Cost* that assumes double track with pavers between tracks, traffic signal modifications for critical train movements and train pre-emption, utility relocation, new vehicles and a train-to-wayside communication system.

Though both systems were designed to operate at 10 minute peak headways, the use of a single track and passing track configuration would result in less reliability than a double-track system. In addition, because the low-end cost estimate does not include utility relocation, the system would be subject to closure for utility access. As a result, the mid-range system would be more suitable for revenue-operation as part of the regional transportation system while the low-end system would be more suitable for a local or tourist-oriented system. Based on these factors, the mid-range system is more likely to perform as a regional transportation solution than the low-end estimate. Both systems require modifications to existing traffic circulation patterns and on-street parking.

Using these assumptions, capital costs would range from $4.7 to $7.6 million per mile for the low end cost and $16.1 to $18.6 million per mile for the mid range cost, depending on the corridor. Table 1 summarizes these estimates.

Table 2: Low-End and Mid –Range Capital Cost Estimates

Corridor	Miles	No of Stations	Low End		Mid-Range	
			Cost	Cost/Mile	Cost	Cost/Mile
Downtown Loop	4.34	17	$29.5	$6.8	$74.2	$17.1
Coburg Road	3.34	13	$25.4	$7.6	$62.1	$18.6
Main/Franklin (S. 14th St.)	10.67	32	$49.5	$4.7	$171.8	$16.1
Main/Franklin (S. 14th St.)	6.56	24	$34.8	$5.3	$112.0	$17.1

Note: Includes construction, vehicles, contingency and project administration (In Millions of 1995 dollars)

Operations and maintenance costs, based on the experience with diesel-electric vehicles in Galveston, Texas, would range from $1.7 million for the Coburg Road line to $2.2 million for the downtown loop to $5.3 million for the Main/Franklin line annually. These costs assume that the urban rail would operate at roughly the same speeds as Lane Transit district buses today. Though operating costs would be lower if electric vehicles were used instead of diesel electric vehicles, capital costs, necessary for the catenary and substations, would be higher.

Ridership estimates were based on the number of trips with origins and destinations in the corridor and the potential for these trips to use transit, plus the additional ridership that could be expected from feeder bus and park and ride. A special factor, reflecting the attractiveness of rail transit was used in the ridership estimates to estimate a high end range. As a result, daily ridership in the range of 3,000 to 6,600 for the low end and 4,000 to 10,000 at the high end could be expected, as shown in Table 2. These estimates indicate that urban rail would not carry a significant share of traffic and would be much lower than the capacity that urban rail offers. The number of new riders, though not calculated specifically at this level of analysis, is likely to be low based on the limited reductions in travel time that are possible with LRT in shared traffic lanes.

Table 3: 2015 Low and High Estimated Daily Ridership

Corridor	Length (miles)	Daily Ridership Low/High	Ridership/mile Low/High
Downtown Loop	4.34	3,300/4,900	760/1,130
Coburg Road	3.34	3,000/4,000	900/1,200
Main/Franklin (S. 58th St.)	10.67	6,600/10,100	620/950
Main/Franklin (S. 14th St.)	6.56	4,400/6,500	670/1,010

Conclusions and Recommendations

Frequent existing transit services in major corridors and planned nodal development are factors that support urban rail in the Eugene-Springfield area. If public right-of-way can be used, another favorable factor would be that rail could be constructed for less than $20 million per mile which is low compared to rail cost in other cities. However, projected 2015 ridership levels for the three corridors analyzed, assuming continuation of current trends and development patterns, appear too low to be competitive with other cities seeking federal transit funding. A review of ridership in other cities that have successfully competed for federal funding indicates that ridership levels are roughly twice that projected for the Eugene/Springfield area.

As a tourist-oriented system, not intended to provide the frequent, reliable services that commuters require, lower cost urban rail could be developed but would still require major financial investments and modifications to the transportation system which may conflict with other transportation policies.

Based on these conclusions, this study recommends that the region act now to implement parking, land use and transit policies that will help increase future ridership potential and help ensure feasibility of urban rail in the future. These policies include:

- *Make long-term parking less available* by not increasing the supply and/or increasing the cost in downtown Eugene, Springfield, U of O campus, medical centers, Riverfront Research Park and other major employment areas. Parking alternatives, including peripheral or satellite parking and additional park and ride capacity, should be pursued. Higher parking costs and longer walking distances to parking are key factors that increase transit use.

- *Encourage trip-making activity along the major corridors and within the downtown region* by increasing densities in designated nodes, encouraging mixed-use commercial and residential development and encouraging in-fill development. Policies that help increase the number of trips made within a corridor and reduce the travel distances between these trip ends can lead to greater use of transit for trips to and within the corridor.

- *Adopt development design standards that support transit use*, including full street grids in residential neighborhoods that allow convenient and direct transit and pedestrians access and building orientation that makes access more convenient for transit and pedestrians than for auto. This will help make transit more attractive by reducing the total trip times for transit compared to auto.

- *Improve bus services to rapid transit standards in major corridors* by increasing service frequencies, improving bus speeds and offering convenient transfer connections between secondary level bus routes and the major bus corridor service. These improvements, which begin to replicate rail services, will help develop the corridor ridership that will eventually help justify the larger capital investment in rail.

- *Within central Eugene, where the ridership is not as easy to forecast as for the major commuter-oriented corridors*, *LTD should consider implementing a circulator service* that would replicate a potential streetcar route. The bus could be specially designated, such as a specially painted natural-gas operated bus. This would help indicate future ridership levels and help determine the most successful future rail route.

- *LTD should work with the Cities of Springfield and Eugene and the U of O to identify possible changes in traffic circulation and/or elimination of parking* to give transit priority, convenient access, and faster running times for service to the greatest concentration of employees. Much as the rail might utilize contra-flow lanes, the pedestrian mall, or travel through campus, these routings should be considered for bus. This will help give transit the priority over the auto that is necessary to attract new riders and qualify for federal funding.

- *A variety of other techniques that would increase the cost of using autos relative to the cost of using transit should be evaluated*. In addition to parking cost and availability, these could include increasing the gas tax, vehicle registration fees or even congestion pricing.

Chapter 3: Alternative Plan Concepts

This section first describes the alternative plan concepts then defines the strategies comprising the alternative plan concepts. The findings and conclusions from the evaluation process are presented. The accompanying table presents the alternative plan concepts in matrix format.

Six Alternative Plan Concepts

As summarized in Chapter 1: Overview of *TransPlan* Update/BRT MIS Process, the following six alternative plan concepts were considered:

Base Case Concept

The Base Case contains strategies that are essentially an extension of current transportation and land use conditions and trends into the year 2015. The Base Case serves as a point of reference from which to gauge the effectiveness of the five alternative plan concepts. The Base Case strategies include:

- Voluntary TDM;
- Existing land use patterns;
- Base transit system; and
- Existing and committed projects roadway network.

Demand Management Emphasis Concept

This alternative plan concept contains higher levels of TDM strategies and lower levels of land use and system improvement strategies. The following strategies are included:

- Voluntary TDM programs;
- TDM pricing measures, including:
    - ⇒ Increased parking fees in central Eugene;
    - ⇒ Reduced transit fare;
    - ⇒ $1.00 per gallon gas tax;
- Nodal development only in new growth areas;
- Enhanced transit system; and
- Existing and committed projects roadway network.

Land Use Emphasis Concept

This alternative plan concept contains higher levels of land use strategies and lower levels of demand management and system improvement strategies. The following strategies are included:

- Nodal development in all potential areas;
- Voluntary TDM programs;
- TDM pricing measure: increased parking fees in central Eugene;
- Enhanced transit system; and
- Committed and Planned projects roadway network.

System Changes Emphasis Concept

This alternative plan concept contains higher levels of transportation system improvement strategies and lower levels of land use and demand management strategies. The following strategies are included:

- Voluntary TDM programs;
- TDM pricing measure: increased parking fees in central Eugene;
- Nodal development only in new growth areas;
- Bus rapid transit system; and
- Committed and Planned projects roadway network.

Equal Emphasis Concept

This alternative plan concept draws equally from the three strategy categories. The following strategies are included:

- Voluntary TDM programs;
- TDM pricing measures, including:
  - ⇒ Increased parking fees in central Eugene;
  - ⇒ Reduced transit fare;
- Nodal development only in central areas;
- Bus rapid transit system; and
- Committed and Planned projects roadway network.

TPR VMT Goal Compliance Concept

This alternative plan concept emphasizes TDM strategies and TSI strategies to meet the Transportation Planning Rule (TPR) goal of reducing vehicle miles traveled (VMT) by 10% per capita over current conditions by the year 2015. The following strategies are included:

- Voluntary TDM programs;
- TDM pricing measures, including:
  - ⇒ Increased parking fees in central Eugene;
  - ⇒ Reduced transit fare;
  - ⇒ Bridge tolls;
  - ⇒ $1.00 per gallon gas tax;
- Nodal development only on major bus routes;
- Bus rapid transit system with exclusive right-of-way on BRT routes; and
- Existing and committed projects roadway network.

Component Strategies used in TransPlan Alternative Plan Concepts

	Base Case	TDM	LUM	TSI	Equal	VMT
Transportation Demand Management Strategies						
Voluntary Programs	X	X	X	X	X	X
Pricing Measures:						
Increased Parking Fees in Central Eugene		X	X	X	X	X
Reduced Transit Fare		X			X	X
Bridge Tolls						X
Gas Tax		X				X
Land Use Measures						
Existing Land Use Patterns	X					
Nodal Development Land Use Patterns:						
In All Potential Areas			X			
Only in New Growth Areas		X		X		
Only in Central Areas					X	
Only on Major Bus Routes						X
Transportation System Improvements						
Transit Systems						
Base Transit System	X					
Enhanced Transit System		X	X			
Bus Rapid Transit (BRT) System				X	X	X[E]
Roadway Networks						
Existing and Committed Projects Network	X	X				X
Committed and Planned Projects Network			X	X	X	

E=This BRT system includes exclusive right-of-way (dedicated lanes) on BRT corridor routes.

Strategies Comprising the Alternative Plan Concepts

Descriptions of the strategies making up the alternative plan concepts follow.

Land Use Measures

Two types of land use patterns are found in the Base Case and alternative plan concepts: existing land use patterns and nodal development land use patterns.

A. Existing Land Use Patterns

Existing land use patterns assume implementation of the existing Metropolitan Plan without significant changes in the patterns of land use and development. Growth is evenly allocated to developable land according to its land use designation. This land use pattern is included only in the Base Case.

B. Nodal Development Land Use Patterns

The nodal development land use pattern, the primary strategy under land use measures, is an expansion and refinement of concepts already included in *Metro Plan*. It consists of centers containing a mix of compatible land uses, a variety of housing types, and a total population somewhat higher than in areas outside the centers. More frequent transit would serve the centers and design and development would enhance pedestrian, bicycle, and transit travel options, as well as accommodate automobiles. All areas within a center would be within an average ¼-mile walking distance of the commercial core and transit stops.

Four different nodal development land use patterns are proposed as alternative strategies. All options involve changes in plan designations to achieve density and mixed-use targets for nodal development.

1. **Nodal Development in All Potential Areas:** This strategy assumes achievement of the nodal development pattern in all areas in Eugene-Springfield that have potential for mixed uses and housing types and that are or can be served by transit. Projected increases in population are allocated to these areas at average densities per plan designation as specified in the Metro Plan. Projected increases in employment are allocated to these areas based on existing densities (employees per acre) for commercial and industrial land. Forty-six (46) areas are assumed to be fully developed consistent with the proposed nodal development design principles by 2015.
2. **Nodal Development Only in New Growth Areas:** This strategy assumes achievement of the nodal development pattern only in potential areas which typically have a substantial amount of vacant land and little existing development and are generally located on the edge of the urban area. Twenty-three (23) areas are assumed to be fully developed consistent with the proposed nodal development design principles by 2015.
3. **Nodal Development Only in Central Areas:** This strategy assumes achievement of the nodal development pattern only in potential areas located in the central urban parts of the Eugene-Springfield region and along major bus routes where a more frequent level of bus service already exists or could be provided. In this strategy, the average density levels in the nodal developments are assumed to be higher than the average levels in land use strategies 1 and 2. Also, it is assumed that some land within the urban growth boundary will not develop by 2015 because of a lack of necessary urban services. Thirty-six (36) areas are assumed to be fully developed consistent with the higher average density levels and other proposed nodal development design principles by 2015.
4. **Nodal Development Only on Major Bus Routes:** This strategy assumes achievement of the nodal development pattern only in potential areas located along major bus routes. In this strategy, the average density levels in the nodal developments are assumed to be higher than the average levels in land use strategies 1 and 2. It also is assumed that some land in the UGB will not be developed by 2015. Twenty-six areas are assumed to

be fully developed consistent with the higher average density levels and other proposed nodal development design principles by 2015.

Transportation Demand Management Strategies

Transportation demand management (TDM) strategies include both voluntary programs and pricing measures.

A. Voluntary Programs

The majority of the voluntary TDM programs are employer-based, and since they are voluntary, there is no legal or regulatory pressure on employers to offer them. Most of these programs are currently offered by at least some employers in the region. This strategy assumes that use of these programs will increase over the next 20 years. The programs include:

1. Preferential parking for carpools/vanpools;
2. Flexible work schedules and telecommuting;
3. Guaranteed ride home program;
4. Employer bus pass program;
5. LTD carpool program; and
6. Transportation allowances.

B. Pricing Measures

Varying levels of TDM pricing measures are incorporated into the alternative plan concepts. Descriptions of the different types of TDM pricing measures included in the plan concepts follow.

1. **Increased Parking Fees:** This strategy assumes that the downtown Eugene parking management area will be expanded to include all area within the Central Area Transportation Study and that average parking costs n central Eugene will increase three-fold.
2. **Reduced Transit Fare:** This strategy assumes an average fare of $.25 per trip. Note: A downtown Eugene fareless square is assumed in all the alternative plan concepts. This is an area in which all transit rides would be free to passengers.
3. **Bridge Tolls:** This strategy assumes a toll of $.50 per crossing of the Willamette River on the Washington/Jefferson Bridge, Ferry Street Bridge, Springfield Bridge and a proposed Valley River Bridge.
4. **Gas Tax:** This strategy assumes an additional $1.00 per gallon gas tax in the year 2015. Assuming the average vehicle gets 20 miles to a gallon of gas, a $1.00 per gallon gas tax is equivalent to increasing general vehicle operating costs by $0.05 per mile.

Transportation System Improvements

Two categories of transportation system improvements are incorporated into the alternative plan concepts: transit systems and roadway networks.

A. Transit Systems

Three alternative transit system options were developed. Evaluation of these alternative transit systems using the travel forecasting model focused on providing a reasonable estimate of service levels to determine transit mode shares and their effects on roadway congestion levels. All three transit systems assume addition of a new downtown Eugene transit station and new Park & Ride facilities at 11th/Bertelsen and 58th/Main, and operation of an electric shuttle-circulator in the Eugene downtown area, with a "fareless square" service area.

1. **Base Transit System:** The base system is essentially an extension of the 1995 transit system. Provisions are made for modest investments in transit to keep it comparable with highway improvements. All bus routes and headways are assumed to remain constant (although it is clear that service hours will have to be increased to maintain existing service levels). Service is extended to newly developed areas as demand warrants.
2. **Enhanced Transit System:** The enhanced system builds upon the base system by providing 10-minute service frequency on major corridors. The enhanced system also supports nodal development by providing at least 20 minute service to all nodal development areas.
3. **Bus Rapid Transit (BRT) System:** BRT contains all the capital improvements planned for the base and enhanced systems and, on top of that, provides more frequent and faster transit service. BRT consists of 4 routes through downtown Eugene and a circular route. Feeder bus routes, which serve neighborhoods not on a BRT line, connect with the BRT bus routes. Exclusive right-of-way (lanes dedicated to BRT) on BRT bus routes is an option included in the TPR VMT Goal Compliance alternative plan concept.

B. Roadway Networks

One of two roadway networks are found in each of the 2015 alternative plan concepts: Existing and Committed Projects Network and the Committed and Planned Projects Network. It should be noted that a series of proposed bicycle system improvements are included in all of the alternative plan concepts. In many cases, the roadway networks described below reflect on-street bicycle system improvements as well.

1. **Existing and Committed Projects Network:** This network includes projects which are under construction or which will be constructed in the next 20 years. In other words, this network assumes construction of all projects currently in the "pipeline," but no additional projects. Most of the existing and committed projects are in the Statewide Transportation Improvement Program (STIP) for 1996-1998. Additional projects are included that are not currently in the STIP. These are medium-term (construction beginning with 5 - 10 years) projects that staff expected to be built to address existing capacity and safety problems.
2. **Committed and Planned Projects Network:** This network includes all projects contained in the Existing and Committed Projects Network, plus additional projects. Most of the additional projects are included in the current *TransPlan* project list. Staff updated this list by removing projects already constructed and projects that are no longer thought to be necessary in the 20 year planning horizon. Projects that address capacity problems and that are likely to be included in the updated *TransPlan* were added to the list.

Alternative Plan Concepts Technical Evaluation

This section describes the technical evaluation process methodology and presents findings and conclusions.

Evaluation Process Methodology

In order to be effective, the evaluation is structured around a framework which includes:

1. A set of **key questions** designed to address major policy areas; and
2. A set of specific **performance measures**, designed to provide useful information on differences among the alternatives and respond to the key questions

Key Questions

In the context of an urban region such as Eugene-Springfield, decisions on public investments and policy inevitably involve multiple objectives and complex, inter-related systems. This presents a challenge when evaluating regional transportation-land use alternatives. In order to maintain an effective and useful structure throughout this complex process, a set of key questions are being addressed. This framework also represents key areas of policy focus. The key questions are:

1. IS THE CONCEPT TECHNICALLY SOUND?
    - Is it efficient?
      ⇒ *Does it minimize trip length, frequency and time for users, optimize the cost effectiveness and convenience of all transportation options and does it meet or exceed appropriate minimum service standards and user needs?*
    - Is it effective?
      ⇒ *Does it provide for efficiency in a useful and serviceable way? What are the joint land use-transportation impacts and the transportation system impacts? What is the potential for ease of reaching a range of destinations?*
2. IS IT ENVIRONMENTALLY SENSITIVE?
    - *How does the alternative impact air and water quality? What are the impacts upon natural areas and open space?*
3. IS IT FINANCIALLY FEASIBLE?
    - *Is the alternative affordable? What are the capital, operating, maintenance, and preservation costs?*
4. IS IT EQUITABLE?
    - *How does it impact different community members and groups?*

Performance Measures/Evaluation Criteria

A diverse list of specific performance measures are used to provide detailed information on how each alternative performs. These measures answer the key questions and were developed from a preliminary listing of several dozen potential measures. They underwent both inter-jurisdictional staff and elected official review and refinement.

The evaluation results are presented in terms of the following performance measures:

- *Daily Fuel Use* - an efficiency measure. An objective for each alternative is to minimize fuel use. In general, a combination of pricing and land use measures have the most affect on fuel use.

- *Congested Miles of Travel* - an efficiency measure. An objective for each alternative is to minimize congested mile of travel. Figure 1 illustrates the relative levels of congestion for each alternative. In every future alternative, congestion is higher than existing conditions, ranging from 2 to 4 times current levels. In general, additional system improvements (both roadway and transit) can have a significant impact on minimizing congestion.

- *Daily Vehicle Miles of Travel per Capita* - a measure of effectiveness. An objective for each alternative is to reduce VMT per capita. The Transportation Planning Rule requires no increase in VMT per capita over 10 years and a 10 percent reduction over 20 years. Locally, the 10 year goal is 15.62 VMT per capita; the 20 year goal is 14.06 VMT per capita.

- *Percent of Person Trips Under 1 Mile* - a measure of effectiveness. An objective for each alternative is to increase the percent of person trips under 1 mile as this provides more opportunity for use of alternative modes.

- *Mode Choice* - an effectiveness measure. This measure looks at the level of choice for 5 modes - walk, bike, bus, drive alone auto, and shared ride auto. An objective for each alternative is to reduce drive alone auto trips while increasing the number of trips taken by other modes. Given the relatively small share of trips achieved by non-auto modes, it is useful to look at the change from the base case. It should also be noted that, given limitations of the model, the actual split between the non-motorized modes (walk and bike) could vary.

- *Vehicle Emissions* - a measure of environmental feasibility. An objective of each alternative is to reduce vehicle emissions. Specifically, the draft plan will be subject to a more formal process to determine conformity with federal and state air quality standards.

- *Costs and Revenues Associated with Each Alternative* - a measure of financial feasibility. An objective of each alternative would be to reduce costs, maximize revenues and minimize (ultimately eliminate) and shortfall.

The technical evaluation is accomplished, in part, by using the travel forecasting model with a set of performance measures. The travel forecasting model is a complex computer-run program comprised of a diverse collection of land use, population, employment, travel behavior and transportation system information. In short, the model attempts to mirror as close as possible the real world of land use development patterns and travel behavior and their interactions on the Eugene-Springfield's transportation system. It can show existing conditions, potential trouble spots and can help to illustrate the impacts of a future scenario, based upon the latest information on how our region is growing.

LCOG's travel forecasts begin with regional population and employment forecasts. The resulting dwelling units and jobs are allocated to available lands of the appropriate comprehensive plan designation. Occupied dwelling units by structure type and geographic location are used to estimate households by household size and vehicle ownership, which are then used to estimate person trip "productions" for each of 7 trip purposes. Employment, stratified by industrial sector, is used to estimate person trip "attractions". The trip distribution model matches productions to attractions using a "gravity" analog, with relative attractiveness proportional to the "mass", or relative number of attractions, and inversely proportional to a function of the "distance", or travel time and cost that separates the production and attraction. The mode choice model is a nested-logit type, as described above. It evaluates the relative "utility", or user costs of each of 9 travel modes for each of four user classes, and determines the probability of selecting each mode.

Technical Analysis Results

The following findings and conclusions were drawn for each alternative plan concept as part of the technical evaluation of TransPlan Alternative Plan Concepts described above. The performance measures described in the previous section are the foundation of the evaluation framework. A range of technical data was generated from the travel forecasting model and information from other sources was used, including:

- Geographic Information System;
- Air Quality forecasting model;
- Estimates of transportation costs and revenues;
- Fuel consumption model; and
- Qualitative assessments of impacts on community members & groups

The accompanying table presents the results of the technical evaluation in matrix format.

Base Case Concept Findings

Implementation of the Base Case results in the following: lower levels of alternative modes use than currently exists; the highest level of VMT per capita; the highest levels of congestion; the highest vehicle emissions and fuel use; and the fewest short trips

Demand Management Emphasis Concept Findings

This alternative achieves the lowest VMT per capita after of the TPR compliance alternative. This is due primarily to the pricing strategies included. Because this alternative is limited to the existing and committed roadway network (as opposed to the more extensive set of planned projects) it also has the highest percentage of congested miles after the Base Case. Additional revenue is available in this alternative as a result of the gas tax and increased parking fees.

Land Use Emphasis Concept Findings

This alternative is one of the highest in terms of short trips (person trips less than 1 mile). This is one reason for its higher levels of walk and bike trips. Because nodes are dispersed, VMT per capita still increases over the 20 year planning horizon. It also has relatively low levels of congestion.

System Changes Emphasis Concept Findings

This alternative represents an improvement over the Base Case in terms of lower drive-alone auto trips. VMT per capita increases over existing conditions but is significantly lower than the Base Case. Congestion is improved over the Base Case primarily as a result of additional roadway projects and Bus Rapid Transit.

Equal Emphasis Concept Findings

This alternative achieves a slight decrease in VMT per capita without fuel taxes or road pricing. This is primarily due to Bus Rapid Transit and nodal development concentrated in central areas. Other than the TPR Compliance alternative, this alternative has the highest percentage of overall alternative mode use, the lowest levels of congestion, and the lowest levels of vehicle emissions.

TPR VMT Goal Compliance Concept Findings

This alternative was developed explicitly to achieve the VMT targets set forth in the state's Transportation Planning Rule. It achieves the 20 year target (10 percent reduction) with an estimated VMT per capita of 13.78. This represents a 11.8 percent reduction from current VMT per capita. As a result of the extensive use of pricing mechanisms, concentrated levels of development, and exclusive right of way for the Bus Rapid Transit system; this alternative performs better than all the other alternatives.

Summary of Technical Analysis of TransPlan Alternative Plan Concepts

			Alternative Plan Concepts					
	Objective	Existing Conditions	Base Case	Demand Management Emphasis	Land Use Emphasis	System Changes Emphasis	Equal Emphasis	TPR VMT Goal Compliance
Key Performance Measures								
Daily Fuel Use (in 1,000s of Gallons)	Minimize	**193**	**271**	**253**	**259**	**262**	**251**	**233**
Congested Miles of Travel	Minimize	**2.6%**	**11.9%**	**9.0%**	**6.3%**	**6.6%**	**5.8%**	**5.0%**
Daily Vehicle Miles of Travel per Capita	Reduce to 14.06	**15.62**	**16.54**	**15.21**	**15.82**	**15.93**	**15.38**	**13.78**
Percent of Person Trips Under 1 Mile	Increase	**13.8%**	**12.7%**	**14.5%**	**14.5%**	**13.6%**	**14.2%**	**16.8%**
Mode Choice								
Percent Walk Trips	Increase	**8.0%**	**7.0%**	**8.6%**	**8.5%**	**8.1%**	**8.5%**	**9.4%**
Percent Bike Trips	Increase	**3.5%**	**3.0%**	**3.4%**	**3.4%**	**3.3%**	**3.4%**	**3.8%**
Percent Bus Trips	Increase	**2.1%**	**2.2%**	**3.6%**	**3.1%**	**3.4%**	**4.0%**	**4.7%**
Percent Drive Alone Auto Trips	Reduce	**42.5%**	**43.5%**	**37.1%**	**39.5%**	**39.5%**	**39.1%**	**34.1%**
Percent Shared Ride Auto Trips	Increase	**27.0%**	**27.3%**	**27.9%**	**27.4%**	**27.4%**	**27.0%**	**27.9%**
Vehicle Emissions (Annual Tons of Carbon Monoxide)	Reduce	**14,142**	**13,723**	**12,995**	**13,131**	**13,182**	**11,065**	**10,070**

Conclusions from Technical Analysis

The evaluation shows that, compared to the Base Case, implementing a more integrated set of strategies can result in:

- Fewer vehicle miles traveled (VMT) system-wide;
- Fewer miles of the transportation system experiencing congestion;
- With Travel Demand Management in place, decreased drive alone auto trips and increased shared auto trips; and,
- An increase in shorter trip lengths, providing the opportunity for use of alternative modes.

Even with the strategies in place, our region will experience increased congestion, and VMT reduction is difficult to achieve without implementing pricing measures. While we may have more congestion, our region's air quality will continue to meet state and federal standards.

The following conclusions can be made on each strategy type:

Nodal Development Conclusions

The nodal development land use strategy, which builds on concepts already included in *Metro Plan,* helps achieve objectives to increase the percentage of walk, bike and bus trips and the percentage of trips under one mile. The strategy also helps to reduce congestion and vehicle miles traveled per capita. The nodal development strategy has the greatest impact when the nodal development areas are limited to those located in the central urban areas and along major bus routes and they are developed at higher average densities. This is consistent with the view that compact urban growth supports use of alternative modes and shorter trips.

TDM Pricing Measures Conclusions

Pricing measures are effective in changing travel behavior and achieving transportation planning objectives particularly when they are combined with land use strategies and improvements in the transportation system. When used alone, pricing measures are not sufficient to avoid decreased mobility and higher levels of congestion. Pricing the use of roads (bridge tolls) has the greatest impact and appears to be necessary to achieve the state's target to reduce vehicle miles traveled per capita by 10 percent. Pricing vehicle use (parking) also has a significant impact even when limited to the central Eugene area. In general, reductions in VMT are only achieved where pricing mechanisms have been introduced. Although the level of public understanding and acceptance of pricing measures is low, they are included in the alternative plan concepts for purposes of comparison and evaluation.

Transportation System Improvements Conclusions

Strategies to improve the transit, roadway, and bicycle/pedestrian elements of the region's transportation system also help achieve the planning objectives. Both an enhanced bus system and a Bus Rapid Transit (BRT) System will significantly increase transit ridership particularly when combined with demand management measures and nodal development patterns. The greatest impacts in terms of increasing the percent of bus trips come from establishment of a BRT System. The travel model shows the highest increase in bus ridership with a BRT system that includes exclusive right of way. Improvements to the road system have a positive impact on congestion and support increased use of transit. A combination of TDM (primarily pricing), land use and system improvements has the greatest impact on congestion. Most planned projects identified in the current *TransPlan,* as well as other major new projects, are necessary to support transit improvements and reduce congestion at key points in the road system.

Chapter 4: Transit Market Analysis and Transit System Analysis

In recent years, the Eugene-Springfield metropolitan area has seen rapid economic growth and development and an increasing demand for faster, more convenient transit service. This has challenged Lane Transit District to find innovative ways to design and maintain new transit services that can more effectively compete with the automobile.

The potential for public transportation in the Eugene-Springfield area was studied through transit market analysis and transit system analysis. This effort focused on matching key elements of transit service and factors affecting transit ridership to identify effective transit strategies. The Bus Rapid Transit concept emerged as the preferred transit strategy.

Transit Market Analysis Findings and Conclusions

Eugene-Springfield transit market analysis included segmentation of 1994 LTD On-Board Survey data by geographic area, trip purpose and household auto ownership for use in the regional travel forecasting model. Transit market analysis also included an attitude and opinion survey conducted in March 1995 and a focus group effort conducted in June 1996. These surveys provided for a better understanding of public perceptions about existing transit service, as well as to anticipate community reaction to and support of the Bus Rapid Transit concept.

Because attitudes toward public transportation so clearly differentiate transit riders from nonriders, these attitudes serve to identify key market segments more likely to be receptive to service and marketing strategies. The majority of LTD riders are "firm" riders, whose attitudes towards personal travel and public transportation suggest they are likely to continue using public transportation. The market survey showed that about 27% of LTD riders are considered "vulnerable" riders, meaning they are current transit users, but attitudes towards personal travel and public transportation indicate they have the potential to stop riding should circumstances change. A third market segment is comprised of "potential riders," who are currently non-users of transit. However, their attitudes are similar to those held by transit users, suggesting the greatest potential for new riders.

Results obtained from both market studies indicate that service quality and rider attitude are key factors in increasing overall ridership and mode share. Both research tools suggest that LTD needs to increase community education efforts as to the benefits of the public transportation system, as well as the extent of services provided. Specific service improvements identified as important to increasing ridership include increased service frequency, and elimination of transfers. The majority of nonriders also identified length of trip as a barrier to transit use. Rider and nonrider attitudes suggest that transit improvements should focus on travel time reduction strategies, increased frequencies, and more direct point to point service with fewer transfers.

Market Segmentation Analysis

The 1994 LTD On-Board Survey was used in the development of the transit modeling effort of the *TransPlan* update. The transit model was employed to assist in the development and evaluation of transit alternatives. Information on origins and destinations and the travel behavior of key market segments of LTD's existing ridership was derived from the On-Board Survey and used to calibrate the transit model.

The mode choice model used by LCOG in its travel forecasting model set is critical in the evaluation of mode share impacts of alternative plan concepts. It was developed using a combination of borrowed elasticities and local data derived largely from a Household Activity Survey (HHS) conducted in 1994. Transit trips were significantly under-represented in the cross-sectional portion of the 94 HHS, due to an under-representation of major transit users such as college students and certain types of lower income households. The expanded transit trips derived from the On-Board Survey data allowed the development of much more reliable and consistent transit trip targets. The survey effort resulted in 34,000 responses of which 20,500 represented weekday transit trips. Essentially, the process for incorporating this data into the regional forecasting model involved the following steps:

1. Survey responses are geocoded to LCOG's 30 districts (aggregation of 295 zones)
2. Responses are allocated to 8 trip purposes
3. Transfer trips are estimated from survey data
4. Data is expanded to represent total regional transit trips

Market Area Survey

Lane Transit District commissioned the Market Area Study in 1995 to gather information regarding community awareness of existing transit service, and attitudes towards using transit. Specific objectives of the study included:

- Identify attitudes and opinions concerning the transit system, its routes and schedules, its perceived performance levels of service to the public and its value to the community.
- Assess attitudes toward transit that affect transportation choices.
- Profile riders and nonriders, including; demographic characteristics, retention of riders, and ridership stimulation opportunities.
- Profile commuters, in the following categories; preferred travel mode, travel patterns, barriers to use of public transportation, and importance of specific service factors.
- Identify attitudes and opinions about transportation option such as buses, carpooling and vanpooling.

A total of 605 computer-assisted telephone interviews were conducted by Northwest Research Group with Lane County residents in late January and early February 1995. The survey averaged 23 minutes in length, and included 67 questions. Key findings are summarized below.

- The community perceives that transportation needs have not always been met, with LTD, ODOT, the cities and the County sharing the blame. The community wants LTD to take a leadership role in setting up solutions to many of these problems.
- Most respondents focus on transportation objectives geared toward increased use of public transportation and high occupancy vehicles, rather than solutions to facilitate single occupant vehicle use.
- Maintaining quality of life is deemed important. Quality of life issues include reducing congestion, improving air quality, and creating an environment in which use of alternative transportation modes is an easier option.

- There will be some resistance to using tax dollars to improve public transportation.
- There is a high awareness level of LTD and its services.
- One third of non-riders have used LTD regularly in the past. Reasons for no longer riding the bus include change of circumstance, access to car, and slower travel time by bus.
- Two-thirds of former riders indicated they are somewhat or very likely to ride LTD in the future.
- Nothing could convince one-third of the nonriders to ride the bus.
- Most important factors in respondents decision to ride the bus are on-time performance, personal safety on the bus and while waiting at the stop, and reliability of the service.
- LTD is rated less favorably on frequency of service, safety at transit stations and stops, speed of travel on the bus, and number of transfer connections needed to reach a destination.
- Riders and nonriders agree that priority for service improvements should be concentrated on frequency of service, travel time, and personal safety at transit stations and bus stops.
- To attract nonriders, LTD should pay attention to comfort and cleanliness of stations and directness of service.

Transit Focus Groups

Four focus groups were conducted between June 10 and 12, 1996, with community members who regularly use transit and business owners who would be impacted by Bus Rapid Transit improvements. Two full size focus groups were conducted with community members who live, work or attend school on a likely pilot corridor. In addition, two mini-focus groups were conducted with owners of locally owned or franchised businesses along the corridor. Specific objectives of this research included gauging public awareness of and support for existing transit service, exploring community reactions to the BRT concept, investigating the extent of likely community support for BRT, and identifying what might be barriers to support. Key findings are summarized below.

- For both residents and businesses alike, the primary transportation issue along the corridor appears to be traffic “congestion,” particularly in Eugene.
- Some area residents feel the transit system contributes to corridor congestion.
- The speed of traffic along the corridor, particularly the Glenwood section, is commonly viewed as a problem.
- Predominant transportation issues for corridor transit users concern ways to improve the system. Key improvements appear to include more direct connections, less transferring, and expanded service.
- Reactions to the BRT concept were generally favorable. Most participants thought it was a positive step for the future of Eugene-Springfield.
- BRT was viewed as a faster, more convenient, and easier way to move more people along the corridor.
- BRT was perceived to represent at least a partial solution to reducing corridor congestion.
- A slight majority of participants felt that BRT would be likely to increase ridership, especially among those who work downtown.
- A small minority of area residents, particularly those who own businesses in Springfield and Glenwood, didn’t see a need for BRT, now or in the future.

Transit System Analysis Findings and Conclusions

The following three alternative transit systems are described in detail on page 27:

1. Base Transit System
2. Enhanced Transit System
3. Bus Rapid Transit (BRT) System

Evaluation of these transit systems using the travel forecasting model focused on providing a reasonable estimate of service levels to determine transit mode shares and their effects on roadway congestion levels. The travel forecasting model indicated that establishment of a BRT system would bring about substantial increases in transit ridership. As proposed, the service would be much more effective than existing service in attracting transit ridership from outlying areas. Of all trip purposes, largest increases are in Home-Based School and College trips.

A primary finding from the modeling effort has to do with ridership in and around the downtown Eugene area. The lower ridership forecast within Central Eugene reflects the limited opportunities to use the BRT buses for short hops. It points up the need for a well-integrated circulator bus system, which will not only improve intra-district transit accessibility, but would further enhance BRT transit accessibility for all trips to Central Eugene.

Model Limitations

Bus Rapid Transit represents a service concept that is new to the Eugene-Springfield region. It involves not only a new route structure, but new vehicle types, fare collection systems, and timed transfers. The model can evaluate the effects of changes in travel times and costs on ridership, but the modal bias constant, which represents the "unexplained" part of the mode choice utility expression, was calibrated using the 1994 Household Survey data. At the time of the survey, this region was served by a few limited-stop express routes, some of which used portions of the freeway system, but the express bus service still differed markedly from the proposed BRT concept. Moreover, we did not obtain a sufficient number of express bus trips in the survey to enable the calibration of separate bias constants. Thus, the bias constants do not reflect any affinity that various segments of the travel market may have for aspects of the BRT service that were not present at the time of the 1994 survey.

For example, we have captured the travel time effects of transit priority operations by developing transit in-vehicle time functions that reflect the findings of a traffic engineering study for the BRT pilot corridors. Priority operations, however, may also result in user-perceived improvements in the reliability of transit in comparison with the private auto. Since the mode choice utility functions do not explicitly include a term for reliability, the user’s perception is captured in the modal bias constant.

The end result is that the BRT ridership estimates may be conservative, especially with respect to the ridership potential among discretionary riders, or those who have an automobile available for their use.

Findings on the Integration of Public Transportation Strategies with Nodal Development

Convenience, passenger amenities, and personal safety have been identified through market research as critical components of transit which are necessary to attract new, “choice” riders. The integration of transit improvements and nodal development areas provide opportunities for increased convenience and access to residential, employment, and commercial activity centers. Combined with other transit improvement strategies such as increased frequencies and express service, the integration of transit with nodal development areas can increase the potential for transit use.

Research to date indicates that BRT and nodal development can be extremely compatible and mutually-supportive strategies, if nodal development occurs along the proposed BRT corridors. In fact, nodal development is the ideal land use pattern for a BRT system, and a BRT system can make nodal development a more attractive and viable land use option.

Nodes include a central, easily-accessed transit stop, with a high level of amenities for riders, such as shelters, benches, lighting, and passenger information. This type of stop/station is the type envisioned for the BRT system. The high level of activity in each node would concentrate activity adjacent to the BRT stops, providing better access between the BRT line and residential, commercial, and employment destinations and increasing use of the transit system. Since BRT stops are planned to be spaced much farther apart than current system bus stops, the concentration of activity around those stops, rather than in a strip along the BRT corridor, will provide the most effective access to the BRT system.

The BRT system would make nodal development more attractive by providing frequent, high speed transit service to those living in or traveling to nodal development centers, thereby reducing automobile traffic within the nodes. In addition, the BRT system includes a network of feeder buses that would provide access from outlying neighborhoods to nearby activity centers and the BRT corridor routes. It is envisioned that these feeder routes would connect with the BRT lines at nodes, thereby providing additional access from nearby neighborhoods to the employment and commercial services offered within each node.

Conclusions on BRT and Nodal Development

The integration of public transportation strategies, such as BRT, with nodal development will enhance the potential for public transportation in Eugene-Springfield for the following reasons:

- Nodes include a central, easily accessed transit stop
- The high level of activity in each node concentrates activity and potential transit users adjacent to transit stops
- Direct transit service from residential areas to commercial nodes allows for more convenient transit access to shopping
- Increased frequencies of BRT service at major nodes will reduce passenger wait time and increase perception of personal safety while waiting

Comparison of Alternative BRT Service Concepts

The BRT concept consists of high-frequency, fast transit service along major transportation corridors, with small bus service in neighborhoods that connects with the BRT corridor service and with nearby activity centers. The following are potential elements of a BRT system:

1. Exclusive bus lanes,
2. A bus guideway system,
3. Traffic signal priority for transit,
4. Low-floor buses for faster boarding,
5. Pre-paid fares for faster boarding,
6. Greater spacing between bus stops,
7. Improved stops and stations (shelters, lighting, information, etc.), and
8. Park-and-Ride lots along BRT corridors.

The BRT system represents a significant change from the current "radial" bus system, with most transfers occurring at the "hubs" in downtown Eugene and downtown Springfield, to a "trunk and feeder" system with frequent transfers throughout the system. LCOG tested four BRT transit networks which represent differing neighborhood service concepts at the ends of BRT routes. This modeling effort evaluated trade-offs between feeder bus frequencies and the elimination of transfers.

A transfer involves out-of-vehicle waiting time, which is generally perceived as two to three times more onerous than time spent on the bus. Furthermore, LCOG's mode choice model coefficients, which are borrowed from long-established urban area models elsewhere, place an additional penalty, equivalent to 4 to 6 minutes of in-vehicle time, on each transfer. This penalty reflects user perceptions of "unpleasantness" associated with transfers, such as exposure to the weather, concerns about bus scheduling and reliability, concerns about personal safety, and so forth.

Each of the scenarios tested included the Base Case land use and highway network. BRT trunk routes were identical, and were assumed to operate at 10-minute headways during both base and peak periods.

- BRT/F assumed feeder buses serving all neighborhoods, and operating at 20-minute headways during base periods, and 10-minute headways during peak periods.

- BRT/1 replaced the highest-ridership feeder loop near each end of each BRT route with a direct extension of the BRT route. It eliminated all transfers on that feeder loop, and even reduced off-peak headways from 20 minutes to 10 minutes. It showed increases, relative to BRT/F, for all trip purposes, with highest proportional increases going to those trip purposes having substantial off-peak travel. However, this is at the cost of additional service hours.

- BRT/2 extended direct neighborhood service on the the 2 highest priority loops. It essentially increased headways in the peak period, since every 2nd bus served a given loop, from 10 minutes to 20 minutes. This resulted in a slight reduction in peak period trips such as home-based work, school and shopping. The off-peak headways remained the same as BRT/F, and with the elimination of transfers from 2 loops at each end of each BRT, off peak transit trips increased above BRT/F levels. However, overall ridership is forecast to be slightly lower.

- BRT/3 extended direct neighborhood service on the highest 3 loops. Preliminary results indicate that the increased base and peak headways on those loops may be offset by the elimination of transfers from 3 loops at each end of each BRT. Ridership remains about the same as the BRT/F, but with significantly fewer service hours.

Chapter 5: Study Summary and Conclusions

Study Summary and Conclusions

This Study has presented an overview of the extensive analysis of transit options leading to the Bus Rapid Transit concept completed as part of the TransPlan Update process. Transit alternatives for the Eugene-Springfield area were developed beginning with the identification of several transit strategies in Phase II: Alternatives Development. The Urban Rail Study provided an analysis of the feasibility of urban rail alternatives for the region. Conclusions of the Urban Rail Study led LTD to identify potential improvements to its existing system which resulted in the development of the BRT concept.

BRT was analyzed as a component of the Alternative Plan Concepts. Results of that analysis indicated that, of the three transit strategies considered, BRT provided the greatest increase in transit ridership. BRT with exclusive right-of-way was shown to provide the highest increase in transit ridership.

The BRT concept was further analyzed in a Transit Market Analysis and Transit System Analysis. The Market Analysis indicated that transit improvements should focus on travel time reduction strategies, increased frequencies, and more direct point to point service with fewer transfers. While transfers are expected to increase slightly under the proposed neighborhood feeder service, the proposed BRT system makes significant strides in increasing service frequencies and reducing travel times. The BRT system travel times are expected to be competitive with single-occupant vehicle (SOV) travel times. The neighborhood feeder service also provides opportunities for more point to point service.

The Transit System Analysis assessed the relationship between BRT and Nodal development and analyzed alternative BRT scenarios to help refine the BRT concept for inclusion in the Draft TransPlan. The integration of BRT with nodal development will enhance the potential for public transportation in Eugene-Springfield for the following reasons:

- Nodes include a central, easily accessed transit stop
- The high level of activity in each node concentrates activity and potential transit users adjacent to transit stops
- Direct transit service from residential areas to commercial nodes allows for more convenient transit access to shopping
- Increased frequencies of BRT service at major nodes will reduce passenger wait time and increase perception of personal safety while waiting

The system analysis showed that the greatest increases in forecasted ridership are in outlying areas, in which BRT represents significant improvements in transit service levels. The Danebo, River Rd, Santa Clara, and Ferry Street Bridge areas of Eugene, and the north and central areas of Springfield achieve significant benefits. Gains are not as great in the east Springfield and Thurston areas, due to the current availability of express bus service.

The BRT system proposed in the Draft TransPlan (described in detail below) is forecast to increase transit's share of the region's person trips by 34%. The percent of households with access to ten minute service frequency goes from 23% currently to 88% in 2015 – a 282% increase. The percent of employment with access to ten minute service frequency goes from 52% currently to 91% in 2015 – a 75% increase.

Bus Rapid Transit, in essence, uses a bus system to emulate the positive characteristics of a light rail system. BRT can be implemented at a fraction of the cost of rail, and can be implemented incrementally. In addition, BRT can lay the foundation for a future rail system.

Description of Proposed BRT System

Following the completion of the BRT alternatives comparison and results of the BRT scenario model runs, the BRT concept was included in the Draft *TransPlan* Decision Document as a proposed transit strategy. A proposed BRT system concept was developed in response to input received during the Draft review process, and as a result of Stakeholder input at the final Symposium. The combination of system components that were packaged together as the BRT concept reflect those technologies that have demonstrated reduced transit travel time and decreased passenger boarding times in other transit systems.

The components that make up a transit system in general include:

1. Route Structure
2. Service Frequency
3. Buses
4. Corridor Features
5. Facilities
6. Park and Ride Lots

The proposed Bus Rapid Transit System is described below in terms of these transit system components.

1. Route Structure

The BRT system involves high-frequency, fast service along major corridors and feeder bus service in neighborhoods.

- Five BRT corridor lines:
  - West 11th/18th - Main Street
  - Willamette - Coburg/Harlow
  - Highway 99 - Centennial
  - River Road - LCC (via Patterson/Hilyard)
  - Circumferential route
- Neighborhood connector routes in outlying areas would connect neighborhoods to nearby employment and shopping areas and to the corridor bus service.
- Closer-in neighborhood routes would continue to provide direct access to downtown.
- Direct service to major activity centers, such as the UO and LCC, would be continued.

2. Service Frequency

- BRT corridor lines
  - 10-minute headways, weekday daytime
  - 20-minute headways, evenings and weekends
- Neighborhood Connector routes
  - 10 minute service, weekday peak
  - 20 minute service, off-peak, evenings and weekends
- Other routes
  - Various headways (some operate peak trips only)

3. Buses

New bus designs and technology will be used as appropriate. It is likely that the District will switch to low-floor buses, which are buses that do not require steps up to the seated area and, therefore, facilitate boarding, especially for persons with mobility impairments. It is also possible that the District eventually will switch to alternatively-fueled vehicles to replace the current diesel buses. BRT corridor lines will use larger (40-foot or longer) buses, while the neighborhood connector routes will use smaller (30-foot or shorter) buses.

4. Corridor Features

The BRT corridor service will include a number of features designed to decrease travel time and reduce operating costs. These features include:

- Exclusive bus lanes
- Transit signal priority and other transit priority treatment (e.g., q-jumpers)
- Stops an average of every .5 mile
- Improved shelters and boarding areas
- A barrier-free fare system

5. Facilities

Lane Transit District's facilities include bus stops, benches, shelters, stations, and support facilities. New facilities will be added as needed to improve the convenience of the service. Stops along the BRT corridor lines will be designed as a station, with covered shelter, seating, lighting, and passenger information. All facilities will be designed to be an attractive addition to the community and will be maintained at a high level.

6. Park & Ride Lots

Lane Transit District will continue the expansion of the Park & Ride network as outlined in LTD's Park & Ride Plan. New lots will be added at strategic locations, primarily along the BRT corridors.

Cost Estimates

LTD developed capital cost estimates for the implementation of a BRT system in the Eugene-Springfield area. A complete system, including exclusive right-of-way is estimated to cost approximately $102 million (1997 $$). Without exclusive right-of-way, the system is estimated to cost approximately $52 million. A comparable fixed route system is estimated to cost approximately $28 million.

The original cost estimate for the complete system assumed implementation of 10% exclusive right-of-way. For the pilot corridor, the preliminary cost estimate was $9.8 million, which also assumed 10% exclusive right-of-way. Preliminary corridor engineering and planning work indicate that the per mile cost to implement the pilot corridor is $2.5 million per mile. This assumes greater than 10% exclusive right-of-way, and does not include the cost of purchasing BRT vehicles.

BRT Implementation Process

Specific determination of which of the BRT elements are used and where they are used will require a significant amount of research and analysis. The research will include consideration of impacts on transit ridership, traffic flow, cost, the environment, and adjacent residences and businesses. Also to be investigated are funding sources to pay for the improvements.

The BRT system would be implemented on a corridor-by-corridor basis. The first corridor is expected to be an east/west line between Springfield and Eugene along Main Street, Franklin Boulevard, and West $11^{th}/13^{th}/18^{th}$. This corridor was selected based on an analysis of several factors, including existing and projected transit ridership, car and bus travel times, population, employment, and coordination with planned nodal development.

The research and analysis process will include community involvement, with an emphasis on encouraging participation by those who work, live, or travel along the pilot corridor. There will also be extensive participation by technical staff from appropriate jurisdictions. The BRT improvements will not be implemented without the approval of both the LTD Board of Directors and the policy board with jurisdiction over the road in question.

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Appendix C

West Eugene EmX Extension Project

Scoping Screening and Evaluation Findings Report

May 9, 2008

Lane Transit District

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Appendix

1 Introduction

The purpose of this report is to provide a summary of findings prepared by Lane Transit District (LTD) on the alternatives proposed by LTD, the public and agencies during the Scoping phase of the West Eugene EmX Extension (WEEE Project). These findings were used by the LTD Board of Directors to determine which of the proposed alternatives advance into the project's Alternatives Analysis (AA)/Draft Environmental Impact Statement (DEIS) for further study. The WEEE Project is being jointly led by LTD and the Federal Transit Administration (FTA) and it is considering the construction and operations of a proposed EmX bus rapid transit (BRT) project in the West 11th Corridor.

In addition to the findings summarized in this report, the LTD Board of Directors and FTA considered public and agency comments received during the Scoping comment period on LTD's initial range of proposed alternatives, advice from the WEEE Project Corridor Committee and recommendations from the LTD EmX Steering Committee as they determined which alternatives would be studied further in the project's AA/DEIS phase.

This report includes the following: in Section 1.0, a summary description of the project's overall process and schedule and a more detailed description of how alternatives are identified and screened (narrowed) within the Scoping phase of the project; in Section 2.0, the project's Purpose and Need Statement and Goal and Objectives and a description of the West 11th Corridor; in Section 3.0, a description of the alternatives proposed by LTD, the public and participating agencies; Section 4.0, the Tier I (Purpose and Need) findings and preliminary screening results; and in Section 5.0 the Tier II (screening evaluation measures) findings.

1.1 Project Description

During the summer of 2007, the Federal Transit Administration (FTA) and the Lane Transit District (LTD) initiated the environmental review for the proposed West Eugene EmX Extension (WEEE) Project in Eugene, Oregon (Lane County).

The West 11th Avenue corridor is the primary east/west transit travel shed linking West Eugene to the Eugene Station in downtown Eugene. The corridor contains several major employment centers, large commercial developments, a growing residential population and valuable natural resources. The West 11th corridor experiences a high level of traffic congestion and safety issues that adversely affect general purpose traffic as well as transit service and operations. Without improvements, congestion and the safety issues in the corridor will only worsen into the future. The area is also experiencing residential, retail and commercial growth and is a focus for local and regional land use plans that emphasize nodal and mixed use development, all aimed at maintaining and improving the area's livability.

Recognizing the traffic and transit problems in West Eugene and the opportunities for transit improvements to aid in making the area a more livable community, the Eugene City Council and the Lane Transit District Board of Directors selected West Eugene as the City's and LTD's priority for the next EmX corridor study. The West Eugene EmX Extension Project will develop and examine alternatives that can address the transit problems and opportunities in West Eugene, generally focusing on transit travel between downtown Eugene and Green Hill Road. A more precise study area, which will define the geographic limits of the corridor, will be developed in the coming months

The Purpose of the proposed West Eugene EmX Extension project is to implement high-capacity public transportation service, through bus rapid transit (BRT), in the West 11th Corridor (east/west) that is less hindered by congestion and that provides efficient, effective, dependable and visually appealing service throughout the life of the project.

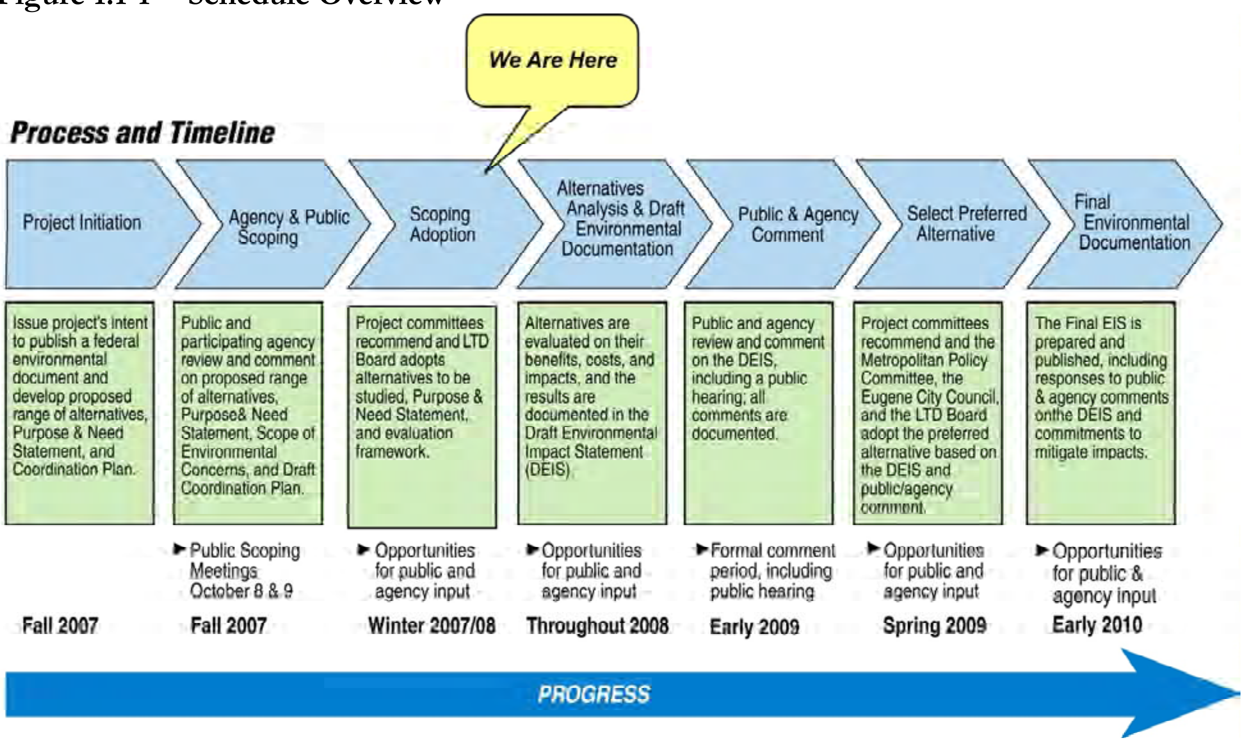
1.2 Project Schedule

The WEEE Project will be implemented over six general phases and time periods:

1. Scoping – fall 2007 through winter 2008
2. AA/DEIS – spring 2008 to winter 2009
3. Locally Preferred Alternative Selection – spring 2009
4. Project Development (Final DEIS, preliminary engineering, final design) – summer 2009 to mid- 2010
5. Construction and testing – 2011
6. Operations – 2011/2

Figure 1.1-1 generally illustrates the process and schedule for the first three phases of the project. As noted in the figure, LTD is concluding Scoping with the March 2008 adoption of the range of alternatives to advance into the AA/DEIS phase of work. At the same time the LTD Board of Directors reviewed and approved the range of environmental issues and disciplines that will be addressed within the project's DEIS and considered revisions proposed by FTA to the project's final Purpose and Need Statement and Goal and Objectives, originally adopted by the LTD Board of Directors in December 2007 (see Section 2.0).

Figure 1.1-1 Schedule Overview



As is generally true of public transportation projects conducted under the National Environmental Policy Act (NEPA) as implemented by FTA, the WEEE project is starting its process with a relatively wide range of proposed alternatives (and options) that will be progressively narrowed and refined as the project advances through each of the six phases. Further, the level of detail prepared for the definition and evaluation of the alternatives will generally increase as the project advances through the six phases. Therefore, as the WEEE Project is currently in the first phase (Scoping), there are a relatively large number of proposed alternatives that are under consideration and the level of detail in the definition of those alternatives and in the data or measures used to evaluate those alternatives is at a relatively general level.

1.3 Identifying and Narrowing Alternatives within Scoping

In a NEPA study, alternatives are developed and proposed as potential ways to address a project's Purpose and Need Statement (see Section 2 of this report). As such, when LTD issued its notice of intent to publish an EIS for the WEEE Project in September 2007, LTD also issued its working Purpose and Need Statement and a general description of the alternatives that it would propose for evaluation in the EIS. In October 2007, prior to and at the project's public Scoping meeting, LTD issued the project's proposed Purpose and Need Statement and proposed range of alternatives to be studied within the project's AA/DEIS and LTD invited public and agency comment on those proposals. In response to the proposed range of alternatives, LTD received various comments from members of the public suggesting that additional alternatives be developed and analyzed within the AA/DEIS. Based on the suggestions received, LTD staff prepared conceptual descriptions and maps of the suggested alternatives, grouping them into mode and alignment alternatives (see Section 3.0).

As noted previously, the LTD Board of Directors, with concurrence from FTA, determined which of the alternatives proposed in Scoping will be advanced into the AA/DEIS for further study and one of the factors that they used in making that determination is the summary of screening and evaluation measures included in this report. Determining which alternatives proposed during Scoping should advance into the AA/DEIS phase is achieved in two steps or tiers: Tier I – Screening; and Tier II – Evaluation.

Tier I – Screening refers to determining whether or not a given alternative would address the project's Purpose and Need Statement (see Section 2.1). For the WEEE Project the project's Purpose and Need Statement was broken down into its five core elements and an assessment was made as to whether an alternative would meet all of those five core elements (see Section 4.0 for more detail). An alternative would need to address all five core elements for the alternative to advance into Tier II – Evaluation. Sections 4.1 to 4.5 provide a summary of the Tier I screening findings. Section 4.6 includes the preliminary results of the Tier I screening process based on those findings, which identifies which alternatives were evaluated within Tier II.

Tier II – Evaluation refers to the development of data or measures used to compare and contrast the proposed alternatives that advance from Tier I into Tier II. One or more of the Tier II evaluation measures address each of the project's objectives (see Section 2.2 for a summary of the project's Goal and Objectives and see Section 4.0 for a description of the Tier II evaluation measures). Note that unlike the Tier I measures, which are threshold measures (an alternative must successfully address each measure to advance into Tier II), the Tier II measures are evaluative and comparative in nature, providing information on a spectrum of tradeoffs between the alternatives considered by the LTD Board of Directors and FTA in making the determination of which alternatives to advance into the AA/DEIS phase of work for further study. Sections 5.2 to 5.10 summarize the Tier II evaluation findings.

The LTD Board of Directors' determination of which alternatives to advance into the AA/DEIS phase of work is documented in the final *WEEE Project AA/DEIS Range of Alternatives Report*. The draft final *WEEE Project AA/DEIS Range of Alternatives Report* was forwarded to the WEEE Project Corridor Committee for review and advice to the LTD Board of Directors and to the EmX Steering Committee for review and recommendations to the LTD Board of Directors. The LTD Board of Directors considered the findings in the draft final reports, public and agency comments received during the Scoping comment period, advice from the Corridor Committee and recommendations from the EmX Steering Committee in adopting the final *WEEE Project AA/DEIS Range of Alternatives Report*. The adopted final *WEEE Project AA/DEIS Range of Alternatives Report* and supporting documents was forwarded to FTA for review and either approval or suggested revisions. No substantive revisions were suggested by FTA. During the AA/DEIS phase of work, the LTD Board of Directors and FTA may agree to add and/or eliminate alternatives for further study in the AA/DEIS based upon new analysis and/or findings, consistent with the project's Purpose and Need Statement and Goal and Objectives.

The findings included within this report and the determination of which alternatives to advance into the AA/DEIS, as documented in the adopted *WEEE Project AA/DEIS Range of Alternatives Report* will be referenced and summarized in the project's draft and final EIS.

2 Purpose and Need, Goal and Objectives and Corridor Definition

This section provides a summary of the WEEE Project's Purpose and Need Statement and Goal and Objectives. The version included herein includes FTA's proposed revisions to the Final Purpose and Need Statement and Goal and Objectives, which was adopted by the LTD Board of Directors on December 19, 2007. The revised version included herein was adopted by the LTD Board of Directors on March 19, 2008. Section 4.0 identifies the five key elements of the Purpose and Need Statement that are used as the Tier I screening measures and Section 5.0 identifies the one or more Tier II screening measures that address each of the project's objectives.

2.1 Purpose and Need Statement

The **Purpose** of the proposed West Eugene EmX Extension project is to implement high-capacity public transportation service, through bus rapid transit (BRT), in the West 11th Corridor (east/west) that is less hindered by congestion and that provides efficient, effective, dependable and visually appealing service throughout the life of the project.

The project would support local, regional, and state plans and goals for land use and transportation, and support economic development and redevelopment opportunities in the corridor, while being sensitive to and protecting the natural and built environmental resources and continue to obtain local public participation in its development.

The **Need** for the project results from:

- Historic and projected increases in traffic congestion in the West 11th Corridor due to increases in regional and corridor population and employment;
- Lengthy transit travel times and deteriorating public transportation reliability in the West 11th Corridor due to growing traffic congestion;
- Increasing operating expenses, combined with increasingly scarce operating resources, while demanding more efficient public transportation operations;
- The decision in the Regional Transportation Plan (RTP) to implement a BRT strategy for the region;
- Recent removal of the West Eugene Parkway as a proposed regional project, further constraining future capacity on the corridor and increasing the need for public transportation-related options;
- The region's growing reliance on public transportation to meet travel needs in the West 11th Corridor;
- Prioritization of the West 11th Corridor by the City of Eugene and LTD as the region's third BRT corridor;
- Local and regional land use and development plans, goals, and objectives that identify the West 11th Corridor for residential, commercial, retail, and industrial development to help accommodate forecasted regional population and employment growth; and

- Limitation of options for transportation improvements caused by the identification and protection of important resources in the natural and built environment in the West 11th Corridor, including but not limited to wetlands, rare plants, and animals and their habitat.

2.2 Goal and Objectives

The West Eugene EmX Extension Project **Goal** is the same as the project's Purpose, as stated above. The Purpose and Goal states the intent of the project; the Need identifies why the project is important. As a whole, the Goal and Objectives guide the establishment of screening criteria and measures that will be used to select the Range of Alternatives to be studied in the project's Draft Environmental Impact Statement (DEIS) and the establishment of evaluation criteria and measures that will be used to select the project's Locally Preferred Alternative (LPA).

Objectives

Within the project corridor, the **Objectives** of the West Eugene EmX Extension Project are to:

1. Improve customer convenience by reducing travel time, increasing service reliability, and making other service improvements;
2. Improve operating and other efficiencies to maximize the use of scarce resources;
3. Serve as a catalyst for planned transit-oriented development and support development that is consistent with adopted land use plans;
4. Help accommodate future growth in travel by increasing public transportation's share of trips;
5. Take into account the travel and safety needs of pedestrians, bicyclists, and motorists;
6. Contribute to establishing a fiscally stable public transportation system;
7. Design the project in a way that is consistent with laws related to resources in the natural and built environment; and
8. Support LTD and the City of Eugene's sustainability policies, including efforts to reduce greenhouse gas emissions.

2.3 West 11th Corridor Definition

The West 11th Corridor was selected by the LTD Board of Directors and the Eugene City Council in January 2007 as the region's next priority for development as the corridor in the region's BRT system, as defined in the *Regional Transportation Plan* (TransPlan).

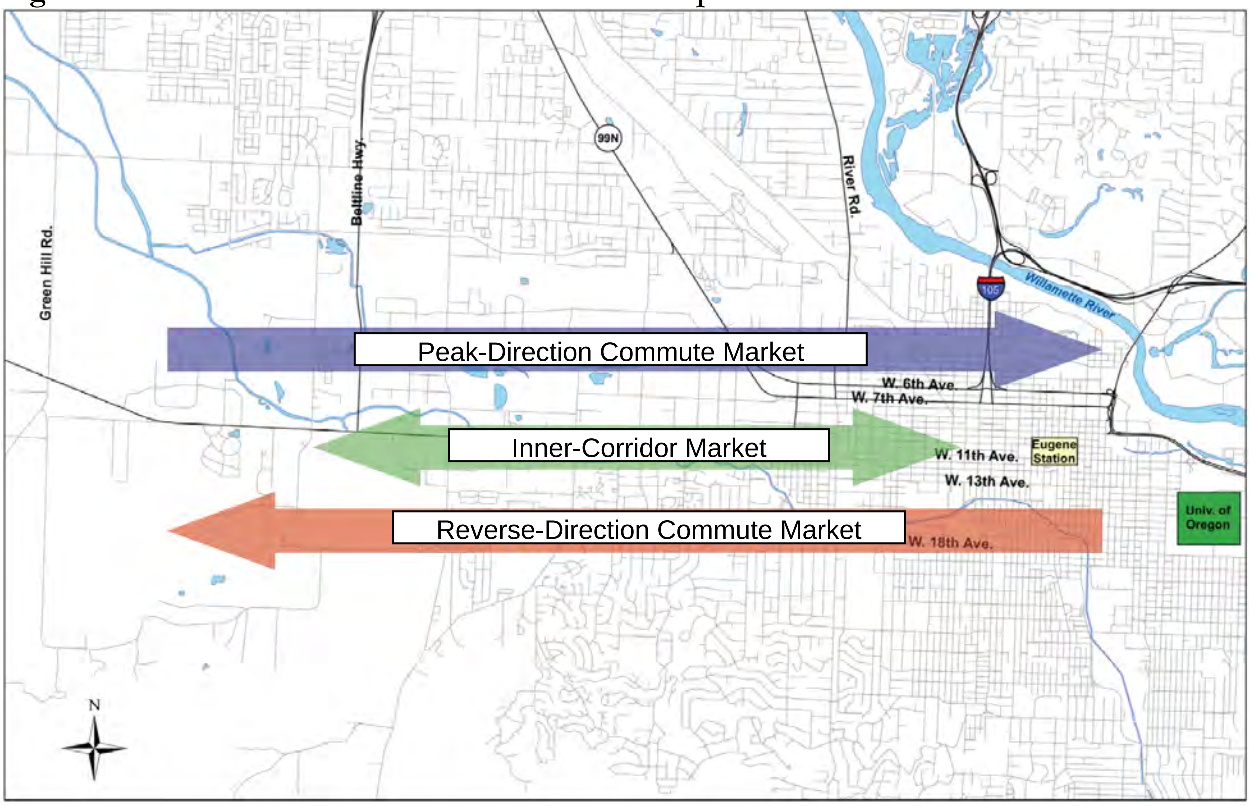
Consistent with FTA practice, the West 11th Corridor is defined both in terms of transit travel markets and in terms of the geographic areas that would primarily be served by the proposed project.

West 11th Corridor Travel Market Definition. The transit travel markets that predominantly make up the West 11th Corridor are the generally east/west travel patterns and demand that extend between and within West Eugene west of downtown Eugene along and in the vicinity of West 11th Avenue and the West 11th/13th Avenue couplet (Figure 2.3-1). These markets include:

- Work and non-work trips originating in West Eugene and west of Eugene generally along West 11th Avenue that are destined to downtown Eugene and other central major activity centers (e.g., the University of Oregon);
- Work and non-work trips that originate outside of the West 11th Corridor and that are destined to the commercial, retail and industrial facilities and centers in the vicinity of West 11th Avenue and work and non-work; and
- Work and non-work trips that originate and are destined to locations within the West 11th Corridor.

The West 11th Corridor transit travel markets are generally located between the West 18th Corridor and the Highway 99 Corridor (both of which are identified in TransPlan as potential BRT corridors).

Figure 2.3-1 West 11th Corridor Travel Market Map



West 11th Corridor Geographic Definition. Figure 2.3-2 illustrates the geographic extent of the West 11th Corridor as defined for the WEEE Project. The units used for this geographic definition are LCOG's transportation analysis zones, which are used in LCOG's regional travel demand forecasting model and can be tied to LCOG's and other jurisdictions' and agencies' geographic information database. The resulting geographic definition of the corridor represents those areas of the region that would be most likely to see travel time and travel behavior changes as a result of the proposed WEEE Project. Note that the geographic areas defining the West 11th Avenue, the West 18th Avenue and the Highway 99 corridors would overlap in some areas, but they would also cover distinctly different overall areas.

The roadway network of the West 11th Corridor generally includes a limited number of east/west streets and arterials that bus routes currently or could operate on: the West 11th/13th Avenue couplet, West 8th Avenue and the West 6th/7th Avenue couplet (generally between Willamette Street in downtown Eugene and Garfield Street to the west); West 11th Avenue and some portions of West 5th and 7th Avenues (generally west of Garfield Street).

Major north/south arterials intersecting some or all of these east/west streets include: I-105, the Washington/ Jefferson Street couplet; Chambers Street, Garfield Street, Seneca Road, Bailey Hill Road, South Bertelsen Road, Beltline Highway and Green Hill Road. In general, the signalized intersections of these east/west and north/south roads have historically experienced and are projected to continue to experience deteriorating traffic operations. Four of these intersections currently operate at level of service E or F and/or with a volume-to-capacity ratio greater than 1.0 (the industry-standard definition of congested intersections). Based on the current TransPlan, over the next twenty years the number of these intersections that would be congested is projected to more than double.

On an average weekday in 2004, approximately 372,000 person trips (travel independent of mode) began or ended in the West 11th Corridor, resulting in approximately 230,000 personal vehicle trips. Of those, approximately 72,000 person trips (19.4 percent) both began and ended in the West 11th Corridor, resulting in approximately 38,000 personal vehicle trips (16.5 percent). Further, there were on an average weekday in 2004 approximately 199,000 personal vehicle trips taken through (but not originating in or destined to) the West 11th Corridor. Total vehicle miles traveled within the corridor amounted to approximately 738,000 miles per average weekday in 2008, 15.1 percent of the regional total (approximately 4.9 million vehicle miles traveled).

Bus routes currently serving all or portions of the West 11th Corridor include: 30 Bertelsen; 41 Barger/West 11th Avenue; 43 West 11th Avenue/Barger, and 93 Veneta. These bus routes operate through many of the increasingly congested intersections described above; a condition that has and will continue to results in: longer transit passenger travel times; a decrease in transit schedule reliability; and increased operating costs.

Between 1990 and 2000, the number of residents in the West 11th Corridor increased by 20 percent, compared to Lane County's growth rate of 14.2 percent (see Table 2.3-1 Corridor Population Characteristics)[1]. Of those people residing in the Corridor, the number of people who identified themselves as 'white', 'black' and 'other race' grew during the 10-year period between 1990 and 2000 (12.6 percent, 15.3 percent and 476.9 percent, respectively), while the numbers of individuals who identified themselves as being of other races declined slightly. The number of people who identified themselves as being of Hispanic origin grew 125.2 percent from 912 in 1990 to 2,054 in 2000. The ratio of males and females within the corridor was relatively the same for the 10-year period. All age groups within the corridor experienced a similar growth to the overall population growth with the exception of two cohorts: 50-64 years and 65 years and older The '50-64 years' age group grew by 73.8 percent over the 10-year period, while the '65 years and older' age group declined by 2.5 percent.

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[1] For 1990 population data, U.S. Census Tracts and Block Groups included: BG2 Tract 10.02 BG2, Tract 25.02 BG1, Tract 39 BG2 BG3 BG4 BG5 BG8 BG9, Tract 42 BG2 BG4BG5, Tract 43 BG7 BG8, Tract 44.01 BG1 BG2 BG3, Tract 44.03 BG1 BG2 BG8 BG9, and Tract 45 BG1 BG2 BG3 BG4 BG5 BG6

For 2000 population data, U.S. Census Tracts and Block Groups included: Tract 10.02 BG2, Tract 25.02 BG1, Tract 39 BG1 BG 2 BG3, Tract 42 BG2 BG3, Tract 43 BG2, Tract 44.01 BG1 BG2
BG3, Tract 44.03 BG1 BG2 BG3, Tract 45 BG1 BG2 BG3 BG4 BG5 BG6

Figure 2.3-2 Geographic Definition of the West 11th Corridor

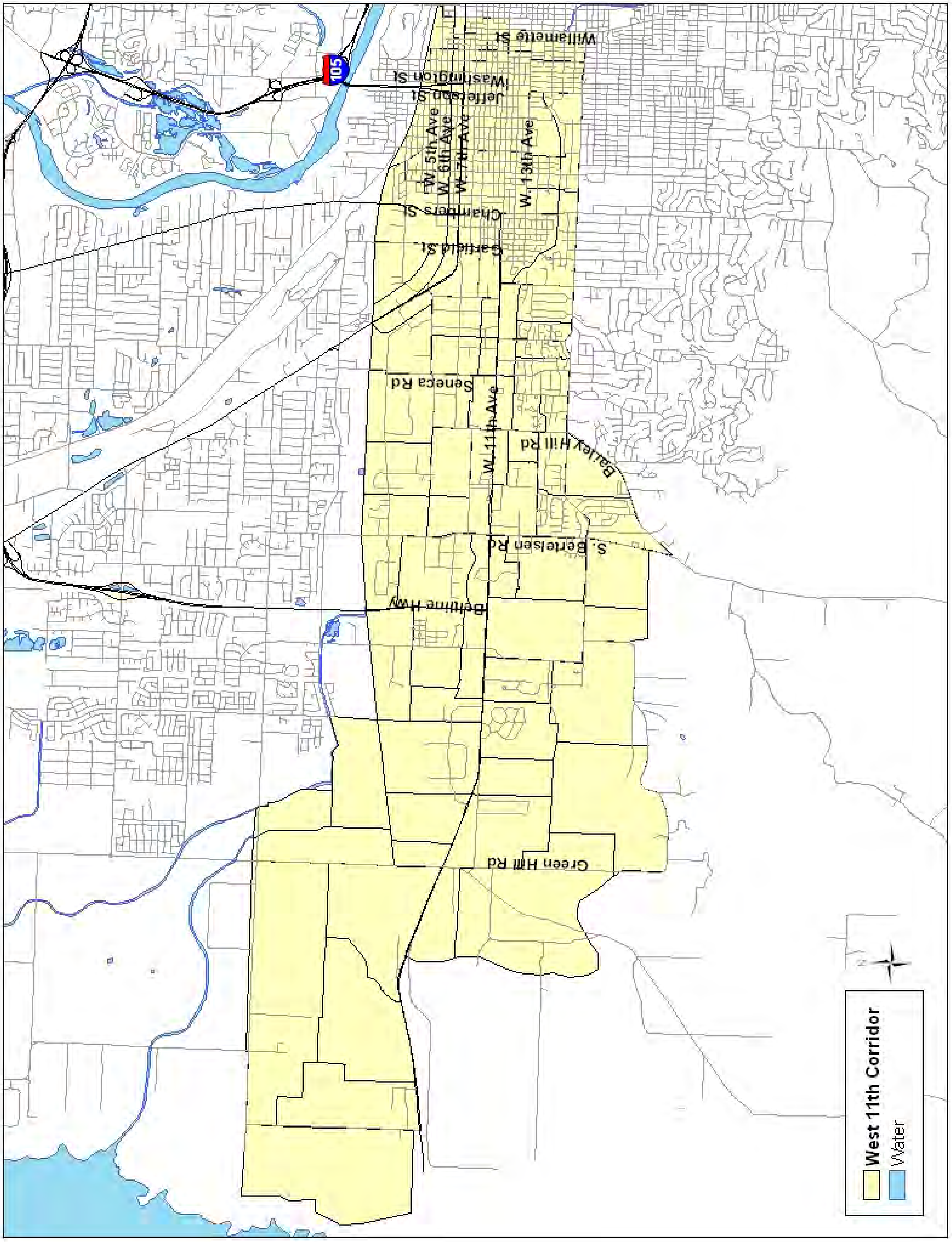

Table 2.3-1 Corridor Population Characteristics

	1990	2000	Change
Corridor Population	20,246	24,358	20.3%
Lane County Population	282,912	322,959	14.2%
Race/Ethnicity			
White	18,264	20,562	12.6%
Black	393	453	15.3%
American Indian, Eskimo, or Aleut	320	309	-3.4%
Asian or Pacific Islander	893	865	-3.1%
Other Race	376	2,169	476.9%
Hispanic Origin Population	912	2,054	125.2%
Gender			
Male	50%	52%	4.0%
Female	50%	48%	-4.0%
Age			
0-17 years	4,033	4,701	16.6%
18-29 years	5,796	7,074	22.0%
30-49 years	6,782	7,802	15.0%
50-64 years	1,621	2,817	73.8%
65 years and older	2,014	1,964	-2.5%

Source: 1990 U.S. Census Data Set: 1990 Summary Tape File 1 (STF 1) and 2000 U.S. Census Data Set: 2000 Summary File 1 (SF 1).

Notes: For race, 'Other Race' includes individuals who identified themselves as being of more than one race.

Households in the Corridor where residents are considered linguistically isolated increased for Spanish speaking households and households where another language was spoken (see table notes) (Table 2.3-2 Corridor Household Language Spoken at Home and Linguistic Isolation). The number of households where residents spoke an Asian or Pacific Island language increased while the number of linguistically-isolated households in this group decreased. 1990 data for households where other Indo-European languages was spoken was not available at the time of this report and, although 2000 data was reported, no comparison was possible.

The number of households in the Corridor grew 17.1 percent from 9,364 in 1990 to 10,969 in 2000 (Table 2.3-3 Corridor Household Characteristics). Within those households, the number of people per household grew slightly from an average of 2.16 in 1990 to 2.22 in 2000. Additionally, the total number of owner occupied homes in the Corridor increased 31.3 percent. Between 1990 and 2000, the percentage of total homes in the Corridor that were owner occupied grew from 31 percent to 34 percent.

From 1990 to 2000, median household income in the Corridor grew 51.5 percent from $16,448 to $24,919 (Table 2.3-4 Corridor Income Characteristics). While median household income increased during the 10-year period, the number of people in the Corridor who are living below the poverty level increased 32.1 percent from 3,908 in 1990 to 5,161 in 2000.

Table 2.3-2 Corridor Household Language Spoken at Home and Linguistic Isolation

	1990	2000	Change
English	8,315	9,329	12.2%
Spanish	397	826	108.1%
Linguistically isolated	93	185	98.9%
Not linguistically isolated	304	641	110.9%
Asian or Pacific Island language	315	348	10.5%
Linguistically isolated	148	117	-20.9%
Not linguistically isolated	167	231	38.3%
Other language	356	112	-68.5%
Linguistically isolated	5	19	280.0%
Not linguistically isolated	351	93	-73.5%
Other Indo-European languages	No data	374	N/A
Linguistically isolated	No data	13	N/A
Not linguistically isolated	No data	361	N/A

Source: 1990 U.S. Census Data Set: 1990 Summary Tape File 3 (STF 3) and 2000 U.S. Census Data Set: 2000 Summary File 3 (SF 3).

Notes:

1. A linguistically isolated household is one in which no member 14 years old and older speaks only English and no person 14 years old and over who speaks a language other than English speaks English ''Very well'' is classified as ''linguistically isolated.'' In other words, a household in which all members 14 years old and over speak a non-English language and also speak English less than ''Very well'' (have difficulty with English) is ''linguistically isolated.'' All the members of a linguistically isolated household are tabulated as linguistically isolated, including members under 14 years old who may speak only English.
2. The category of other languages includes Native North American languages, Hungarian, Arabic, Hebrew, African languages, Syriac, Finnish.

Table 2.3-3 Corridor Household Characteristics

	1990	2000	Change
Households	9,364	10,969	17.1%
Study Area Population	20,246	24,358	20.3%
People per Household	2.16	2.22	2.8%
Tenure			
Owner Occupied (# / % Total)	2,862 / 31%	3,759 / 34%	31.3%
Renter Occupied (# / % Total)	6,502 / 69%	7,210 / 66%	10.9%

Source: 1990 U.S. Census Data Set: 1990 Summary Tape File 1 (STF 1) and 2000 U.S. Census Data Set: 2000 Summary File 1 (SF 1).

Table 2.3-4 Corridor Income Characteristics

	1990	2000	Change
Median Household Income	$16,448	$24,919	51.5%
Number of People Living Below Poverty Level	3,908	5,161	32.1%

Source: 1990 U.S. Census Data Set: 1990 Summary Tape File 3 (STF 3) and 2000 U.S. Census Data Set: 2000 Summary File 3 (SF 3).

Educational attainment of Corridor residents also changed over the 10-year period (Table 2.3-5 Corridor Educational Attainment Characteristics). The total number of residents with some high school education or with less than a 9th grade education declined, while those with a high school diploma or some level of higher education increased.

Table 2.3-5 Corridor Educational Attainment Characteristics

Educational Attainment (Highest level attained)	1990	2000	Change
Less than 9th Grade	652	537	-17.6%
Some High School	1,277	1,237	-3.1%
High School Diploma (or equivalent)	3,046	3,579	17.5%
Some College	3,434	4,489	30.7%
Associates Degree	837	1,165	39.2%
Bachelors Degree	2,587	2,786	7.7%
Graduate or Professional Degrees	1,316	1,873	42.3%

Source: 1990 U.S. Census Data Set: 1990 Summary Tape File 3 (STF 3) and 2000 U.S. Census Data Set: 2000 Summary File 3 (SF 3).

Residents in the Corridor, 16 years and older, used varying means of transportation to travel to work (Table 2.3-6 Corridor Means of Transportation to Work Characteristics). In 1990, most residents drove to work alone (61 percent) and by 2000 the percentage of residents driving to work alone declined slightly (57 percent). Changes in the percentages of residents carpooling, bicycling or walking to work experienced no change or a slight change during the 10-year period, while the percentages of people who rode public transit experienced a larger change from 6 percent to 10 percent.

Table 2.3-6 Corridor Means of Transportation to Work Characteristics

Means of Transportation to Work (16 years and older)	1990	2000
Drove alone	61%	57%
Carpooled	12%	11%
Public Transit	6%	10%
Bicycled and Walked	17%	17%

Source: 1990 U.S. Census Data Set: 1990 Summary Tape File 3 (STF 3) and 2000 U.S. Census Data Set: 2000 Summary File 3 (SF 3).

Fueling residential growth in the West 11th Corridor is the land that is zoned and planned for residential development and that is either undeveloped or redevelopable (Tables 2.3-7, 2.3-8, 2.3-9 and 2.3-10). For purposes of this screening level evaluation, tax lots were categorized as developed, redevelopable, vacant, or non-developable based on the ratio of land value to improvement value and the zoning classification. Undeveloped or vacant land was defined as parcels with an improvement value less than $1,000 and redevelopable land was defined as parcels with a land value to improvement value ratio greater than 1.5 and the improvement value must be greater than $1,000. For more detailed information on the methods used for calculating buildable lands, please see Section 5.4.1 of this report.

Based on transportation analysis zones, there are a total of 3,804 acres in the Corridor, of which 3,556 acres are located in the Urban Growth Boundary (UGB) and approximately 248 acres are located outside the Urban Growth Boundary. Land within the UGB is zoned and regulated by the City of Eugene and land outside the UGB is zoned and regulated by Lane County.

Table 2.3-7 Corridor Acres of Zoned Residential, Industrial and Commercial Land

Zoning	Acres in UGB	Acres outside UGB	Acres in Corridor TAZs
Residential	1,257.9	247.8	1,466.3
Industrial	1,890.7	0	1890.7
Commercial	407.8	0	407.8
Total	3,556.4	247.8	3,804.2

Note: TAZ = Transportation Analysis Zone

Thirty percent of the residential zoned land within the UGB is considered vacant or redevelopable and 57 percent of the residential zoned land in the Corridor but outside the UGB is considered vacant or redevelopable.

Table 2.3-8 Corridor Acres of Zoned Residential Land in City and County that is Developed, Redevelopable and Vacant

Residential Land	Acres	Percent of Land
In Urban Growth Boundary (UGB)		
Developed	837.3	67%
Redevelopable	131.6	10%
Vacant	249.6	20%
Unknown	39.4	3%
Total	1,257.9	100%
Outside Urban Growth Boundary (UGB)		
Developed	105.7	43%
Redevelopable	72.5	29%
Vacant	69.6	28%
Total	247.8	100%
BOTH		
Developed	943	64%
Redevelopable	204.1	14%
Vacant	319.2	22%
Total	1,466.3	100%

The 1,891 acres of industrial zoned land within the Corridor is located entirely within the UGB. Of those industrial acres, 55 percent are vacant or redevelopable.

Table 2.3-9 Corridor Acres of Zoned Industrial Land in City and County that is Developed, Redevelopable and Vacant

Residential Land	Acres	Percent of Land
In Urban Growth Boundary (UGB)		
Developed	795.3	42%
Redevelopable	189.1	10%
Vacant	858.6	45%
Unknown	47.7	3%
Total	1,890.7	100%
Outside Urban Growth Boundary (UGB)		
Developed	0	0
Redevelopable	0	0
Vacant	0	0
Total	0	0

The 408 acres of commercial zoned land within the Corridor is located entirely within the UGB. Of those commercial acres, 34 percent are vacant or redevelopable.

Related to the employment growth is that the West 11th Corridor includes a number of designated mixed-use activity centers in addition to downtown Eugene: Midtown; Whiteaker; Chambers; Westmoreland; City View; Bailey Hill; Churchill; Beltline Employment; Willow Creek Residential; Willow Creek Employment; Greenhill Employment; and Crow Road. The City considers mixed-use centers as the centerpiece of its efforts to effectively manage the city's growth while maintaining its livability standards. The concept of mixed-use centers is to maintain the existing urban growth boundary by encouraging infill development and redevelopment. Select locations throughout the City have been designated for higher density, mixed-use development. Mixed-used centers are envisioned at all scales from the neighborhood to commercial centers to large employment centers.

While the West Eugene Wetlands Plan has led to the designation and acquisition of land for wetland preservation and restoration, the West 11th Corridor still retains a relatively large number of acres that are zoned for industrial, commercial or retail uses, that are not planned for wetland restoration or preservation and that are vacant or redevelopable (currently approximately 1,189 acres).

Table 2.3-10 Corridor Acres of Zoned Commercial Land in City and County that is Developed, Redevelopable and Vacant

Residential Land	Acres	Percent of Land
In Urban Growth Boundary (UGB)		
Developed	264.6	65%
Redevelopable	95.3	23%
Vacant	45.9	11%
Unknown	2	0.5%
Total	407.8	100%
Outside Urban Growth Boundary (UGB)		
Developed	0	0
Redevelopable	0	0
Vacant	0	0
Total	0	0

Table 2.3-11 Zoning Designations of Land within the Corridor by Jurisdiction

Zone	Acres	Percent of City or County	Percent of Total Acreage
In UGB / City OF Eugene			
AG	278.5	6%	4%
COM (C-1, C-2, C-3, C-4, GO)	407.8	9%	6%
Industrial (I-1, I-2, I-3)	1891	42%	28%
Park and Open Space (NR)	460.1	10%	7%
Government and Education (PL)	114.2	3%	2%
Residential (Low Density, R1)	911.4	20%	14%
Residential (Medium Density, R2)	261.4	6%	4%
Residential (High Density, R3, R4)	85.1	2%	1%
Special	121.5	3%	2%
TOTAL CITY	4,531	100%	68%
Outside UGB / Lane County			
Farm Lands (E-40)	1,611.2	75%	24%
Impacted Forest Lands (F-2)	208.4	10%	3%
Quarry and Mine Operations (QM)	53.2	2%	1%
Rural Public Facility (RPF)	14.9	1%	0.2%
Rural Residential (RR-5, RR-10)	247.8	12%	4%
TOTAL COUNTY	2,135.5	100%	32%
Acreage Total (City And County)	6,666.5		100%

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3 Proposed Alternatives

This section provides a brief description of alternatives proposed for evaluation through this project study. During Scoping, alternatives were proposed for further study in the project's AA/DEIS by LTD (see Section 3.1) and the public (see Section 3.2); no alternatives were proposed by public agencies or jurisdictions. For the purpose of this report and for the project Scoping screening of alternatives, alternatives are characterized as either mode alternatives (see Sections 3.1.1 and 3.2.1) or alignment alternatives (see Sections 3.1.2 and 3.2.2). Design options will be developed, evaluated, and screened as needed and as appropriate throughout the AA/DEIS phase as the conceptual definitions and designs of the remaining alignment alternatives are developed

3.1 Proposed by LTD

At the outset of the Scoping process, LTD proposed one mode alternative and several alignment alternatives for consideration by the interested public and agencies. The mode and alignment alternatives proposed by LTD are described in Section 3.1.1 and 3.1.2, respectively.

3.1.1 Mode Alternatives

A mode alternative is defined as the mode of operation used to provide service along a given alignment or within a given corridor. Transit modes typically are characterized by the type of vehicle used to provide the transit service and/or the type of alignment that a particular or several modes would travel on. Urban transportation modes are typically broken down into: single-occupant automobile; multiple-occupant automobile; transit; bicycle; pedestrian; and truck/freight. Urban transit modes are further broken down into modes, such as fixed-route bus, light rail, monorail, etc., each with somewhat industry-standard general characteristics that define that mode of transit operations.

Following is a conceptual description of the transit mode alternatives that were proposed by LTD for the WEEE Project to be studied further in the AA/DEIS. Section 4.0 of this report provides a summary of the Tier I screening of alternatives to advance into the AA/DEIS.

- **Fixed Route Bus – No-Build Alternative.** Fixed route bus service is defined as transit vehicles, typically 35 to 60 feet in length, operating on a fixed schedule and on a fixed route, generally using general purpose lanes of traffic on public streets and highways. In general, fixed route buses use the same signal system and phases that general purpose traffic uses at intersections. Therefore, as congestion and unreliability increase and travel times decrease for general purpose traffic, they do so for transit vehicles operating on those same streets and through those same intersections. Fixed route bus service typically boards and deboards passengers at posted bus stops (and sometimes un-posted stops, such as in evening hours) and transit centers. Bus stops typically include some passenger information and may or may not include a shelter and/or a bench. Fixed route bus service is typically the most prominent type of service provided by transit districts, including LTD. While fixed route bus service would be a component of all alternatives for the West 11th Corridor, only the No-Build Alternative proposed by LTD (and required under NEPA) would rely exclusively on fixed route bus service in the West 11th Corridor. Because fixed route bus service would be in all of the alternatives and the No-Build Alternative is required by NEPA and the FTA in an AA/DEIS, fixed route bus service as a mode and the No-Build Alternative are not screened or evaluated within this report or as a part of the WEEE Project's Scoping process.

- **Transportation Systems Management (TSM) Bus.** The TSM Alternative represents the best that can be done for mobility with existing infrastructure – that is, without construction of a new transit guideway. The LTD Board of Directors, with FTA concurrence, has removed West 11th Avenue, generally between Jefferson and Chambers Streets for consideration of TSM improvements. The New/Small Starts Baseline Alternative, shares its definition with the TSM Alternative. The Baseline Alternative must be approved by FTA before projects can be approved to advance into Project Development or Preliminary Engineering.
- **BRT.** BRT is generally defined as a variety or menu of capital and operating improvements within a corridor that are made to improve transit travel times, reliability and ridership. Typically and as implemented and proposed by LTD, BRT projects include a separated right-of-way for transit operations for all or a portion of the length of the corridor. Also, BRT projects typically include: transit priority or pre-emption at at-grade signalized intersections; queue jumps (where vehicles operate in mixed traffic rather than in separate right-of-way); "branding" (name, vehicle colors, logos, etc. that are different than those for the fixed route system); vehicles with greater passenger-carrying capacity, doors on both sides of the vehicles and amenities that tend to reduce the time it takes to board and deboard passengers (e.g., more and wider doors, level boarding, off-vehicle ticketing, etc.); and stations, rather than bus stops, that typically include larger and/or more comfortable waiting areas, improved passenger information, distinctive style related to the project's branding, etc. An important characteristic of BRT is that many of capital improvements can be applied or not applied depending on specific conditions in the corridor to reduce costs and/or adverse impacts without or with minimal relative deterioration in transit travel time and reliability.

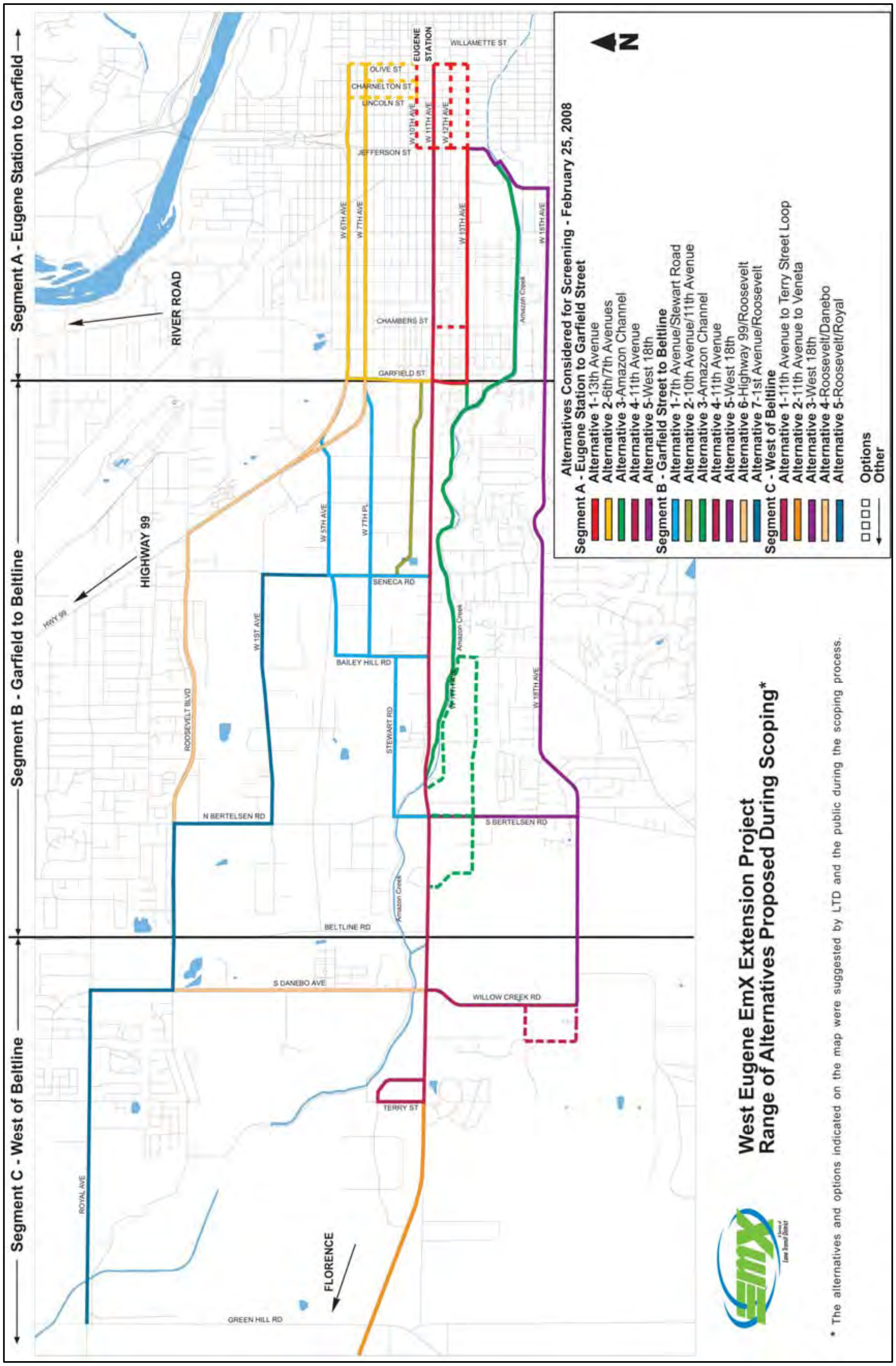
3.1.2 Alignment Alternatives by Segment

Proposed alignment alternatives considered in this screening level evaluation are described below and depicted in Figure 3.1-1. Alignment alternatives described in this section have been proposed by LTD and the public; no alternatives were proposed by Participating Agencies.

For the purposes of this screening level analysis, the West 11th corridor is divided into three segments:

- Segment A: Eugene Station (Downtown) to Garfield Street
- Segment B: Garfield Street to Beltline Road
- Segment C: Beltline Road to a Western Terminus

Figure 3.1-1 Alignment Alternatives Proposed During Scoping



Each of the three segments is generally unique in its character, land use and density of development. A variety of alternatives have been proposed for each of the segments and this screening evaluates each of those alternatives by segment. Consideration of alignment alternatives by segment in this screening evaluation is intended to allow for selecting the most promising alternatives for further study and does not preclude consideration of the Corridor as a whole.

Alignment alternatives proposed by LTD for consideration by the public and agencies are identified in the table below. Each alignment alternative was assigned a letter designation that corresponds to designations in Figure 3.1-1. These designations are indicated in the table below. For the Tier I screening evaluation, alignment alternatives have been described only by their location and type of facility. For the Tier II screening evaluation, alignment alternatives forwarded from the Tier I evaluation have been further defined and are described in Section 5 of this report.

Table 3.1-1 Alignment Alternatives Proposed by LTD

Segment Alternative Number Designation	Alternative Name / Description
Segment A - Eugene Station to Garfield Street	
Alternative 1	13th Avenue
Alternative 2	6th / 7th Avenues
Segment B - Garfield Street to Beltline Road	
Alternative 3	Amazon Channel
Alternative 4	11th Avenue
Segment C - West of Beltline Segment	
Alternative 1	11th Avenue to Terry Street Loop

Note: See Figure 3.1-1 for an illustration of these alignment alternatives.

3.2 *Proposed by Public*

During the Scoping process, the public proposed mode and alignment alternatives for consideration in addition to the alternatives proposed by LTD. These mode and alignment alternatives proposed by the public are described in sections 3.2.1 and 3.2.2, respectively. Additional information regarding rail related modes is included in this report in Appendix A (Characteristics of Streetcars and Light Rail Systems in the USA) and Appendix B (Applicability of Rail in the Eugene-Springfield Metropolitan Area).

3.2.1 Mode Alternatives

Section 3.1.1 of this report provides a summary description of what mode alternatives are and which modes LTD proposed for further study in the project's AA/DEIS. This section describes the mode alternatives proposed by the public for further study in the AA/DEIS.

- **Electric (Trolley) Bus.** Electric bus is generally and for the purposes of this report as fixed route bus service (see Section 3.1.1) with electric buses used to operate the transit service. Electric trolley buses use an overhead wiring system (i.e., catenary) to provide power to the vehicle that have an electrical motor and drive train. Electric trolley buses are operated in Seattle and San Francisco, where in general they have been retained and not replaced by diesel buses because of their generally superior performance in steep terrain. In general, all of the characteristics associated with fixed route (diesel) buses are also associated with electric trolleys, except that trolley buses tend to be quieter and produce fewer fumes. In addition, trolley buses generally have an operational limitation not present with diesel buses, which is that they cannot pass each other unless the vehicle to be passed has its power poles disconnected or unless specific passing catenary is provided for. Catenary must also be provided connecting the corridor alignment with the maintenance facility and the maintenance facility typically has internal catenary connecting the storage yard with the maintenance building and bays.

- **Streetcar.** The streetcar mode is generally characterized as similar to the electric trolley bus, except that the vehicle operates on steel tracks using steel wheels. That is, streetcars typically operate in mixed traffic, using general purpose travel lanes and the signal system for general purpose intersections. Streetcar vehicles tend to have tighter turning radii and less restrictive horizontal clearances than light rail vehicles, but they also tend to have lower top operating speeds and they are typically not combined into consists (i.e., train sets) of two or more vehicles. Streetcar vehicle characteristics are optimized in the typical operating environment for streetcars, which is urban or inner urban transit circulation. Streetcars cannot pass each other unless passing track and catenary is provided. Tracks and catenary must link the corridor alignment with the maintenance facility and within the maintenance facility.
- **Light Rail.** Light rail is generally characterized as the operation of urban line haul transit routes by electric trains generally operating in reserved transit right-of-way (which can be at, below or above grade), with the ability to operate in mixed traffic and across at-grade mixed-traffic intersections (either with or without priority or pre-emption). Like electric trolleys and streetcars, power is supplied to the vehicles using overhead electrical wiring (i.e., catenary) and like streetcars, light rail vehicles cannot pass each other, unless passing track and catenary is provided. Light rail vehicles tend to be approximately 100 feet in length and can be combined into consists or trains of two to four vehicles – the train length is generally limited by the minimum block length of the streets or right-of-way that it operates (for example, in Portland the shortest blocks are 200 feet in downtown Portland, so TriMet limits its light rail trains to two 100-foot cars).
- **Grade Separated Transit.** Grade separated transit, often termed "heavy rail" or "Metro rail" generally operates urban line haul transit routes using electric trains that operate either above or below grade (with some at-grade running with no at-grade intersections). Power is typically supplied via a third rail under the vehicle, which requires the transit right-of-way to be secure from pedestrians. As with other rail alternatives, grade separated vehicles cannot pass each other without passing track. Tracks in grade separated right-of-way must be provided from the corridor alignment to and within the maintenance facility. Trains can be relatively long, depending on the vehicle technology used, as the right-of-way at stations is generally not limited by block length.

3.2.2 Alignment Alternatives by Segment

Alignment alternatives proposed by the public for consideration are identified in the table below. Each alignment alternative was assigned a letter designation that corresponds to designations on Figure 3.1-1. These designations are indicated in the table below. For the Tier I screening evaluation, alignment alternatives have been described only by their location and type of facility. For the Tier II screening evaluation, alignment alternatives forwarded from the Tier I evaluation have been further defined and are described in Section 5 of this report.

In addition to the alternatives outlined in Table 3.2-1, three other alignment alternatives were proposed by the public during the Scoping comment period that do not fall within any of the corridor segments: Highway 126 to Florence, Oregon; Highway 99 to Barger Drive and Junction City; and River Road to north of Beltline Highway (see Figure 3.1-1). LTD staff conducted an early screening of these alternatives based on the Tier I measure requiring alignment alternatives to be within the West 11th Corridor to advance for further study. Before fully conducting the Tier I Screening, LTD determined that these three alignment alternatives were not within the West 11th Corridor (see Figure 2.3-2 and Section 2.3) and therefore did not warrant further study.

Table 3.2-1 Alignment Alternatives Proposed by the Public[1]

Segment	Alternative Number Designation	Alternative Name / Description
Segment A - Eugene Station to Garfield Street		
	Alternative 3	Amazon Channel
	Alternative 4	11th Avenue
	Alternative 5	West 18th Avenue
Segment B - Garfield Street to Beltline Road		
	Alternative 1	7th Place / Stewart Road
	Alternative 2	10th Avenue / 11th Avenue
	Alternative 3	Amazon Channel*
	Alternative 5	West 18th
	Alternative 6	Highway 99 / Roosevelt
	Alternative 7	1st Avenue / Roosevelt
Segment C – West of Beltline Segment		
	Alternative 2	11th Avenue to City of Veneta
	Alternative 3	West 18th
	Alternative 4	Roosevelt / Danebo
	Alternative 5	Roosevelt / Royal

*This Alternative 3 – Amazon Channel, proposed by the public, represents a design option for the Amazon Channel alignment. This option proposes that the alignment travel along the Amazon Channel from Garfield Street to Bailey Hill Road, on Bailey Hill Road to 13th Avenue, along 13th Avenue to Bertelsen, along Bertelsen to 11th Avenue.

1. In addition to the alternatives outlined in Table 3.2-1, three other alignment alternatives were proposed by the public during the Scoping comment period that do not fall within any of the corridor segments: Highway 126 to Florence, Oregon; Highway 99 to Barger Drive and Junction City; and River Road to north of Beltline Highway (see Figure 3.1-1). LTD staff conducted an early screening of these alternatives based on the Tier I measure requiring alignment alternatives to be within the West 11th Corridor to advance for further study. Before fully conducting the Tier I Screening, LTD determined that these three alignment alternatives were not within the West 11th Corridor (see Figure 2.3-2 and Section 2.3) and therefore did not warrant further study.

Note: See Figure 3.1-1 for an illustration of these alignment alternatives.

3.3 Proposed by Participating Agencies

No mode or alignment alternatives were proposed by Participating Agencies.

4 Findings – Meets Purpose and Need

This section provides a preliminary assessment of whether or not the proposed alternatives for the WEEE Project AA/DEIS (see Section 2.0) address the project's Purpose and Need Statement (see Section 2.0) to determine whether or not the proposed alternatives will advance into Tier II for further study.

An alternative that was found to not address the project's Purpose and Need Statement during the Tier I screening was removed from further study, because, by definition, it would not be selected as the project's Locally Preferred Alternative; and an alternative that was found to address the project's Purpose and Need Statement was forwarded into the Tier II screening for further study. Sections 4.1 through 4.5 summarize the Tier I findings for the proposed alternatives; and Section 4.6 provides a summary of the alternatives screened out from further study in Tier II, based on those findings, and the alternatives that advanced into Tier II for further study.

Following is a list of the five elements of the project's Purpose and Need Statement that were used for the Tier I screening to preliminarily determine whether or not the alternatives would address the project's Purpose and Need Statement.

In order to advance from the Tier I to the Tier II evaluation phases, it must be found that the proposed alternative:

- *Would be within the east/west West 11th Corridor;*
- *Would primarily be a transit investment;*
- *Is BRT if it is a high capacity transit mode;*
- *Would improve transit travel time and reliability; and*
- *Would serve developed and/or developable land.*

Note that these Tier I measures are threshold questions. That is, a "yes/no" determination is made for each question/measure; and an alternative must achieve a "yes" for each question/measure in order for that alternative to advance into Tier II for further study.

4.1 Would be within the East/West West 11th Corridor

The Purpose of the WEEE Project is focused on addressing problems, opportunities and alternatives, specifically within the West 11th Corridor. For an alternative to advance into the Tier II evaluation it must be found to primarily address the transit travel markets that make up the West 11th Corridor. This section first defines the West 11th Corridor and its transit travel markets and then it assesses whether or not the proposed alignment alternatives would primarily address that corridor and its constituent markets. The proposed mode alternatives are not corridor-dependent, so they have all been found to address the West 11th Corridor.

4.1.1 Definition of the West 11th Corridor

As noted in Section 2.3, the West 11th Corridor is primarily defined in terms of transit travel markets, although it is also defined geographically in terms of LCOG's transit analysis zones (TAZs) (see figures 2.3-1 and 2.3-2). To reiterate, the West 11th Corridor is an east/west oriented transit travel shed that is generally located in West Eugene and west of Eugene, focused on the West

11th/13th Avenue couplet between downtown Eugene and Garfield Street and on West 11th Avenue west of Garfield Street. The West 11th Corridor is primarily made up of three transit travel markets:

- Peak-direction commute trips;
- Reverse direction commute trips (e.g., off-peak direction trips); and
- Inner corridor trips.

There are many transit travel corridors, sheds and markets in West Eugene that overlap in current and potential users and geographic areas, but the West 11th Corridor is distinct and identifiable. To keep a study of this size manageable, both in terms of study resources, the range of alternatives to be studied in detail and the regional resources that might be needed to fund potential solutions, it is important for the WEEE Project to focus on addressing the identified problems and opportunities in the current priority corridor. The region has other proposed projects and/or studies addressing other transportation problems, corridors and markets in West Eugene, which this project will coordinate with, if appropriate and feasible. It is through system planning (i.e., TransPlan) and the regional allocation of study and project resources (i.e., the Metropolitan Transportation Improvement Program) that the region sets priorities and the WEEE Project, focusing on the West 11th Corridor, is a result of that process.

Other east/west corridors in the general west Eugene area include the West 18th Corridor, the Highway 99 Corridor and the River Road Corridor, which are each identified in the BRT system plan in TransPlan as distinct proposed BRT corridors that could all be implemented (depending on their performance, costs and ability to generate adequate funding). It is possible that some alignment alternatives could serve one or more of these four transit corridors in West Eugene. However, in order for a proposed alignment alternative to advance into the Tier II analysis it must be found at a minimum to address the West 11th Corridor markets.

As noted in Section 2.3, the roadway network of the West 11th Corridor generally includes a limited number of east/west streets and arterials that bus routes currently or could feasibly operate on: the West 11th/13th Avenue couplet; West 8th Avenue and the West 6th / 7th Avenue couplet (generally between Willamette Street in downtown Eugene and Garfield Street to the west – this is the current signed routing for Highway 126 between downtown Eugene and West 11th Avenue west of Garfield Street); West 11th Avenue; and some portions of West 5th and 7th Avenues (generally west of Garfield Street).

4.1.2 Findings

Following is a summary of the findings related to whether or not an alignment alternative would address the primary transit travel markets that are included within the West 11th Corridor, broken down by segment. See Section 3.0 for a description and maps illustrating these alignment alternatives. A brief explanation is provided for the alternatives which did not address the West 11th Corridor.

4.1.2.1 Segment A – Eugene Station to Garfield Street

Following are the alignment alternatives in the Eugene Station to Garfield Street Segment found by LTD that could address the West 11th Corridor and its primary transit travel markets:

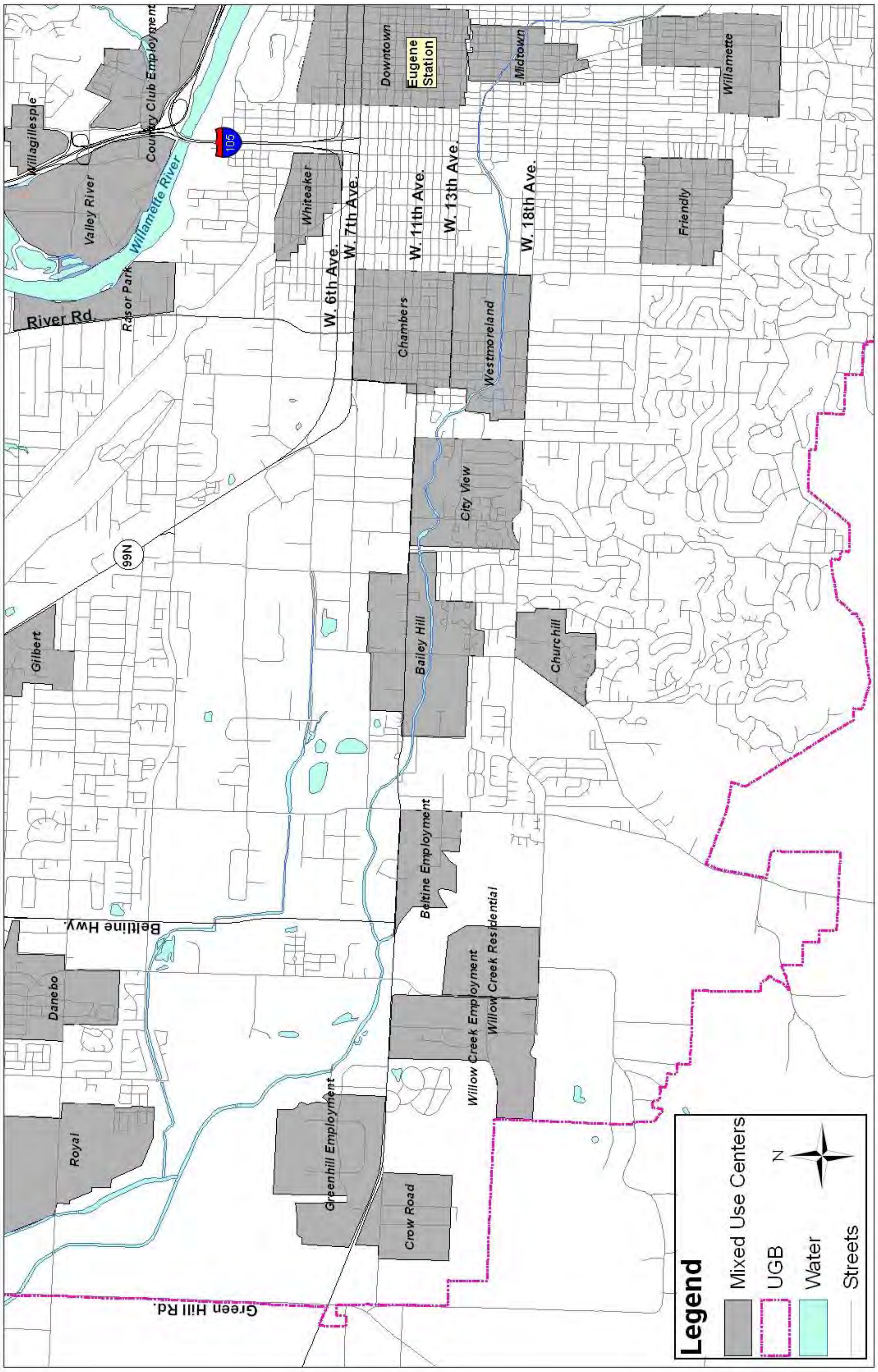
- Alternative 1 – 13th Avenue

- Alternative 2 – 6th/7th Avenues (Couplet)
- Alternative 3 – Amazon Channel
- Alternative 4 – 11th Avenue

Following are the alignment alternatives in the Eugene Station to Garfield Street Segment that LTD found would not address the West 11th Corridor and its primary transit travel markets:

- Alternative 5 – West 18th (coupled with Alternative 5 in Segment B). LTD found that an alignment on West 18th Avenue would not address the West 11th Corridor and its primary transit travel markets because:
    1) Most of the commercial, retail and employment centers in the West 11th Corridor are located along or near West 11th Avenue and there are relatively few similar mixed-use centers in the West 11th Corridor that could be readily accessed from a West 18th Avenue alignment (see Figure 4.1-1).
    2) Travel via transit on West 18th Avenue would tend to be out of direction for most of the West 11th Corridor into and east of downtown Eugene, resulting in increased travel time and relatively lower transit ridership (see Section 4.5).
    3) An alignment on West 18th Avenue in this segment would primarily address the West 18th Corridor and its transit travel markets, which is different than the West 11th Corridor and its transit travel markets.

Figure 4.1-1 Mixed Use Centers in West 11th Corridor



4.1.2.2 Segment B – Garfield Street to Beltline

Following are the alignment alternatives in the Garfield to Beltline Segment which LTD found could address the West 11th Corridor and its primary transit travel markets (as such, these alignments are advanced into the Tier II Evaluation):

- Alternative 1 – 7th Avenue/Stewart Road
- Alternative 2 – 10th Avenue/11th Avenue
- Alternative 3 – Amazon Channel
- Alternative 4 – 11th Avenue

Following are the alignment alternatives in the Garfield to Beltline Segment which LTD found that would not address the West 11th Corridor and its primary transit travel markets:

- Alternative 5 – West 18th (coupled with Alternative 5 in Segment B)
  1) Most of the commercial, retail and employment centers in the West 11th Corridor are focused along or near West 11th Avenue and there are relatively few similar mixed-use centers in the West 11th Corridor that could be readily accessed from a West 18th Avenue alignment (see Figure 4.1-1).
  2) Travel via transit on West 18th Avenue would tend to be out of direction for most of the West 11th Corridor into and east of downtown Eugene, resulting in increased travel time and relatively lower transit ridership (see Section 4.4).
  3) An alignment on West 18th Avenue in this segment would primarily address the West 18th Corridor and its transit travel markets, which is different than the West 11th Corridor and its transit travel markets.
- Alternative 6 – Highway 99/Roosevelt (coupled with Alternative 4 in Segment C)
  1) Most of the commercial, retail and employment centers in the West 11th Corridor are focused along or near West 11th Avenue and there are relatively few similar mixed-use centers in the West 11th Corridor that could be readily accessed from a Highway 99 and Roosevelt Boulevard alignment (see Figure 4.1-1).
  2) Travel via transit on Highway 99 and Roosevelt Boulevard would tend to be out of direction for most of the West 11th Corridor into and east of downtown Eugene, resulting in increased travel time and relatively lower transit ridership (see Section 4.4).
  3) An alignment on Highway 99 and Roosevelt Boulevard in this segment would primarily address the Highway 99 Corridor and its transit travel markets, which is different than the West 11th Corridor and its transit travel markets.
- Alternative 7 – 1st Avenue/Roosevelt (coupled with Alternative 5 in Segment C)
  1) Most of the commercial, retail and employment centers in the West 11th Corridor are focused along or near West 11th Avenue and there are relatively few similar mixed-use centers in the West 11th Corridor that could be readily accessed from a West 1st Avenue and Roosevelt Boulevard alignment (see Figure 4.1-1).

2) Travel via transit on West 1st Avenue and Roosevelt Boulevard would tend to be out of direction for most of the West 11th Corridor into and east of downtown Eugene, resulting in increased travel time and relatively lower transit ridership (see Section 4.4).

3) An alignment on West 1st Avenue in this segment would primarily address the Highway 99 Corridor and its transit travel markets, which is different than the West 11th Corridor and its transit travel markets.

4.1.2.3 Segment C – West of Beltline Segment

Following are the alignment alternatives in the West of Beltline Segment which LTD found could address the West 11th Corridor and its primary transit travel markets:

- Alternative 1 – 11th Avenue to Terry Street Loop
- Alternative 2 – 11th Avenue to Veneta

Following are the alignment alternatives in the West of Beltline Segment which LTD found would not address the West 11th Corridor and its primary transit travel markets:

- Alternative 3 – West 18th (coupled with Alternative 5 in Segment B/A – note that an alignment on West 18th Avenue between approximately Bertelsen Road and Willow Creek Road could be part of design option for a terminus loop for Alternative 1 in Segment B/C, which could address the West 11th Corridor's transit travel markets).
  1) Most of the commercial, retail and employment centers in the West 11th Corridor are focused along or near West 11th Avenue and there are relatively few similar mixed-use centers in the West 11th Corridor that could be readily accessed from a West 18th Avenue alignment (see Figure 4.1-1).
  2) Travel via transit on West 18th Avenue would tend to be out of direction for most of the West 11th Corridor into and east of downtown Eugene, resulting in increased travel time and relatively lower transit ridership (see Section 4.4).
  3) An alignment on West 18th Avenue in this segment would primarily address the West 18th Corridor and its transit travel markets, which is different than the West 11th Corridor and its transit travel markets.
- Alternative 4 – Roosevelt/Danebo (coupled with Alternative 6 in Segment B)
  1) Most of the commercial, retail and employment centers in the West 11th Corridor are focused along or near West 11th Avenue and there are relatively few similar mixed-use centers in the West 11th Corridor that could be readily accessed from a Danebo Avenue and Roosevelt Boulevard alignment (see Figure 4.1-1).
  2) Travel via transit on Danebo Avenue and Roosevelt Boulevard would tend to be out of direction for most of the West 11th Corridor into and east of downtown Eugene, resulting in increased travel time and relatively lower transit ridership (see Section 4.4).
  3) An alignment on Danebo Avenue and Roosevelt Boulevard in this segment would primarily address the Highway 99 Corridor and its transit travel markets, which is different than the West 11th Corridor and its transit travel markets.

- Alternative 5 – Roosevelt/Royal (coupled with Alternative 7 in Segment B)
    1) Most of the commercial, retail and employment centers in the West 11th Corridor are focused along or near West 11th Avenue and there are relatively few similar mixed-use centers in the West 11th Corridor that could be readily accessed from a Roosevelt Boulevard and Royal Avenue alignment (see Figure 4.1-1).
    2) Travel via transit on Roosevelt Boulevard and Royal Avenue would tend to be out of direction for most of the West 11th Corridor into and east of downtown Eugene, resulting in increased travel time and relatively lower transit ridership (see Section 4.4).
    3) An alignment on Roosevelt Boulevard and Royal Avenue in this segment would primarily address the Highway 99 Corridor and its transit travel markets, which is different than the West 11th Corridor and its transit travel markets.

4.2 Would Primarily be a Transit Investment

A primary component of the Purpose of the WEEE Project is to address problems and opportunities in the West 11th Corridor that are transit related. For an alternative to advance into the Tier II evaluation it must be found to primarily address transit problems and opportunities. Other projects in the region do or could address other modes of travel (e.g., automobile, bicycle, pedestrian) and, while the problems and opportunities of those other modes are not the focus of the WEEE Project, interface with those other modes will be addressed as one of the project's objectives (see Section 5.9).

All of the following modes of travel that were proposed to be studied in the WEEE Project's EIS were found by LTD to be primarily a transit investment that would address transit problems and opportunities and therefore all of the following modes could advance into Tier II for evaluation (if they also meet all other Tier I screening measures):

- Bus (under the No-Build and TSM alternatives)
- Trolley Bus (with overhead catenary – a.k.a., electric bus)
- BRT
- Streetcar
- Light Rail
- Grade-Separated Transit

All of the alignment alternatives proposed for further study in the WEEE Project's EIS would be for one or more of these six transit modes, so all of the proposed alignment alternatives could also advance into Tier II for evaluation (if they also meet all other Tier I screening measures).

4.3 Is BRT if it is a High Capacity Transit Mode

This section provides an assessment of whether or not the proposed alternatives are BRT if they are a high capacity transit mode. The screening for this Tier I measure occurs in two steps:

- First, a determination is made of whether the alternative is a high capacity transit mode or not. If the alternative is a high capacity transit mode then the alternative passes this screening measure and receives a "yes"; if the alternative is a high capacity transit mode then it must pass the second determination.

- Second, a determination is made of whether or not the alternative is BRT or not.

This section first provides a summary of the prior evaluation of high capacity transit alternatives performed by LTD and LCOG that provides the rationale for screening out all but BRT alternatives from further study in Tier II (see Section 4.3.1). Then this section summarizes: 1) the determination of whether or not an alternative is a high capacity transit alternative (see Section 4.3.2); and 2) the determination of whether the proposed high capacity transit alternatives are BRT or not (see Section 4.3.3).

4.3.1 Prior Evaluation of High Capacity Transit Alternatives

This section provides a summary of two prior studies of high capacity transit modes that were conducted by LTD and LCOG that provide the rationale for only advancing BRT high capacity transit alternatives out of Tier I into Tier II for further study. Those studies were:

- Bus Rapid Transit Concept Major Investment Study (1997); and
- Eugene/Springfield Area Urban Rail Feasibility Study (1995).

Key participants in the studies included: LCOG, the Oregon Department of Transportation, LTD, the cities of Eugene and Springfield, Lane County and the Federal Highway Administration. The results of these two studies are documented respectively in the: 1) *Bus Rapid Transit (BRT) Concept Major Investment Study (MIS) Final Report* (LCOG, 1997); and 2) *Urban Rail Feasibility Study Eugene/Springfield Area Final Report* (LCOG, 1995).

Based upon these two studies, the region's Metropolitan Planning Organization (MPO) adopted the transit policies in its regional transportation plan (*Eugene-Springfield Regional Transportation Plan* (TransPlan)) in 2001. In that plan, BRT was identified as the region's preferred high capacity transit mode. As part of that plan, the MPO also set as a transportation priority the implementation of a BRT system based on a set of potential BRT corridors (Chapter 2, pages 28 to 30).

The region's evaluation of high capacity transit alternatives in the BRT MIS and the Urban Rail Feasibility Study and the resulting selection of BRT as the region's preferred high capacity transit mode is reflected in the WEEE Project's Purpose and Need Statement:

> *The Purpose of the proposed West Eugene EmX Extension project is to implement high-capacity public transportation service, through bus rapid transit, in the West 11th Corridor…. The Need for the project results from: …The decision in the Regional Transportation Plan (RTP) to implement a BRT strategy for the region; [and] …Prioritization of the West 11th Corridor by the City of Eugene and LTD as the region's third BRT corridor;…*

Following is a description of the BRT MIS and Urban Rail Feasibility Study processes and a determination of the continuing validity of the conclusions reached in those studies for the WEEE Project.

The region's evaluation of high capacity transit alternatives took place over four phases (see Chapter 1 of the *BRT MIS Final Report* for more detail):

- Phase I: Needs/Issues and Goals/Objectives (June 1992 to June 1993)
- Phase II: Alternatives Development (July 1993 to October 1995)

- Phase III: Alternatives Evaluation and Draft Plan Direction (November 1995 to April 1997)
- Phase IV: Draft Plan Development, Review and Adoption (May 1997 to 1999)

An inclusive public process was implemented by LCOG to support the study's evaluation process including (see Chapter 1 of the *BRT MIS Final Report* for more detail):

- Focus groups conducted in December 1995 and May 1996;
- A public opinion survey conducted in May 1996;
- Community workshops held in May 1996;
- A symposium to receive stakeholder review and recommendations in August 1996; and
- Public hearings conducted by LCOG in conjunction with the TransPlan update in 1997 to 1999.

The Urban Rail Feasibility Study was incorporated as a part of the BRT MIS Phase II and Phase III (development and evaluation of alternatives, respectively). The study evaluated and screened a range of alternatives (described below) based on the following evaluation measures:

- Increases transit ridership
- Reduces vehicle miles traveled
- Reinforces desired urban form, linking land use, transportation, economic development and community livability
- Contributes to overall air quality improvement
- Minimizes traffic disruption
- Provides and improves access to major activities
- Creates intermodal transportation opportunities
- Minimizes private property takings

The study evaluated two concepts for the implementation of urban rail or high capacity transit meant to capture the spectrum of modes available:

- Low-End Cost – generally in-street operations with relatively limited transit reserved right-of-way and traffic signal modifications, with relatively few displacements and utility relocations and a limited communication (typical of streetcar or low-cost light rail); and
- Mid-Range Cost – primarily reserved transit right-of-way and traffic signal modifications to provide for transit priority at key intersections, with a greater number of displacements and utility locations and a train-to-wayside communication system (typical of light rail or heavy rail).

In general, these two concepts represent the two ways that urban rail systems could be implemented within the Eugene/Springfield area: either using available street right-of-way, with transit primarily operating in mixed-traffic conditions; or creating new transit right-of-way. The first concept would reduce costs and impacts. However, the increases in transit travel time savings and resulting ridership increases would be relatively small. The second concept would increase costs and impacts but there would be relatively greater increases in transit ridership due to greater improvements in transit travel time and reliability.

The Low-End Cost option was found within the urban rail study to inadequately address the study's goals and objectives, key being: 1) improving transit travel times and reliability; 2) increasing transit ridership needed to reduce the region's reliance on automobiles (as measured in decreasing vehicle miles traveled); and 3) providing for a economically-viable and financially stable transit system (as measured in reducing transit operating costs and competitiveness for Federal capital funds). These findings also hold true for the WEEE Project – high capacity transit alternatives that would generally have transit operating in mixed traffic with relatively few signal improvements would not meet a key element of the project's Purpose and Need Statement: to reduce dependency on the automobile by attracting transit riders through improved transit travel time and reliability.

The BRT MIS study found that there are primarily two ways to implement the Mid-Range Cost concept: urban rail or BRT, and either would adequately address the project goals and objectives missed by the Low-End Cost concepts. However, the BRT MIS study also found that there would be a substantial capital cost difference between the implementation of a Mid-Range Cost urban rail concept and a Mid-Range Cost BRT concept, with the urban rail costs being substantially greater than the BRT capital costs. This finding still holds true today as current cost estimates for both systems suggest that light rail capital costs are in a range of 5-10 times more in capital costs then a similarly configured BRT system.

Because both concepts would be implemented along the same corridors (with the same population and employment, resulting in the same level of transit demand) and both concepts would generally result in the same reduction in dependency upon the automobile through similar transit travel time savings and improved reliability, both concepts would also result in approximately the same increases in transit ridership and transit user travel time savings.

The BRT MIS study also concluded that either the urban rail or BRT implementation of the Mid-Range Cost concept would require the use of Federal funding, which is most readily available for these types of projects in the form of Section 5309 discretionary funds. That finding still holds true today for the WEEE Project.

Under current legislation, Congress has mandated that FTA's assessment of project's applying for Section 5309 funds (either as New Starts or Small Starts projects) be based on an evaluation and rating of the project's justification (i.e., performance) and the project's local financial commitment. The key performance justification measure used in FTA's assessment is termed "cost-effectiveness," which uses a standardized method and formula for calculating the ratio of costs compared to time savings for transit users. The resulting cost per transit user benefit (in hours) is a threshold measure that all projects must meet in order for FTA to recommend the project to Congress for Section 5309 funds.

The BRT MIS study found that a Mid-Range Cost urban rail concept implemented in the Eugene-Springfield area with its population and employments densities would tend to not meet FTA's threshold measure for cost-effectiveness and would therefore not be competitive for Federal Section 5309 funds; but the study also found that a Mid-Range Cost BRT concept would meet FTA's threshold measure for cost-effectiveness (as confirmed by the Pioneer Parkway EmX Project which received a 'High' cost-effectiveness ranking through FTA's evaluation process).

This conclusion was reached and is still valid because the resulting benefits (in transit user travel time savings) would generally be the same for BRT and for urban rail in the same corridors, but the capital costs of the BRT concept would be substantially lower than the capital costs of the urban rail concept in the same corridor. Further, because of the relatively moderate level of transit demand in the Eugene/Springfield corridors, the operating costs savings that generally accrue for urban rail systems due to economies of scale would not be realized in Eugene/Springfield corridors. For example, Portland's MAX light rail lines generally operate frequently (i.e., above policy headways) with vehicle consists of 200 feet in length using one operator, thereby reducing the operating costs per passenger place mile (compared to providing the same number of place miles[2] with smaller vehicles) – and because during the peak periods in the peak direction most of those places miles are occupied on the MAX light rail trains. Due to the relatively high demand in their light rail corridors, the cost per passenger mile is also reduced, compared to what the cost per passenger mile would be using smaller vehicles. In the Eugene-Springfield area, without the high demand to fill the larger urban rail vehicles, there would be no economy of scale.

There are two primary reasons why BRT generally has a lower capital cost than urban rail in the same corridor generally resulting in the same transit travel time and reliability improvements:

- First, the vehicle, infrastructure and support facility costs for BRT are generally lower than for urban rail when constructed in the same corridor using similar performance and design standards (e.g., an urban rail corridor would require rail cars, catenary and substations and connecting guideway to and construction of a specialized maintenance facility);
- Second, a BRT line does not require a continuous transit guideway in order to be effectively implemented within a corridor. In contrast, an urban rail line must be constructed continuously throughout the corridor. That is, a BRT vehicle may operate in a BRT guideway, then shift to in-street operations, then back to a BRT guideway, and so forth. In contrast, an urban rail vehicle must have a continuous length of rail alignment between the start and terminus of the line. Therefore, a BRT project has much more latitude in balancing capital costs and transit travel time and reliability improvements than does urban rail. For example, in areas where congestion or other conditions in existing streets would not impair transit travel times and/or reliability, a BRT line could operate in mixed traffic, substantially reducing capital costs by avoiding the cost of the BRT guideway in that location, but without sacrificing travel time and reliability – in the same location, urban rail would still incur substantial capital costs for the continuous rail alignment, even if the rail vehicles operated in mixed-traffic conditions.

Therefore, not only is the cost per mile of the fixed guideway segments less expensive for BRT than for urban rail, but a BRT line can avoid substantial capital costs by avoiding the construction of a fixed guideway where it would not be cost effective. LTD has successfully implemented this approach of substantially reducing capital costs without substantially reducing benefits in its existing Franklin Corridor EmX line and in its planned and approved Pioneer Parkway EmX line.

In January 2008, LTD collected comparative data on examples of Low-Cost and Mid-Range urban rail (streetcars and light rail systems) in cities across the country and included data from LTD's Franklin Corridor EmX (see Appendix A: Characteristics of Streetcars and Light Rail Systems in the USA (LTD: January 2008)). That comparative analysis found that all Mid-Range Cost urban rail projects across the country had operating expenses per mile substantially greater than LTD's

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[2] Place miles refers to the total carrying capacity (seated and standing) of each bus or train and is calculated by multiplying the vehicle capacity of each bus or train by the daily vehicle miles traveled. Place miles aide in highlighting differences between alternatives caused by a different mix of vehicles and levels of service.

Franklin Corridor EmX. Further, the data confirms the findings and conclusions from the BRT MIS and Urban Rail Study that transit demand in the region's BRT corridors, including the West 11th Corridor, is and will remain for the foreseeable future at a level that would not justify the substantially higher costs associated with Mid-Range Cost urban rail.[3]

4.3.2 Is the Alternative a High Capacity Transit Alternative

In general, alternatives proposed for the WEEE Project fall into three categories: transit mode; alignment; and/or length. This Tier I screening measure only applies to proposed transit modes, independent of their associated alignment or length. The modes proposed for the WEEE Project during Scoping include the following:

- Bus (under the No-Build and TSM alternatives)
- Trolley Bus (with overhead catenary – a.k.a., electric bus)
- BRT
- Streetcar
- Light Rail
- Separated Guideway (e.g., light rail, heavy rail or monorail, generally operating above or below grade).

For the WEEE Project Tier I Screening, bus and trolley bus are classified as non-high capacity transit modes and therefore would not advance into the Tier II evaluation. BRT, streetcar, light rail and separated guideway are classified as high capacity transit modes and are assessed further in sections below.

4.3.3 Is the Alternative BRT

As noted in the introduction to Section 4.3, in order to address the WEEE Project's Purpose and Need Statement a proposed high capacity transit mode alternative must be BRT in order to advance into the Tier II screening evaluation (see Section 4.2 for the basis of that screening measure). Streetcar, light rail and separated guideway mode alternatives (and any proposed alignments/lengths directly associated with those mode alternatives), will not advance into the Tier II screening for further study, because they are not BRT; the BRT mode (and any proposed alignments/lengths directly associated with BRT) may advance into the Tier II screening for further study (if it meets all of the Purpose and Need Tier I threshold measures) because it is BRT.

4.4 Would Improve Transit Travel Time and Reliability

A primary element of the WEEE Project's Purpose is to improve the speed and reliability of transit service in the West 11th Corridor. The need for addressing speed and reliability of transit is based in the historic and projected increases in congestion at intersections in the roads that transit uses in the corridor. An investment that would improve transit's speed and reliability would tend to: increase

[3] The BRT MIS and Urban Rail Study used a forecast year of 2015, while the WEEE Project will use a forecast year of 2031. However, the general trend of population and employment growth and other factors affecting transit travel demand generally remain consistent across the 2015 and the 2031 forecasts.

transit patronage; decrease operating costs; and reduce automobile use and its related adverse environmental impacts (compared to the No-Build and other alternatives).

Transit travel time and reliability can be improved through the implementation and use of a variety of techniques, including but not limited to: separate transit right-of-way; queue bypass lanes, typically at intersections or signalized on-ramps; transit priority at signalized intersections or on-ramps; more direct routing; increased frequency, thereby reducing the wait time between vehicles; fewer bus stops or stations; reduced dwell times at bus stops or stations; and improved operating plans.

Both the mode and the alignment alternatives could affect transit travel time and reliability in the West 11th Corridor.

4.4.1 Transit Travel Time Improvements and the Mode Alternatives

Table 4.4-1 summarizes the speed and reliability improvements generally associated with the transit modes proposed for the WEEE Project. As shown in the table, the following mode alternatives proposed for further study in the WEEE Project's AA/DEIS could all lead to improved transit speed and reliability. Therefore, those modes could advance into the Tier II evaluation for further study based on this screening measure, if they also successfully address all other Tier I screening measures.

- Bus (under the TSM alternative)
- BRT
- Light Rail
- Separated Guideway (e.g., light rail, heavy rail or monorail, generally operating above or below grade).

As shown in Table 4.4-1, the following proposed transit modes do not typically include characteristics that would significantly improve transit travel time and reliability, compared to fixed-route buses operating in general purpose traffic. As such, they do not address this element of the WEEE Project's Purpose and Need Statement, because they would not tend to significantly improve transit speed and reliability in the West 11th Corridor:

- Trolley Bus (with overhead catenary – a.k.a., electric bus)
- Streetcar

Table 4.4-1 Typical Speed/Reliability Measures by Mode

Mode	Typical Speed/Reliability Measures
TSM Bus	• Queue bypass lanes • Transit-priority signals • Direct routing • Increased frequency
Trolley Bus	• Incidental improvements
Streetcar	• Incidental improvements
BRT	• Transit-only right-of-way • Queue bypass lanes • Transit-priority signals • Direct routing • Fewer stations • Reduced dwell times • Improved operating plans
Light Rail	• Transit-only right-of-way • Queue bypass lanes • Transit-priority signals • Direct routing • Fewer stations • Reduced dwell times • Improved operating plans
Separated Guideway	• Transit-only right-of-way • Queue bypass lanes • Transit-priority signals • Transit pre-emption • Direct routing • Fewer stations • Reduced dwell times • Improved operating plans

Source: LTD: February 2008.
TSM = transportation systems management; BRT = bus rapid transit.

4.4.2 Transit Travel Time Improvements and the Alignment Alternatives

A key element of the Purpose of the WEEE Project is to improve transit travel times for the primary markets within the West 11th Corridor and to increase transit ridership, thereby reducing single-occupant vehicle use. Alignment alternatives were generally assessed as to whether or not they would place the transit alignment within the West 11th Corridor so that the primary transit markets would generally have access to the transit improvements without a significant amount of out-of-direction travel, long walk distances (to access transit) and/or travel time delay.

The somewhat contiguous east/west streets that transit could operate on that are within the West 11th Corridor and that would provide acceptable (i.e., relatively central) access to residential, commercial and mixed-use centers within the West 11th Corridor are: West 6th, 7th, 10th, 11th and 13th Avenues (east of Garfield Street) and West 7th Place, Stewart Road; West 5th, 10th, and 11th Avenues (west of Garfield Street). East/west streets that are generally south of West 13th (or the Amazon Channel) and north of West 5th Avenue would not be located so that a majority of the West 11th Corridor travel markets could utilize them without experiencing a significant amount of out-of-direction travel, long walk distances (to access transit) and/or travel time delay.

Based on this assessment of streets, the following Alignment Alternatives, by segment, would tend to allow for improved transit travel times for the primary markets within the West 11th Corridor:

Segment A – Eugene Station to Garfield Street
Alternative 1 – 13th Avenue
Alternative 2 – 6th/7th Avenues
Alternative 3 – Amazon Channel
Alternative 4 – 11th Avenue

Segment B – Garfield Street to Beltline
Alternative 1 – 7th Avenue/Stewart Road
Alternative 2 – 10th Avenue/11th Avenue
Alternative 3 – Amazon Channel
Alternative 4 – 11th Avenue

Segment C – West of Beltline Segment
Alternative 1 – 11th Avenue to Terry Street Loop
Alternative 2 – 11th Avenue to Veneta

Based on this assessment of streets, the following alignment alternatives would not tend to allow for improved transit travel times for the primary markets within the West 11th Corridor:

Segment A – Eugene Station to Garfield Street
Alternative 5 – West 18th

Segment B – Garfield Street to Beltline
Alternative 5 – West 18th
Alternative 6 – Highway 99/Roosevelt
Alternative 7 – 1st Avenue/Roosevelt

Segment C – West of Beltline Segment
Alternative 3 – West 18th
Alternative 4 – Roosevelt/Danebo
Alternative 5 – Roosevelt/Royal

4.5 Would Serve Developed and/or Developable Land

A primary element of the WEEE Project's Purpose is to provide improved transit service to developed or developable (and redevelopable) land. Only those alternatives that would serve developed and developable land are to be advanced into Tier II evaluation for further study. It is important to serve developed or developable land because transit relies on linking trip origins (e.g., residential areas) with destinations (e.g., employment, shopping and educational centers) with competitive transit service to generate increased ridership and to reduce automobile trips. As such, a transit alternative that would predominantly serve undeveloped and undevelopable land would not meet the project's Purpose and Need.

Figure 4.5-1 illustrates the developed/developable land and the undevelopable land in the West 11th Corridor and the alignment alternatives that were proposed during Scoping. In general, undeveloped and undevelopable land is defined as land that is designated within the region's comprehensive plan and/or zoning as: right-of-way; parks and open space; and/or protected for natural resource preservation or restoration. As demonstrated in Figure 4.5-1, all alternatives proposed in Scoping would serve developed and redevelopable land to varying degrees. Developed and developable land is defined as all other land within the region's urban growth boundary.

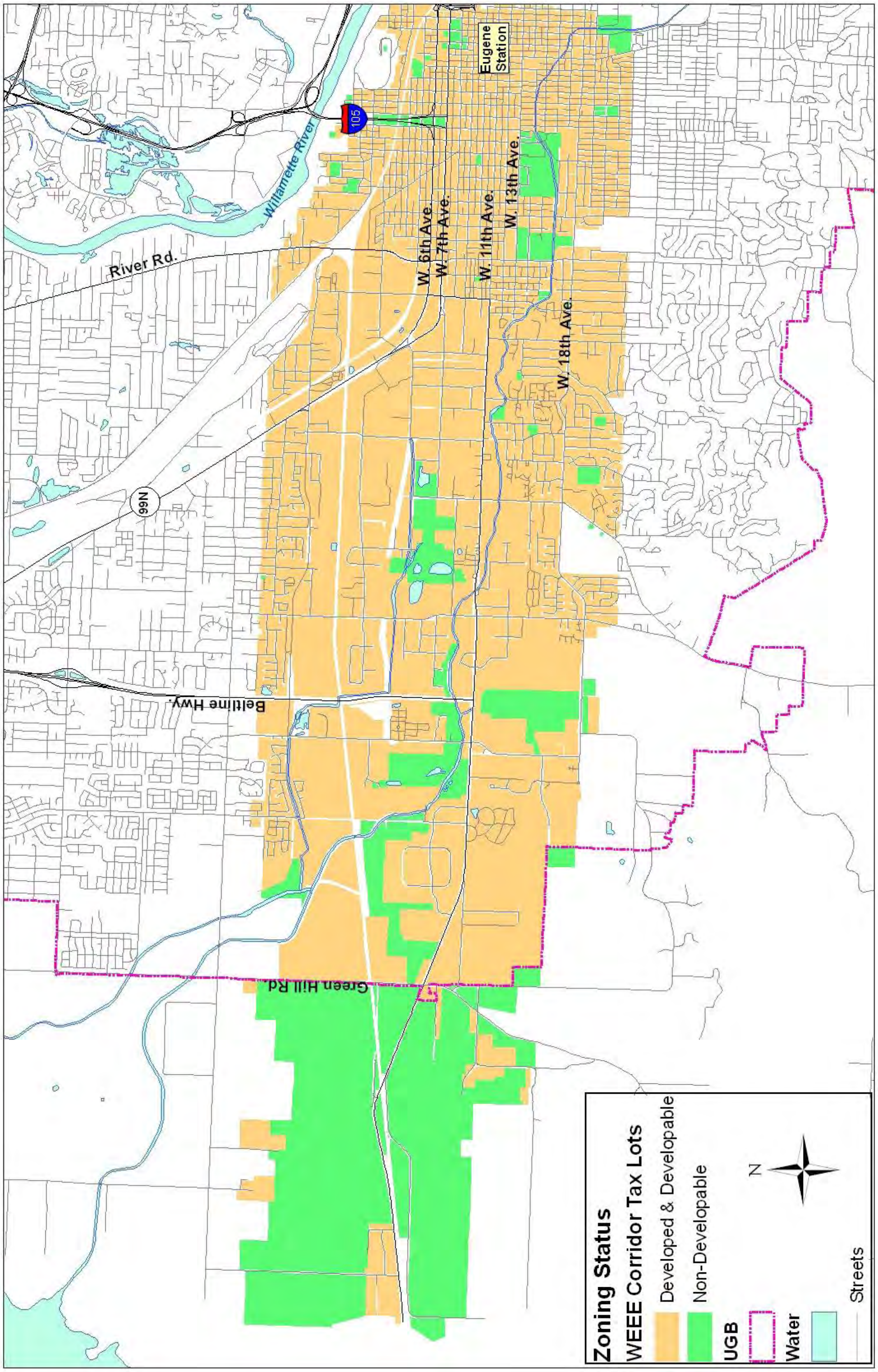
LTD has found that all mode alternatives could be designed to serve developed and/or developable land. Therefore, all mode alternative could advance into the Tier II evaluation for further study based on this screening measure, provided they also successfully meet the project's other Tier I screening measures.

To be assessed positively under this measure, an alignment alternative would not need to exclusively or even predominantly serve developed or redeveloped land in order to advance into the Tier II evaluation for further study. It is within Tier II (and within the AA/DEIS) where the relative degree to which an alternative would serve developable and redevelopable land and existing and planned mixed-use and other activity centers is or will be assessed (see Section 5.4). Instead, to be positively assessed under this measure an alignment alternative would need to have the potential to provide transit service to one or more areas of developed and/or developable land. Based on an assessment of Figure 4.5-1, LTD has found that all of the alignment alternatives in all segments meet this screening measure. Even Alternative 2 – 11th Avenue to Veneta in the West of Beltline Segment would provide transit service to some developed and developable land. Although a large percentage of the proposed alignment for Alternative 2 – 11th Avenue to Veneta would be located adjacent to undeveloped and undevelopable land, it would also directly serve two important developed and developing sites: the Cone industrial area in the vicinity of West 11th Avenue and Terry Street and portions of the City of Veneta, thereby addressing this screening measure.

4.6 Alternatives Screened Out and In

This section summarizes the results of the screening analysis based on addressing the WEEE Project's Purpose and Need Statement, as documented in Sections 4.2 through 4.5. These results are first presented for the modal alternatives and then for the alignment alternatives that were proposed for further study in the WEEE Project's AA/DEIS. For an alternative to advance into the Tier II screening (see Section 5.0), the alternative would need to demonstrate the potential to address all five of the Tier I screening measures.

Figure 4.5-1 Developed and Developable and Non-Developable Land Based on Zoning Classification



4.6.1 Results of the Tier I Screening for Modal Alternatives

Table 4.6-1 summarizes the results of the Tier I screening described in Sections 4.2 through 4.5 for the proposed modal alternatives. Based on the results of the Tier I screening of modes, the following modes will advance into the Tier II evaluation for further study (see Section 5.0): TSM Bus and BRT; and the following modes will not advance into the Tier II evaluation for further study: trolley bus, streetcar, light rail and separated guideway.

Table 4.6-1 Summary Tier I Screening Results – Modal Alternatives

Mode	Is in W 11th Corridor	Is Primarily Transit	Is BRT if it is HCT	Would Improve Speed/Reliability	Would Serve Developed/able Land
TSM Bus	N/A	Yes	N/A	Yes	N/A
Trolley Bus	N/A	Yes	N/A	No	N/A
Streetcar	N/A	Yes	No	No	N/A
BRT	N/A	Yes	Yes	Yes	N/A
Light Rail	N/A	Yes	No	Yes	N/A
Separated Guideway	N/A	Yes	No	Yes	N/A

Source: LTD; February 2008 (see Sections 4.2 to 4.5).
Note: TSM = transportation systems management; BRT = bus rapid transit.

Fixed route bus service, which would be the exclusive transit mode in the West 11th Corridor under the No-Build Alternative, is required by FTA and will be advanced to the AA/DEIS for evaluation.

4.6.2 Results of the Tier I Screening for Alignment Alternatives

Table 4.6-2 summarizes the results of the Tier I screening described in Sections 4.2 through 4.5 for the proposed alignment alternatives. Based on the results of the Tier I screening of alignment alternatives, the following alignment alternatives by corridor segment will advance into the Tier II evaluation for further study (see Section 5.0):

Table 4.6-2 Summary Tier I Screening Results –Alignment Alternatives

Segment/Alignment Alternative	Is in W 11th Corridor	Is Primarily Transit	Is BRT if it is HCT	Would Improve Speed/Reliability	Would Serve Developed/able Land
Segment A – Eugene Station to Garfield Street					
1 – 13th Avenue	Yes	Yes	N/A	Yes	Yes
2 – 6th/7th Avenues	Yes	Yes	N/A	Yes	Yes
3 – Amazon Channel	Yes	Yes	N/A	Yes	Yes
4 – 11th Avenue	Yes	Yes	N/A	Yes	Yes
5 – West 18th	No	Yes	N/A	No	Yes
Segment B – Garfield Street to Beltline					
1 – 7th Avenue/Stewart Road	Yes	Yes	N/A	Yes	Yes
2 – 10th Avenue/11th Avenue	Yes	Yes	N/A	Yes	Yes
3 – Amazon Channel	Yes	Yes	N/A	Yes	Yes
4 – 11th Avenue	Yes	Yes	N/A	Yes	Yes
5 – West 18th	No	Yes	N/A	No	Yes
6 – Highway 99/Roosevelt	No	Yes	N/A	No	Yes
7 – 1st Avenue/Roosevelt	No	Yes	N/A	No	Yes
Segment C – West of Beltline Segment					
1 – 11th Avenue to Terry Street Loop	Yes	Yes	N/A	Yes	Yes
2 – 11th Avenue to Veneta	Yes	Yes	N/A	Yes	Yes
3 – West 18th	No	Yes	N/A	No	Yes
4 – Roosevelt/Danebo	No	Yes	N/A	No	Yes
5 – Roosevelt/Royal	No	Yes	N/A	No	Yes

Source: LTD; February 2008 (see Sections 4.2 to 4.5).
Note: TSM = transportation systems management; BRT = bus rapid transit..

Segment A – Eugene Station to Garfield Street
Alternative 1 – 13th Avenue
Alternative 2 – 6th/7th Avenues
Alternative 3 – Amazon Channel
Alternative 4 – 11th Avenue

Segment B – Garfield Street to Beltline
Alternative 1 – 7th Avenue/Stewart Road
Alternative 2 – 10th Avenue/11th Avenue
Alternative 3 – Amazon Channel
Alternative 4 – 11th Avenue

Segment C – West of Beltline Segment
Alternative 1 – 11th Avenue to Terry Street Loop
Alternative 2 – 11th Avenue to Veneta

The following alignment alternatives will not advance into the Tier II evaluation for further study:

Segment A – Eugene Station to Garfield Street
Alternative 5 – West 18th

Segment B – Garfield Street to Beltline
Alternative 5 – West 18th
Alternative 6 – Highway 99/Roosevelt
Alternative 7 – 1st Avenue/Roosevelt

Segment C – West of Beltline Segment
Alternative 3 – West 18th
Alternative 4 – Roosevelt/Danebo
Alternative 5 – Roosevelt/Royal

5 Tier II Screening

This section describes the alignment alternatives evaluated during the second level of screening (also referred to as Tier II Evaluation), the screening criteria and measures used to evaluate those alternatives and the resulting findings. The alignment alternatives evaluated in Tier II were selected and advanced for further study based upon the results of the Tier I Screening measures, described in Section 4.0, and summarized in Table 4.6-2.

The Tier I Screening of mode alternatives resulted in the selection of the following modes: fixed route bus service under the No-Build Alternative, TSM bus service under the TSM Alternative and BRT service under the BRT Alternative. These mode alternatives are not assessed in the Tier II Evaluation because: (1) fixed route bus service, which would be the exclusive transit mode in the West 11th Corridor under the No-Build Alternative is required by FTA; (2) as is general practice, LTD and FTA have agreed to carry forward TSM bus service under the TSM alternative; and (3) the alignment alternatives evaluated in this section would all apply to the BRT mode.

Section 5.1 provides a description of the alignment alternatives analyzed in the Tier II Evaluation. Sections 5.2 through 5.10 documents the measure or measures used for each evaluation criteria, the methods and background data used to calculate the measure(s) and the findings reached based upon the measures. In general, the measures and findings were calculated and reached for each alternative within each segment, independent of alternatives being evaluated in other segments. However, a few of the measures, the measures were calculated and findings reached based upon logical combinations of alternatives across two or three segments (i.e., 5.2.1 Travel Time, 5.3.1 Operating Efficiencies and 5.10.1 Sustainability).

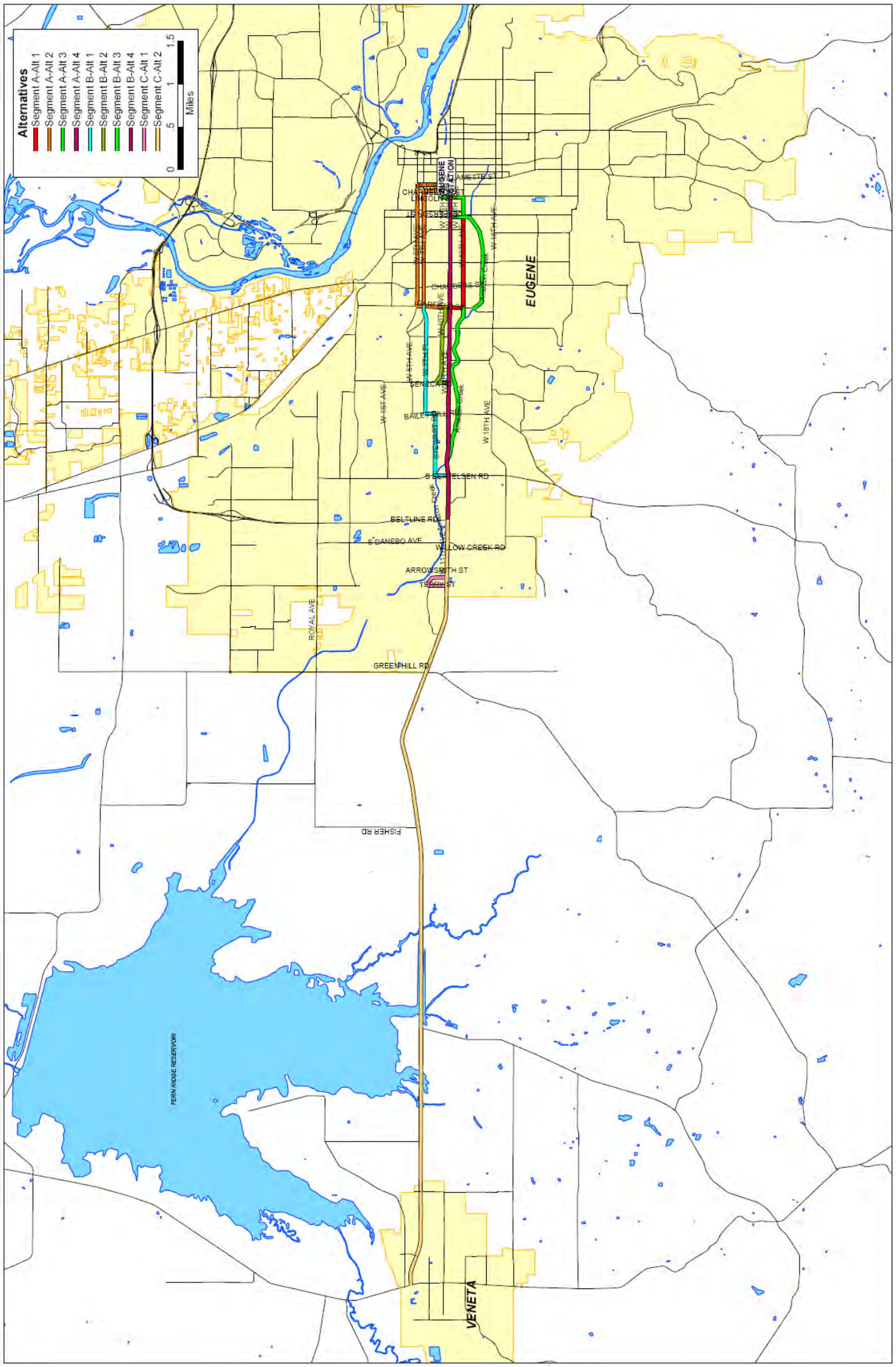
1. Improve customer convenience by reducing travel time, increasing service reliability, and making other service improvements:
   - Round trip transit travel time between select origins and destinations
2. Improve operating and other efficiencies to maximize the use of scarce resources:
   - Operating service hours (round trip travel time proposed service frequency)
   - Operating hours of regular service replaced by EmX within the corridor
3. Support development that is consistent with planned land use documents and serve as a catalyst for planned transit-oriented development:
   - Vacant and redevelopable land value within ¼-mile (or ⅓ mile in the context of BRT) of the alignment
   - Number of mixed-use centers (land use nodes) served by the alignment
4. Help accommodate future growth in travel by increasing public transportation's share of trips:
   - Population and employment density within ¼-mile (or ⅓ mile in the context of BRT) of alignment
5. Consider the mobility and safety needs of pedestrians, bicyclists, and motorists:
   - General assessment of alternative's interface with pedestrian, bicycle and vehicle facilities
6. Provide for a fiscally stable public transportation system:
   - General assessment of alternatives effect on the fiscal stability of the public transportation system

7. Design the project in a way that protects resources in the natural and built environment:
   - Potential for displacement of residents and businesses
   - Potential impact to historic trees
   - Likelihood of adverse impact to environmentally-sensitive natural resources (i.e., wetlands, parklands, historic resources, critical habitat)
8. Support LTD's sustainability policy and the City of Eugene's efforts to reduce greenhouse gas emissions:
   - General assessment on the alternative's ability to support LTD's sustainability policy

5.1 Proposed Tier II Alignment Alternatives

This section provides a brief description of the alignment alternatives evaluated within the Tier II Evaluation. These alignment alternatives were determined, through the first level of screening, to meet the project's Purpose and Need (see Section 4.0). The Tier II alignment alternatives proposed by LTD and the public are described in sections 5.1.1 and 5.1.2, respectively, and depicted in Figure 5.1-1. No alternatives were proposed by Participating Agencies. Note that the descriptions and potential placement of a BRT alignment included in this section are only for the purpose of assessing the relative potential for impacts in this Tier II analysis and are not meant to describe where the BRT alignment would actually be placed. The proposed design of the alignment alternatives selected for further study in the AA/DEIS will be prepared as an early stage in the AA/DEIS and those designs will be used to assess the potential impact of the alternatives.

Figure 5.1-1 Proposed Tier II Alignment Alternatives



5.1.1 Tier II Alignment Alternatives Proposed by LTD

For the Tier II screening level evaluation, the alignment alternatives were assigned abbreviated names. These names are identified in Table 5.1-1.

Table 5.1-1 Tier II Alignment Alternatives Proposed by LTD

Segment / Alternative Name	Alternative
Segment A	Eugene Station to Garfield Street
SA-A1	13th Avenue
SA-A2	6th/7th Avenues (Couplet)
Segment B	Garfield Street to Beltline Road
SB-A3	Amazon Channel
SB-A4	11th Avenue
Segment C	Beltline to West Terminus
SC-A1	11th Avenue to Terry St Loop[4]

For the purposes of this screening level evaluation, basic characteristics were defined for each of the alternatives. These characteristics are summarized in Table 5.1-2.

Table 5.1-2 Characteristics of Tier II Alignment Alternatives

Characteristic	Description
Street Section	The section of the alignment certain characteristics apply to.
Fixed Facility Type	The number of lanes of the EmX fixed facility. For this screening level analysis, only single-lane and two-lane fixed facilities were considered.
Width	The width of the EmX fixed facility, in feet.
Right-of-Way Assumptions	Assumptions regarding the location of the fixed facility in relation to existing right-of-way and any additional right-of-way required to place the fixed facility.
Total Length (miles)	Total round-trip distance, in miles, of the fixed facility for the segment alternative.
Total Number of Stations	Total number of EmX stations for the segment alternative. The number of EmX stations was generally based on the standard formula of two - three (2-3) stations per mile. However, for some segment alternatives, this number was adjusted to reflect fewer destinations, therefore, less need for stations along the alignment.

The basic characteristics of the alternatives proposed by LTD are described in the remainder of this section.

Segment A: Eugene Station to Garfield Street

This segment of the corridor extends from the Eugene Station in downtown west to Garfield Street.

Segment A – Alternative 1: 13th Avenue

For this alignment alternative, EmX originates from the Eugene Station and, between Olive and Jefferson Streets, traverses in a single lane fixed facility on 10th, 11th, and 13th Avenues, and Lincoln and Jefferson Streets (See Figure 5.1-2 and Table 5.1-3). For the Olive-Jefferson section, on-

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[4] Earlier documents indicated an alignment alternative named "11th Avenue (two-way) to Willow Creek to Pitchford Ave". For the purposes of this screening level evaluation, the "11th Avenue (two-way) to Willow Creek to Pitchford Ave" alternative is considered similar to the "11th Avenue (two-way) to Terry St Loop" and, therefore, was not analyzed separately for this report.

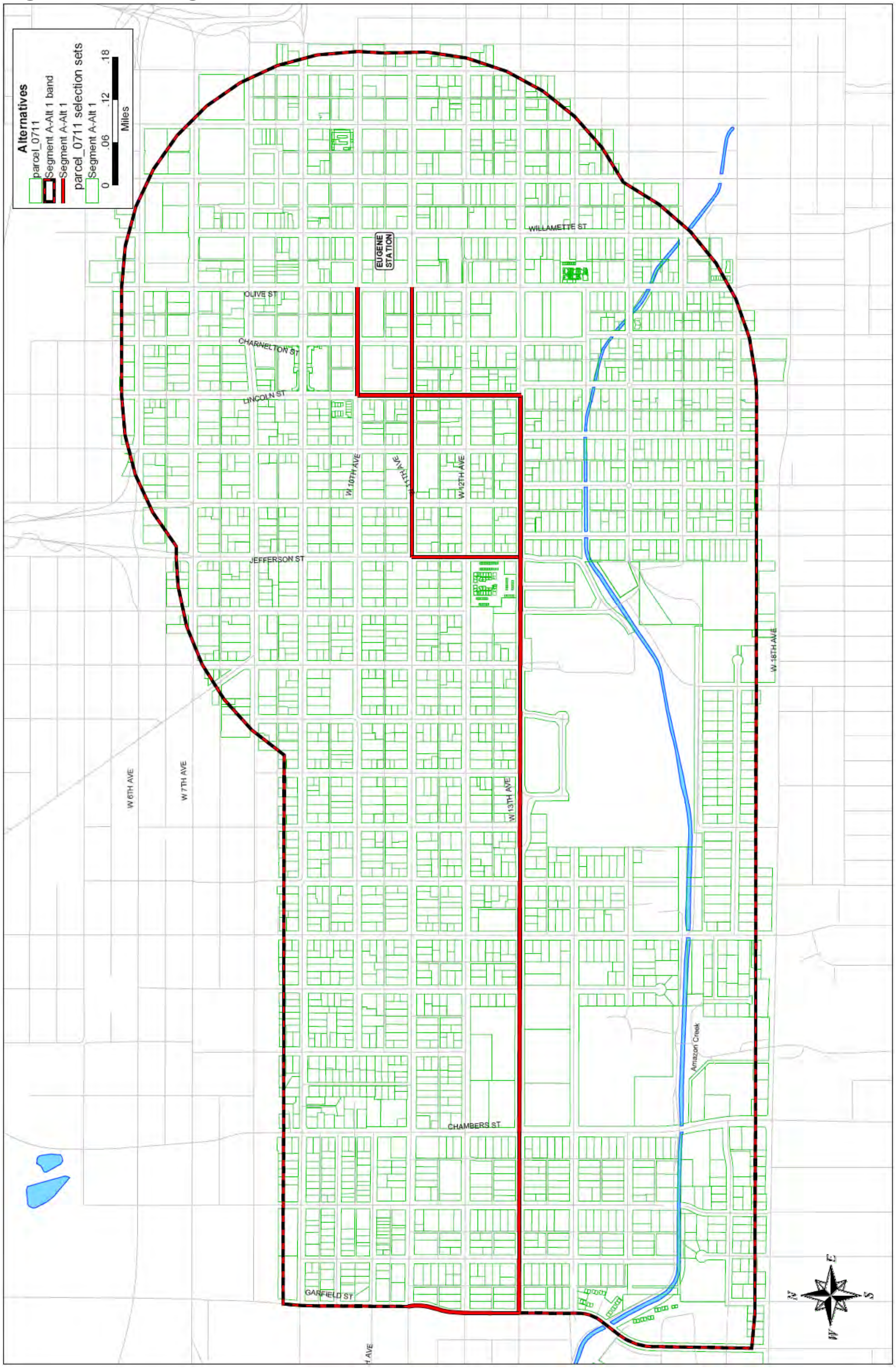
street parking would be removed to accommodate the facility and no additional right-of-way would be required. From Jefferson Street to Garfield Street, EmX travels on 13th Avenue in a two-lane fixed facility. For the Jefferson-Garfield section, right-of-way needed to accommodate the two-lane fixed facility would be acquired behind the existing curb on the south side of 13th Avenue. The total round-trip distance of this alternative would be approximately 3.6 miles and this segment would likely require nine EmX stations.

Table 5.1-3 Segment A – Alignment 1 Summary Description

Street Section	Fixed Facility Type	Width	Screening Evaluation Assumptions
Olive – Jefferson	Single lane	12 feet	Remove parking only, no additional R-O-W required
Jefferson – Garfield	Two lane	24 feet	R-O-W taken from behind curb south side

Total Length / Travel Distance (miles)	3.6
Total Number Stations	9

Figure 5.1-2 Alignment Alternative SA-A1



Segment A – Alternative 2: 6th/7th Avenues (Couplet)

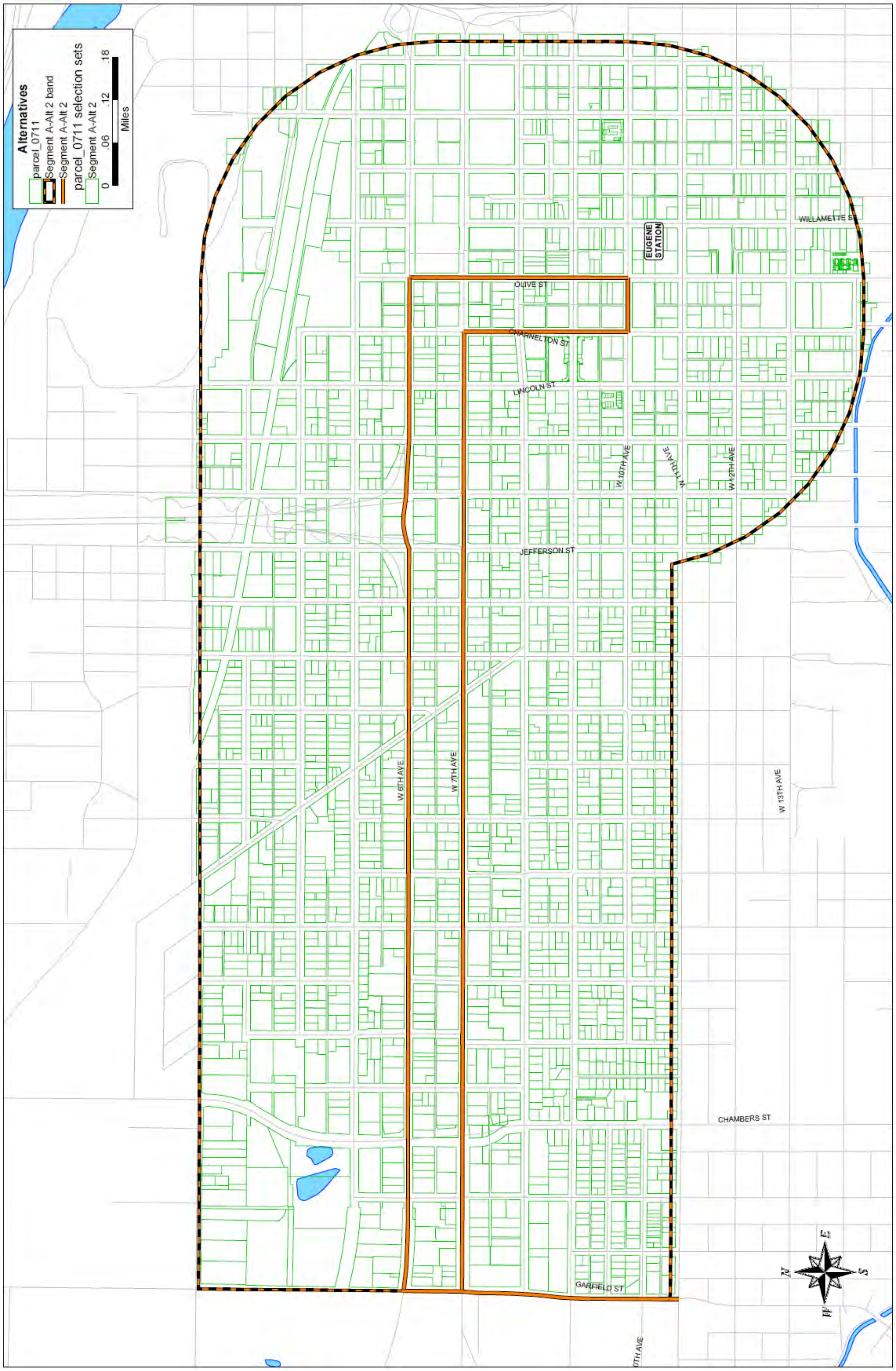
This alignment alternative proposes a "couplet," meaning EmX travels westbound on one street and eastbound on a nearby parallel street. For this alignment alternative, EmX originates from the Eugene Station between Olive and Garfield Streets, traverses in a single lane fixed facility westbound on 6th Avenue and eastbound on 7th Avenue (Figure 5.1-3 and Table 5.1-4). For the Olive-Garfield section, on both 6th and 7th Avenues, right-of-way to accommodate the single lane fixed facility would be acquired from behind the existing curb on the south side of each street. Garfield Street provides the north-south connection to Segment B alignment alternatives. For this section, right-of-way to accommodate the two-lane fixed facility would be acquired from behind the existing curb on the side of the street that minimizes potential impacts. The total round-trip distance from the Eugene station to 6th/7th and Garfield is approximately 4.1 miles and this segment would likely require 10 EmX stations. The EmX vehicle access 6th and 7th Avenues via Olive Street (northbound) and Charnelton Street (southbound). On-street parking on both streets would be removed to provide the EmX facilities.

Table 5.1-4 Segment A – Alignment 2 Summary Description

Street Section	Fixed Facility Type	Width	Screening Evaluation Assumptions
Olive – Garfield	Single lane couplet	12 feet	R-O-W taken from behind curb from side that minimizes impact, remove on-street parking on both sides of street
Garfield (north – south section between 10th and 6th)	Two lane	24 feet	R-O-W taken from behind curb from side that minimizes impacts, remove on-street parking on both sides of street

Total Length / Travel Distance (miles)	4.1
Total Number Stations	10

Figure 5.1-3 Alignment Alternative SA-A2



Segment B: Garfield Street to Beltline Road

This segment extends from Garfield Street west to Beltline Road.

Segment B – Alternative 3: Amazon Channel

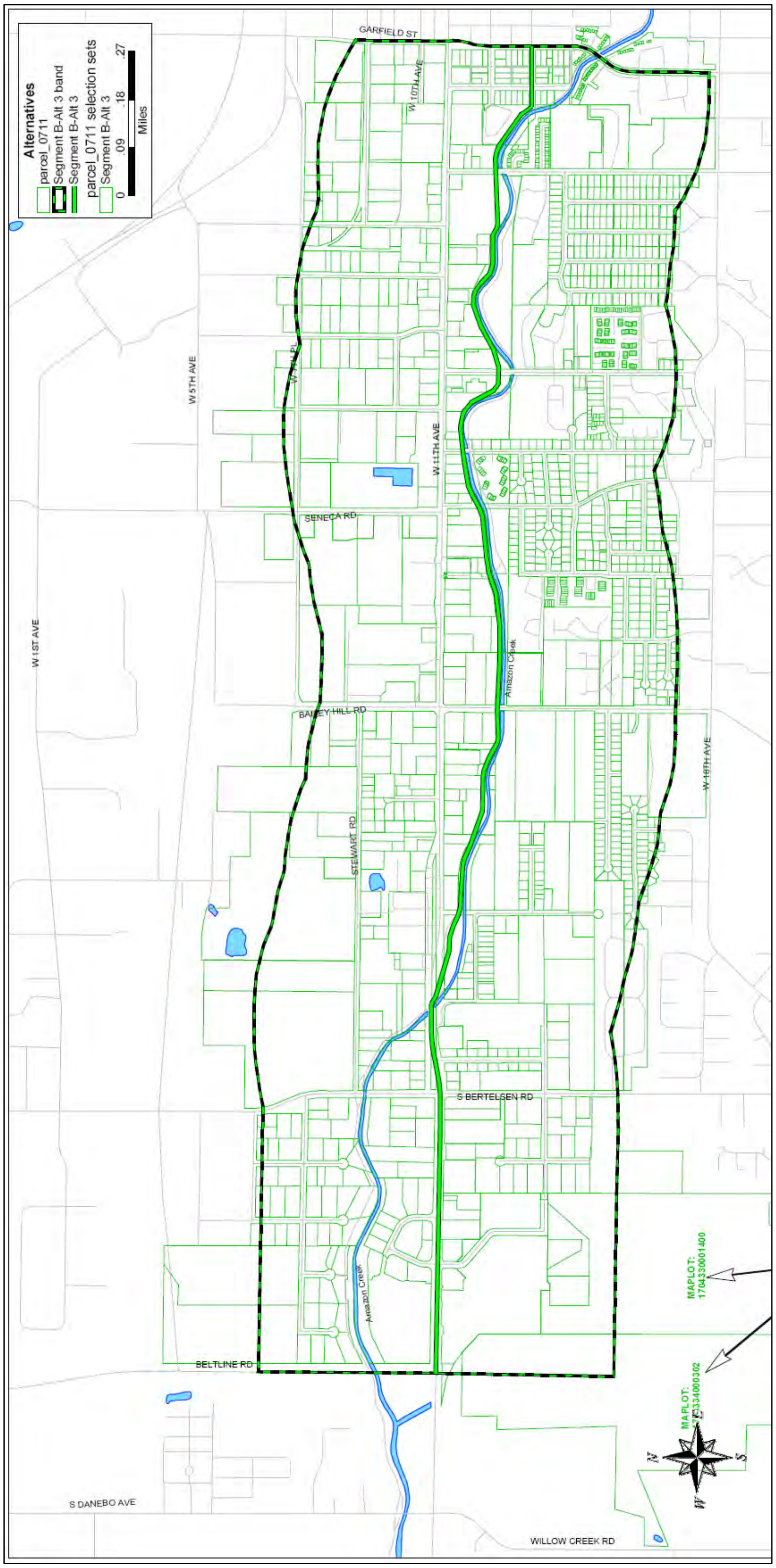
This alignment alternative proposes EmX to traverse in a two-lane fixed facility located on the north side of the Amazon Channel between Garfield Street and the area where the Amazon Channel crosses West 11th Avenue (see Figure 5.1-4 and Table 5.1-5). Near the intersection of the Amazon Channel and 11th Avenue, EmX would enter 11th Avenue to travel on 11th Avenue in a two-lane fixed facility until Beltline Road. For this section, right-of-way to accommodate the fixed facility would be acquired from behind the existing curb on both sides of 11th Avenue. The total round-trip distance of this alternative would be approximately 5.1 miles and this segment would likely require 12 EmX stations.

Table 5.1-5 Segment B – Alignment 3 Summary Description

Street Section	Fixed Facility Type	Width	Screening Evaluation Assumptions
Amazon Channel: Garfield – Amazon Channel / 11th Avenue Intersection	Two lane	24 feet	R-O-W taken from north side of Amazon Channel
W 11th Avenue: Amazon Channel / 11th Avenue Intersection – Beltline	Two lane	24 feet	R-O-W taken from behind curb 12 feet from each side

Total Length / Travel Distance (miles)	5.1
Total Number Stations	12

Figure 5.1-4 Alignment Alternative SB-A3



Segment B – Alternative 4: 11th Avenue

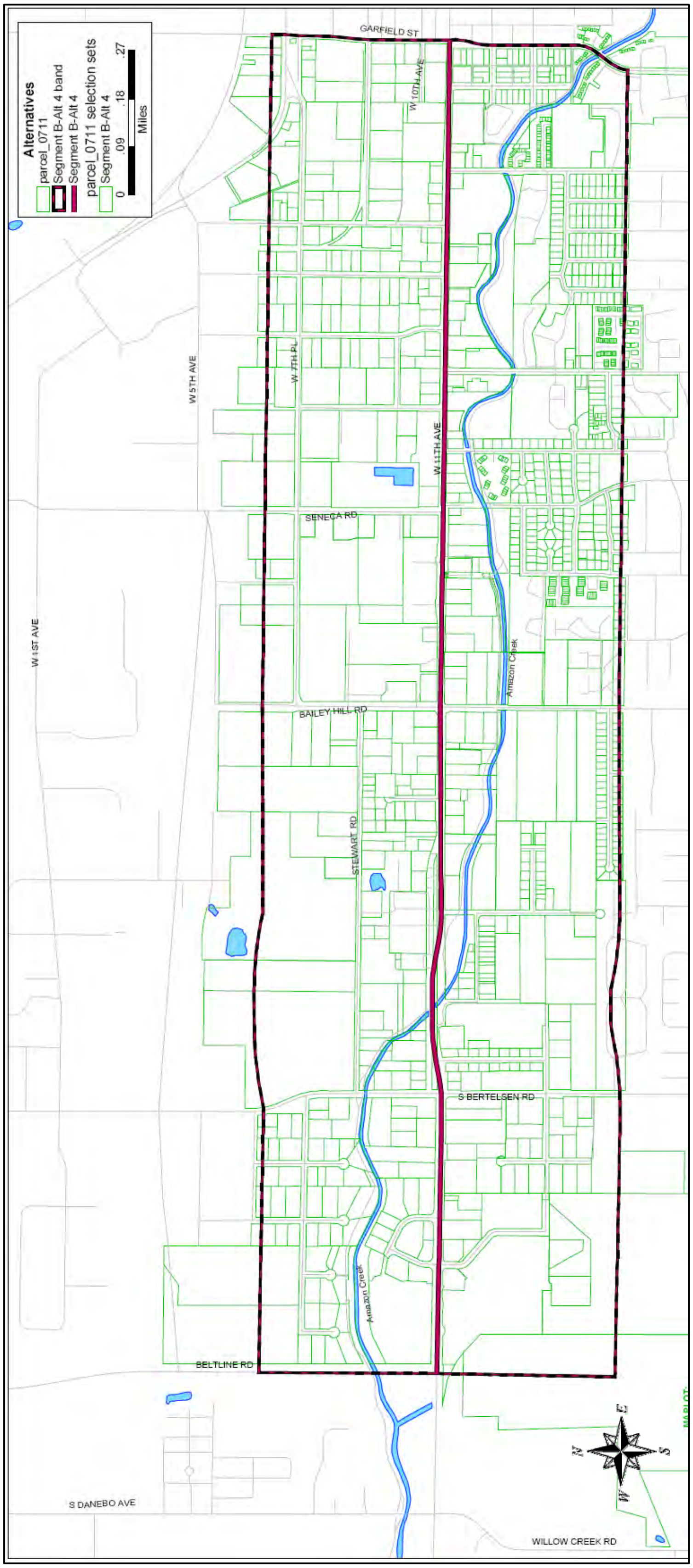
This alignment alternative proposes EmX to traverse in a two-lane fixed facility located on 11th Avenue (see Figure 5.1-5 and Table 5.1-6). For this section, right-of-way to accommodate the fixed facility would be acquired from behind the existing curb on both sides of 11th Avenue. The total round-trip distance of this alternative would be approximately 5.0 miles and this segment would likely require 12 EmX stations.

Table 5.1-6 Segment B – Alignment 4 Summary Description

Street Section	Fixed Facility Type	Width	Screening Evaluation Assumptions
Garfield – Beltline	Two lane	24 feet	R-O-W taken from behind curb 12 feet from each side

Total Length / Travel Distance (miles)	5.0
Total Number Stations	12

Figure 5.1-5 Alignment Alternative SB-A4



Segment C: Beltline Road to West Terminus

This segment extends from Beltline Road to a west terminus proposed in the alignment alternative.

Segment C – Alternative 1: 11th Avenue to Terry Street Loop

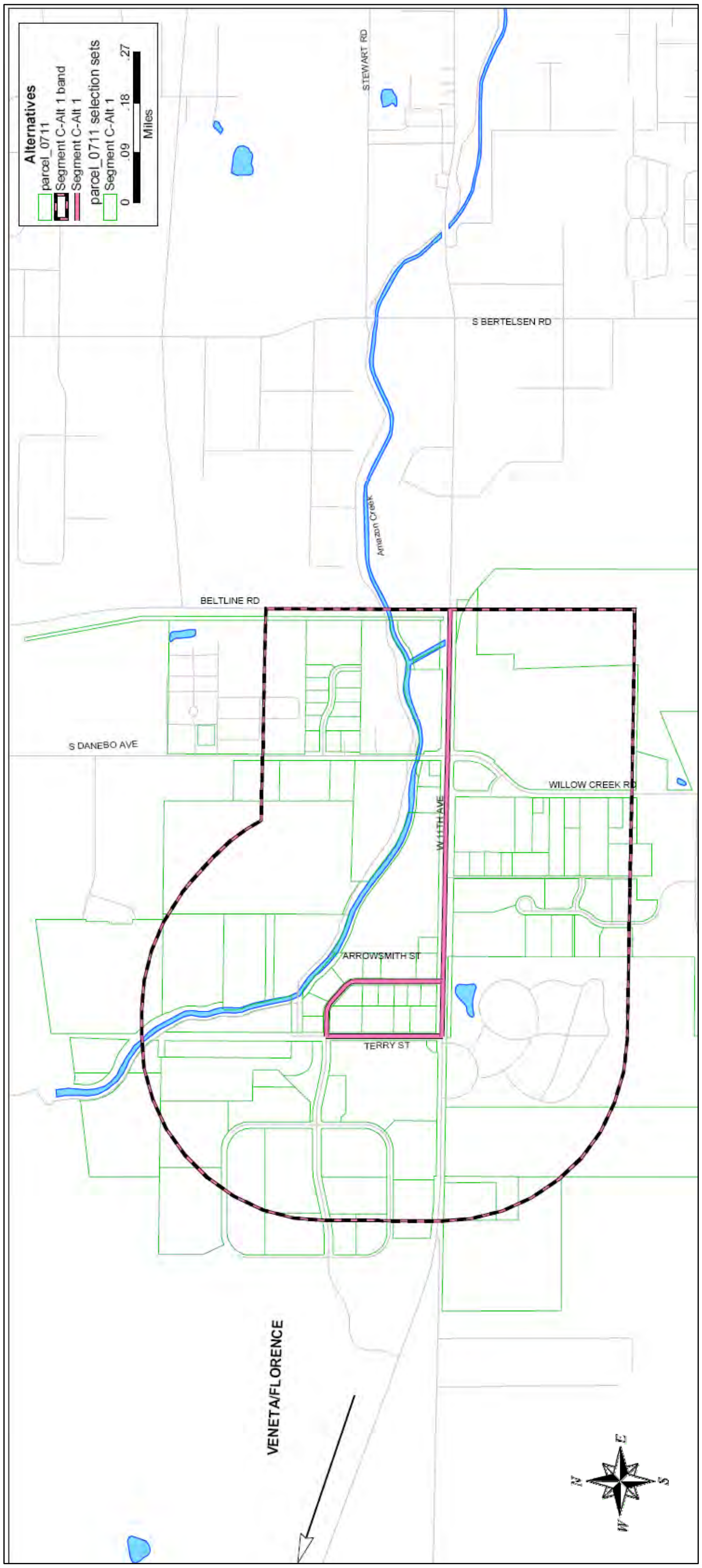
This alignment alternative proposes EmX to traverse in a two-lane fixed facility located on 11th Avenue and looping on Terry Street (see Figure 5.1-6 and Table 5.1-7). For this section, right-of-way to accommodate the fixed facility would be acquired from behind the existing curb on both sides of 11th Avenue and Terry Street. The total round-trip distance of this alternative would be approximately 1.9 miles and this segment would likely require five (5) EmX stations.

Table 5.1-7 Segment C – Alignment 1 Summary Description

Street Section	Fixed Facility Type	Width	Screening Evaluation Assumptions
Beltline – Terry St Loop	Two lane	24 feet	R-O-W taken from behind curb 12 feet from each side

Total Length / Travel Distance (miles)	1.9
Total Number Stations	5

Figure 5.1-6 Alignment Alternative SC-A1



5.1.2 Alignment Alternatives Proposed by the Public

At the conclusion of the Tier I screening, several alignment alternatives proposed by the public were forwarded into the Tier II screening evaluation. These alignment alternatives are described in this section.

For the screening level evaluation, the alignment alternatives were assigned abbreviated names. These names are described in Table 5.1-8.

Table 5.1-8 Alignment Alternatives Proposed by the Public

Segment / Alternative Name	Alternative
Segment A	Eugene Station to Garfield Street
SA-A3	Amazon Channel
SA-A4	11th Avenue
Segment B	Garfield Street to Beltline Road
SB-B1	7th Place / Stewart Road
SB-B2	10th Avenue / 11th Avenue
Segment C	Beltline Road to West Terminus
SC-A2	11th Avenue to Veneta

Segment A: Eugene Station to Garfield Street

This segment of the corridor extends from the Eugene Station in downtown west to Garfield Street.

Segment A – Alternative 3: Amazon Channel

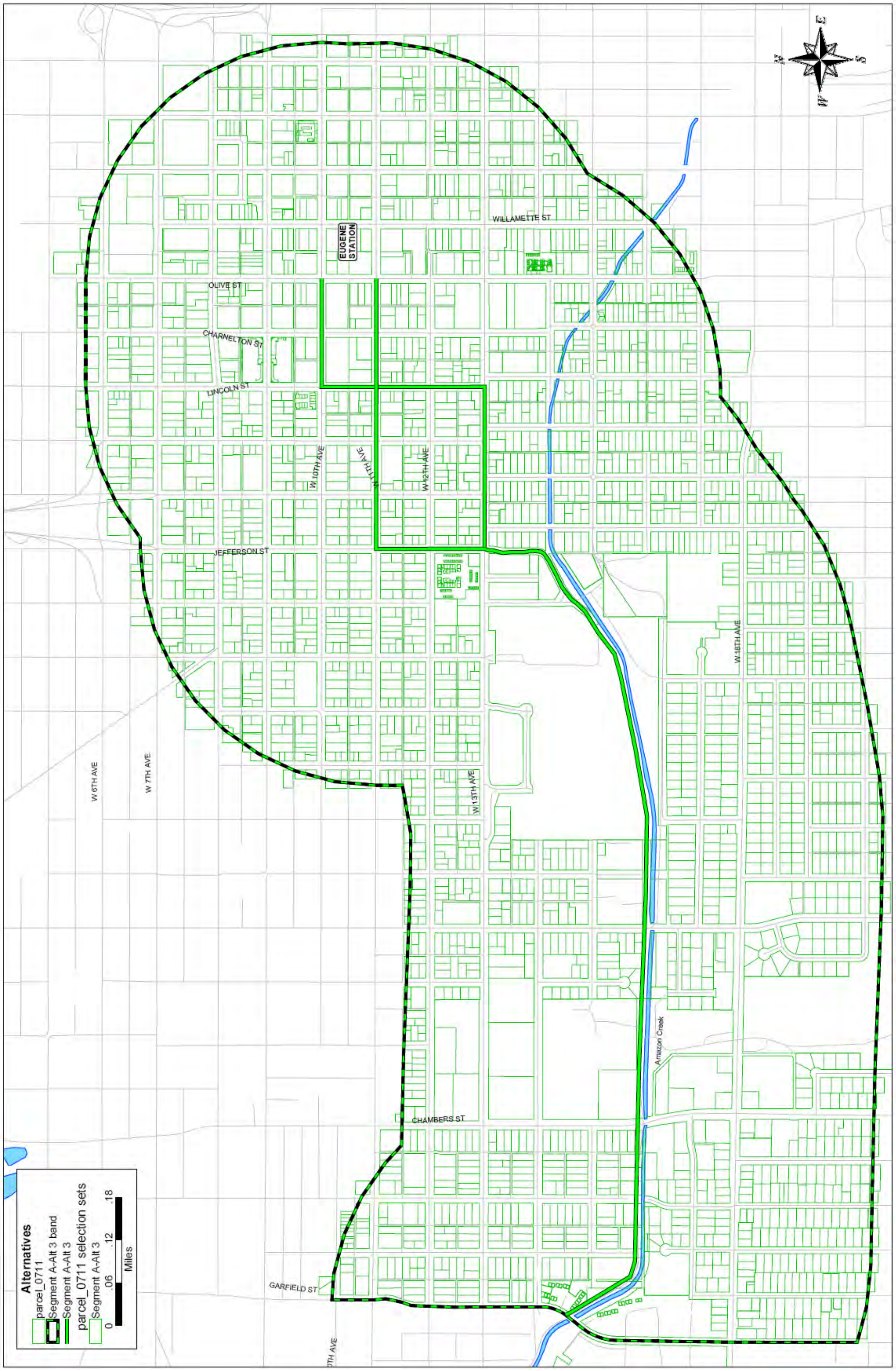
For this alignment alternative, EmX originates from the Eugene Station and, between Olive and Jefferson Streets, traverses in a single lane fixed facility on 10th, 11th, and 13th Avenues, and Lincoln and Jefferson Streets (see Figure 5.1-7 and Table 5.1-9). For the Olive-Jefferson section, on-street parking would be removed to accommodate the facility and no additional right-of-way would be required. From Jefferson Street to Garfield Street, EmX travels on the north side of the Amazon Channel in a two-lane fixed facility. For this section, right-of-way needed to accommodate the two-lane fixed facility would be acquired on the north side of the Amazon Channel. The total round-trip distance of this alternative would be approximately 3.8 miles and this segment would likely require nine (9) EmX stations.

Table 5.1-9 Segment A – Alignment 3 Summary Description

Street Section	Fixed Facility Type	Width	Screening Evaluation Assumptions
Olive – Jefferson	Single lane	12 feet	Remove parking only, no additional R-O-W required
Jefferson – Garfield	Two lane	24 feet	R-O-W taken from north side of Amazon Channel

Total Length / Travel Distance (miles)	3.8
Total Number Stations	9

Figure 5.1-7   Alignment Alternative SA-A3



Segment A – Alternative 4: 11th Avenue

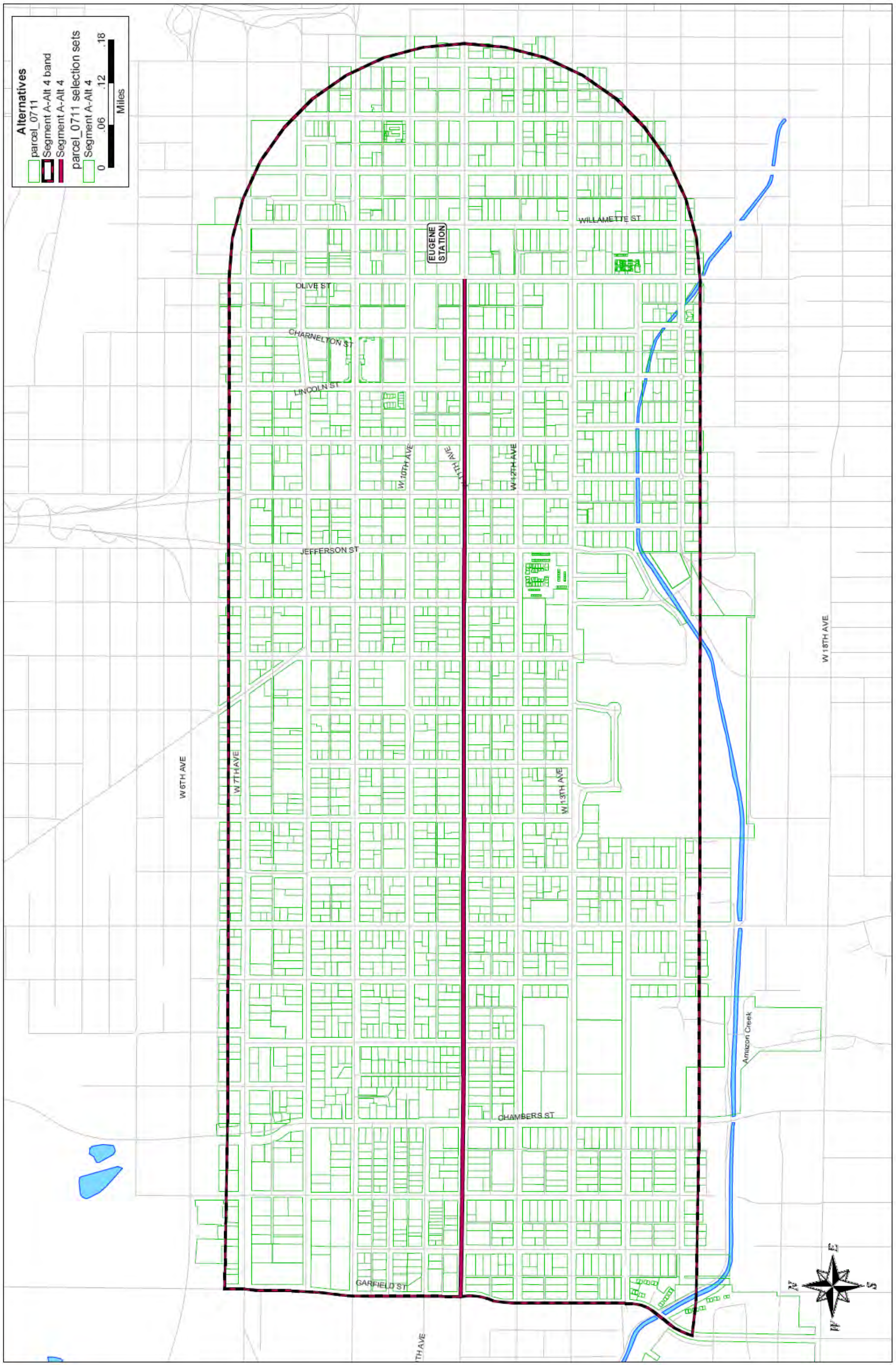
This alignment alternative proposes EmX to traverse in a two-lane fixed facility located on 11th Avenue (see Figure 5.1-8 and Table 5.1-10). For this section, right-of-way to accommodate the fixed facility would be acquired by removing parking on both sides of the existing roadway and acquiring additional right-of-way from the planting strip behind the existing curb on one side of 11th Avenue. The planting strip to be acquired for additional right-of-way would be determined based on which side minimizes potential impacts to resource trees. The total round-trip distance of this alternative would be approximately 2.9 miles and this segment would likely require seven (7) EmX stations.

Table 5.1-10 Segment A – Alignment 4 Summary Description

Street Section	Fixed Facility Type	Width	Screening Evaluation Assumptions
Olive – Garfield	Two lane	24 feet	Remove parking from both sides of roadway, additional R-O-W required from planter strip behind curb on side that minimizes impacts to resource trees

Total Length / Travel Distance (miles)	2.9
Total Number Stations	7

Figure 5.1-8 Alignment Alternative SA-A4



Segment B: Garfield Street to Beltline Road

This segment extends from Garfield Street west to Beltline Road.

Segment B – Alternative 1: 7th Place / Stewart Road

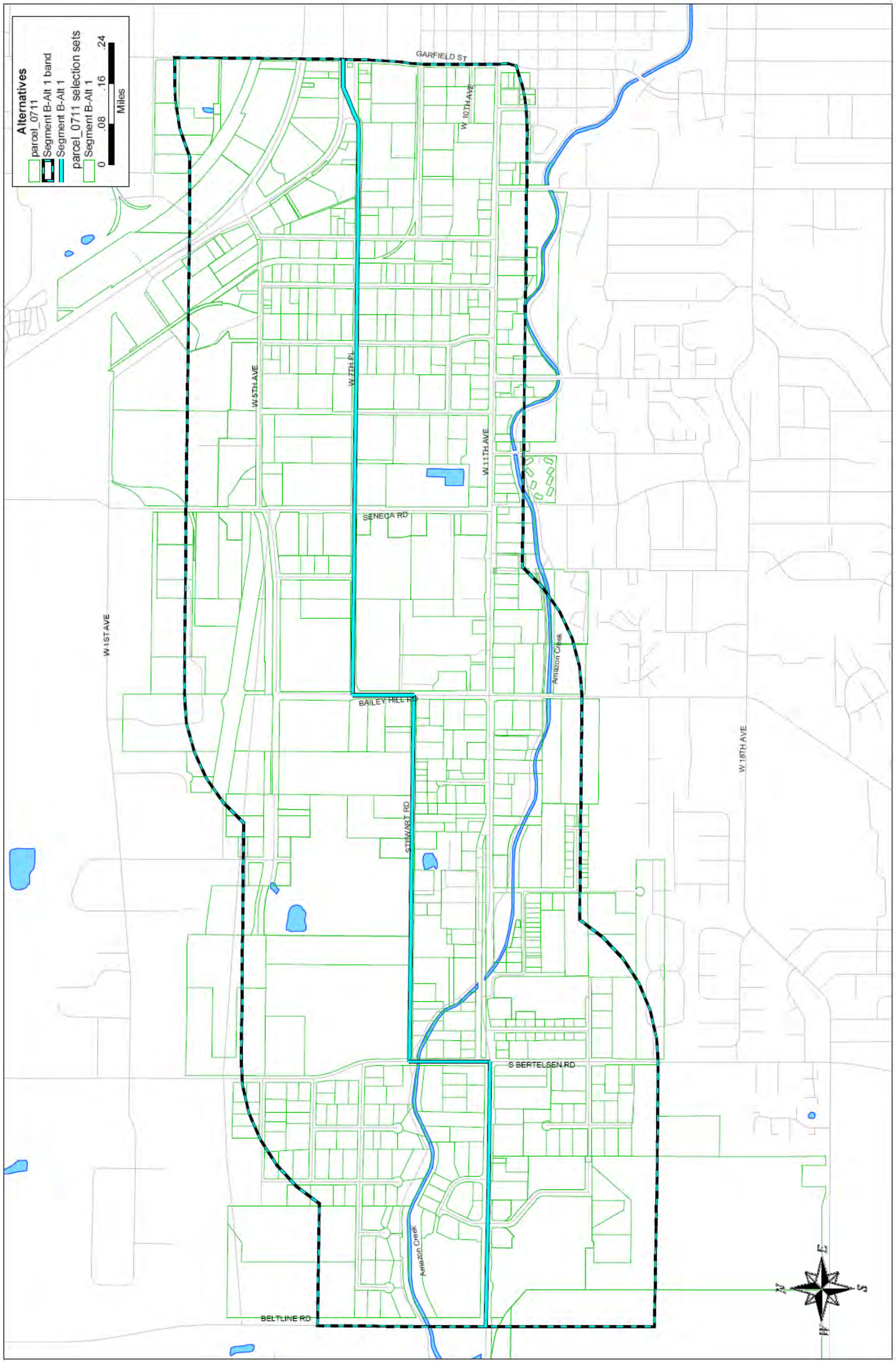
This alternative proposes that EmX travel in a two-lane fixed facility on 7th Place between Garfield Street and Bailey Hill Road, then using Bailey Hill Road as a north-south connector, travel on Stewart Road to between Bailey Hill and Bertelsen Roads, then using Bertelsen Road as a north-south connector, travel on 11th Avenue between Bertelsen and Beltline Roads (see Figure 5.1-9 and Table 5.1-11). For this section, right-of-way to accommodate the fixed facility would be acquired from behind the existing curb on one side of all roadways. The side on which the right-of-way will be acquired will be determined based on which side minimizes potential impacts, except that right-of-way would not be acquired on the north side of West 7th Avenue, between Bailey Hill Road and Market Street, or on the north side of Stewart Road west of the current road closure barricade. The total round-trip distance of this alternative would be approximately 5.5 miles and this segment would likely require 13 EmX stations.

Table 5.1-11 Segment B – Alignment 1 Summary Description

Street Section	Fixed Facility Type	Width	Screening Evaluation Assumptions
Garfield – Beltline	Two lane	24 feet	R-O-W taken from behind curb on side that minimizes impacts

Total Length / Travel Distance (miles)	5.5
Total Number Stations	13

Figure 5.1-9   Alignment Alternative SB-A1



Segment B – Alternative 2: 10th Avenue / 11th Avenue

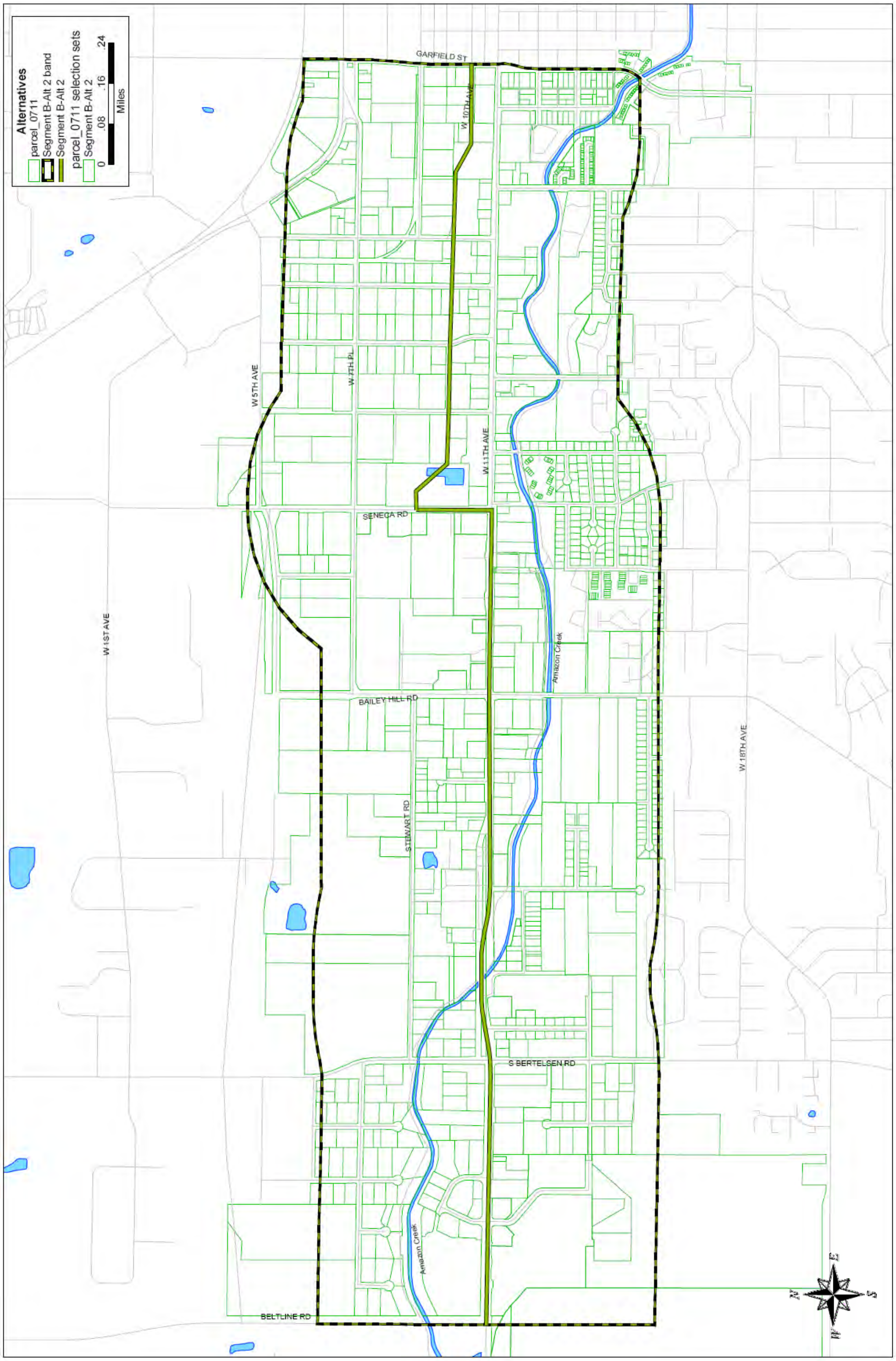
This alignment alternative proposes EmX to traverse in a two-lane fixed facility on 10th Avenue between Garfield Street and Seneca Road, then using Seneca Road as a north-south connector, travel on 11th Avenue between Seneca and Beltline Roads (see Figure 5.1-10 and Table 5.1-12). It should be noted that sections of 10th Avenue are currently not connected as a continuous arterial. Right-of-way to accommodate the fixed facility would be acquired on both sides of the existing roadways behind the existing curb. The total round-trip distance of this alternative would be approximately 5.4 miles and this segment would likely require 13 EmX stations.

Table 5.1-12 Segment B – Alignment 2 Summary Description

Street Section	Fixed Facility Type	Width	Screening Evaluation Assumptions
Garfield – Beltline	Two lane	24 feet	R-O-W taken from behind curb 12 feet from each side

Total Length / Travel Distance (miles)	5.4
Total Number Stations	13

Figure 5.1-10 Alignment Alternative SB-A2



Segment C: Beltline Road to West Terminus

This segment extends from Beltline Road to a west terminus proposed in the alignment alternative.

Segment C – Alternative 2: 11th Avenue to Veneta

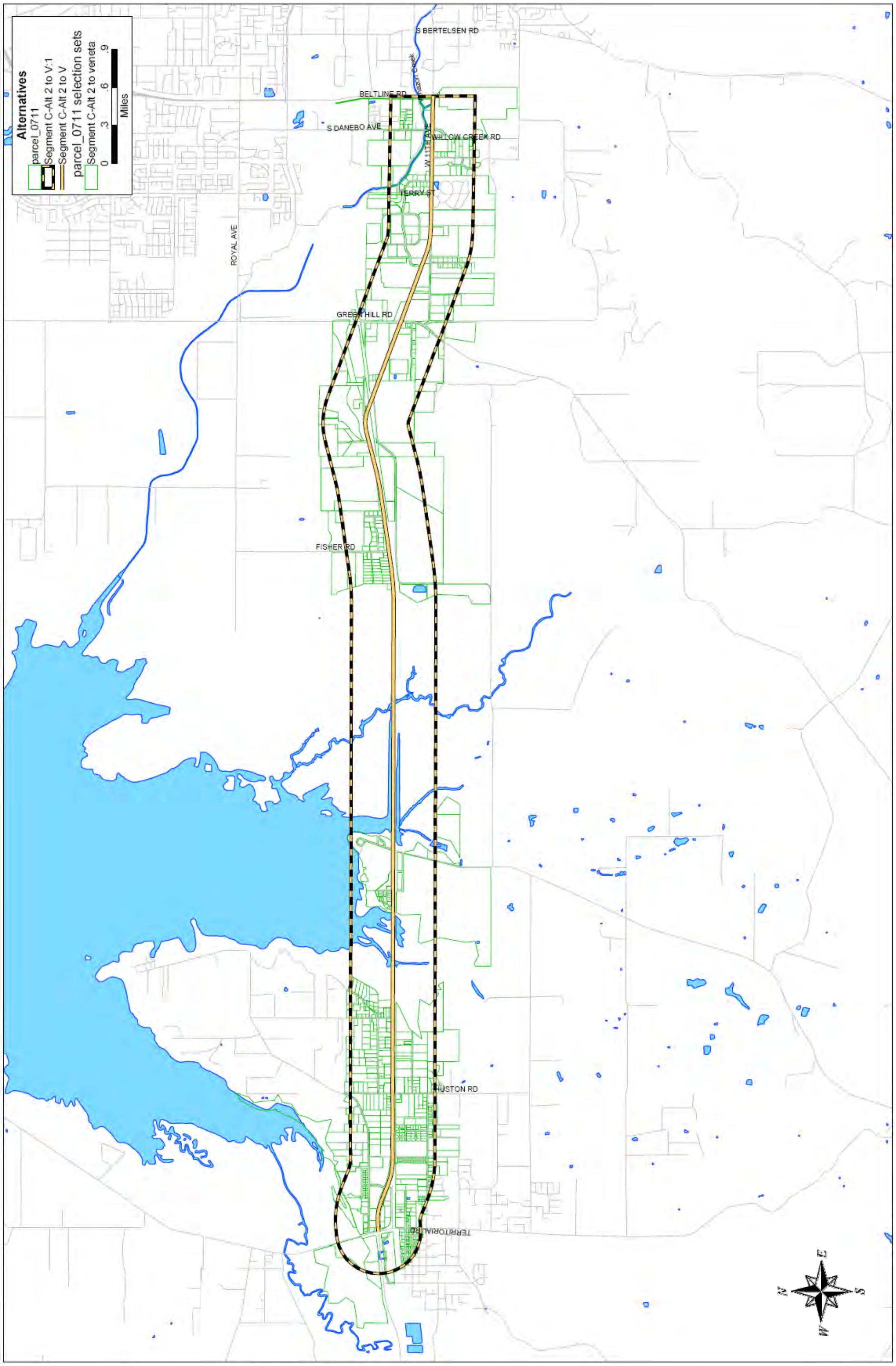
This alignment alternative proposes EmX to traverse in a two-lane fixed facility located on 11th Avenue between Beltline Road and the town of Veneta (see Figure 5.1-11 and Table 5.1-13). Right-of-way to accommodate the fixed facility would be acquired from behind the existing curb on both sides of 11th Avenue, except where BLM-owned land abuts the existing roadway right-of-way. The total round-trip distance of this alternative is approximately 18.2 miles and this segment would likely require 16 EmX stations. The data for this alignment generally comes from two sources, one generally east of Fisher Road and one west of Fisher Road. While the data is generally readily available for the segment east of Fisher Road, some of the data is not available for the segment west of Fisher Road.

Table 5.1-13 Segment C – Alignment 2 Summary Description

Street Section	Fixed Facility Type	Width	Screening Evaluation Assumptions
Beltline – Veneta	Two lane	24 feet	R-O-W taken from behind curb 12 feet from each side

Total Length / Travel Distance (miles)	18.2
Total Number Stations	16

Figure 5.1-11 Alignment Alternative SC-A2



5.2 Improve Customer Convenience

The Improve Customer Convenience criterion is based on the project's objective to improve customer convenience by reducing travel time, increasing service reliability, and making other service improvements.

5.2.1 Round Trip Transit Travel Time between Select Origins and Destinations

One of the key measures customers use to determine convenience is their overall travel time between destinations. This criterion measures the round trip transit travel time between select pairs of origins and destinations.

5.2.1.1 Rationale / Methods

Four origin-destination pairs were used to evaluate alternatives for this criterion:

- Eugene Station to Terry Street
- Eugene Station to Beltline Road
- Eugene Station to Garfield/11th
- Eugene Station to Veneta

At a screening level, the evaluation does not address north-south travel.

The following assumptions were used in evaluating alternatives:

- There were no transit priority measures (such as queue jump lanes or transit signal priority) assumed in the calculation of the travel times
- Everyone travels at the posted speed limit
- Same delays for all stop streets
- Same delays for all signals
- Estimated by each of the minimum operating segments
- Included stops at stations, number of stops per mile estimated at three per mile.

5.2.1.2 Data Tables

Table 5.2-1 Segment A Travel Time Comparison (round trip)

	SA-A1 W 13th Avenue	SA-A2 6th/7th Avenue	SA-A3 Amazon	SA-A4 11th Avenue
Travel Distance	0.8	0.64	0.8	0.48
Posted Speed Limit	20	25	20	20
Travel Distance	0.3	3.5	0.5	2.48
Posted Speed Limit	30	30	30	30
Travel Distance	2.5	0.2	2.4	0
Posted Speed Limit	30	40	25	0
Traffic signals	17	25	12	16
Stop Signs	0	2	2	0
Stations	9	10	9	7
Travel Time (minutes)	15.1	18.30	15.8	12.8
Total Travel Distance	3.6	4.1	3.7	2.96
Speed (mph)	14	13	14	14

Estimated travel time for BRT assumes that the BRT vehicle travels the posted speed limit, stops 20 seconds at each station, and is delayed an average of 15 seconds for each traffic signal and 20 seconds for each stop sign.

Table 5.2-2 Segment B Travel Time Comparison (round trip)

	SB-A1 7th Place/Stewart	SB-A2 10th Place/11th Avenue	SB-A3 Amazon	SB-A4 W 11th Avenue
Travel Distance	0.7	1.7	3.6	4.4
Posted Speed Limit	25	25	25	35
Travel Distance	2.5	3	1	0.4
Posted Speed Limit	35	35	35	45
Travel Distance	1.9	0.4	0.4	0
Posted Speed Limit	40	45	45	0
Travel Distance	0.4	0	0	0
Posted Speed Limit	45	0	0	0
Traffic signals	12	14	6	22
Stop Signs	12	12	10	0
Stations	13	13	12	12
Travel Time	18.7	21.3	19.7	17./4
Total Travel Distance	5.5	5.1	5	4.8
Speed (mph)	18	14	15	17

Estimated travel time for BRT assumes that the BRT vehicle travels the posted speed limit, stops 20 seconds at each station, and is delayed an average of 15 seconds for each traffic signal and 20 seconds for each stop sign. Travel speed along the Amazon Channel section was assumed to be 25 miles per hour.

Table 5.2-3 Segment C Travel Time Comparison (round trip)

	SC-A1 11th Avenue - Terry	SC-A2 11th Avenue - Fisher Rd	SC-A2 11th Avenue - Veneta (Territorial)
Travel Distance	0.5	0	0
Posted Speed Limit	25	0	0
Travel Distance	0.9	0.9	0.9
Posted Speed Limit	45	45	45
Travel Distance	0.5	6.3	17.3
Posted Speed Limit	55	55	55
Traffic signals	3	8	10
Stop Signs	1	0	0
Stations	4	8	16*
Travel Time	5.4	12.7	27.9
Total Travel Distance	1.9	7.4	18.1
Speed (mph)	21	35	39

Estimated travel time for BRT assumes that the BRT vehicle travels the posted speed limit, stops 20 seconds at each station, and is delayed an average of 15 seconds for each traffic signal and 20 seconds for each stop sign.

*Owing to the rural nature of the area, the stations spacing has been increased.

Table 5.2-4 Travel Time Comparison of Alignments (Minutes)

	Alignment Alternative						
	SA-A1, SB-A4	SA-A2, SB-A1	SA-A3, SB-A3	SA-A4, SB-A4	SA-A4, SB-A2	SA-A2, SB-A4	SA-A2, SB-A2
Origin-Destination Pairs	13th / 11th	6th / 7th / 7th Place / Stewart	Amazon / W11th	11th Avenue	11th / 10th Place / 11th	6th / 7th / 11th	6th / 7th / 10th Place
Eugene Station to Terry Street	38	40.9	38.7	35.7	39.6	41.2	45.1
Eugene Station to Beltline Road	32.5	35.4	33.2	30.2	34.1	35.7	39.6
Eugene Station to Garfield/11th	15.1	18.3	15.8	12.8	-	-	-
Eugene Station to Fisher Rd	45.2	48.1	45.9	42.9	46.8	48.4	52.5
Eugene Station to Veneta	60.4	63.3	61.1	58.1	32.0	63.3	67.5

Estimated travel time for BRT assumes that the BRT vehicle travels the posted speed limit, stops 20 seconds at each station, and is delayed an average of 15 seconds for each traffic signal and 20 seconds for each stop sign.

5.2.1.3 Findings: Improve Customer Convenience

This criterion is based on the project's objective to improve customer convenience by reducing travel time, increasing service reliability, and making other service improvements. For the purposes of this screening evaluation, customer convenience was measured by evaluating the round trip transit travel time between select pairs of origins and destinations. Shorter travel times were considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

Table 5.2-5 Summary Travel Time Comparison of Alignments (Minutes)

	Alignment Alternative						
	SA-A1, SB-A4	SA-A2, SB-A1	SA-A3, SB-A3	SA-A4, SB-A4	SA-A4, SB-A2	SA-A2, SB-A4	SA-A2, SB-A2
Origin-Destination Pairs	13th / 11th	6th / 7th / 7th Place / Stewart	Amazon / W11th	11th Avenue	11th / 10th Place / 11th	6th / 7th / 11th	6th / 7th / 10th Place
Eugene Station to Terry Street	◎	○	◎	◎	◎	○	○
Eugene Station to Beltline Road	◎	◎	◎	◎	◎	◎	◎
Eugene Station to Garfield Street / 11th	●	●	●	●	-	-	-
Eugene Station to Fisher Rd	○	○	○	○	○	○	○
Eugene Station to Veneta	○	○	○	○	○	○	○

Notes:
● = Potential travel time less than 20 minutes
◎ = Potential travel time between 20 and 40 minutes
○ = Potential travel time greater than 40 minutes

Overall

- The West 11th Avenue alignment would offer the shortest travel times for all origin-destination pairs. This route is the most direct route.
- The West 13th Avenue and the Amazon Channel alignments would be the next best alignments with travel times approximately three minutes longer than the West 11th Avenue travel time. The West 6th / 7th Avenue and West 10th Place alignment would have the longest travel time.

Eugene Station to Garfield Street

- The West 11th Avenue alignment would be the most direct and shortest route.
- Average speeds on each of the alignments would be relatively similar (14 mph).
- Travel times would vary from 13 minutes to 17 minutes. The West 11th Avenue alignment would have the shortest travel time and the West 6th / 7th Avenue alignment would have the longest travel time.
- The number of traffic signals would play a significant role in the length of travel time for the West 6th / 7th Avenue alignment.

Garfield Street to Beltline Road

- The West 11th Avenue alignment would be the most direct and shortest route.
- Average speeds on each of the alignments would vary from 14-18 mph. The West 7th Place/Stewart alignment would be the fastest, owing to the large sections with posted speeds of 40mph.

Beltline Road to West Terminus

- Higher posted speeds would allow for shorter travel times in this section.
- It is likely that fewer EmX stations would be initially developed in this section of the corridor as there are few destinations.

5.3 Improve Operating and Other Efficiencies to Maximize the Use of Scarce Resources

This criterion is based on the project's objective to improve operating and other efficiencies to maximize the use of scarce resources. Two measures were used to determine if alternatives had the potential to improve operating and other efficiencies: operating service hours and daily operating costs.

5.3.1 Operating Service Hours (Round Trip Travel Time* Proposed Service Frequency)

This measure is an indicator of service provision costs. Lengthier operating service hours result in higher operating costs.

5.3.1.1 Rationale / Methods

This measure uses travel time from criterion 5.1 and multiplies the 'travel time' by the likely 'service frequency'. A service frequency of 10 minutes in the peak travel time was used for all alternatives.

Using an average daily service cost of $72 per hour, multiply the 'daily operating service hours' by the 'average daily service cost'. The resulting data is an estimate of the daily service cost to operate EmX for the proposed alignment alternative.

5.3.1.2 Data Tables

Table 5.3-1 Daily Operating Service Hours

	Alignment Alternative						
	SA-A1, SB-A4	SA-A2, SB-A1	SA-A3, SB-A3	SA-A4, SB-A4	SA-A4, SB-A2	SA-A2, SB-A4	SA-A2, SB-A2
Origin-Destination Pairs	13th / 11th	6th / 7th / 7th Place / Stewart	Amazon / W11th	11th Avenue	11th / 10th Place / 11th	6th / 7th / 11th	6th / 7th / 10th Place
Eugene Station to Terry Street	52	56	53	49	54	56	62
Eugene Station to Beltline Road	44	48	45	41	47	49	54
Eugene Station to Garfield/11th	21	24	22	18	-	-	-
Eugene Station to Fisher Rd	66	70	67	63	69	71	76
Eugene Station to Veneta	83	87	84	79	85	87	92

Assumptions:
Weekday Service Duration: 5:40 AM to 10:20 PM
15 minute service: 5:40 AM to 6 AM, # of trips= 1
10 minutes service: 6 AM to 8 PM, # of trips= 72
20 minutes service 8 PM to 10:50 PM, # of trips= 9
Daily Total = 82
No allowance made for breaks or operator relief.

Table 5.3-2 Daily Service Cost (Dollars)

	Alignment Alternative						
	SA-A1, SB-A4	SA-A2, SB-A1	SA-A3, SB-A3	SA-A4, SB-A4	SA-A4, SB-A2	SA-A2, SB-A4	SA-A2, SB-A2
Origin-Destination Pairs	13th / 11th	6th / 7th / 7th Place / Stewart	Amazon / W11th	11th Avenue	11th / 10th Place / 11th	6th / 7th / 11th	6th / 7th / 10th Place
Eugene Station to Terry Street	$3,739	$4,025	$3,808	$3,513	$3,897	$4,054	$4,438
Eugene Station to Beltline Road	$3,198	$3,483	$3,267	$2,972	$3,355	$3,513	$3,897
Eugene Station to Garfield/11th	$1,486	$1,801	$1,555	$1,260	$ -	$ -	$ -
Eugene Station Fisher Rd	$4,448	$4,733	$4,517	$4,221	$4,605	$4,763	$5,166
Eugene Station to Veneta	$5,943	$6,229	$6,012	$5,717	$6,101	$6,258	$6,642

Assumptions: Operating cost= $72/hour

5.3.1.3 Findings: Improve Operating and other Efficiencies

This criterion is based on the project's objective to improve operating and other efficiencies to maximize the use of scarce resources. For the purposes of this screening evaluation, improving operating and other efficiencies was measured by evaluating operating service hours and daily operating costs. Fewer operating service hours and daily operating costs were considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

Table 5.3-3 Summary Daily Service Cost (Dollars)

	Alignment Alternative						
	SA-A1, SB-A4	SA-A2, SB-A1	SA-A3, SB-A3	SA-A4, SB-A4	SA-A4, SB-A2	SA-A2, SB-A4	SA-A2, SB-A2
Origin-Destination Pairs	13th / 11th	6th / 7th / 7th Place / Stewart	Amazon / W11th	11th Avenue	11th / 10th Place / 11th	6th / 7th / 11th	6th /7th / 10th Place
Eugene Station to Terry Street	●	⭘	●	●	●	⭘	⭘
Eugene Station to Beltline Road	●	●	●	●	●	●	●
Eugene Station to Garfield/11th	●	●	●	●	-	-	-
Eugene Station to Fisher Rd	⭘	⭘	⭘	⭘	⭘	⭘	⭘
Eugene Station to Veneta	⭘	○	○	⭘	○	○	○

Notes:
● = Potential daily service cost under $4,000
⭘ = Potential daily service cost between $4,000 and $6,000
○ = Potential daily service cost over $6,000

Overall

- The West 11th Avenue alignment would have the lowest relative daily service cost of the origin-destination pairs. As the route length increases, naturally the daily service cost increases.
- The West 13th Avenue and the Amazon Channel alignments to West 11th Avenue would be the next best alignments in terms of daily service cost due to travel times that would be approximately three minutes longer than the West 11th Avenue alignment travel time. There would be a small service cost advantage to the West 13th/West 11th Avenue alignment (SA-A1 and SB-A4).
- The highest service costs would be for the West 6th/7th Avenue and West 10th Place alignment (SA-A2 and SB-A2).

Eugene Station to Garfield Street

- The West 11th Avenue alignment would be the most direct and shortest route and, therefore, would have the lowest operating cost (SA-A4). Because it would be the shortest segment in the evaluation, this section would have the lowest daily service cost for all the alignments.

Eugene Station to Beltline Road

- Again, costs are a factor of distance and travel time. The West 11th Avenue alignment would offer the lowest daily service cost, while the highest would be the West 6th/7th Avenue and West 10th Place alignments (SA-A2 and SB-A2).

- The West 13th Avenue/11th Avenue alignment would have the next lowest service cost compared to the direct West 11th Avenue alignment.

Eugene Station to West Terminus

- Generally, there would be some gains in travel time in this segment due to higher travel speeds at the west end of the project area. However, services costs would be the highest from Eugene Station to the western project terminus because it would encompass the greatest travel distance.
- The SA-A4 and SB-A4 alignment along West 11th would have the lowest relative service costs.

5.3.2 Operating Hours of Regular Service Replaced by EmX within the Corridor

This measure evaluates how much of the existing service can be reallocated to EmX or, in the reverse, it measures how much additional service must LTD provide.

5.3.2.1 Rationale / Methods

This measure was evaluated by reviewing existing service along the proposed corridors and the amount of service hours provided along the corridor by all routes, then estimating which daily hours of service can be replaced by EmX and adding in EmX service hours based on 10 minute PM peak hour frequency. This evaluation only looked at service within the corridor, for at least part of the route.

5.3.2.2 Data Tables

Table 5.3-4 Daily Hours of Service Replaced (Hours)

	Alignment Alternative								
	SA-A1, SB-A4	SA-A2, SB-A1	SA-A3, SB-A3	SA-A4, SB-A4	SA-A4, SB-A2	SA-A2, SB-A4	SA-A2, SB-A2	SA-A1, SB-A3	SA-A4, SB-A3
Origin-Destination Pairs	13th / 11th	6th / 7th / 7th Place / Stewart	Amazon / W 11th	11th Avenue	11th / 10th Place / 11th	6th / 7th / 11th	6th / 7th / 10th Place	13th / Amazon	11th / Amazon
Eugene Station to Terry Street	60	19	17	60	60	35	35	60	60
Eugene Station to Beltline Road	59	18	16	59	59	34	34	59	59
Eugene Station to Garfield/11th	43	18	0	43	43	18	18	43	43
Eugene Station to Fisher Road	64	23	21	64	64	39	39	64	64
Eugene Station to Veneta	68	27	25	68	68	43	43	68	68

Assumptions:
Amazon between Eugene Station and Garfield does not replace any existing service.
6th / 7th Avenue replaces services on 8th Avenue

5.3.2.3 Findings: Improve Operating and other Efficiencies

This criterion is based on the project's objective to improve operating and other efficiencies to maximize the use of scarce resources. For the purposes of this screening evaluation, improving operating and other efficiencies was measured by evaluating the number of daily hours of service that could be replaced by the EmX alternative. Higher numbers of daily operating hours replaced were considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

Overall

- Owing to the limited services that would be replaced on 6th / 7th Avenues, the West11th and West13th alignments would perform better.
- On some sections, three times the amount of service on West 11th or West 13th could be replaced, compared to the amount of replaced service hours on 6th / 7th Avenues.
- The further the EmX route extended from downtown, the less the replacement opportunities.

Eugene Station to Garfield Street

- The West 11th and West13th corridors provide the most opportunity for service replacement.
- The Amazon alignment was not assumed to replace any regular service.
- Although the 6th / 7th Avenues alignment would replace the service on 8th Avenue, the amount of hours replaced would be less than half of those replaced on the West11th / West13th corridors.

Garfield Street to Beltline Road

- The West 7th Place alignment would replace no existing service.
- The 10th Place alignment and the Amazon alignments would replace service on West11th Avenue.
- The service replacement opportunities in the West11th Avenue section would be less than nearer downtown.

Beltline Road to West Terminus

- The major opportunity for service replacement in this section would be the Veneta route. However, should this corridor be selected, the amount of EmX service in the corridor would exceed the current service.

Table 5.3-5 Summary Daily Hours of Service Replaced (Hours)

	Alignment Alternative								
	SA-A1, SB-A4	SA-A2, SB-A1	SA-A3, SB-A3	SA-A4, SB-A4	SA-A4, SB-A2	SA-A2, SB-A4	SA-A2, SB-A2	SA-A1, SB-A3	SA-A4, SB-A3
Origin-Destination Pairs	13th / 11th	6th / 7th / 7th Place / Stewart	Amazon / W 11th	11th Avenue	11th / 10th Place / 11th	6th / 7th / 11th	6th / 7th / 10th Place	13th / Amazon	11th / Amazon
Eugene Station to Terry Street	●	O	O	●	●	**O**	**O**	●	●
Eugene Station to Beltline Road	●	O	O	●	●	**O**	**O**	●	●
Eugene Station to Garfield/11th	●	O	O	●	●	O	O	●	●
Eugene Station to Fisher Road	●	**O**	**O**	●	●	**O**	**O**	●	●
Eugene Station to Veneta	●	**O**	**O**	●	●	●	●	●	●

Notes:
● = Potential to replace 40 or more service hours
O = Potential to replace between 20 and 40 service hours
O = Potential to replace less than 20 service hours

5.4 Support Development

This criterion is based on the project's objective to serve as a catalyst for planned transit-oriented development and support development that is consistent with adopted land use plans. Two measures were used to determine if alternatives had the potential to serve as a catalyst for or support development in the West Eugene Corridor: serving vacant and redevelopable land and designated mixed-use centers.

5.4.1 Vacant and Redevelopable Land Served by the Alignment

This measure evaluates the amount of vacant and redevelopable land located within 1/3 mile of the proposed EmX alignment. Studies have shown that BRT, along with other implementation factors such as the design characteristics of the BRT system, favorable market conditions and transit-supportive zoning, can promote positive changes in land use, encouraging redevelopment opportunities along the BRT corridor and enhancing property values.[5, 6]

5.4.1.1 Rationale / Methods

The assessed values of tax lots within 1/3 mile of each alignment alternative were reviewed to identify underdeveloped and vacant land in the corridor. Any tax lot touched by the buffer line was included, which means portions of tax lots fall outside the 1/3 mile buffer area around alignment alternatives.

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[5] Transit Cooperative Research Program Report 90, Bus Rapid Transit Volume 1: Case Studies in Bus Rapid Transit. 2003. www.trb.org

[6] Transit Cooperative Research Program Report 90, Bus Rapid Transit Volume 2: Implementation Guidelines. 2003. www.trb.org

For purposes of this screening level evaluation, tax lots were categorized as developed, redevelopable, vacant, or non-developable based on the ratio of land value to improvement value and the zoning classification. Some tax lots were categorized as "unknown" because the land value and the improvement value were equal to $0. At this screening level evaluation, time was not invested in investigating these relatively few number of parcels. Some of the "unknown" parcels may be easements or small remnants in the GIS parcel data. The following ratios were used to categorize the tax lots:

Developed	Land Value / Improvement Value < 1.5, and Improvement Value = or > $1,000
Redevelopable	Land Value / Improvement Value = or > 1.5, and Improvement Value = or > $1,000
Vacant	Improvement Value < $1,000
Unknown	Land Value and Improvement Value both = $0
Non-Developable	All tax lots were excluded from the above categories if the parcel had a parks and open space, natural resource, or public land zoning classification within the Urban Growth Boundary or farm or forest zoning classification on land under Lane County's jurisdiction. It was assumed higher intensity development or redevelopment would be precluded from all of these lands. No field investigations or agency consultations were conducted to confirm the validity of the data.

Alternatives that provide the greatest opportunity for redevelopment are considered more favorable because they support the City's policies and plans.

Zoning was used to indicate land uses; however, actual use of parcels was not considered in this screening level evaluation. Actual use of parcels may be considered during the impact analysis.

5.4.1.2 Data Tables and Figures

Table 5.4-1 Vacant and Redevelopable Land within 1/3 mile of BRT Alignment

Segment/ Alternative	Total Acres	Developed[1]			Redevelopable[2]			Vacant[3]			Non-Developable[4]			Unknown[5]		
		Acres	Percent	Value	Acres	Percent	Value	Acres	Percent	Value	Acres	Percent	Value	Acres	Percent	Value
SA-A1	617.3	417.1	67.6%	$254,600,021	45.2	7.3%	$45,563,511	29.9	4.8%	$14,810,337	102.5	16.6%	$30,312,615	22.6	3.7%	$0
SA-A2	581.8	418.8	72.0%	$263,058,115	83.3	14.3%	$73,027,230	47.6	8.2%	$20,758,764	30.3	5.2%	$21,608,371	1.8	0.3%	$0
SA-A3	687.3	455.7	66.3%	$267,205,959	46.5	6.8%	$45,819,755	28.5	4.1%	$14,675,443	133.7	19.5%	$32,722,432	22.9	3.3%	$0
SA-A4	566.3	380	67.1%	$235,840,305	45.7	8.1%	$42,504,793	21.6	3.8%	$12,108,441	97	17.1%	$23,917,264	22	3.9%	$0
SB-A1	1336.1	533.7	39.9%	$159,749,215	175.2	13.1%	$92,225,264	431.5	32.3%	$41,982,927	190.7	14.3%	$4,759,373	5	0.4%	$0
SB-A2	1239.7	532.2	42.9%	$172,059,143	141.3	11.4%	$87,015,146	347.4	28.0%	$33,908,970	187	15.1%	$5,176,516	31.8	2.6%	$0
SB-A3	1204	574.6	47.7%	$187,142,382	128.8	10.7%	$80,618,721	300	24.9%	$33,714,004	163.7	13.6%	$4,713,688	36.9	3.1%	$0
SB-A4	1176.2	531.3	45.2%	$174,639,445	131.8	11.2%	$82,373,424	290	24.7%	$32,182,202	186.2	15.8%	$5,173,935	36.9	3.1%	$0
SC-A1	715.2	216.5	30.3%	$14,041,677	66.8	9.3%	$7,313,049	183.9	25.7%	$11,681,180	211.8	29.6%	$3,547,219	36.2	5.1%	$0
SC-A2 to Veneta[6]	3626.7	843.4	23.3%	$70,491,366	229.5	6.3%	$13,369,199	539.5	14.9%	$28,481,229	1969.4	54.3%	$18,292,156	44.9	1.2%	$0

Notes:
1) Developed: Land Value/Improvement Value = less than 1.5 and Improvement Value = $1,000 or greater
2) Redevelopable: Land Value/Improvement Value = 1.5 or greater and Improvement Value = $1,000 or greater
3) Vacant: Improvement Value = less than $1,000
4) Non-Developable: Includes all tax lots with a zoning classification of natural resource, parks/open space, public land, farm, or forest
5) Unknown: Land Value and Improvement Value both = $0
6) SC-A2 travels to the City of Veneta and includes Veneta tax lots in the evaluation

5.4.1.3 Findings: Planned Transit-Oriented Development

This criterion is based on the project's objective to serve as a catalyst for planned transit-oriented development and support development that is consistent with adopted land use plans. For the purposes of this screening evaluation, serving as a catalyst for and / or supporting development was measured by evaluating the amount of vacant and redevelopable land served by the alternative. Serving greater amounts of vacant and redevelopable land was considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

Segment A: Eugene Station to Garfield Street

- Tax lots in Segment A, which are all located close to the downtown, are more developed and have higher property values.
- In Segment A, Alternative 2 (6th / 7th Avenues) provides the highest relative potential for redevelopment opportunities, while Alternatives 1 (13th Avenue) and 4 (11th Avenue) provides the least relative potential for redevelopment.
- The Non-Developable land in this segment is generally characterized by Government and Education zoned land such as the Lane County Fairgrounds.

Table 5.4-2 Summary Segment A Vacant and Redevelopable Land within 1/3 mile of BRT Alignment Potentially Available for Redevelopment

		Redevelopable and Vacant Land		
Segment / Alternative	Total Acres within 1/3 Mile	Acres	Percent	Relative Potential
SA-A1	617.3	75.1	12.2%	○
SA-A2	581.8	130.9	22.5%	●
SA-A3	687.3	75	10.9%	**○**
SA-A4	566.3	67.3	11.9%	○

Segment B: Garfield Street to Beltline Road

- Over one-third of the tax lots in Segment B are categorized as redevelopable or vacant.
- In Segment B, Alternative 1 (7th Place / Stewart Road) provides the highest relative potential for redevelopment opportunities, while Alternatives 3 (Amazon Channel) and 4 (11th Avenue) provides the least relative potential for redevelopment.

Table 5.4-3 Summary Segment B Vacant and Redevelopable Land within 1/3 mile of BRT Alignment Potentially Available for Redevelopment

Segment / Alternative	Total Acres within 1/3 Mile	Redevelopable and Vacant Land		
		Acres	Percent	Relative Potential
SB-A1	1,336.1	606.7	45.4%	●
SB-A2	1,239.7	488.7	39.4%	⭘
SB-A3	1,204.1	428.8	35.6%	○
SB-A4	1,176.2	421.8	35.9%	○

Segment C: Beltline Road to West Terminus

- Segment C, Alternative 2 (11th Avenue to Veneta) evaluated tax lots to the City of Veneta. Tax lots from Veneta are included in this evaluation. A significant portion of SC-A2 falls outside of a designated Urban Growth Boundary and includes rural County lands. This is reflected in the large amount (54.3 percent) that is categorized as Non-Developable, with many lots zoned for exclusive farm use.
- Segment C, Alternative 1 (11th Avenue – Beltline to Terry Street) would provide the highest relative potential for redevelopment.

Table 5.4-4 Summary Segment C Vacant and Redevelopable Land within 1/3 mile of BRT Alignment Potentially Available for Redevelopment

Segment / Alternative	Total Acres within 1/3 Mile	Redevelopable and Vacant Land		
		Acres	Percent	Relative Potential
SC-A1	715.2	250.7	35.1%	●
SC-A2	3,626.7	769	21.2%	○

5.4.2 Number of Mixed Use Centers (Land Use Nodes) Served by the Alignment

The concept of mixed use development is the official growth management policy for the City of Eugene. This concept is supported by the adoption of the Growth Management Study (February 1998) and TransPlan, the regional transportation plan (December 2001).

TransPlan identifies potential mixed use centers, which could mature into quality neighborhoods with higher densities, mixed uses, more transportation options, convenient shopping and services, and amenities. Combined with improved transit, these centers are anticipated to reduce reliance on automobile travel and the need for costly street improvements, to slow sprawl onto nearby agricultural and forest lands, and to provide a greater variety of housing types inside the Urban Growth Boundary.

Alignments providing service to the greatest percentage of a mixed use center are considered to have the highest potential for supporting the City's designated areas for development and growth management policies and are better able to maximize transportation options.

5.4.2.1 Rationale / Methods

The total percentage of each mixed use center within 1/3 mile of each alignment alternative was calculated. If 67 percent or more of the area of a mixed use center falls within the 1/3 mile buffer of an alternative, then the alignment has a high potential to serve the mixed use center. If 33 percent to 67 percent of the area of a mixed use center falls within the 1/3 mile buffer of an alternative, then the alignment has a moderate potential to serve the mixed use center. If less than 33 percent of the mixed use center area is within the 1/3 mile buffer of an alternative, then the alignment has a low potential of serving the mixed use center. Alternatives with a higher potential to serve a mixed use center are generally considered more supportive of the City's mixed use center concept.

5.4.2.2 Data Tables and Figures

Table 5.4-5 Percentage of Mixed Use Center Served by Alignment Alternative

	Mixed Use Centers												
	Segment A					Segment B				Segment C			
Alternative	Downtown	Midtown	Whiteaker	Chambers	Westmoreland	City View	Bailey Hill	Churchill	Beltline Employment	Willow Creek Residential	Willow Creek Employment	Greenhill Employment	Crow Road
A1	67-100	33-66	0	67-100	67-100	0-32	67-100	0	67-100	0-32	33-66	33-66	0
A2	67-100	0-32	67-100	67-100	0-32	33-66	67-100	0	67-100	0-32	33-66	67-100	67-100
A3	67-100	33-66	0	0-32	67-100	67-100	67-100	0	67-100	NA	NA	NA	NA
A4	67-100	0-32	0	67-100	33-66	33-66	67-100	0	67-100	NA	NA	NA	NA

Notes:
NA = Not Applicable

Figure 5.4-1 Alternative SA-A1: Mixed Use Centers within 1/3 Mile

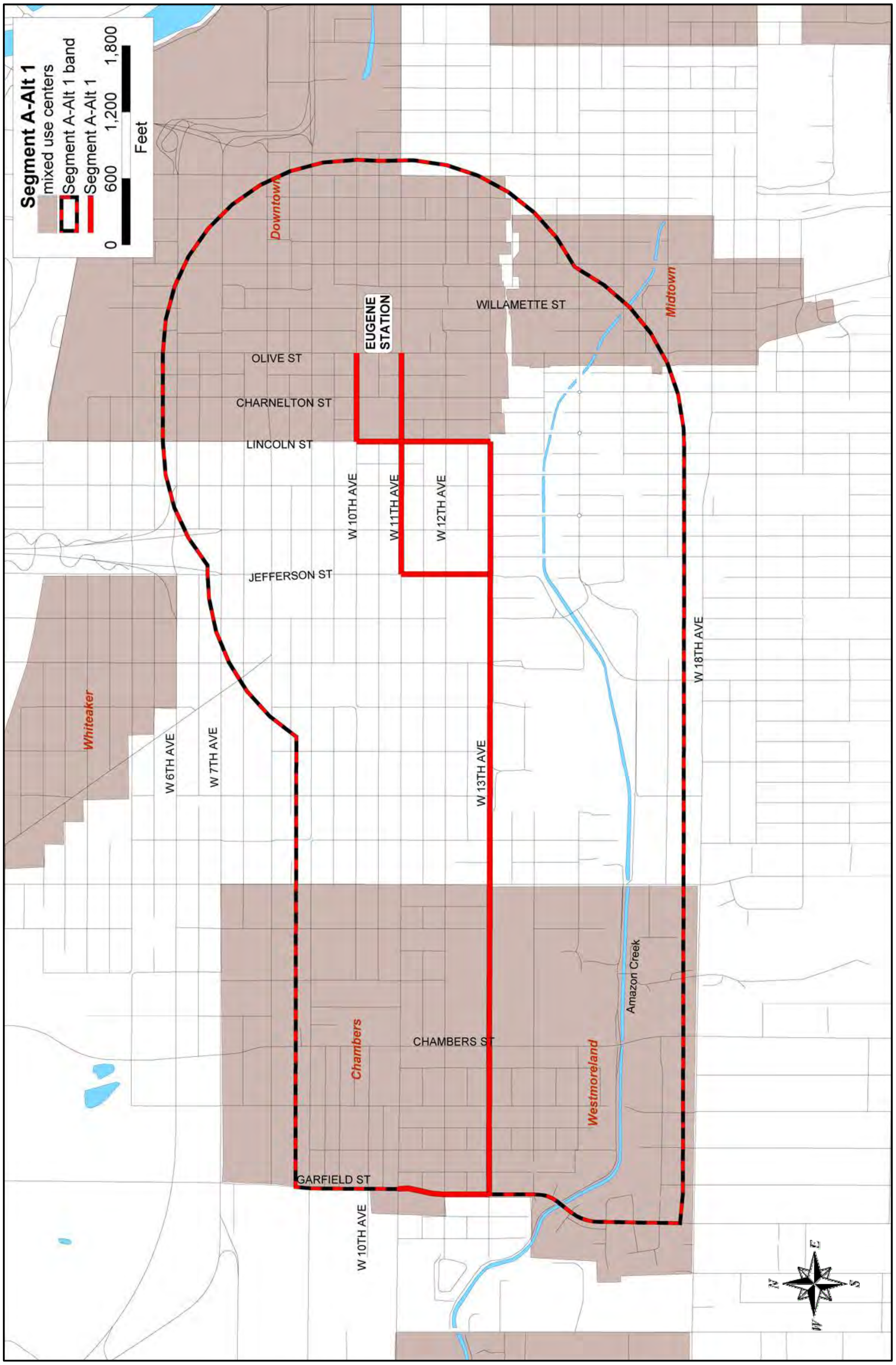


Figure 5.4-2 Alternative SA-A2: Mixed Use Centers within 1/3 Mile

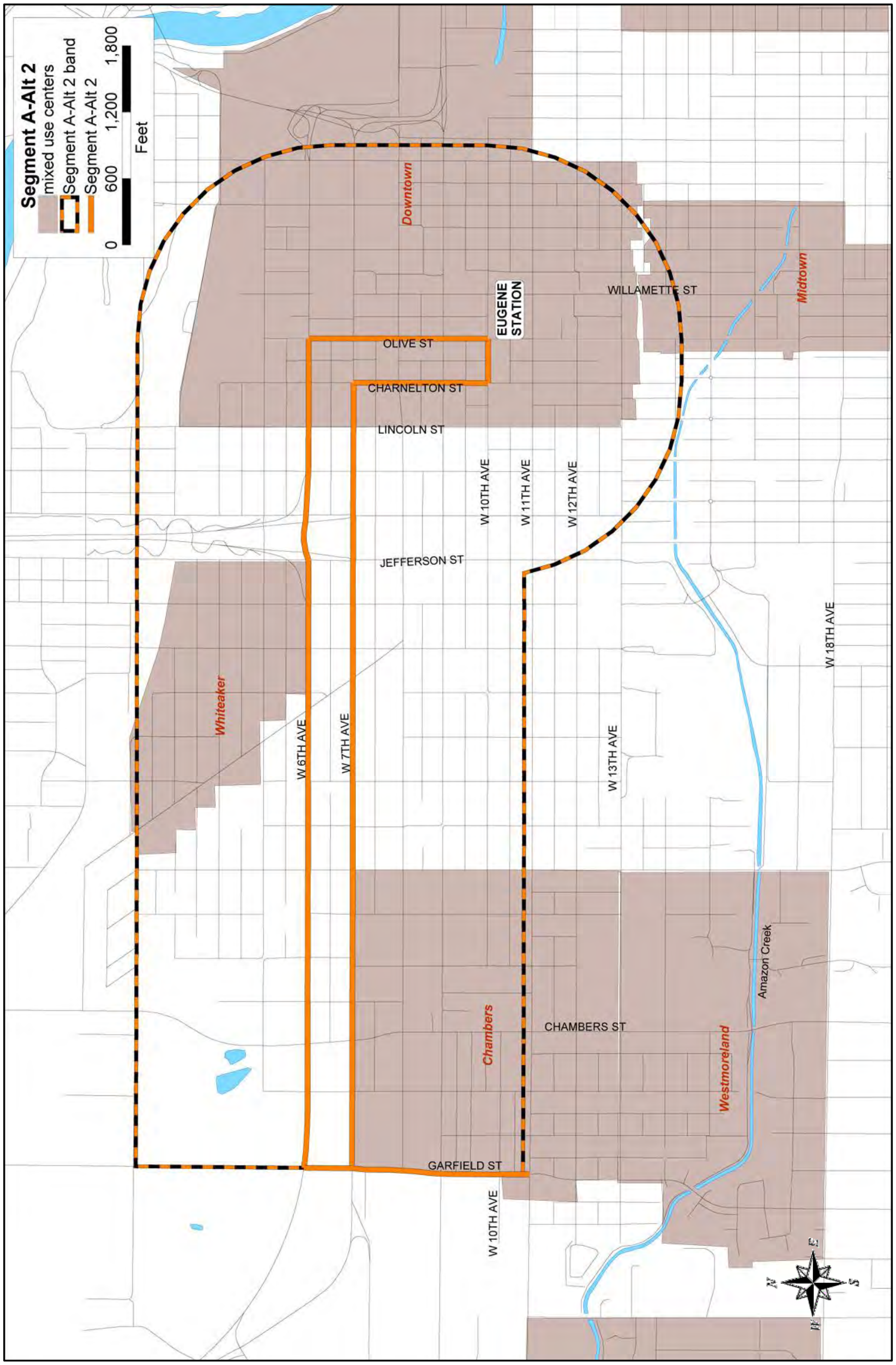


Figure 5.4-3 Alternative SA-A3: Mixed Use Centers within 1/3 Mile

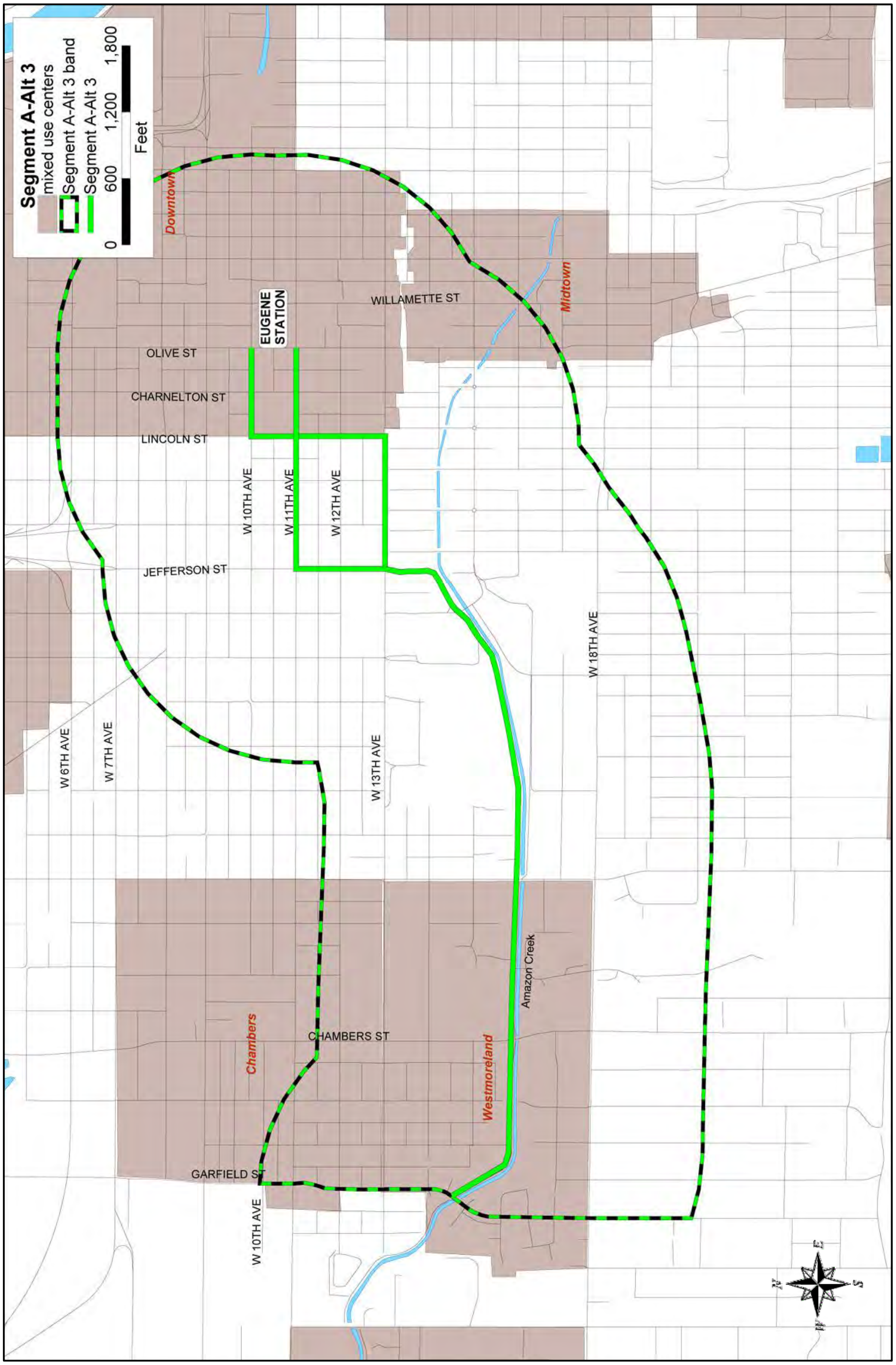


Figure 5.4-4 Alternative SA-A4: Mixed Use Centers within 1/3 Mile

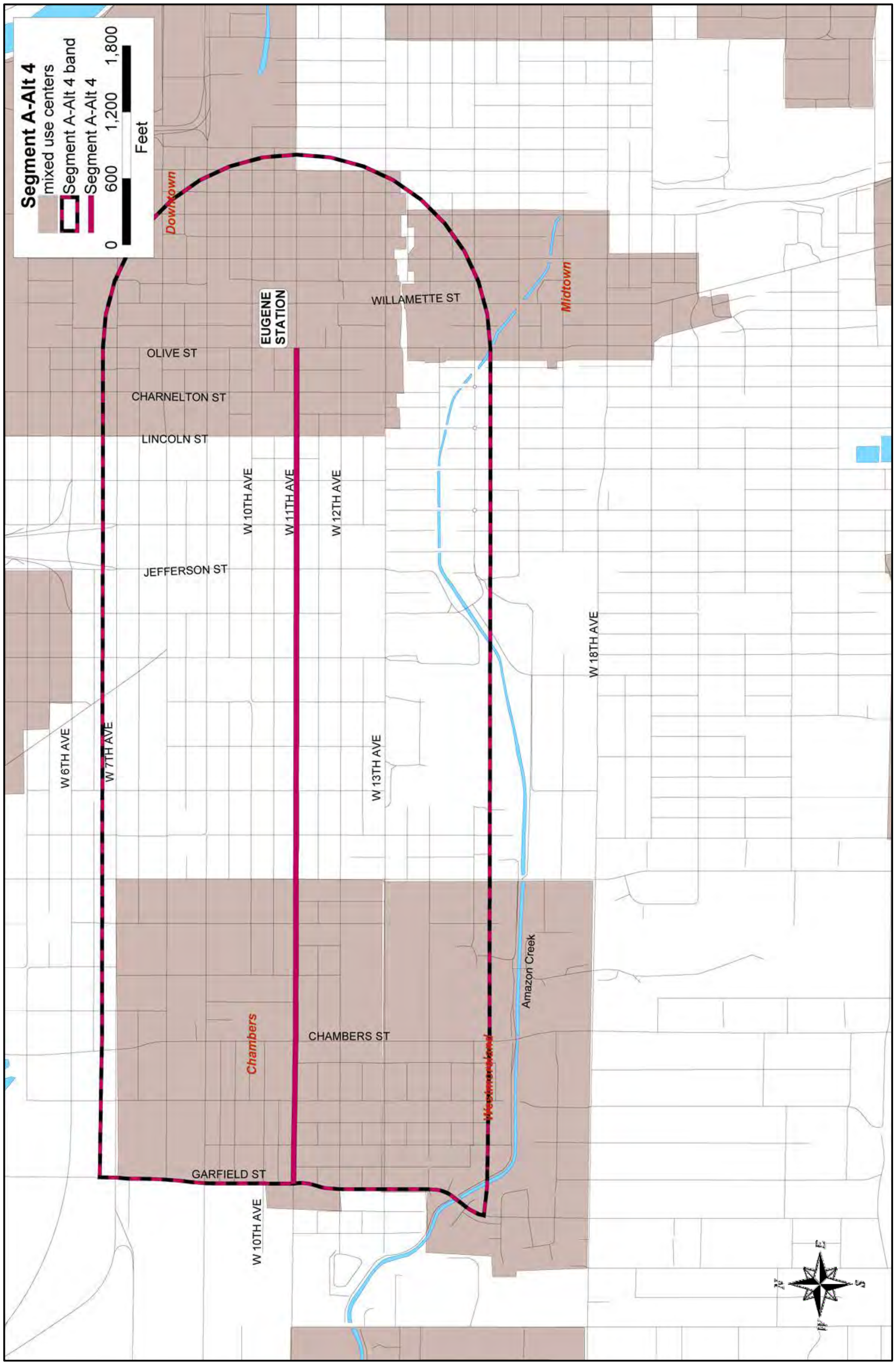


Figure 5.4-5 Alternative SB-A1: Mixed Use Centers within 1/3 Mile

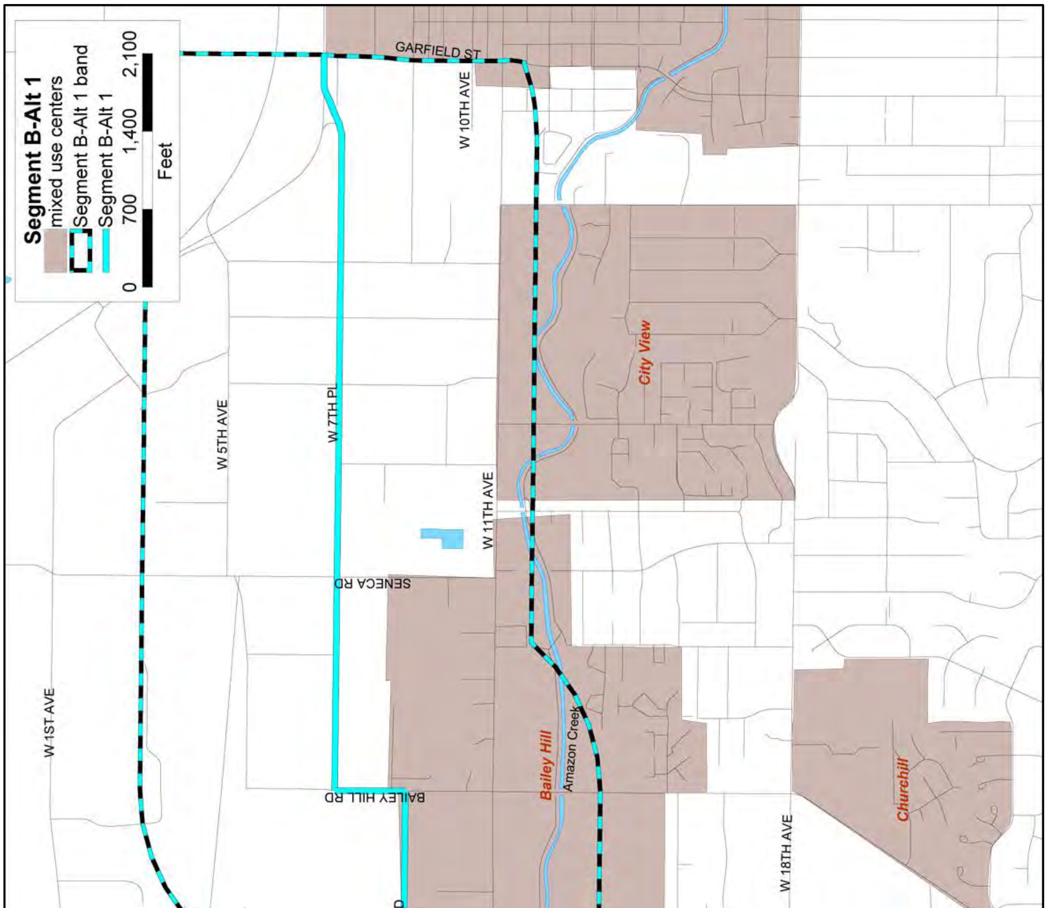


Figure 5.4-6 Alternative SB-A2: Mixed Use Centers within 1/3 Mile

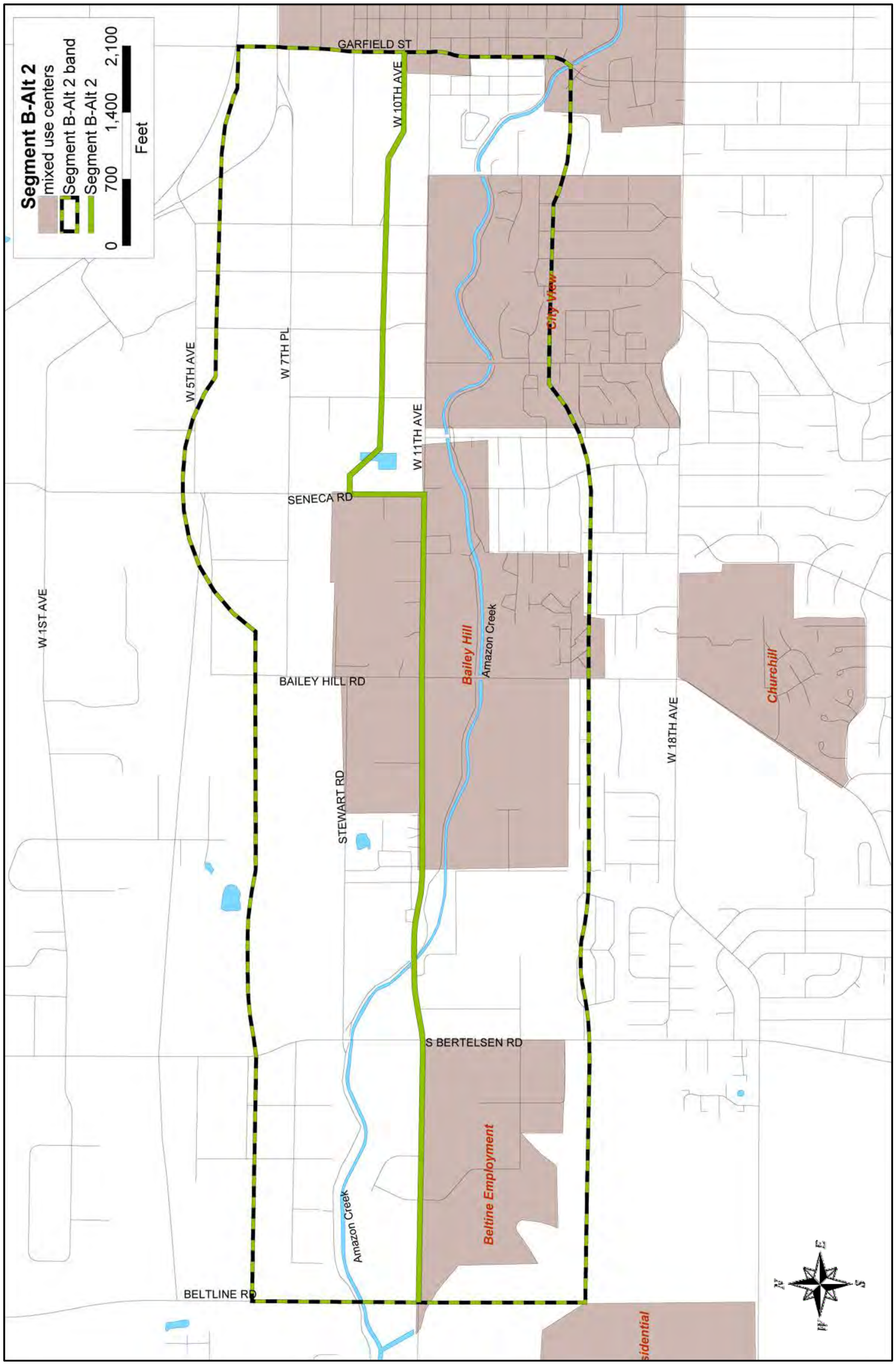


Figure 5.4-7 Alternative SB-A3: Mixed Use Centers within 1/3 Mile

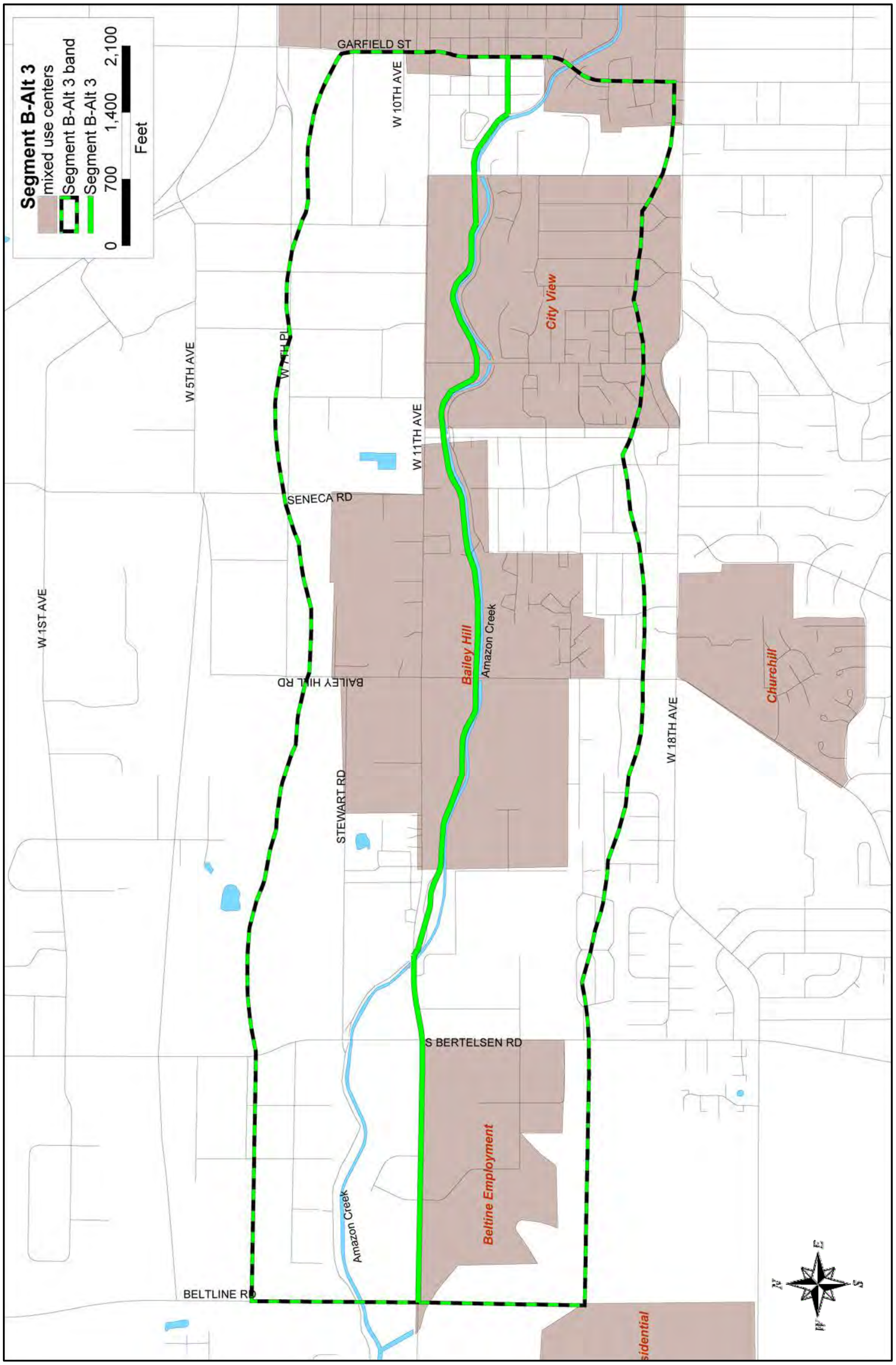


Figure 5.4-8 Alternative SB-A4: Mixed Use Centers within 1/3 Mile

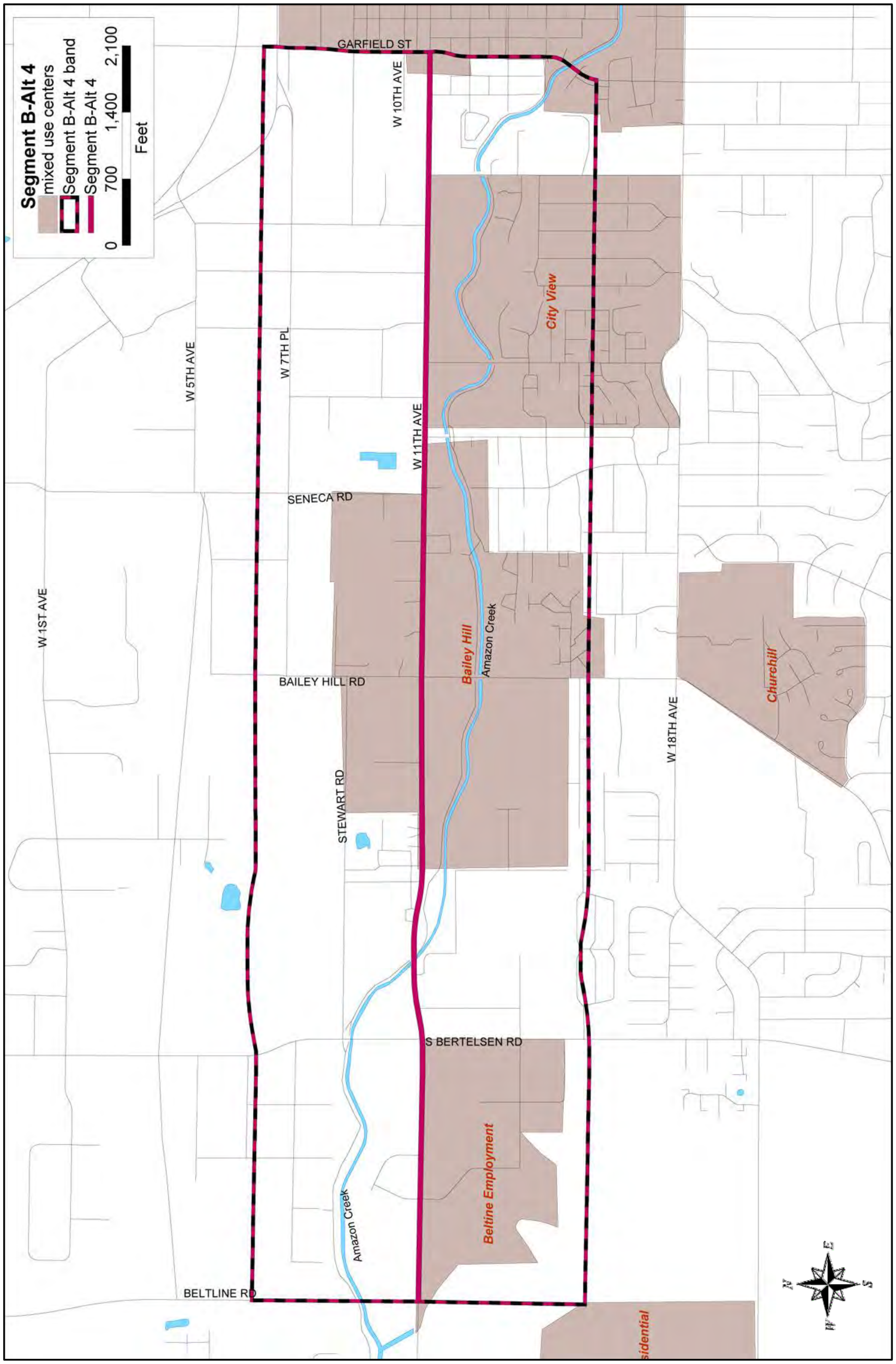


Figure 5.4-9 Alternative SC-A1: Mixed Use Centers within 1/3 Mile

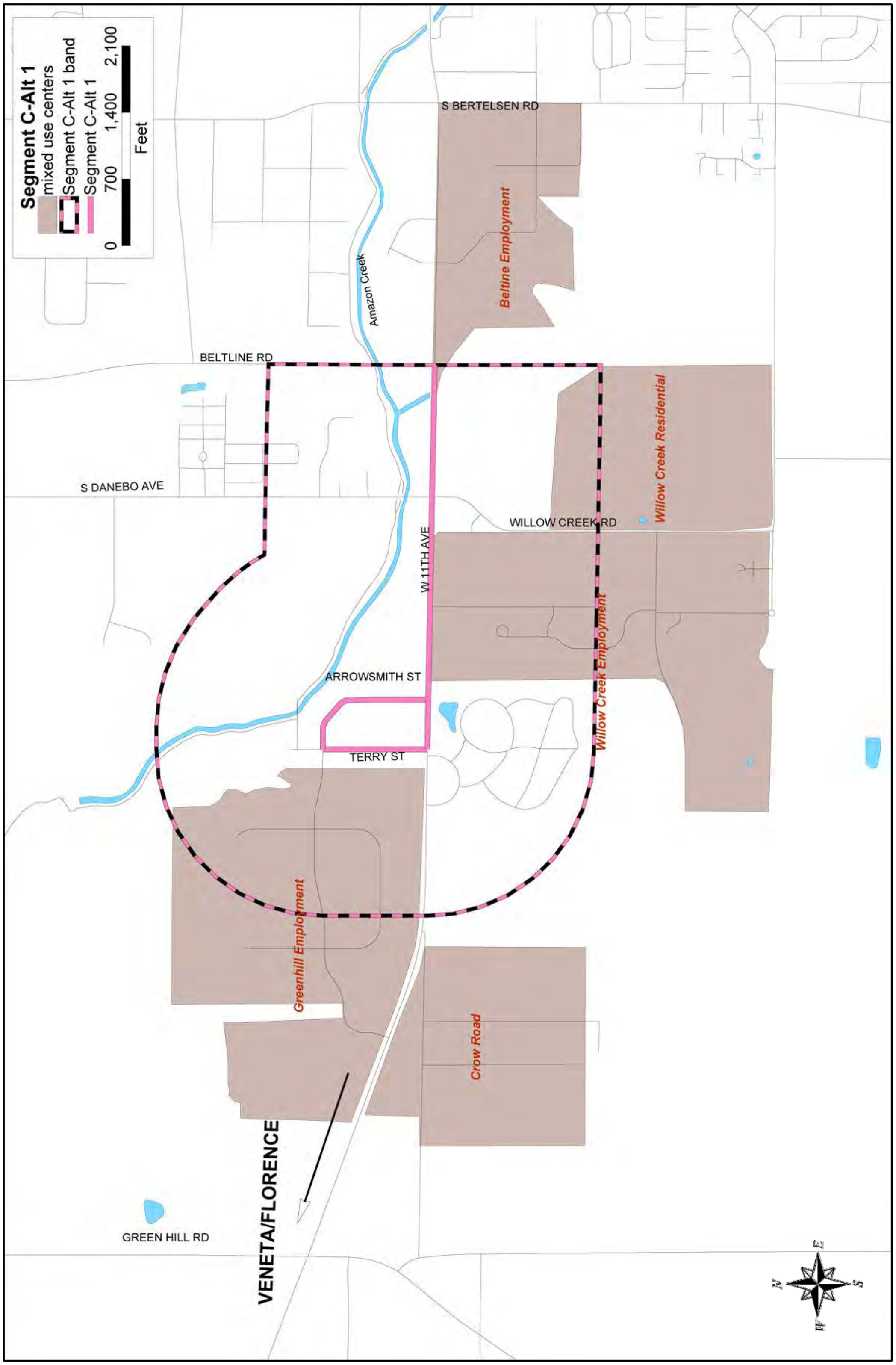
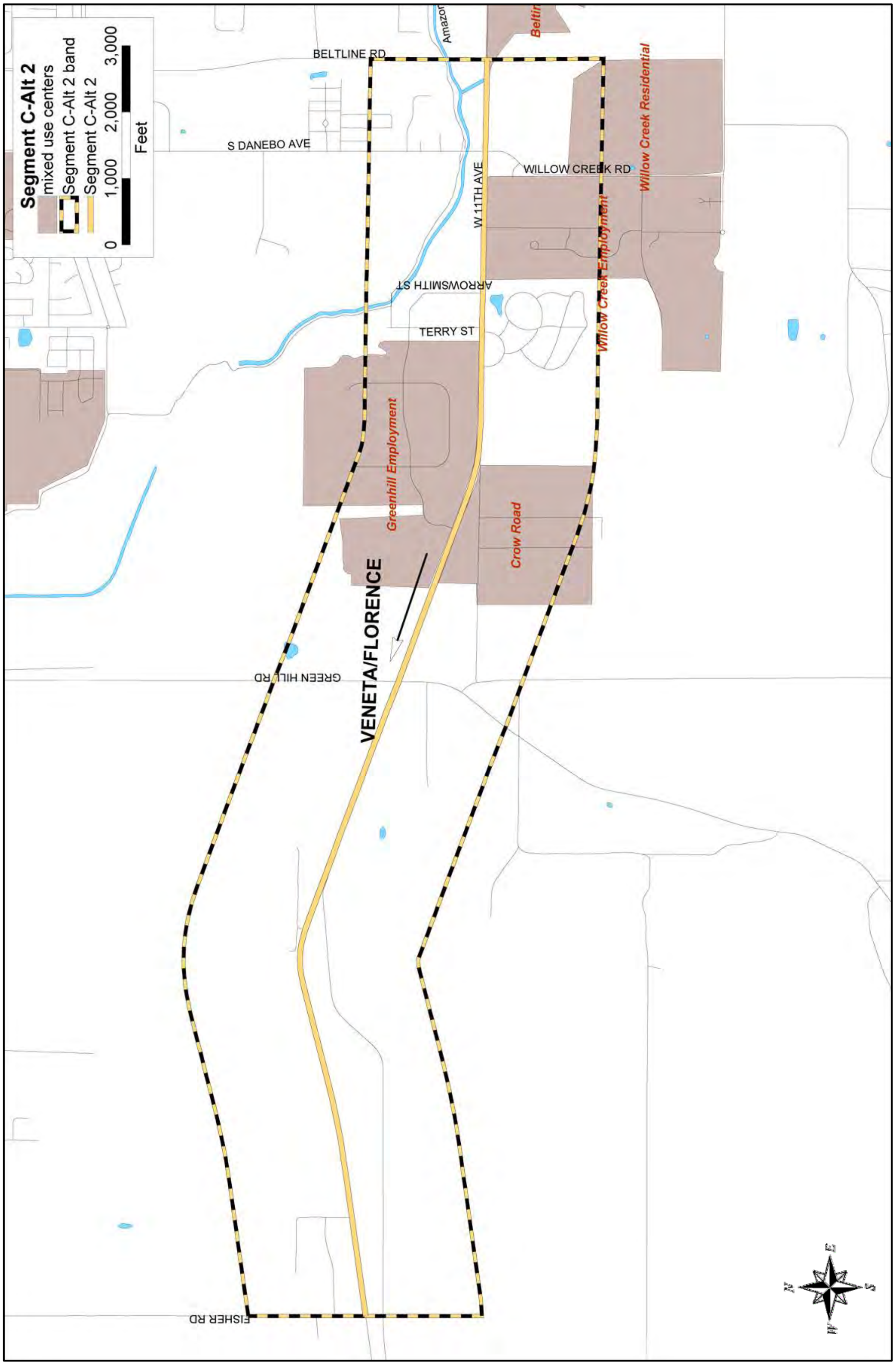


Figure 5.4-10 Alternative SC-A2: Mixed Use Centers within 1/3 Mile



5.4.2.3 Findings: Planned Transit-Oriented Development

This criterion is based on the project's objective to serve as a catalyst for planned transit-oriented development and support development that is consistent with adopted land use plans. For the purposes of this screening evaluation, serving as a catalyst for and / or supporting development was measured by evaluating the percentage of mixed-used centers potentially served by the alternative. Serving greater percentages of a mixed use center as well as a greater number of mixed use centers was considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

Segment A: Eugene Station to Garfield Street

- Of the five mixed use centers in Segment A, the Downtown Mixed Use Center would receive a high level of service from all four alignment alternatives and the Chambers Mixed Use Center would receive a high level of service from three of the four alignment alternatives (Table 5.4-6).
- Segment A, Alternative 1 (13th Avenue) has the potential to provide a high level of service to 3 of the mixed use centers (Downtown, Chambers, and Westmoreland), a moderate level of service to Midtown Mixed Use Center and low to no level of service to the Whiteaker Mixed Use Center.
- Segment A, Alternative 2 (6th / 7th Avenues) has the potential to provide a high level of service to 3 of the 5 mixed use centers (Downtown, Whiteaker, and Chambers), while having the potential to provide low to no level of service to the Midtown and Westmoreland Mixed Use Centers.
- Segment A, Alternative 3 (Amazon Channel) has the potential to provide a high level of service to two of the five mixed use centers (Downtown and Westmoreland), a moderate level of service to the Midtown Mixed Use Center, and to provide low to no level of support to the Whiteaker and Chambers Mixed Use Centers.
- Segment A, Alternative 4 (11th Avenue) has the potential to provide a high level of service to two of the five mixed use centers (Downtown and Chambers), a moderate level of service to the Westmoreland Mixed Use Center, and to provide low to no level of support to the Midtown and Whiteaker Mixed Use Centers.

Table 5.4-6 Summary Segment A Level of Potential Service to Mixed Use Centers

Segment / Alternative	Mixed Use Centers												
	Segment A					Segment B				Segment C			
	Downtown	Midtown	Whiteaker	Chambers	Westmoreland	City View	Bailey Hill	Churchill	Beltline Employment	Willow Creek Residential	Willow Creek Employment	Greenhill Employment	Crow Road
SA-A1	●	⊙	○	●	●	○	○	○	○	○	○	○	○
SA-A2	●	○	●	●	○	○	○	○	○	○	○	○	○
SA-A3	●	⊙	○	○	●	○	○	○	○	○	○	○	○
SA-A4	●	○	○	●	⊙	○	○	○	○	○	○	○	○

Notes:
● = High potential to serve mixed use center
⊙ = Moderate potential to serve mixed use center
○ = Low potential to serve mixed center

Segment B: Garfield Street to Beltline Road

- Of the four mixed use centers in Segment B, the Bailey Hill and Beltline Employment Mixed Use Centers would receive the highest level of service from all four alignments, while the City View Mixed Use Center would receive varying levels of service from each of the alternatives and the Churchill Mixed Use Center would receive low to no service from all four alignments (Table 5.4-7).
- Segment B, Alternative 1 (7th Place / Stewart Road) has the potential to provide a high level of service to two of the centers (Bailey Hill and Beltline Employment) and a low level of service to the remaining two centers (City View and Churchill).
- Segment B, Alternatives 2 (10th Avenue / Seneca Road) and 4 (11th Avenue) both have the potential to provide a high level of service to two of the four mixed use centers (Bailey Hill and Beltline Employment), a moderate level of service to the City View Mixed Use Center, and to provide low to no level of service to the Churchill Mixed Use Center.
- Segment B, Alternative 3 has the potential to provide a high level of service to three of the four mixed use centers (City View, Bailey Hill and Beltline Employment) and low to no level of service to the Churchill Mixed Use Center.

Table 5.4-7 Summary Segment B Level of Potential Service to Mixed Use Centers

Segment / Alternative	Mixed Use Centers												
	Segment A					Segment B				Segment C			
	Downtown	Midtown	Whiteaker	Chambers	Westmoreland	City View	Bailey Hill	Churchill	Beltline Employment	Willow Creek Residential	Willow Creek Employment	Greenhill Employment	Crow Road
SB-A1	○	○	○	○	○	○	●	○	●	○	○	○	○
SB-A2	○	○	○	○	○	◎	●	○	●	○	○	○	○
SB-A3	○	○	○	○	○	●	●	○	●	○	○	○	○
SB-A4	○	○	○	○	○	◎	●	○	●	○	○	○	○

Notes:
● = High potential to serve mixed use center
◎ = Moderate potential to serve mixed use center
○ = Low potential to serve mixed center

Segment C: Beltline Road to West Terminus

- Of the four mixed use centers in Segment C, the Willow Creek Employment and Greenhill Employment Mixed Use Centers have the potential to receive relatively higher levels of service than the Willow Creek Residential and Crow Road Mixed Use Centers (Table 5.4-8).
- Segment C, Alternative 1 (11th Avenue / Terry Street Loop) has the potential to provide a moderate level of service to two of the mixed use centers (Willow Creek Employment and Greenhill Employment) and low to no level of service to the remaining two mixed use centers (Willow Creek Residential and Crow Road).
- Segment C, Alternative 2 (11th Avenue / Fisher Road / Veneta) has the potential to provide a high level of service to two of the four mixed use centers (Greenhill Employment and Crow Road), a moderate level of service to the Willow Creek Employment Mixed Use Center, and to provide low to no level of service to the Willow Creek Residential Mixed Use Center.

Table 5.4-8 Summary Segment C Level of Potential Service to Mixed Use Centers

Segment / Alternative	Mixed Use Centers												
	Segment A					Segment B				Segment C			
	Downtown	Midtown	Whiteaker	Chambers	Westmoreland	City View	Bailey Hill	Churchill	Beltline Employment	Willow Creek Residential	Willow Creek Employment	Greenhill Employment	Crow Road
SC-A1	○	○	○	○	○	○	○	○	○	○	◉	◉	○
SC-A2	○	○	○	○	○	○	○	○	○	○	◉	●	●

Notes:
● = High potential to serve mixed use center
◉ = Moderate potential to serve mixed use center
○ = Low potential to serve mixed center

5.5 *Help Accommodate Future Growth in Travel*

This criterion is based on the project's objective to help accommodate future growth in travel by increasing public transportation's share of trips. Measuring the amount of population employment density served by alternatives was used to determine if alternatives had the potential to increase public transportation's share of trips.

5.5.1 Population and Employment Density

This criterion is an indicator of potential ridership. Higher population and employment densities generally have higher levels of transit ridership.

5.5.1.1 Rationale / Methods

The total area (in acres) within 1/3 mile of each alignment alternative was calculated using GIS.

The total population within 1/3 mile of each alignment alternative was calculated using GIS. Population was based on 2000 U.S. Census block data. The 'population density' was calculated by dividing the total number of people by the total number of acres within the 1/3 mile buffer area.

Total employment within 1/3 mile of each alignment alternative was also calculated using GIS. Employment was based on 2004 employment data from LCOG. The 'employment density' was calculated by dividing the total number of employees by the total number of acres within the 1/3 mile buffer area.

Higher population and employment densities within the 1/3 mile buffer area are indicators of potentially high levels of transit ridership.

5.5.1.2 Data Tables and Figures

Table 5.5-1 Population and Employment Density within 1/3 mile of BRT Alignment

Segment / Alternative	1/3-Mile Buffer Area (sq ft)	1/3-Mile Buffer Area (acres)	2000 U.S. Census Block Population	Population Density (People / Ac)	Employment	Employment Density (Employees / Ac)
SA-A1	35,317,056	811	7,813	9.64	11,668	14.39
SA-A2	35,661,452	819	8,133	9.93	17,219	21.03
SA-A3	38,177,412	876	8,159	9.31	11,395	13.00
SA-A4	31,074,728	713	7,058	9.89	11,235	15.75
SB-A1	48,706,840	1,118	92	0.08	7,344	6.57
SB-A2	47,190,588	1,083	3,735	3.45	7,323	6.76
SB-A3	46,637,700	1,071	5,796	5.41	6,192	5.78
SB-A4	45,600,516	1,047	4,616	4.41	6,824	6.52
SC-A1	22,320,766	512	104	0.20	1,042	2.03
SC-A2	170,858,256	3,922	1933	0.49	1,591	0.41

Notes: Data created by LTD from Lane Council of Governments' 2000 U.S. Census data and 2004 Employment data

5.5.1.3 Findings: Accommodate Future Growth in Travel

This criterion is based on the project's objective to help accommodate future growth in travel by increasing public transportation's share of trips. Measuring the amount of population employment density served by alternatives was used to determine if alternatives had the potential to increase public transportation's share of trips. Serving areas with higher population and / or employment densities was considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

Segment A: Eugene Station to Garfield Street

- In Segment A, all four alignment alternatives have the potential serve areas with higher population densities.
- In Segment A, Alternatives 2 (6th / 7th Avenues) and 4 (11th Avenue) have the potential to serve areas with higher employment densities, while Alternatives 1 (13th Avenue) and 3 (Amazon Channel) have the potential to serve areas with moderate employment densities

Table 5.5-2 Summary Segment A Potential Population and Employment Density Served by BRT Alignment

Segment / Alternative	Population Density (People / Ac)	Population Density (People / Ac)	Employment Density (Employees / Ac)	Employment Density (Employees / Ac)
SA-A1	9.64	●	14.39	◯
SA-A2	9.93	●	21.03	●
SA-A3	9.31	●	13.00	◯
SA-A4	9.89	●	15.75	●

Notes:
● = Potential to serve areas with higher population density or higher employment density
◯ = Potential to serve areas with moderate population density or moderate employment density
○ = Potential to serve areas with low population density or low employment density

Segment B: Garfield Street to Beltline Road

- In Segment B, Alternatives 3 (Amazon Channel) and 4 (11th Avenue) have the potential to serve areas with a higher population density, Alternative 2 (10th Avenue / Seneca Road) has the potential to serve an area with a moderate population density, and Alternative 1 (7th Place / Stewart Road) has the potential to serve an area with a low population density.
- In Segment B, Alternatives 1 (7th Place / Stewart Road), 2 (10th Avenue / Seneca Road) and 4 (11th Avenue) have the potential serve areas with higher employment densities, while Alternative 3 (Amazon Channel) has the potential to serve an area with a moderate employment density.

Table 5.5-3 Summary Segment B Potential Population and Employment Density Served by BRT Alignment

Segment / Alternative	Population Density (People / Ac)	Population Density (People / Ac)	Employment Density (Employees / Ac)	Employment Density (Employees / Ac)
SB-A1	0.08	○	6.57	●
SB-A2	3.45	◯	6.76	●
SB-A3	5.41	●	5.78	◯
SB-A4	4.41	●	6.52	●

Notes:
● = Potential to serve areas with higher population density or higher employment density
◯ = Potential to serve areas with moderate population density or moderate employment density
○ = Potential to serve areas with low population density or low employment density

Segment C: Beltline Road to West Terminus

- In Segment C, both Alternatives 1 (11th Avenue / Terry Street Loop) and 2 (11th Avenue / Veneta) have the potential serve areas with a low population density
- In Segment C, Alternative 1 (11th Avenue / Terry Street Loop) has the potential serve an area with a higher employment density, while Alternative 2 (11th Avenue / Veneta) has the potential to serve an area with a low employment density.

Table 5.5-4 Summary Segment C Potential Population and Employment Density Served by BRT Alignment

Segment / Alternative	Population Density (People / Ac)	Population Density (People / Ac)	Employment Density (Employees / Ac)	Employment Density (Employees / Ac)
SC-A1	0.20	○	2.03	●
SC-A2	0..49	○	0.41	○

Notes:
● = Potential to serve areas with higher population density or higher employment density
○ = Potential to serve areas with moderate population density or moderate employment density
○ = Potential to serve areas with low population density or low employment density

5.6 *Mobility and Safety Needs of Pedestrians, Bicyclists and Motorists*

This criterion is based on the project's objective to take into account the travel and safety needs of pedestrians, bicyclists, and motorists. Pedestrian, bicycle and roadway (motor vehicle facilities) were evaluated to determine if alternatives had the potential to cause conflicts with any of the facilities.

5.6.1 Interface with Pedestrian, Bicycle and Vehicle Facilities

This criterion measures whether EmX will create potential conflicts with other users, in particular the non-motorized modes.

5.6.1.1 Rationale / Methods

- Review existing facilities along the proposed alignments, what type of bike facilities existed.
- Pedestrian facilities (sidewalk or pathway) exist along the majority of the alignment alternatives.
- The EmX may cause some pedestrian facilities to be relocated, but will not remove any pedestrian facilities.
- Some pedestrian crossings may be longer in cases where to the EmX has widened the roadway and/ or right-of-way.
- Dedicated bicycle facilities exist on a small portion of the alignment alternatives
- The potential for conflicts between bicycles and EmX will exist. The degree of conflict will depend upon several factors including existence of dedicated bicycle lanes, type of intersection control and intersection geometry.
- The EmX will not reduce the number of motor vehicle travel lanes for any of the alignment alternatives.
- The type of traffic signal phasing and potential use of priority measures for EmX will affect the impact EmX will have on motor vehicle safety and mobility.

5.6.1.2 Data Tables

Table 5.6-1 Segment A: Pedestrian and Bicycle Facilities, Traffic Volumes

Segment / Alternative	Pedestrian Facility	Dedicated Bike Facility	Traffic Volume
SA-A1	Yes	None	W. 11th - 11,000 to 15,000 ADT
			W. 13th - 7,000 to 15,000 ADT
SA-A2	Yes	None	W. 6th - 19,000 to 28,000 ADT
			W. 7th - 19,000 to 28,000 ADT
			Garfield - 12,000 ADT
SA-A3	Yes	Generally Yes	W. 11th - 11,000 to 15,000 ADT
			W. 13th - 7,000 to 15,000 ADT
			Amazon Creek – Zero
SA-A4	Yes	None	W. 11th - 11,000 to 15,000 ADT

Table 5.6-2 Segment B: Pedestrian and Bicycle Facilities, Traffic Volumes

Segment / Alternative	Pedestrian Facility	Dedicated Bike Facility	Traffic Volume
SB-A1	Yes	None	W. 11th - 23,000 ADT
SB-A2	Yes	None	W. 11th - 23,000 ADT
SB-A3	Yes	Generally Yes	W. 11th - 23,000 ADT
			Amazon Creek – Zero
SB-A4	Yes	None	W. 11th - 23,000 ADT

Table 5.6-3 Segment C: Pedestrian and Bicycle Facilities, Traffic Volumes

Segment / Alternative	Pedestrian Facility	Dedicated Bike Facility	Traffic Volume
SC-A1	Yes	None	W. 11th - 20,000 ADT
SC-A2	Generally No	None	W. 11th - 14,000 to 20,000 ADT

5.6.1.3 Findings: Travel and Safety Needs

This criterion is based on the project's objective to take into account the travel and safety needs of pedestrians, bicyclists, and motorists. For the purposes of this screening evaluation, travel and safety needs of pedestrians, bicyclists and motorists was qualitatively assessed by reviewing the various types of facilities to determine if alternatives had the potential to cause conflicts with any of the facilities. The potential to cause less conflict was considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

- There is a low potential for impact to pedestrian facilities with any of the alternatives in any of the segments.
- There is a moderate potential for impact to bicycle facilities for all alternatives in all segments due to conflicts that can exist between EmX and bicycles.

- There is a moderate potential for impact to motor vehicle safety and mobility for all alternatives as traffic signal phasing modifications will result.

Table 5.6-4 Summary Segment A: Adverse Impacts to Mobility and Safety Needs of Pedestrians, Bicyclists and Motorists

Segment / Alternative	Pedestrians	Bicyclists	Motorists
SA-A1	●	⭘	⭘
SA-A2	●	⭘	⭘
SA-A3	●	⭘	⭘
SA-A4	●	⭘	⭘

Notes: ● = Low potential for impact; ⭘ = Moderate potential for impact; ○ = High potential for impact

Table 5.6-5 Summary Segment B: Adverse Impacts to Mobility and Safety Needs of Pedestrians, Bicyclists and Motorists

Segment / Alternative	Pedestrians	Bicyclists	Motorists
SB-A1	●	⭘	⭘
SB-A2	●	⭘	⭘
SB-A3	●	⭘	⭘
SB-A4	●	⭘	⭘

Notes: ● = Low potential for impact; ⭘ = Moderate potential for impact; ○ = High potential for impact

Table 5.6-6 Summary Segment C: Adverse Impacts to Mobility and Safety Needs of Pedestrians, Bicyclists and Motorists

Segment / Alternative	Pedestrians	Bicyclists	Motorists
SC-A1	●	⭘	⭘
SC-A2	●	⭘	⭘

Notes: ● = Low potential for impact; ⭘ = Moderate potential for impact; ○ = High potential for impact

5.7 Provide for a Fiscally Stable Public Transportation System.

This criterion is based on the project's objective to contribute to establishing a fiscally stable public transportation system. Order of magnitude capital cost estimates were calculated based on the length of alternatives and the likely number of stations to be needed for the alternatives. This measure was used to determine if alternatives had the potential to contribute to a fiscally stable public transportation system.

5.7.1 General Assessment of Alternatives Effect on the Fiscal Stability

This section provides a general assessment of the effect that the alignment alternatives would have on the fiscal stability of LTD, focusing on the potential capital cost of the project as an affordability measure.

5.7.1.1 Rationale / Methods

The Pioneer Parkway 60 percent construction estimate, dated August 16, 2006, was used as the cost basis for the dollars per mile for constructing the BRT alignment ($1,800,000 per mile). The Pioneer Parkway 60 percent construction estimate, dated August 16, 2006, was used as the cost basis for the unit cost for constructing a BRT station ($432,000).

Construction costs were estimated for a two-way fixed facility and the option of operating the EmX in 50 percent mixed traffic. Cost estimates for operating in mixed traffic were assumed to be one half the construction estimate for a two-way fixed facility.

The order of magnitude estimate (OME) is equal to the sum of (cost per mile x length of the segment alternative) + (unit cost per station x number of stations per segment alternative).

The construction estimates do not include support facilities, site work and special conditions, systems, right-of-way, land, existing improvements, vehicles, professional services or contingencies.

5.7.1.2 Data Tables

Table 5.7-1 Segment A Order of Magnitude Estimated Range of Costs

Segment / Alternative	Length (miles)	Estimated Length		Estimated Construction Cost		Estimated Station Cost		Order of Magnitude Estimate	
		Transitway Lane (miles)	50% Mixed Traffic (miles)	Estimated Cost 2-way Fixed Facility (000)[1]	Estimated Cost 50% Mixed Traffic (000)	Stations	Station Cost (000)[2]	2-way Fixed Facility (000)[3]	50% Mixed Traffic (000)***
SA-A1	3.6	3.6	1.8	$3,240.00	$1,620.00	9	$3,888.00	$7,128.00	$5,508.00
SA-A2	4.1	4.1	2.1	$3,690.00	$1,845.00	10	$4,320.00	$8,010.00	$6,165.00
SA-A3	3.8	3.8	1.9	$3,420.00	$1,710.00	9	$3,888.00	$7,308.00	$5,598.00
SA-A4	2.9	2.9	1.5	$2,610.00	$1,305.00	7	$3,024.00	$5,634.00	$4,329.00

1 Cost Basis ($/Mile) = $900,000.00 (per Pioneer Parkway 60% construction estimate date 8/16/2006)
2 Station Cost Basis ($/Station) = $432,000 (per Pioneer Parkway 60% construction estimate date 8/16/2006)
3 Order of Magnitude Estimate (OME) = stations + cost per mile
Estimates do not include: Support Facilities, Site work and Special Conditions, Systems, Right-of-way, Land, Existing Improvements, Vehicles, Professional Services or Contingencies

Table 5.7-2 Segment B Order of Magnitude Estimated Range of Costs

Segment / Alternative	Length (miles)	Estimated Length		Estimated Construction Cost		Estimated Station Cost		Order of Magnitude Estimate	
		Transitway Lane (miles)	50% Mixed Traffic (miles)	Estimated Cost 2-way Fixed Facility (000)[1]	Estimated Cost 50% Mixed Traffic (000)	Stations	Station Cost (000)[2]	2-way Fixed Facility (000)[3]	50% Mixed Traffic (000)[3]
SB-A1	5.5	5.5	2.75	$4,950.00	$2,475.00	13	$5,616.00	$10,566.00	$8,091.00
SB-A2	5.4	5.4	2.7	$4,860.00	$2,430.00	13	$5,616.00	$10,476.00	$8,046.00
SB-A3	5.1	5.1	2.55	$4,590.00	$2,295.00	12	$5,184.00	$9,774.00	$7,479.00
SB-A4	5	5	2.5	$4,500.00	$2,250.00	12	$5,184.00	$9,684.00	$7,434.00

1 Cost Basis ($/Mile) = $900,000.00 (per Pioneer Parkway 60% construction estimate date 8/16/2006)
2 Station Cost Basis ($/Station) = $432,000 (per Pioneer Parkway 60% construction estimate date 8/16/2006)
3 Order of Magnitude Estimate (OME) = stations + cost per mile
Estimates do not include: Support Facilities, Site work and Special Conditions, Systems, Right-of-way, Land, Existing Improvements, Vehicles, Professional Services or Contingencies

Table 5.7-3 Segment C Order of Magnitude Estimated Range of Costs

Segment / Alternative	Length (miles)	Estimated Length		Estimated Construction Cost		Estimated Station Cost		Order of Magnitude Estimate	
		Transitway Lane (miles)	50% Mixed Traffic (miles)	Estimated Cost 2-way Fixed Facility (000)[1]	Estimated Cost 50% Mixed Traffic (000)	Stations	Station Cost (000)[2]	2-way Fixed Facility (000)[3]	50% Mixed Traffic (000)[3]
SC-A1	1.9	1.9	0.95	$1,710.00	$855.00	5	$2,160.00	$3,870.00	$3,015.00
SC-A2	18.2	18.2	9.1	$16,380.00	$8,190.00	16	$6,912.00	$23,292.00	$15,102.00

1 Cost Basis ($/Mile) = $900,000.00 (per Pioneer Parkway 60% construction estimate date 8/16/2006)
2 Station Cost Basis ($/Station) = $432,000 (per Pioneer Parkway 60% construction estimate date 8/16/2006)
3 Order of Magnitude Estimate (OME) = stations + cost per mile
Estimates do not include: Support Facilities, Site work and Special Conditions, Systems, Right-of-way, Land, Existing Improvements, Vehicles, Professional Services or Contingencies

5.7.1.3 Findings: Establishing a Fiscally Stable Public Transportation System

This criterion is based on the project's objective to contribute to establishing a fiscally stable public transportation system. For the purposes of this screening evaluation, contributing to a fiscally stable public transportation system was measured by evaluating the potential capital costs of constructing the various alternatives. Lower costs were considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

In Segment A, Alternative 4 (11th Avenue) is potentially the relatively lower cost alternative, while Alternative 2 (6th / 7th Avenues) is potentially the relative higher cost alternative. Alternatives 1 (13th Avenue) and 3 (Amazon Channel) are the mid-range cost alternatives.

Table 5.7-4 Summary Segment A Order of Magnitude Estimated Range of Costs

Segment / Alternative	Order of Magnitude Estimate	
	Transitway	50% Mixed Traffic
SA-A1	◘	◘
SA-A2	○	○
SA-A3	◘	◘
SA-A4	●	●

Notes: ● = Potential lower cost alternative; ◘ = Potential moderate cost alternative; ○ = Potential higher cost alternative

- In Segment B, Alternative 4 (11th Avenue) is potentially the relatively lower cost alternative for the 2-way Fixed Facility and moderate cost alternative for the 50% mixed traffic option.
- In Segment B, Alternatives 3 (Amazon Channel) is close to Alternative 4 in cost, while Alternative 2 is potentially the moderate cost alternative.
- In Segment B, Alternative 1 (7th Place / Stewart Road) is the relatively higher cost alternative.

Table 5.7-5 Summary Segment B Order of Magnitude Estimated Range of Costs

Segment / Alternative	Order of Magnitude Estimate	
	2-way Fixed Facility	50% Mixed Traffic
SB-A1	○	○
SB-A2	◘	◘
SB-A3	◘	◘
SB-A4	●	●

Notes: ● = Potential lower cost alternative; ◘ = Potential moderate cost alternative; ○ = Potential higher cost alternative

- In Segment C, Alternative 1 (11th Avenue / Terry Street Loop) is the relatively lower cost alternative while Alternative 2 (11th Avenue / Veneta) is the relatively higher cost alternative. Alternative 1 only travels over distance of 1.9 miles while Alternative 2 reaches 18.2 miles west to Veneta.

Table 5.7-6 Summary Segment C Order of Magnitude Estimated Range of Costs

Segment / Alternative	Order of Magnitude Estimate	
	2-way Fixed Facility	50% Mixed Traffic
SC-A1	●	●
SC-A2	○	○

Notes: ● = Potential lower cost alternative; ◘ = Potential moderate cost alternative; ○ = Potential higher cost alternative

5.8 Design the Project to Protect Environmental Resources

This criterion is based on the project's objective to design the project in a way that is consistent with laws related to resources in the natural and built environment. Six measures were used to determine if alternatives had the potential to impact built or natural resources: potential residential or business displacements and potential impacts or effects on historic trees, historic resources, parks and open spaces, wetlands, and critical habitat.

5.8.1 Potential for Displacements

This criterion measures the potential for each of the alternatives to displace residences and businesses.

5.8.1.1 Rationale / Methods

Width of the two-lane and single lane fixed facilities as well as the location of required right-of-way are described in Section 5.1 of this report.

Potential displacements were determined through aerial photo reconnaissance and no field investigations were conducted. The additional width for the alternative alignments was measured from the back of the sidewalk. Where there is no sidewalk, the width was measured from the edge of the roadway.

For the purposes of this coarse level screening evaluation, if an alignment potentially crossed through any part of a structure or butted up against a structure, then it was counted as a potential displacement.

For SA-A1 and SA-A3, it was assumed that Jefferson Street and the streets to the east would not require additional right-of-way and only on-street parking would be removed. For SA-A2, it was assumed no additional right-of-way would be required along Charnelton Street, Olive Street, and 10th Avenue. SA-A4 is also assumed to fit within the existing right-of-way for the entire alternative with on-street parking and the planting strip removed. No residential or business displacements are identified in these areas.

SA-A3 and SB-A3 utilize portions of the area adjacent to the Amazon Channel where there is not an existing vehicular roadway. For these alternatives a right-of-way was delineated on the north side of the channel to determine potential displacements. SB-A2 passes through portions of land that do not have an existing roadway. A right-of-way was also delineated in this area and to identify potential displacements.

Structures were identified on aerial photos and categorization by use was determined by zoning classification from the tax lot parcel data.

5.8.1.2 Data Tables and Figures

Table 5.8-1 Potential Displacements of Businesses, Residences and Public Facilities

	Commercial Zone		Industrial Zone		Residential Zone		Government / Education Zone			
Segment / Alternative	Total Lots	Potential Displacements	Total Lots	Potential Displacements	Total Lots	Potential Displacements	Total Lots	Potential Displacements	Potential Displacements TOTAL	Area Counted
SA-A1	2	1	0	0	30	23	9	1	25	south side of 13th, east side of Garfield
SA-A2	327		20		0		6			both sides of alignment for entire alternative
6th Ave North Side		21		1		0		0	22	north side of 6th Ave
6th Ave South Side		25		0		0		0	25	south side of 6th Ave
7th Ave North Side		24		0		0		0	24	north side of 7th Ave
7th Ave South Side		30		0		0		0	30	south side of 7th Ave
Garfield West Side		1		2		0		0	3	west side of Garfield St
Garfield East Side		4		3		0		0	7	east side of Garfield St
SA-A3	0	0	0	0	15	13	6	1	14	north side of Amazon Channel segment
SA-A4	92	0	0	0	83	0	0	0	0	both sides of alignment for entire alternative
SB-A1	17		77		14		0			both sides of alignment for entire alternative
North Side		3		8		0		0	11	north side of alignment
South Side		0		16		8		0	24	south side of alignment
SB-A2	40	6	72	12	0	0	0	0	18	both sides of alignment for entire alternative
SB-A3	30	13	44	8	10	0	0	0	21	north side of Amazon Channel segment, both sides of street segments
SB-A4	74	13	59	2	0	0	0	0	15	both sides of alignment for entire alternative
SC-A1	3	0	28	2	3	0	0	0	2	both sides of alignment for entire alternative
SC-A2	8	0	19	1	16	0	0	0	1	both sides of alignment for entire alternative

Figure 5.8-1 Alternative SA-A1: Potential Displacements of Businesses, Residences and Public Facilities within 1/3 Mile

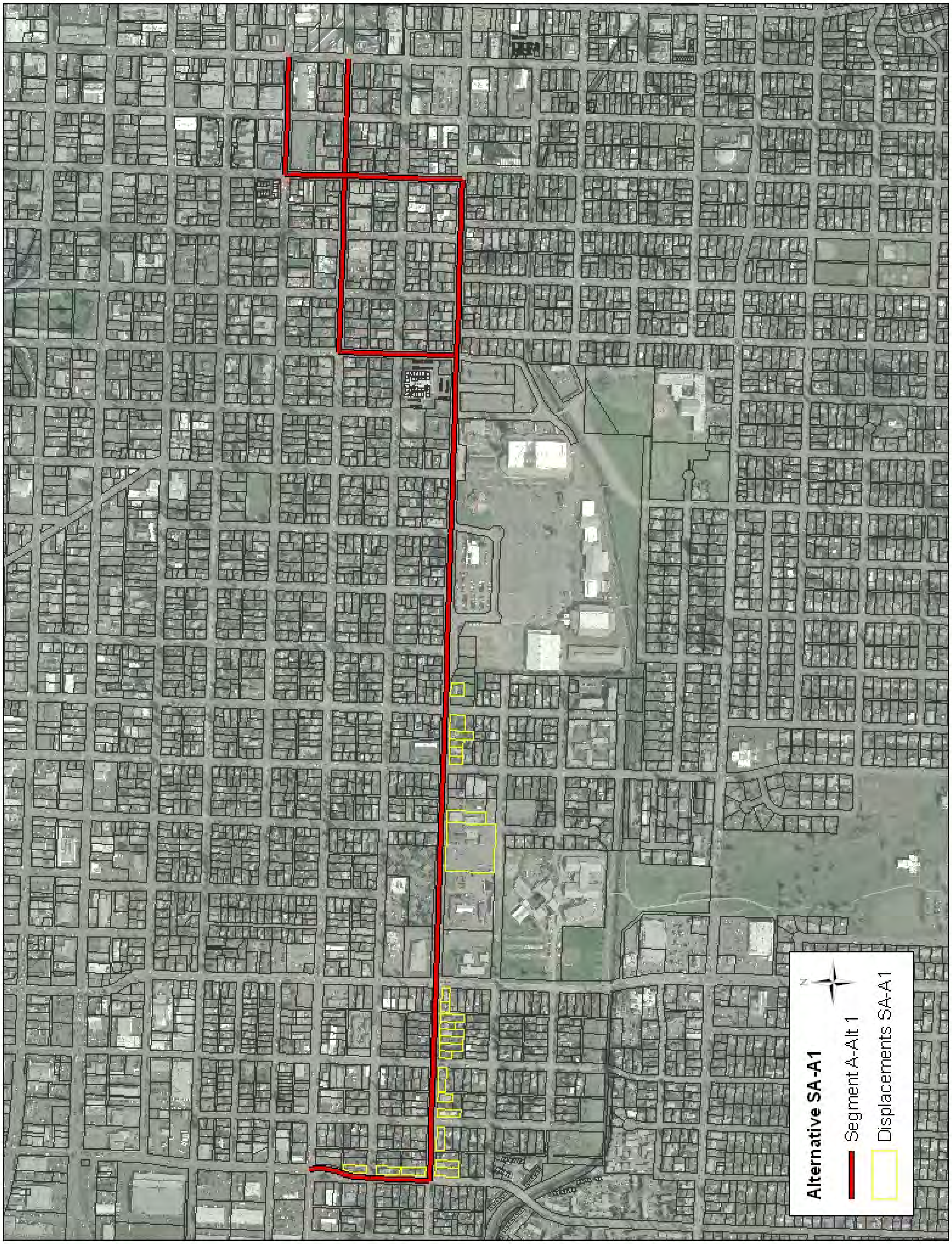


Figure 5.8-2 Alternative SA-A2: Potential Displacements of Businesses, Residences and Public Facilities within 1/3 Mile

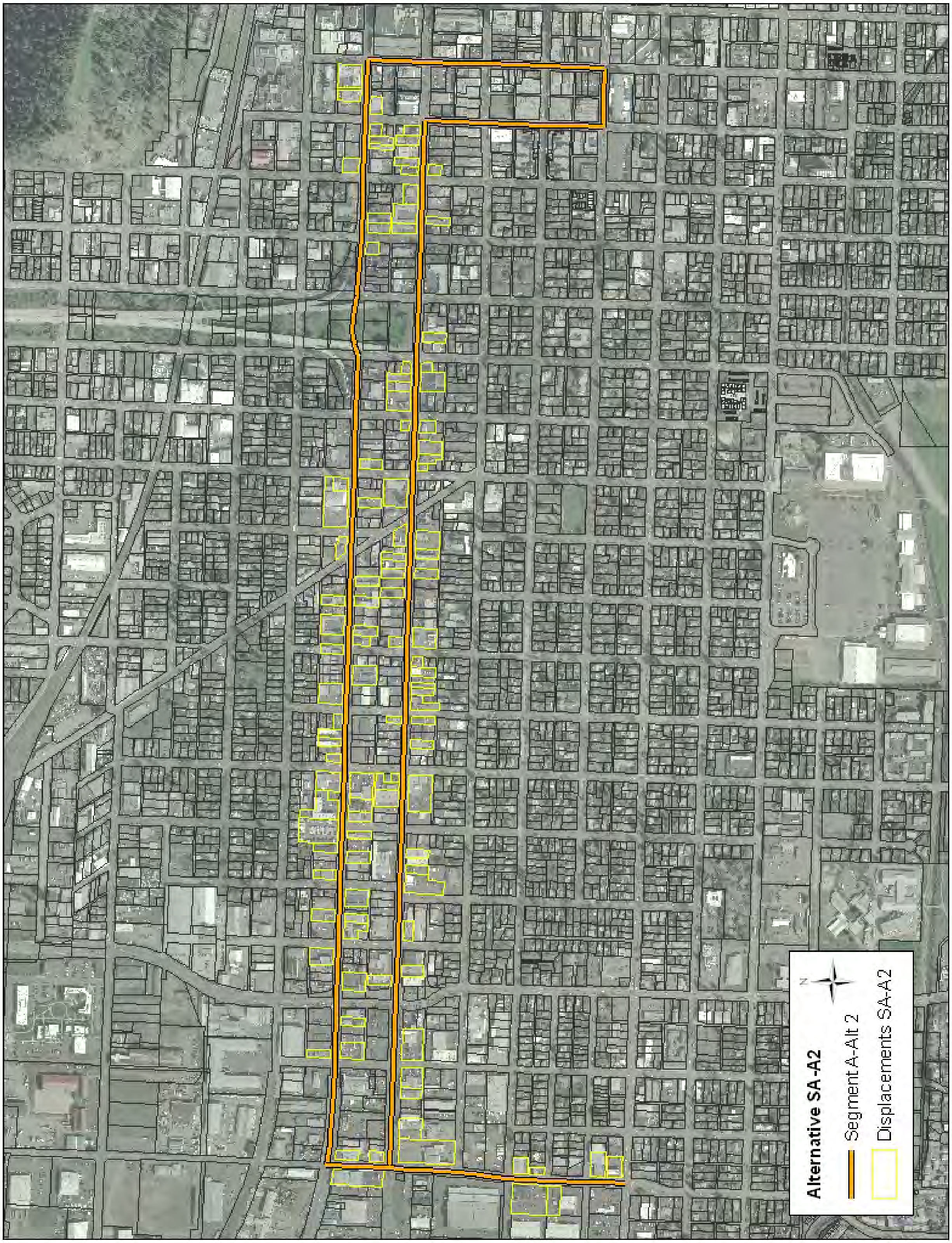


Figure 5.8-3 Alternative SA-A3: Potential Displacements of Businesses, Residences and Public Facilities within 1/3 Mile

Figure 5.8-4 Alternative SB-A1: Potential Displacements of Businesses, Residences and Public Facilities within 1/3 Mile

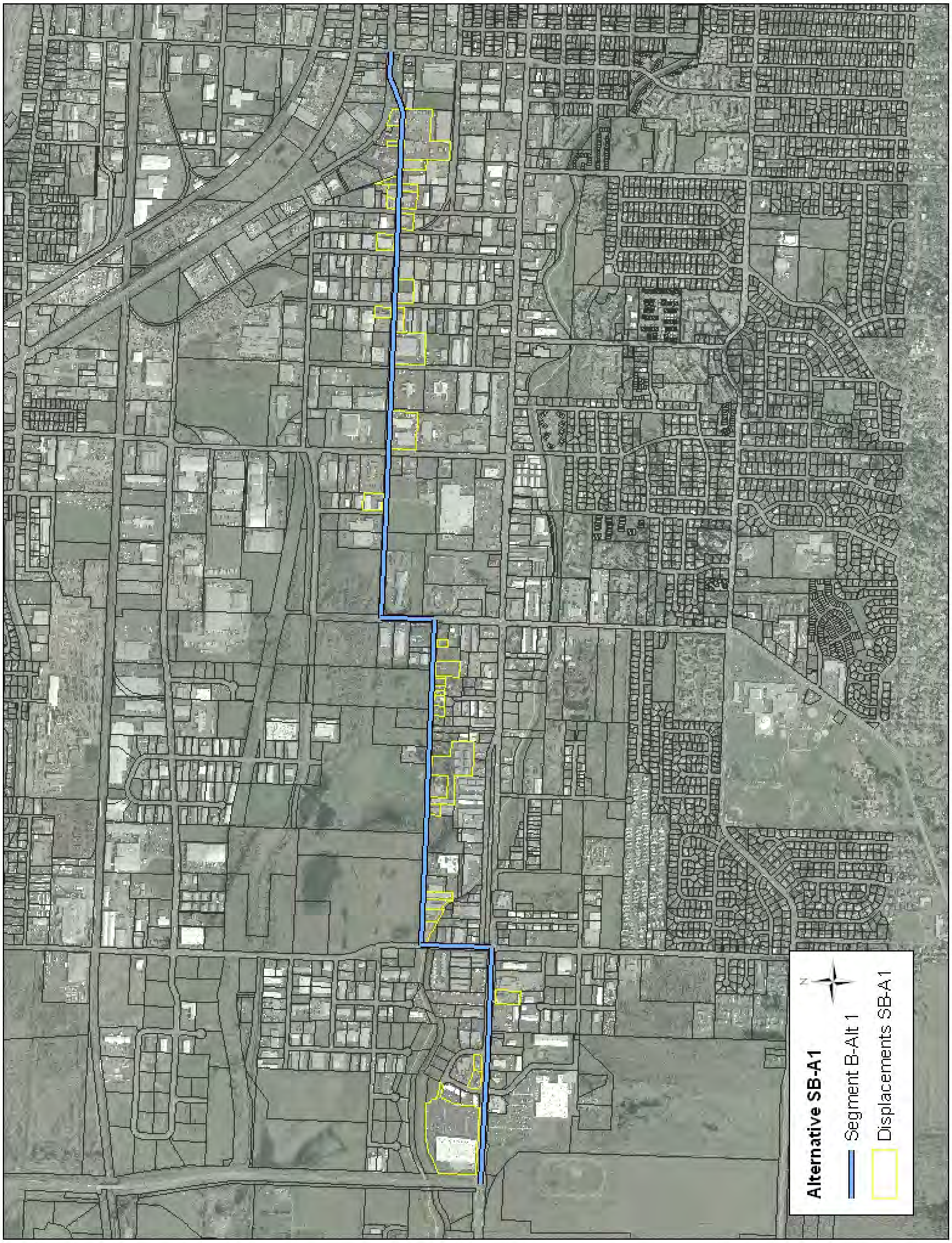


Figure 5.8-5 Alternative SB-A2: Potential Displacements of Businesses, Residences and Public Facilities within 1/3 Mile

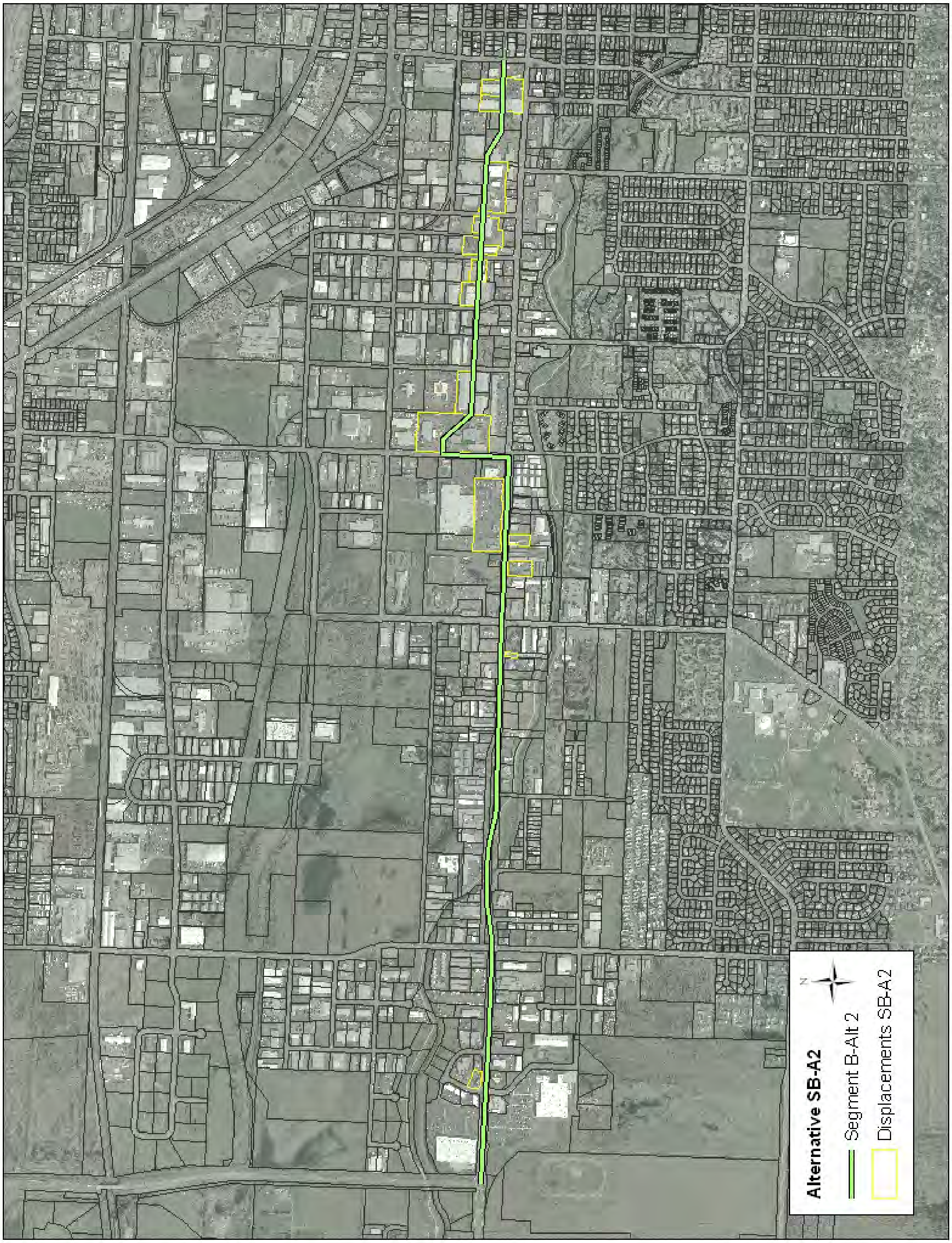


Figure 5.8-6 Alternative SB-A3: Potential Displacements of Businesses, Residences and Public Facilities within 1/3 Mile

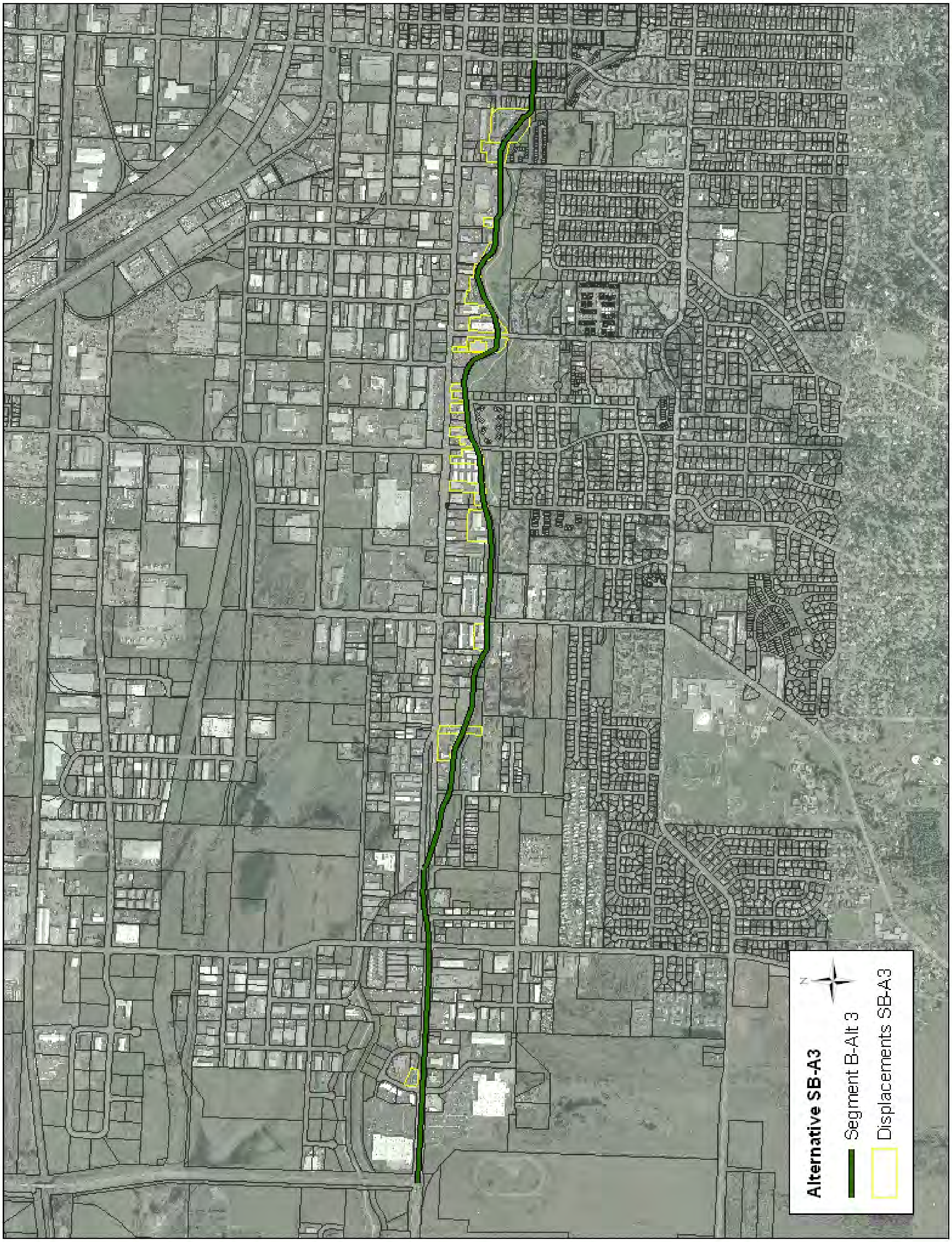
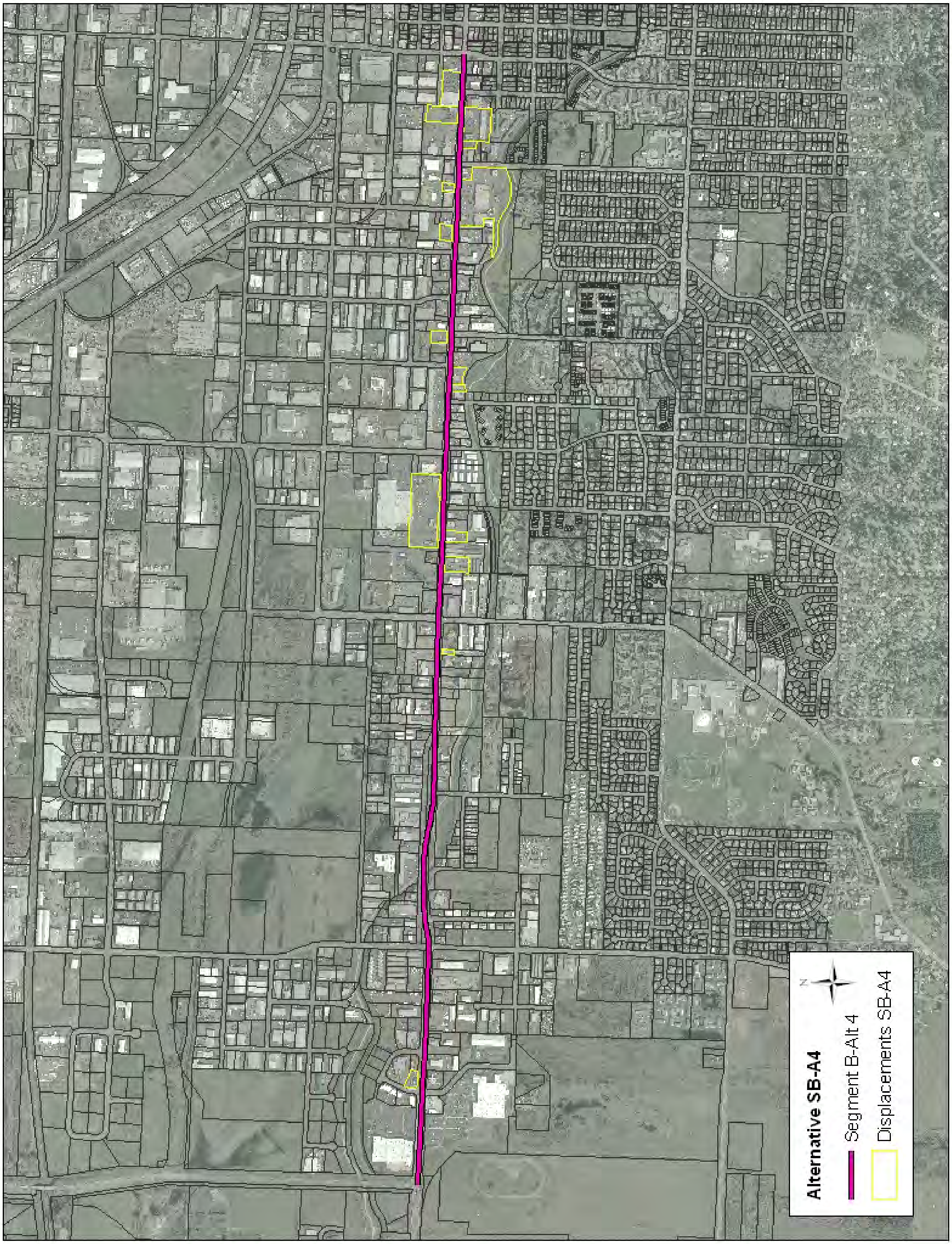


Figure 5.8-7 Alternative SB-A4: Potential Displacements of Businesses, Residences and Public Facilities within 1/3 Mile



5.8.1.3 Findings: Consistent with Laws Related to Resources in Natural and Build Environment

This criterion is based on the project's objective to design the project in a way that is consistent with laws related to resources in the natural and built environment. For the purposes of this screening evaluation, consistency with laws related to natural and built environment resources was measured by evaluating the potential of each alternative to displace residences and businesses. Fewer displacements were considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

Segment A: Eugene Station to Garfield Street

- In Segment A, Alternative 2 (6th/7th Avenue couplet) has the potential for a relatively higher number of displacements. If the alignment is widened to the side of the street with the least amount of potential displacements on 6th and 7th Avenues and Garfield Street, there is potential for 49 total displacements. The vast majority of these structures are on commercially zoned lots.
- In Segment A, Alternative 1 (13th Avenue) has the next highest number with a potential of 25 displacements. It was assumed that 13th Avenue would be widened to the south and Garfield Street to the east to accommodate the BRT alignment. Of the 25 potential displacements, 23 of the structures are zoned residential, mostly located on the south side of 13th Avenue.
- In Segment A, Alternative 3 (Amazon Channel) has the potential to displace 13 residences and one government / education use. The government/education use is a structure that may potentially be clipped by the alignment on the Lane County Fairgrounds.
- In Segment A, Alternative 4 (11th Avenue) is estimated to have no displacements. It is anticipated that the alignment can be accommodated by removing on-street parking and the planting strip.

Table 5.8-2 Summary Segment A Potential Displacements

	Commercial Zone	Industrial Zone	Residential Zone	Government / Education Zone		
Segment / Alternative	Potential Displacements	Potential Displacements	Potential Displacements	Potential Displacements	Potential Displacements TOTAL	Area Counted
SA-A1	●	●	○	●	**○**	south side of 13th, east side of Garfield
SA-A2						
SA-A2 Overall					○	
6th Ave North Side	○	●	●	●	**○**	north side of 6th Ave
6th Ave South Side	○	●	●	●	**○**	south side of 6th Ave
7th Ave North Side	○	●	●	●	**○**	north side of 7th Ave
7th Ave South Side	○	●	●	●	○	south side of 7th Ave
Garfield West Side	●	**○**	●	●	**○**	west side of Garfield St
Garfield East Side	○	**○**	●	●	○	east side of Garfield St
SA-A3	●	●	**○**	●	●	north side of Amazon Channel segment
SA-A4	●	●	●	●	●	both sides of alignment for entire alternative

Notes:
● = Potential lower number of displacements
○ = Potential moderate number of displacements
○ = Potential higher number of displacements

Segment B: Garfield Street to Beltline Road

- In Segment B, Alternative 1 (West 7th Place to Stewart Road to West 11th Avenue) has the potential to displace relatively fewer uses if widening occurs on the north side of the alignment (total 11) and Alternative 3 (Amazon Channel) has the potential to displace relatively more uses (total 21). Note if Alternative 1 was widened to the south side, there is potential for 24 displacements.
- In Segment B, Alternative 1 (West 7th Place to Stewart Road to West 11th Avenue) has the potential to displace three (3) commercial and eight (8) industrial uses on the north side and 16 industrial and 8 residential uses on the south side.
- In Segment B, Alternative 2 (10th Avenue / Seneca Road) has the potential to displace six (6) commercial uses and 12 industrial uses. A portion of this alternative from Garfield Street to Seneca Road passes through industrial land and does not follow an existing roadway. It was assumed a 24 foot wide path would pass through these lands, and this is where the majority of potential industrial displacements occur.

- In Segment B, Alternative 3 (Amazon Channel) has the potential to displace 13 commercial uses and eight (8) industrial uses.
- In Segment B, Alternative 4 (11th Avenue) has the potential to displace 13 commercial uses and two (2) industrial uses.

Table 5.8-3 Summary Segment B Potential Displacements

	Commercial Zone	Industrial Zone	Residential Zone	Government / Education Zone		
Segment / Alternative	Potential Displacements	Potential Displacements	Potential Displacements	Potential Displacements	Potential Displacements TOTAL	Area Counted
SB-A1 (both sides of alignment for entire alternative)						
North Side	●	⭘	●	●	●	north side of alignment
South Side	●	○	⭘	●	○	south side of alignment
SB-A2	●	⭘	●	●	⭘	both sides of alignment for entire alternative
SB-A3	⭘	⭘	●	●	○	north side of Amazon Channel segment, both sides of street segments
SB-A4	⭘	●	●	●	⭘	both sides of alignment for entire alternative

Notes:
● = Potential lower number of displacements
⭘ = Potential moderate number of displacements
○ = Potential higher number of displacements

Segment C: Beltline Road to West Terminus

- In Segment C, Alternative 1 is a relatively short alignment with the potential for 2 displacements. Both displacements are industrial uses.
- In Segment C, Alternative 2 has 1 identified potential displacement along West 11th Avenue. This alternative extends to Veneta and travels through rural lands that typically do not have structures close to the road right-of-way. Therefore, no displacements are anticipated in the rural areas. For this screening evaluation, high-resolution ortho-photography was used to estimate potential displacements in the Eugene metro area to just west of Green Hill Road. For the remainder of Segment 2, other aerial reconnaissance was utilized to estimate potential displacements. Based on this higher level view of the alignment from roughly Green Hill Road to Veneta, it does not appear structures are in close proximity to the alignment to warrant consideration of additional displacements.

Table 5.8-4 Summary Segment C Potential Displacements

	Commercial Zone	Industrial Zone	Residential Zone	Government / Education Zone		
Segment / Alternative	Potential Displacements	Potential Displacements	Potential Displacements	Potential Displacements	Potential Displacements TOTAL	Area Counted
SC-A1	●	●	●	●	●	both sides of alignment for entire alternative
SC-A2	●	●	●	●	●	both sides of alignment for entire alternative

Notes:
● = Potential lower number of displacements
◘ = Potential moderate number of displacements
○ = Potential higher number of displacements

5.8.2 Potential Impact to Historic Trees

This criterion measures the potential of the proposed alternatives to impact historic trees.

5.8.2.1 Rationale / Methods

Width of the two-lane and single lane fixed facilities as well as the location of required right-of-way are described in Section 2 of this report.

Within its city limits, the City of Eugene regulates the preservations of heritage, or historic, trees. A heritage tree is defined by the City as a tree "having exceptional value to the community due to its size and species." Heritage trees can be either on public or private property. The Historic Street Tree Amendment to the City of Eugene Charter (1984) requires an affirmative vote of the citizens of Eugene before the removal of any historic tree(s) for any street widening project. Potential impacts to trees were determined through tree inventory source data and GIS calculations; no field investigations were conducted.

Tree inventory source data was provided by the City of Eugene's urban forester. For this Tier II analysis, trees along the proposed alignment alternatives were categorized by diameter breast height (DBH)[7] into three categories: trees 0-7 inches DBH, 8-24 inches DBH, and 25 inches or greater DBH. Potential impacts to trees in all categories are recorded in the data table. For a tree to be classified as "Historic" it must have a circumference of 25 inches DBH, be living for at least 50 years and be in the city limits as of 1915. However, based on LTD's previous experience in determining historic trees in the City of Eugene in conjunction with building an EmX facility, trees with a circumference less than 25 inches can be determined to be historic through other methods.

[7] The diameter of a tree trunk/s measured at 4.5 feet above mean ground level at the base of the trunk/s. For trees with multiple trunks diameter breast height is the sum of the diameters of all trunks at DBH for the common base of the trunks. Administrative Order No. 58-00-01-F of the City Manager of the City Of Eugene. March 2000.

Trees with a DBH 25 inches or greater were assumed to have a high potential for being historic. Trees with a DBH between 8 and 24 inches were assumed to have a moderate potential for being historic. Additional field evaluations would be required to determine if a tree with a DBH between 8 and 24 inches would be classified by the City of Eugene as a historic tree. Trees with a DBH less than 8 inches were assumed to have low to no potential of being classified as historic by the City. Trees west of Greenhill Road are not historic because they are located outside of the City limits.

5.8.2.2 Data Tables and Figures

Table 5.9-1 Potential Impacts to Trees by DBH

	DBH (inches)				
Segment / Alternative	0-7	8-24	25 and greater	TOTAL	Area Counted
SA-A1	44	18	1	63	south side of 13th, east side of Garfield
SA-A2					
6th North side	20	58	1	79	North side of street
6th South side	22	74	7	103	South side of street
7th North side	13	75	3	91	North side of street
7th South side	17	62	0	79	South side of street
Charnelton West side	6	13	0	19	North side of street
Charnelton East side	1	18	0	19	South side of street
Olive West side	13	15	0	28	North side of street
Olive East side	18	23	0	41	South side of street
Garfield West side	0	0	0	0	North side of street
Garfield East side	9	7	0	16	South side of street
SA-A3	0	0	0	0	north side of Amazon Channel segment
SA-A4					
North side	51	54	34	139	North side of street
South side	61	64	7	132	South side of street
SB-A1					
North side	14	0	0	14	North side of street
South side	7	0	0	7	South side of street
SB-A2	31	7	0	38	both sides of street
SB-A3	36	0	0	36	north side of Amazon Channel segment, both sides of street segments
SB-A4	57	21	0	78	both sides of street
SC-A1	218	1	0	219	both sides of street
SC-A2	218	1	0	219	both sides of street Beltline to Fisher Road The segment from Fisher Road to Territorial Highway was evaluated by air photo reconnaissance, there is approximately 1.7 miles of this segment has trees lining the roadway.

Notes: DBH = Diameter Breast Height
Source: Tree inventory data from City of Eugene Urban Forester

Figure 5.9-1 Alternative SA-A1: Potential Tree Impacts within 1/3 Mile

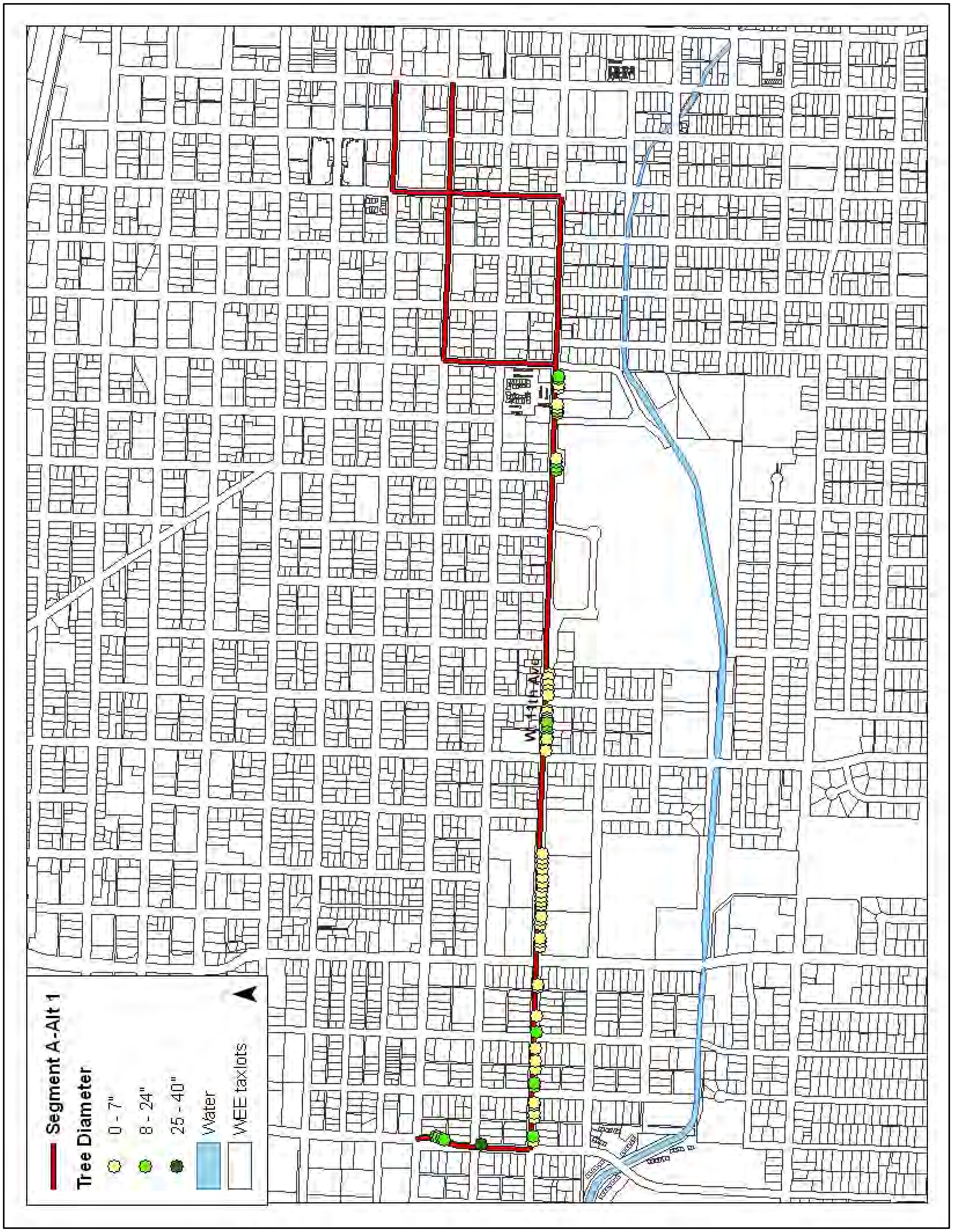


Figure 5.9-2 Alternative SA-A2: Potential Tree Impacts within 1/3 Mile

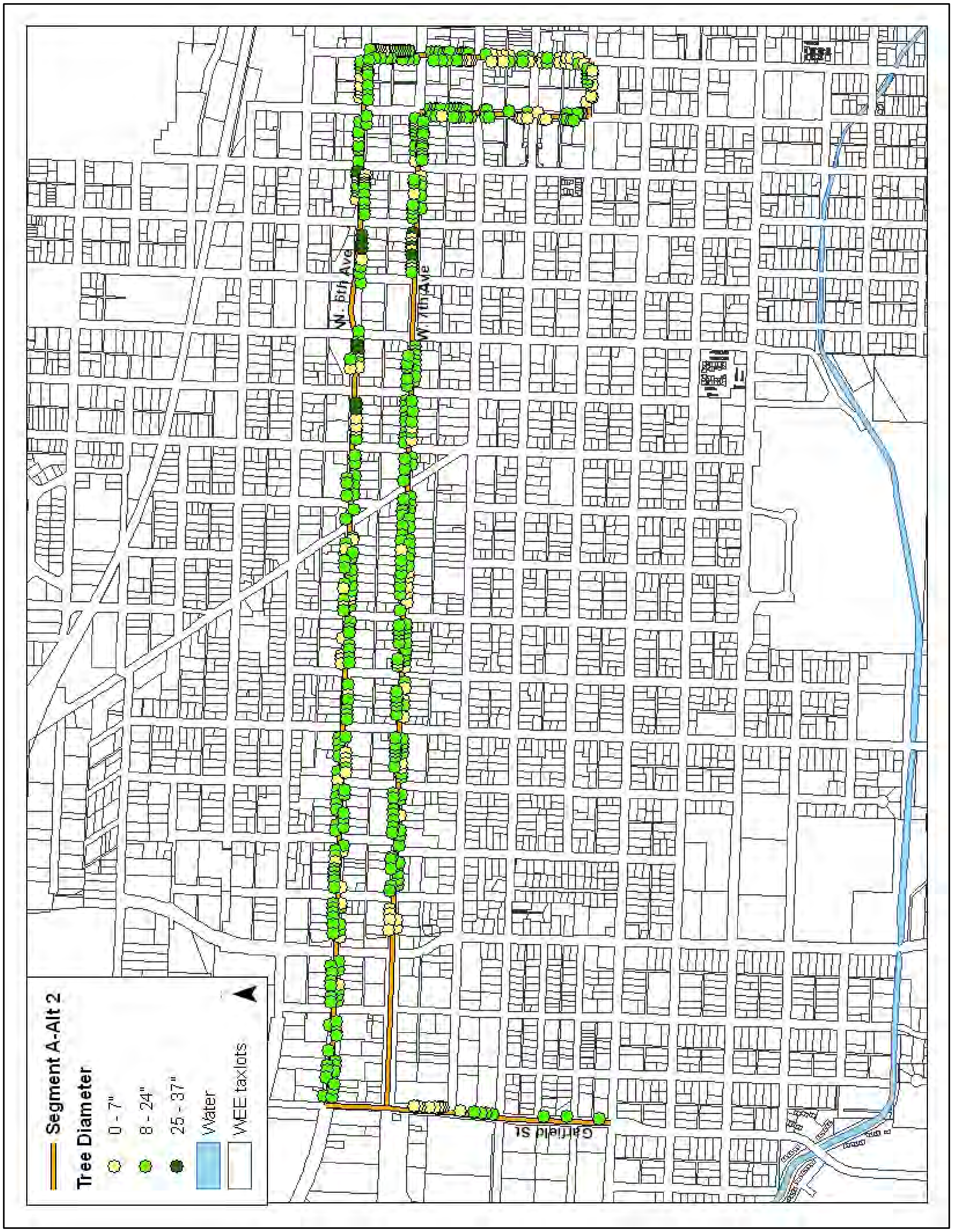


Figure 5.9-3 Alternative SA-A4: Potential Tree Impacts within 1/3 Mile

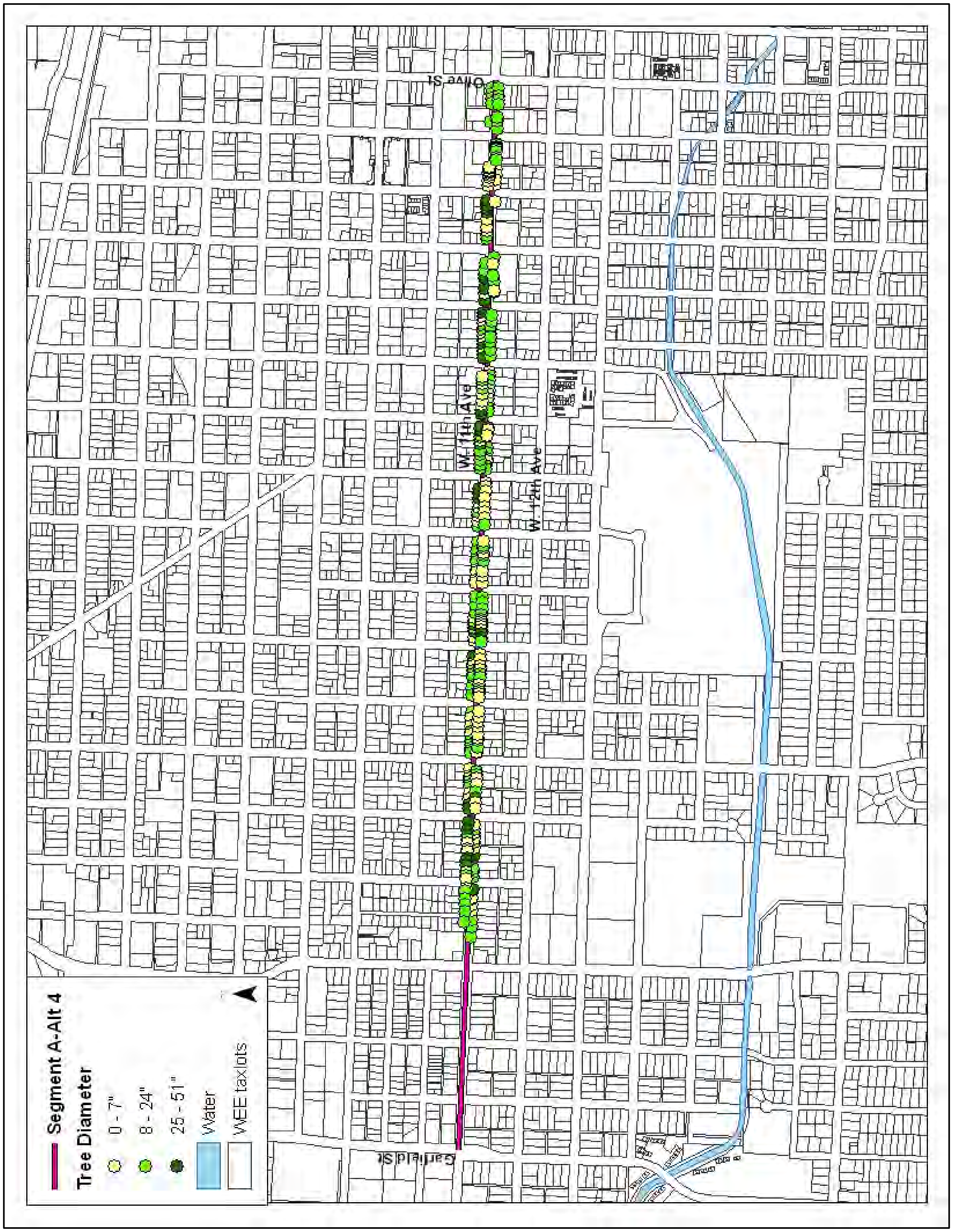


Figure 5.9-4 Alternative SB-A1: Potential Tree Impacts within 1/3 Mile

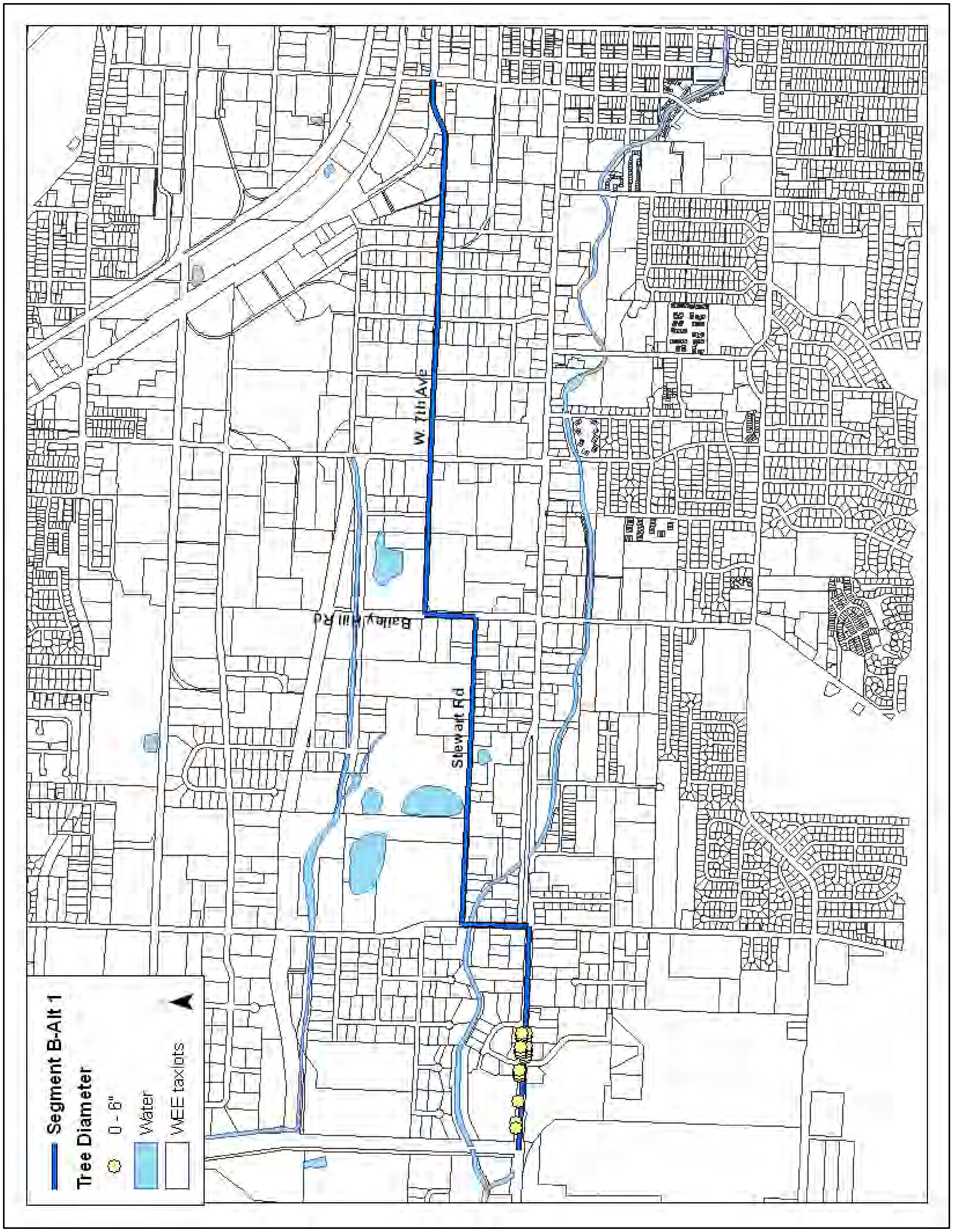


Figure 5.9-5 Alternative SB-A2: Potential Tree Impacts within 1/3 Mile

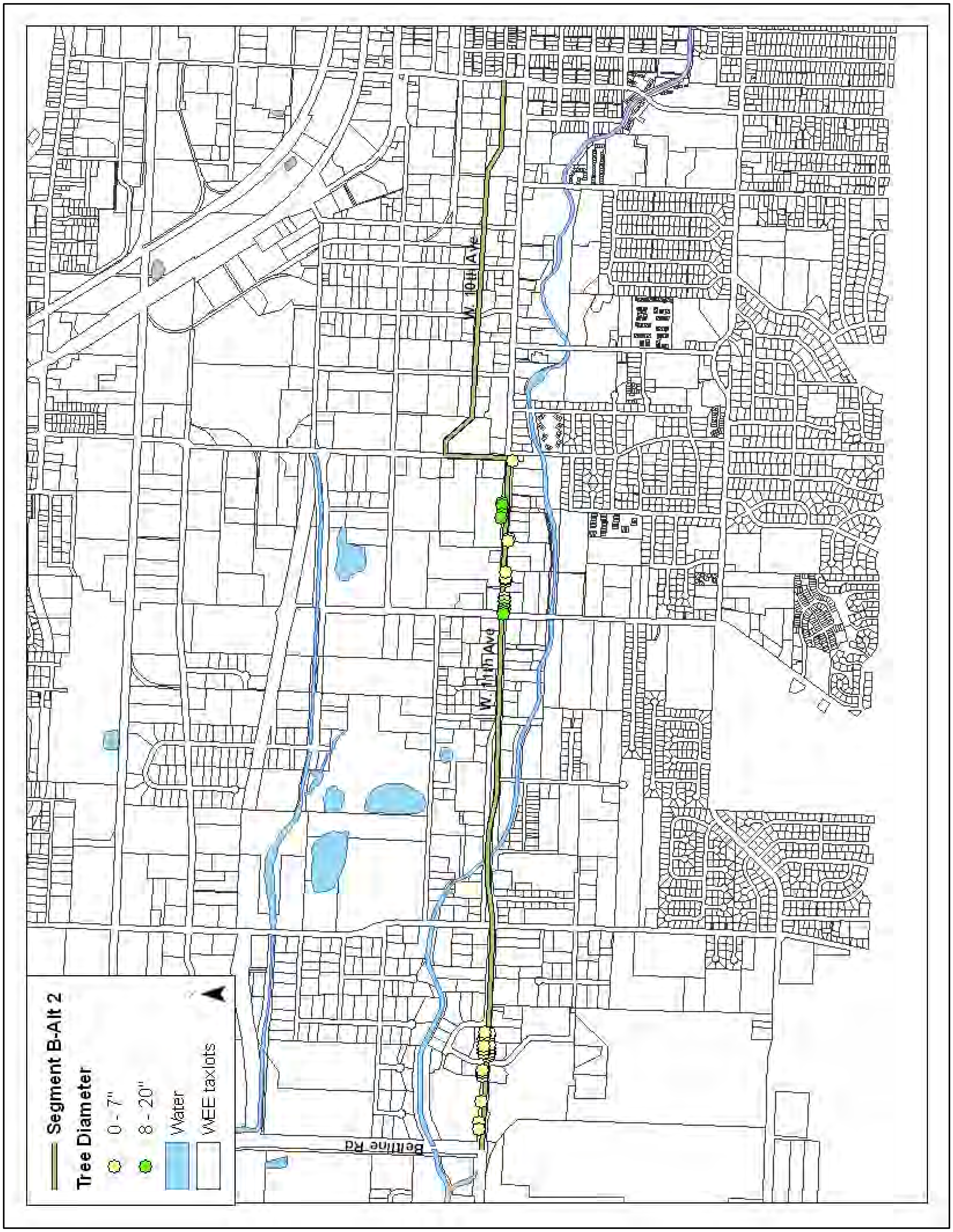


Figure 5.9-6 Alternative SB-A3: Potential Tree Impacts within 1/3 Mile

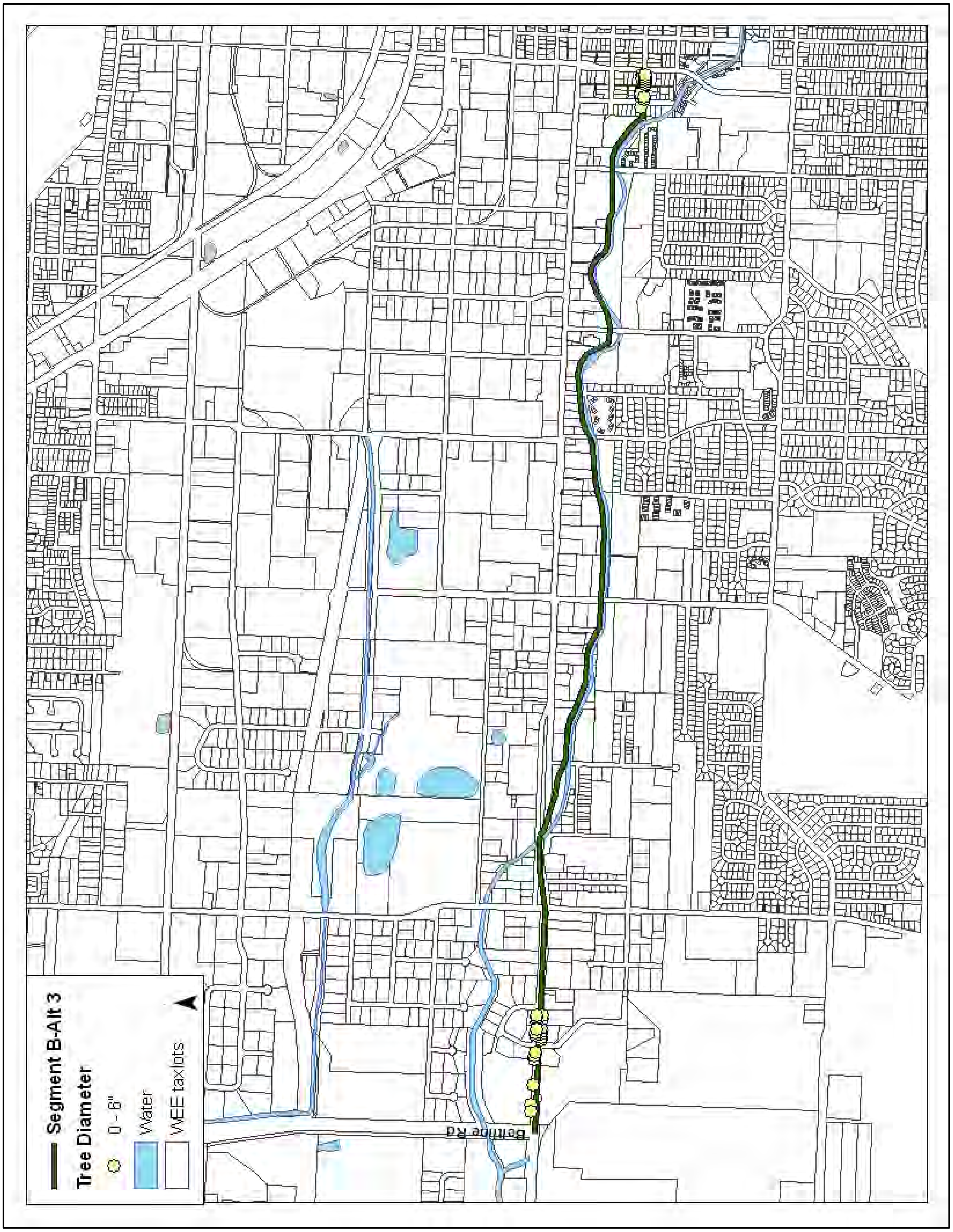


Figure 5.9-7 Alternative SB-A4: Potential Tree Impacts within 1/3 Mile

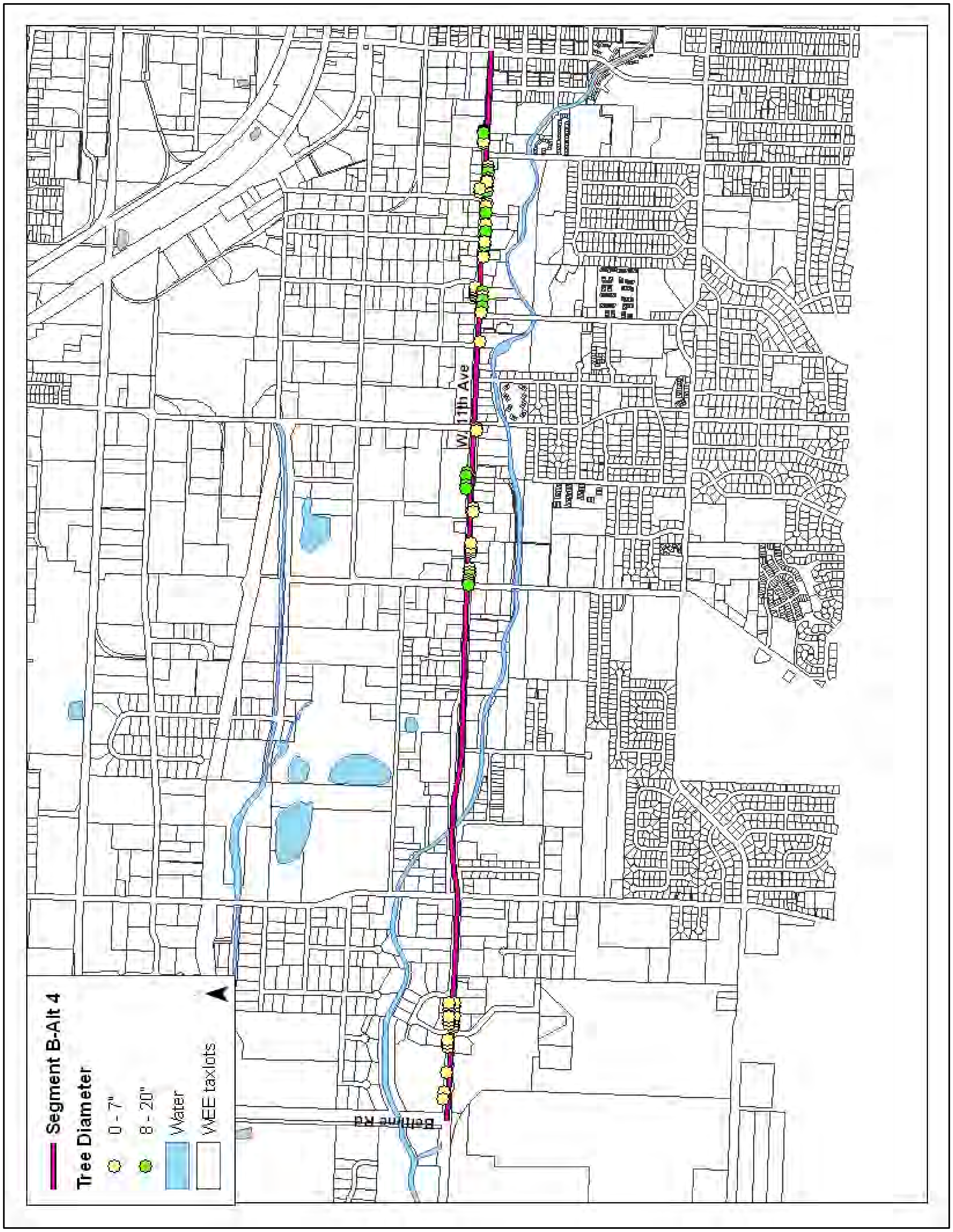


Figure 5.9-8 Alternative SC-A1: Potential Tree Impacts within 1/3 Mile

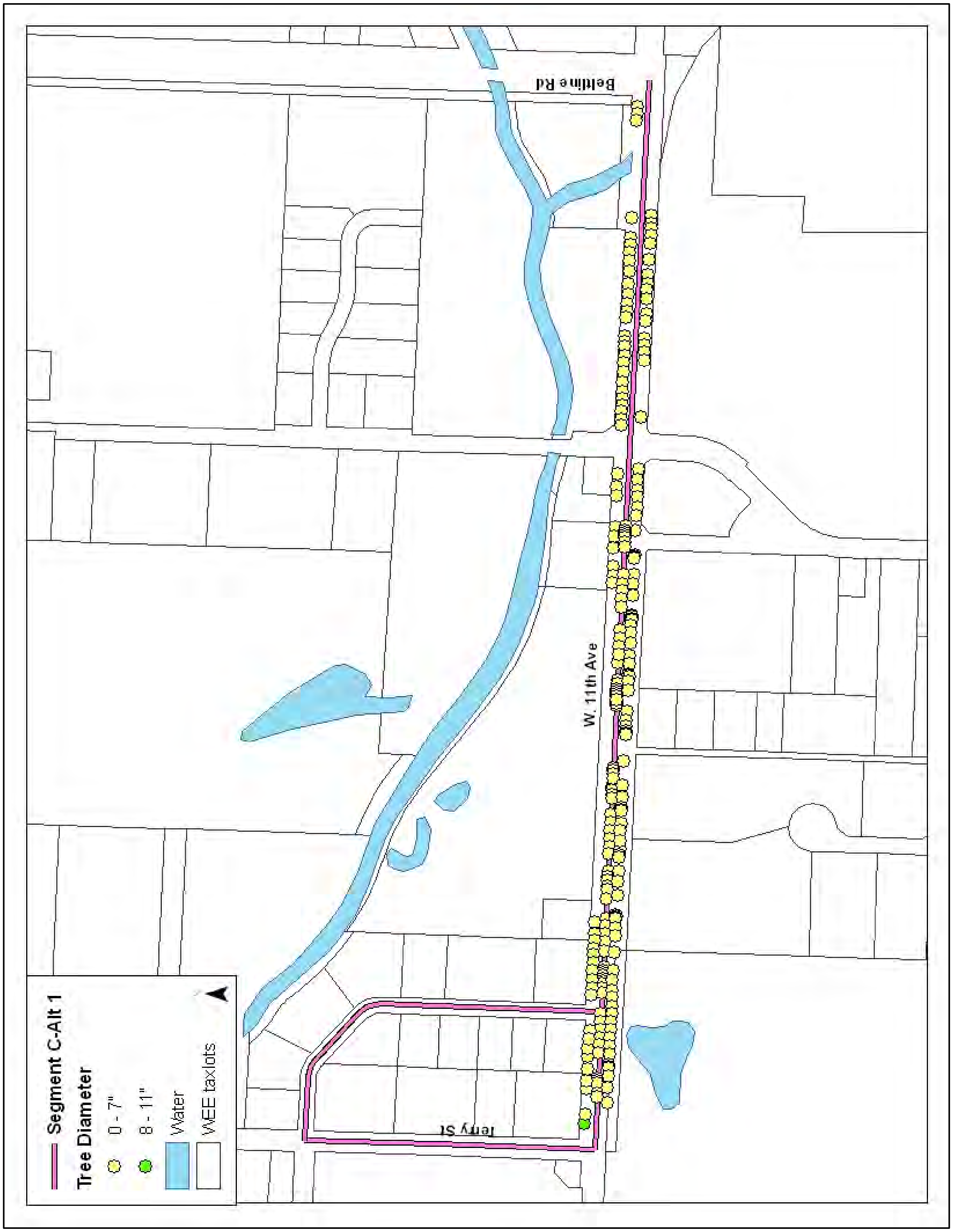
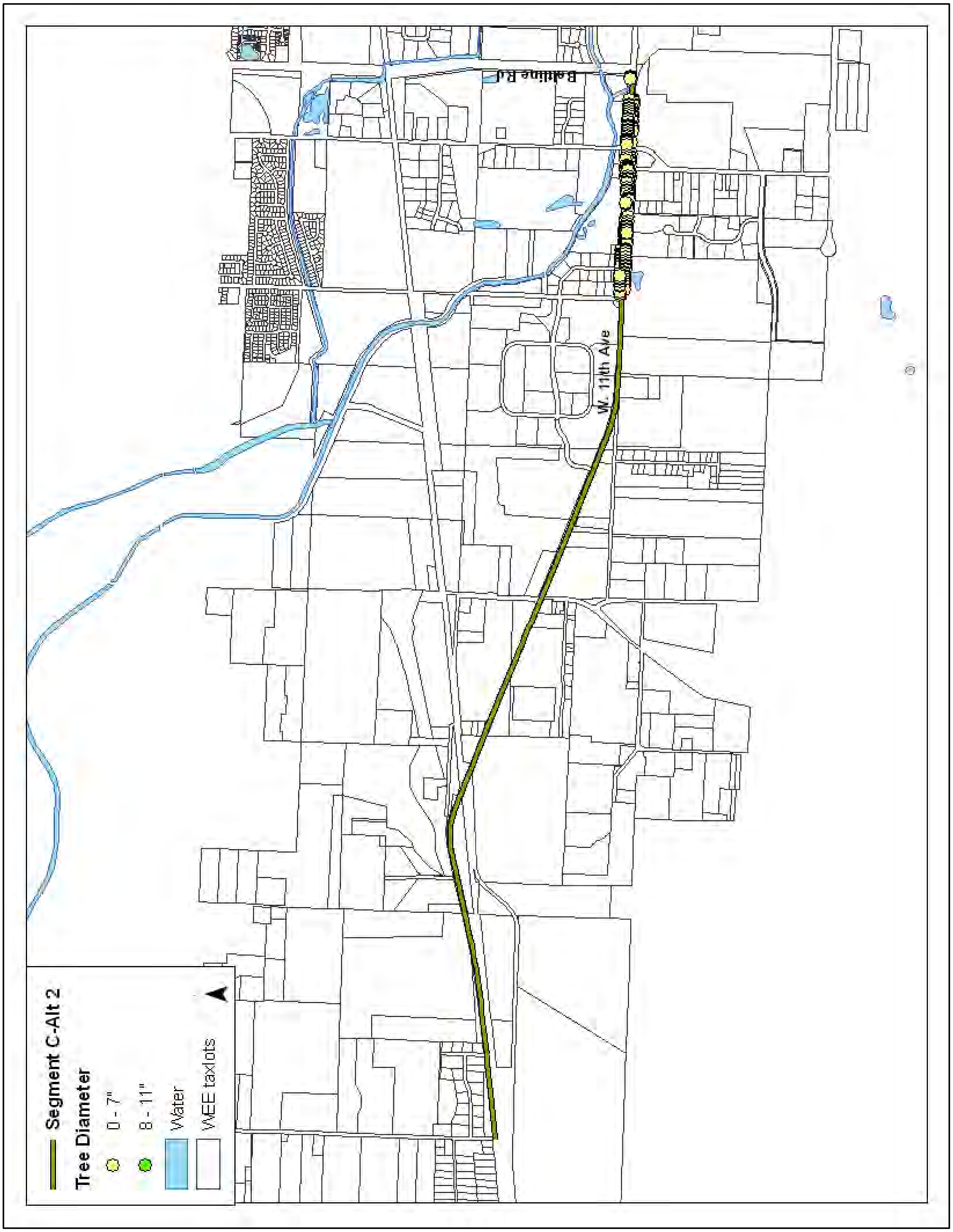


Figure 5.9-9 Alternative SC-A2: Potential Tree Impacts within 1/3 Mile



5.8.2.3 Findings: Consistent with Laws Related to Resources in Natural and Build Environment

This criterion is based on the project's objective to design the project in a way that is consistent with laws related to resources in the natural and built environment. For the purposes of this screening evaluation, consistency with laws related to natural and built environment resources was measured by evaluating the potential of each alternative to impact historic trees by displacement. Fewer impacts to trees were considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

Segment A: Eugene Station to Garfield Street

- In Segment A, Alternative 1 (13th Avenue) has the potential to displace 63 trees, of which 18 trees are 8-24 inches DBH and one (1) tree is 25 inches or greater DBH.
- In Segment A, Alternative 2 (6th / 7th Avenues) right-of-way acquisition for both sides of the street was reviewed. Acquiring right-of-way from the south side of 6th Avenue will have the potential for a relatively higher number of impacts to trees than acquiring right-of-way from the north side of the roadway (103 trees on the south side and 79 trees on the north side). Acquiring right-of-way from the north side of 7th Avenue will have the potential for a relatively higher number of impacts to trees than acquiring right-of-way from the south side (91 trees on the north side and 79 trees on the south side). The number of trees potentially affected on the north-south streets varied from 0 to 28 trees, and all of the trees were less than 25 inches DBH.
- In Segment A, Alternative 3 (Amazon Channel) is not anticipated to displace any trees.
- In Segment A, Alternative 4 (11th Avenue) has the potential for a relatively higher number of impacts to trees. Both sides of the street were reviewed to determine if right-of-way acquisition on one side or the other minimized impacts to trees. Acquiring right-of-way from the north side of 11th Avenue has the potential to displace 139 trees, of which 54 trees are 8-24 inches DBH and 34 trees are 25 inches or greater DBH. Acquiring right-of-way from the south side of 11th Avenue has the potential to displace 132 trees, of which 64 trees are 8-24 inches DBH and seven (7) trees are 25 inches or greater DBH.

Table 5.9-2 Summary Segment A Potential Impacts to Trees by DBH

Segment / Alternative	DBH (inches) 0-7	8-24	25 and greater	TOTAL
SA-A1	**o**	●	●	●
SA-A2				
6th North side	**o**	○	●	○
6th South side	**o**	○	●	○
7th North side	●	○	●	○
7th South side	●	○	●	○
Charnelton West side	●	●	●	●
Charnelton East side	●	●	●	●
Olive West side	●	●	●	**o**
Olive East side	●	**o**	●	○
Garfield West side	●	●	●	●
Garfield East side	●	●	●	●
SA-A3	●	●	●	●
SA-A4				
North side	**o**	**o**	**o**	**o**
South side	**o**	**o**	●	**o**

Notes: DBH = Diameter Breast Height
● = Potential lower number of displacements: 0-20 trees
o = Potential moderate number of displacements: 21-40 trees
○ = Potential higher number of displacements: 41 or more trees

Segment B: Garfield Street to Beltline Road

- The majority of potentially affected trees in Segment B are less than 8 inches DBH.
- In Segment B, Alternative 4 (11th Avenue) has the potential to impact a relatively higher number of trees than other alternatives in this segment.
- Acquiring right-of-way from the south side of the street for Alternative 1 (7th Place / Stewart Road) has the potential to impact relatively fewer trees than other alternatives in this segment.
- In Segment B, Alternative 1 (7th Place / Stewart Road) right-of-way acquisition for both sides of the street was reviewed. Acquiring right-of-way from the north side of the street has the potential to impact 14 trees, all less than 8 inches DBH. Acquiring right-of-way from the south side of the street has the potential to impact seven (7) trees, all less than 8 inches DBH.
- In Segment B, Alternative 2 (10th Avenue / Seneca Road) has the potential to impact 38 trees, of which 31 trees are less than 8 inches DBH and seven (7) trees are 8-24 inches DBH.
- In Segment B, Alternative 3 (Amazon Channel) has the potential to impact 36 trees, all less than 8 inches DBH.
- In Segment B, Alternative 4 (11th Avenue) has the potential to impact 78 trees, of which 57 trees are less than 8 inches DBH and 21 trees are 8-24 inches DBH.

Table 5.9-3 Summary Segment B Potential Impacts to Trees by DBH

	DBH (inches)			
Segment / Alternative	0-7	8-24	25 and greater	TOTAL
SB-A1				
North side	●	●	●	●
South side	●	●	●	●
SB-A2	⭘	●	●	⭘
SB-A3	⭘	●	●	⭘
SB-A4	○	⭘	●	○

Notes: DBH = Diameter Breast Height
● = Potential lower number of displacements: 0-20 trees
⭘ = Potential moderate number of displacements: 21-40 trees
○ = Potential higher number of displacements: 41 or more trees

Segment C: Beltline Road to West Terminus

- In Segment C, both of the alternatives have the potential to impact 219 trees, of which 218 trees are less than 8 inches DBH and 1 tree is 8-24 inches DBH. This reflects the segment from Beltline to Fisher Road, where tree data was available. For the segment from Fisher Road to Territorial Highway, air photos were reviewed and there is potential for additional tree impacts for alternative SC-A2 due to the proximity of trees to the roadway. The type and size of these trees is unknown.

Table 5.9-4 Summary Potential Impacts to Trees by DBH

	DBH (inches)			
Segment / Alternative	0-7	8-24	25 and greater	TOTAL
SC-A1	○	●	●	○
SC-A2	○	●	●	○

Notes: DBH = Diameter Breast Height
● = Potential lower number of displacements: 0-20 trees
⭘ = Potential moderate number of displacements: 21-40 trees
○ = Potential higher number of displacements: 41 or more trees

5.8.3 Potential Impact to Historic Resources

This criterion measures the potential of the proposed alternatives to impact historic resources.

5.8.3.1 Rationale / Methods

For this screening level evaluation, potential effect was determined by proximity to an alignment alternative. Historic resources were identified for "potential effect" if the resource was located within 100 feet of the centerline of an alignment alternative.

The Historic Resource inventory data was provided by the City of Eugene and it contained 303 total sites throughout the City.

5.8.3.2 Data Tables and Figures

Table 5.9-5 Potential Impact to Historic Resources

Segment / Alternative	Historic Resources	
	Potential Effect	Number of Resources Potentially Affected
SA-A1	yes	8
SA-A2	yes	7
SA-A3	yes	8
SA-A4	yes	2
SB-A1	no	0
SB-A2	no	0
SB-A3	no	0
SB-A4	no	0
SC-A1	no	0
SC-A2	no	0

Notes: The number of historic sites within 100 feet of each segment/alternative was identified.

Figure 5.9-10 Alternative SA-A1: Potential Effects to Historic Resources within 1/3 Mile

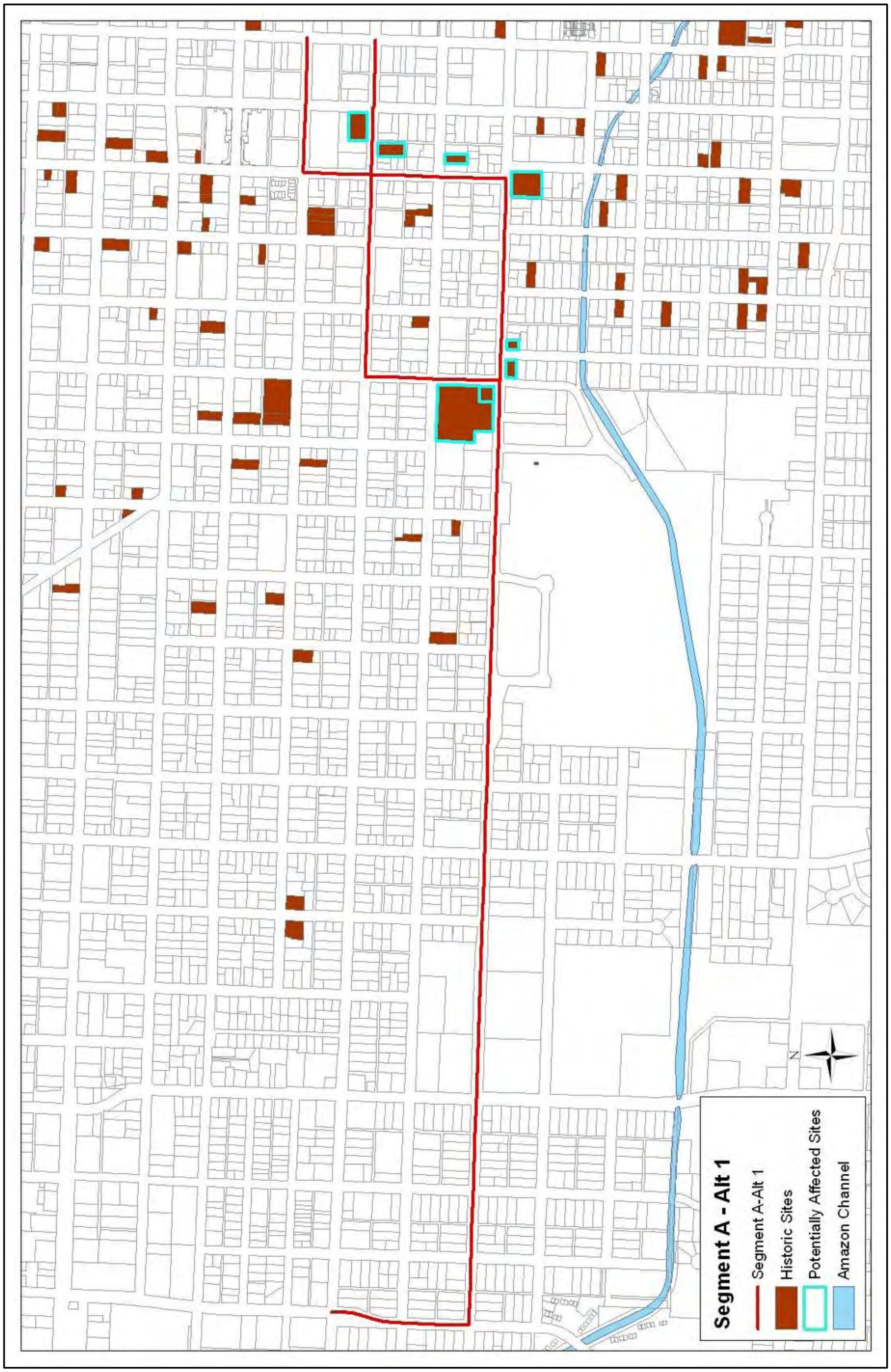


Figure 5.9-11 Alternative SA-A2: Potential Effects to Historic Resources within 1/3 Mile

Figure 5.9-12 Alternative SA-A3: Potential Effects to Historic Resources within 1/3 Mile

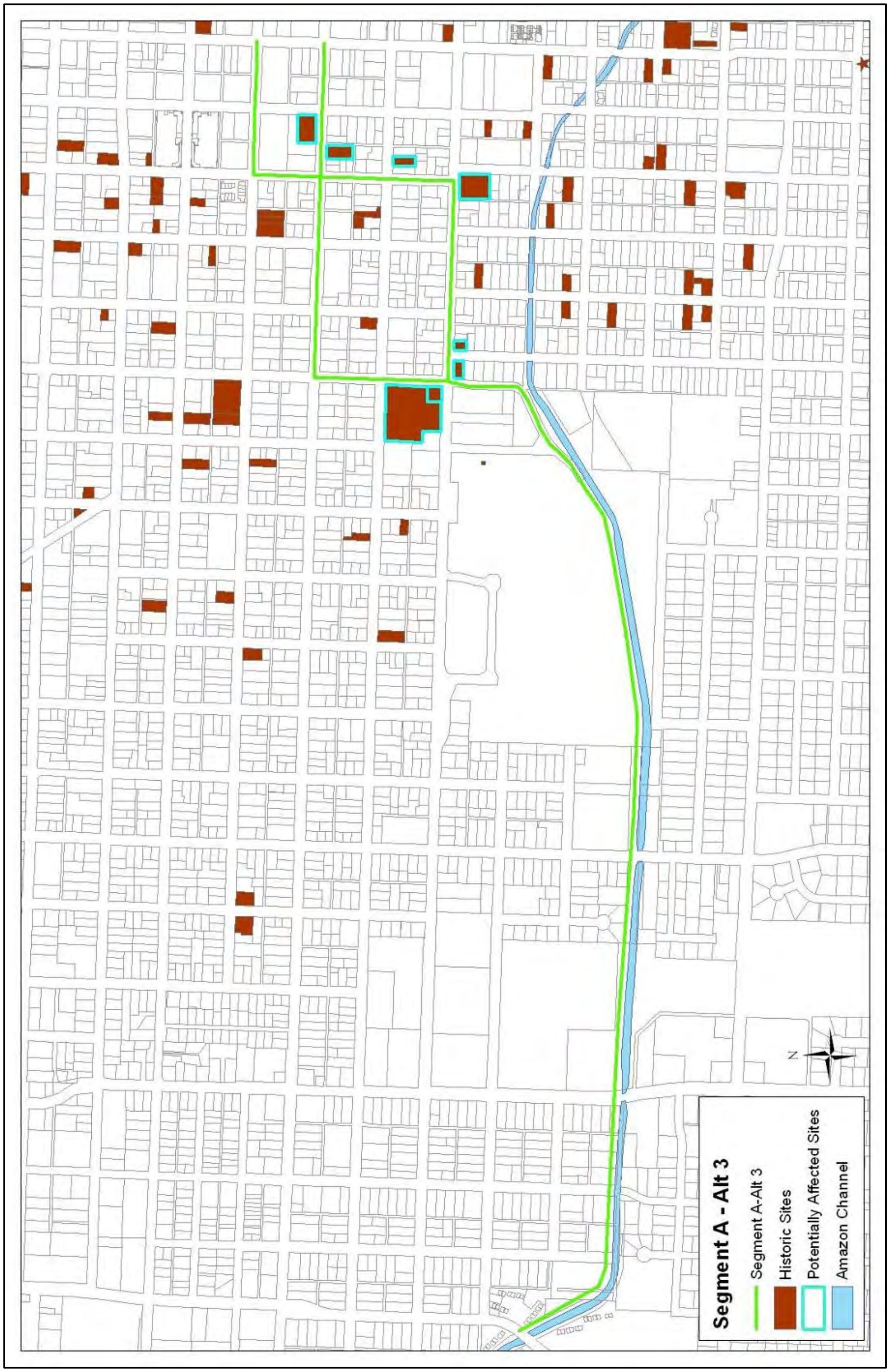
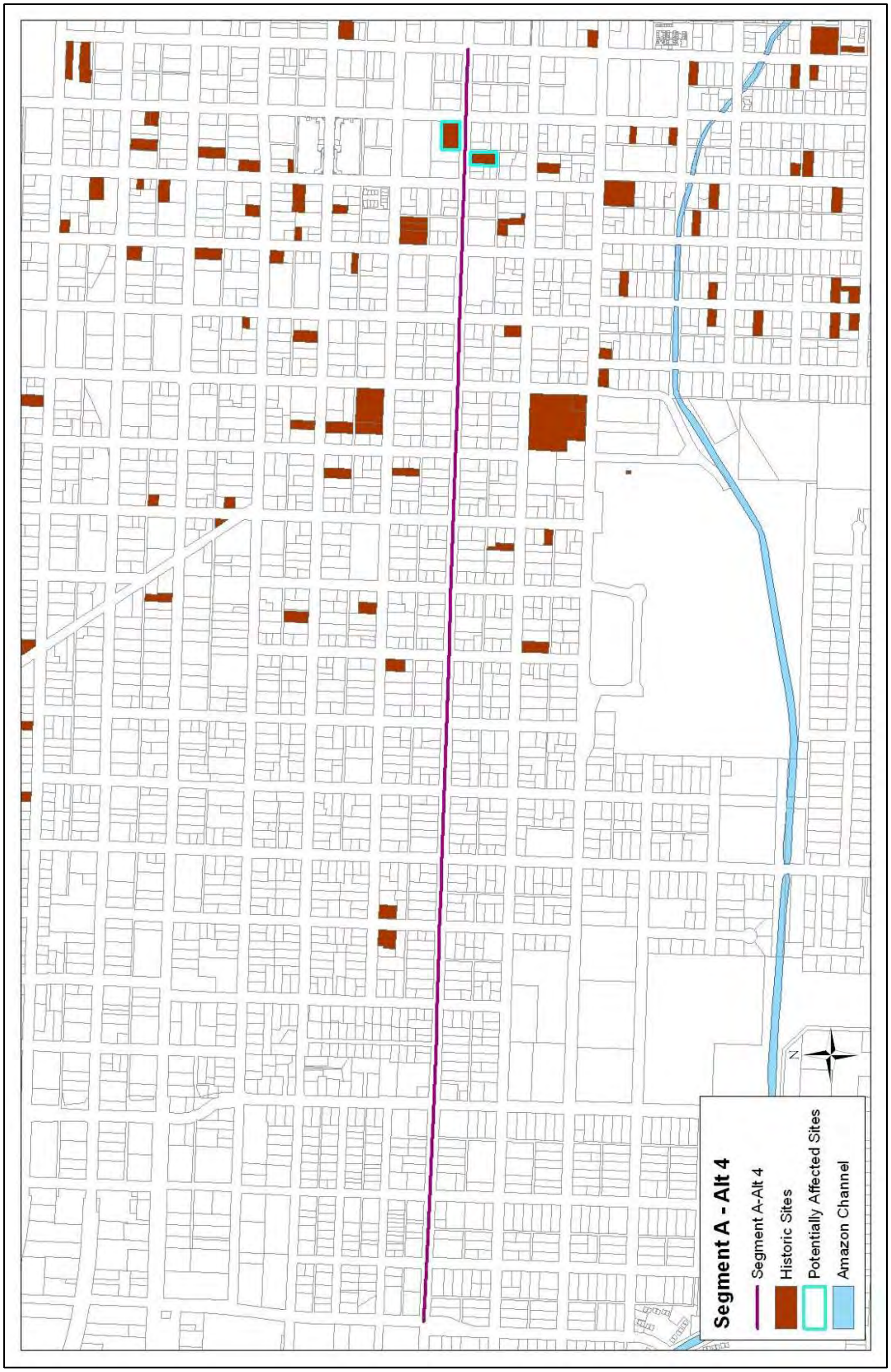


Figure 5.9-13 Alternative SA-A4: Potential Effects to Historic Resources within 1/3 Mile



5.8.3.3 Findings: Consistent with Laws Related to Resources in Natural and Build Environment

This criterion is based on the project's objective to design the project in a way that is consistent with laws related to resources in the natural and built environment. For the purposes of this screening evaluation, consistency with laws related to natural and built environment resources was measured by evaluating the potential of each alternative to affect historic resources. Fewer effects on historic resources were considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

- No historic structures were potentially displaced by any of the proposed alignment alternatives.
- In Segment A, Alternative 1 (13th Avenue) has the potential to affect eight historic resources.
- In Segment A, Alternative 2 (6th / 7th Avenues) has the potential to affect seven historic resources.
- In Segment A, Alternative 3 (Amazon Channel) has the potential to affect eight historic resources.
- In Segment A, Alternative 4 (11th Avenue) has the potential to affect two historic resources.
- In Segment B, no potential effects to historic resources are anticipated.
- In Segment C, no potential effects to historic resources are anticipated.

5.8.4 Likelihood of Adverse Impact to Environmentally-Sensitive Natural Resources

This criterion measures the potential of the proposed alternatives to impact environmentally-sensitive natural resources such as wetlands, parks and open spaces and critical habitat.

5.8.4.1 Wetlands

This criterion measures the potential of the proposed alternatives to impact wetlands.

5.8.4.1.1 Rationale / Methods

- Wetlands data was provided by LCOG.
- A 50-foot buffer was created around each alternative to assess potential effect on wetland resources.
- The square feet of wetland resource area that fell within the buffer zone was calculated. Direct effects on wetlands were not calculated.
- Potential impacts to wetlands were determined through wetland inventory source data and GIS calculations; no field investigations were conducted.

5.8.4.1.2 Data Tables and Figures

Table 5.9-6 Potential Impact to Wetlands

Segment / Alternative	Wetlands Potential Impact	Potential Effect (SF)	Potential Effect (Ac)
SA-A1	no	0	0
SA-A2	no	0	0
SA-A3	no	0	0
SA-A4	no	0	0
SB-A1	yes	44,096	1.0
SB-A2	yes	4,801	0.1
SB-A3	yes	107,735	2.5
SB-A4	yes	4,794	0.1
SC-A1	yes	17,398	0.4
SC-A2*	yes	149,033	3.4

* The segment from Fisher Road to Territorial Highway was evaluated using National Wetlands Inventory Data. There are wetland locations adjacent to this alignment west of Fisher Road

Notes: A 50-foot buffer was created around each segment / alternative. The square feet of wetlands that fell within the buffer zone was calculated.

Figure 5.9-14 Alternative SB-A1: Potential Effects to Wetland Resources within 1/3 Mile

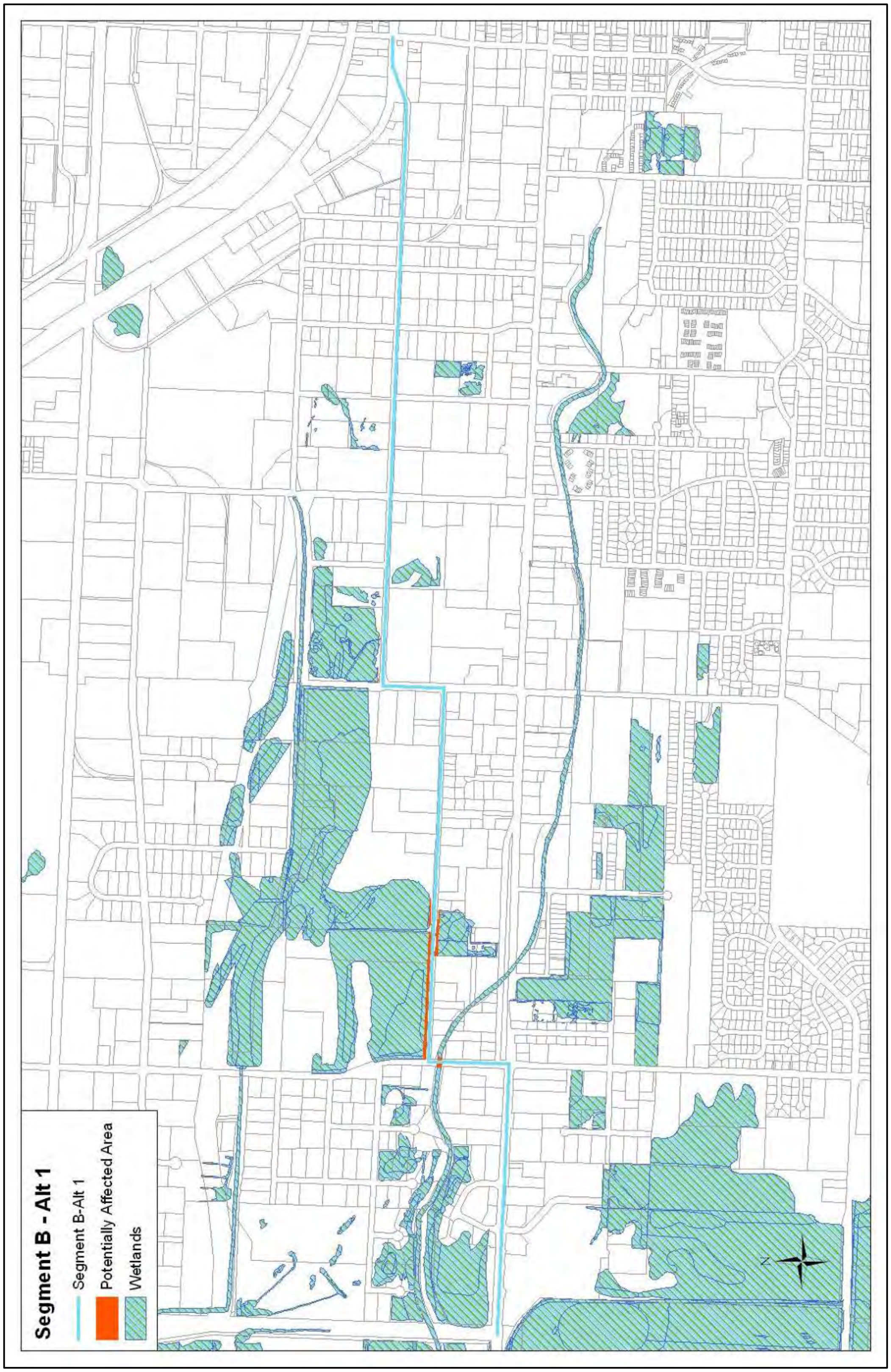


Figure 5.9-15 Alternative SB-A2: Potential Effects to Wetland Resources within 1/3 Mile

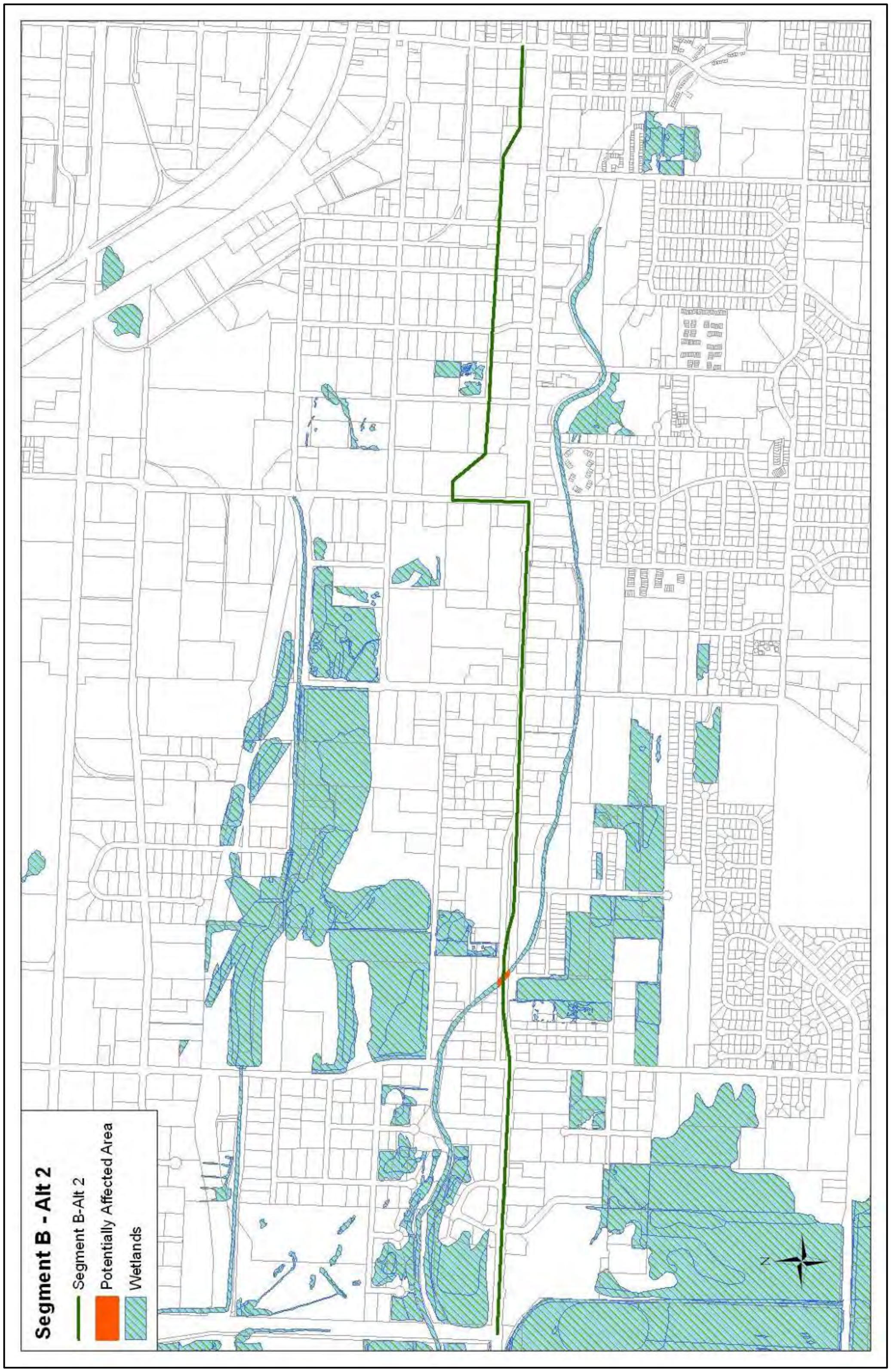


Figure 5.9-16 Alternative SB-A4: Potential Effects to Wetland Resources within 1/3 Mile

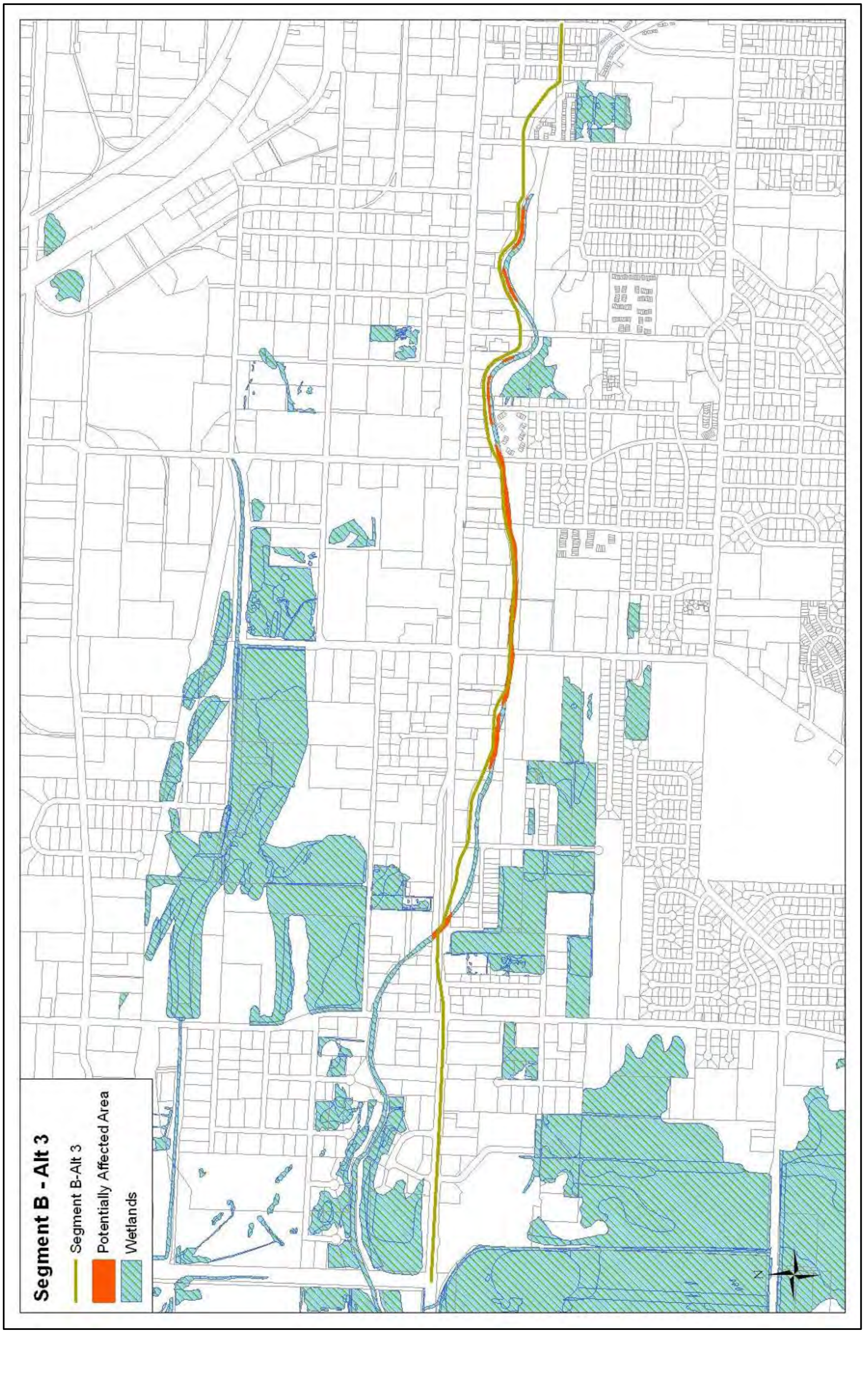


Figure 5.9-17 Alternative SB-A3: Potential Effects to Wetland Resources within 1/3 Mile

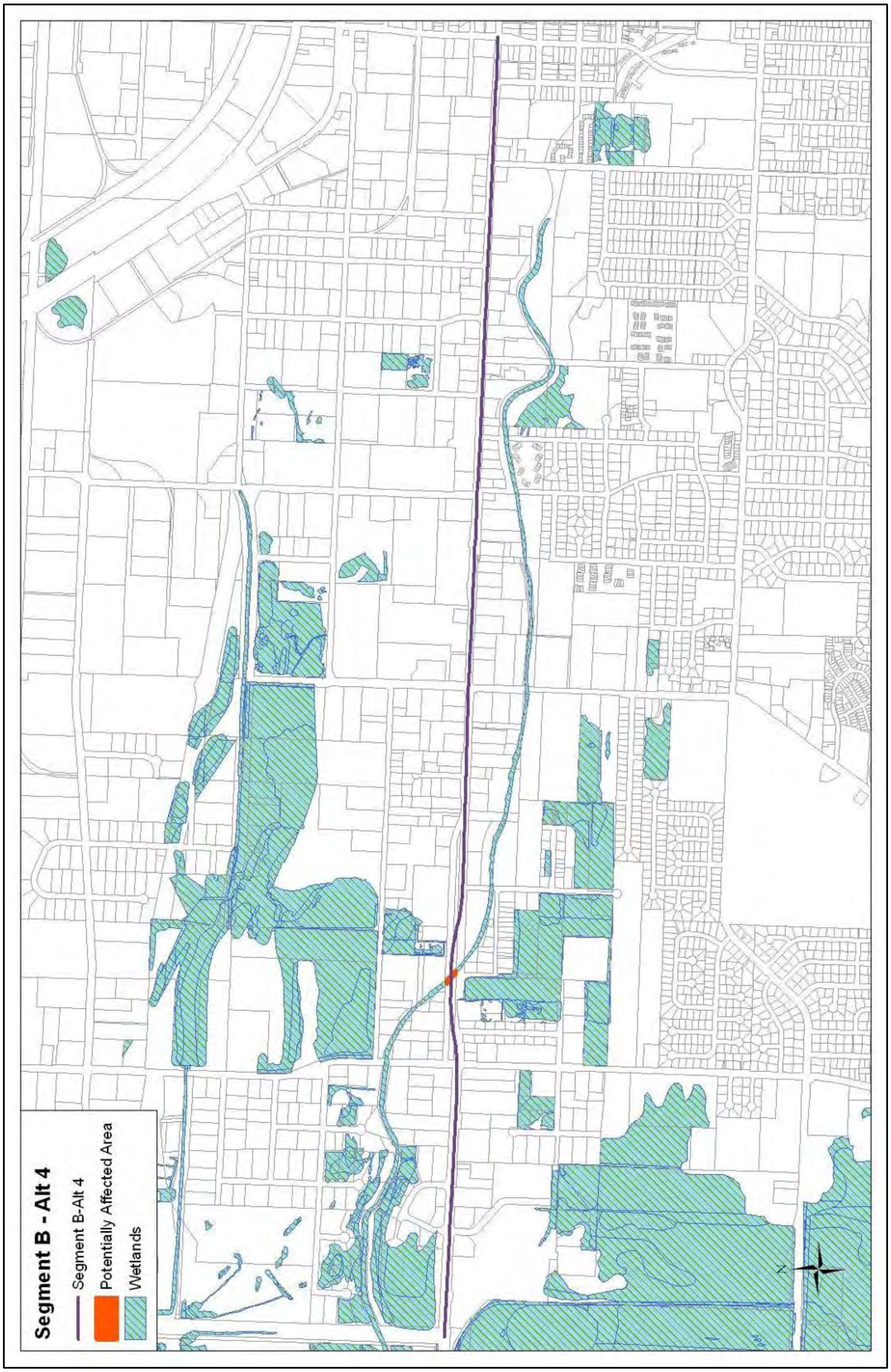
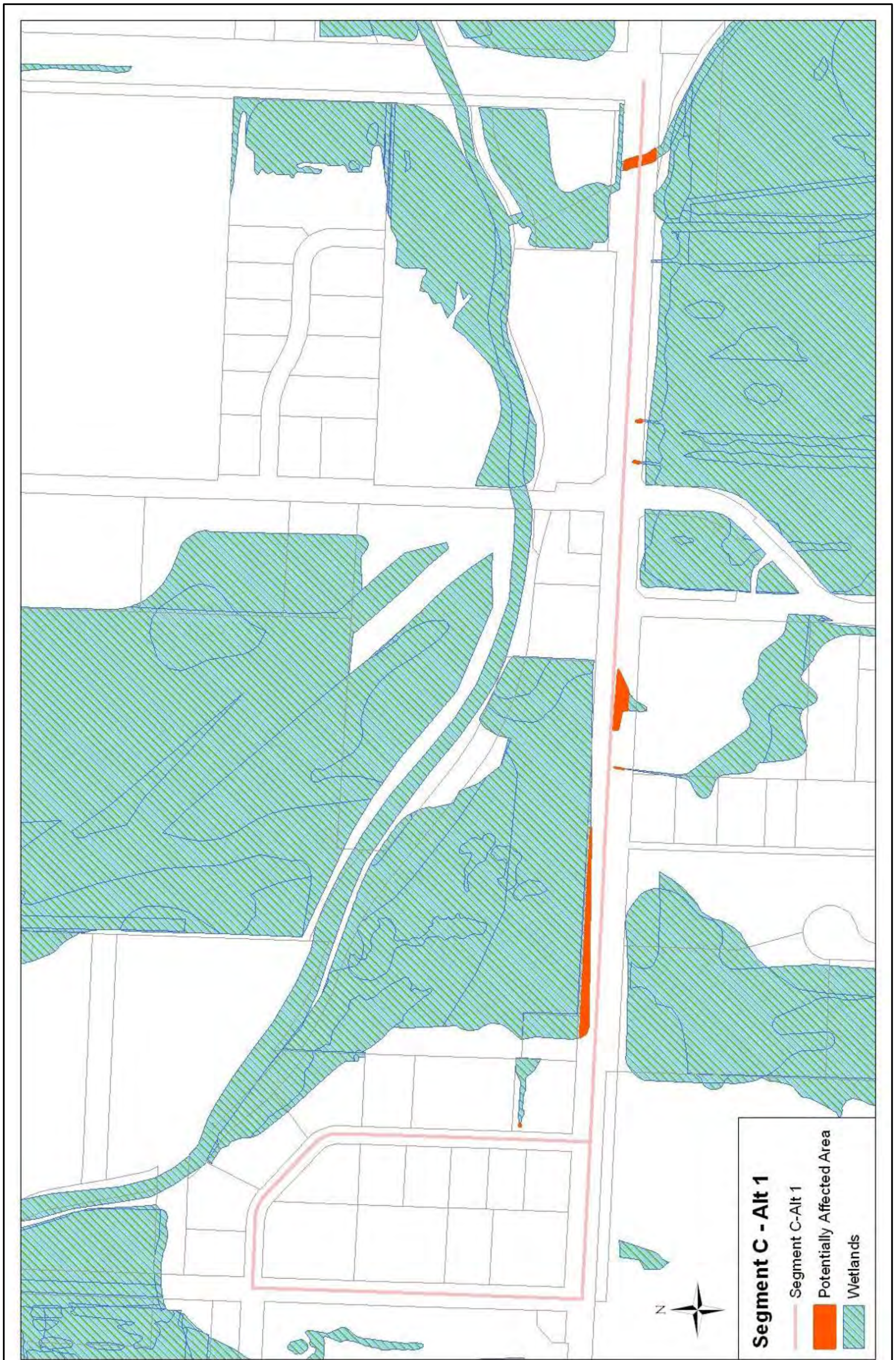


Figure 5.9-18 Alternative SC-A1: Potential Effects to Wetland Resources within 1/3 Mile



5.8.4.1.3 Findings: Consistent with Laws Related to Resources in Natural and Build Environment

This criterion is based on the project's objective to design the project in a way that is consistent with laws related to resources in the natural and built environment. For the purposes of this screening evaluation, consistency with laws related to natural and built environment resources was measured by evaluating the potential of each alternative to impact wetlands. Fewer impacts to wetland resource areas were considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

- In Segment A, no potential effects to wetlands are anticipated.
- In Segment B, Alternative 3 (Amazon Channel) has the potential for the highest number of wetland resource acres affected (approximately 2.5 acres) and Alternatives 2 (10th Avenue / Seneca Road) and 4 (11th Avenue) have the potential for the fewest number of wetland resource acres affected (approximately less than 0.1 acres each).
- In Segment C, Alternative 2 (11th Avenue / Veneta) has the potential for the highest number of wetland resource acres affected (approximately 3.4 acres). In addition, there is potential for wetland impacts on the route from Fisher Road to Territorial Highway Quantities are not known, but there are significant wetland resources where the alignment passes by Fern Ridge Reservoir.

5.8.4.2 Parks and Open Space

This criterion measures the potential of the proposed alternatives to impact parks and open spaces. Note that parks and open spaces here are defined as land that is designated as parks and/or open space in the Eugene Comprehensive Plan. Some of this land may qualify for protection under Section 4(f) and some may not. A determination of Section 4(f) eligibility has not been made for this screening level analysis. Inclusion of parks and open spaces" for the purpose of this report and the Tier II evaluation is and will not be a factor in determining Section 4(f) eligibility for further phases of the WEEE Project. A preliminary and final determination of Section 4(f) eligibility for any land that could be used by the WEEE Project will be made by FTA through the project's DEIS and FEIS, respectively, which, if appropriate, will incorporate a Section 4(f) Evaluation Report.

5.8.4.2.1 Rationale / Methods

- Parks and open space data was provided by LCOG and includes designated open space areas.
- A 50-foot buffer was created around each alternative to assess potential effect on parks and open spaces.
- The area (in square feet) of parks and open spaces that fall within the buffer zone was calculated. Direct impacts to parks and open spaces were not calculated.
- Potential impacts to parks and open spaces were determined through GIS source data and calculations; no field investigations were conducted.

5.8.4.2.2 Data Tables and Figures

Table 5.9-7 Potential Impact to Parks and Open Spaces

Segment / Alternative	Parks and Open Spaces		
	Potential Impact	Potential Effect (SF)	Potential Effect (Ac)
SA-A1	yes	2,996	0.1
SA-A2	yes	27,363	0.6
SA-A3	yes	143,316	3.3
SA-A4	no	0	0.0
SB-A1	yes	142,159	3.3
SB-A2	yes	22,566	0.5
SB-A3	yes	420,454	9.7
SB-A4	yes	22,614	0.5
SC-A1	yes	10,452	0.2
SC-A2	no	0	0

Notes: A 50-foot buffer was created around each segment/alternative. The square feet of parks and open spaces that fall within the buffer zone was calculated.
The segment from Fisher Road to Territorial Hwy. was evaluated using web based maps. There is one park in this segment. Potential effect quantities are not reflected in the table above.

Figure 5.9-19 Alternative SA-A1: Potential Effects to Parks and Open Space within 1/3 Mile

Figure 5.9-20 Alternative SA-A2: Potential Effects to Parks and Open Space within 1/3 Mile

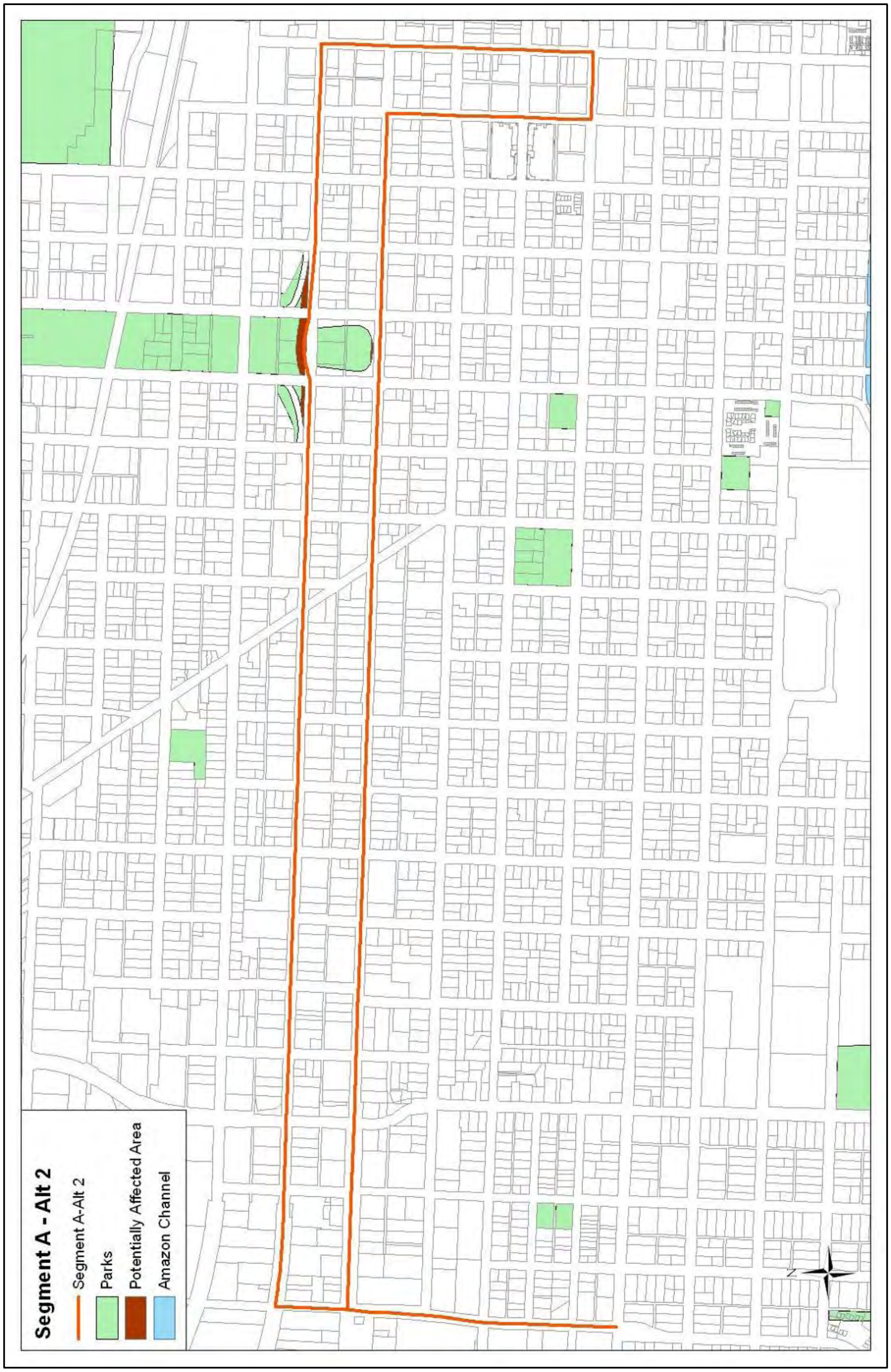


Figure 5.9-21 Alternative SA-A3: Potential Effects to Parks and Open Space within 1/3 Mile

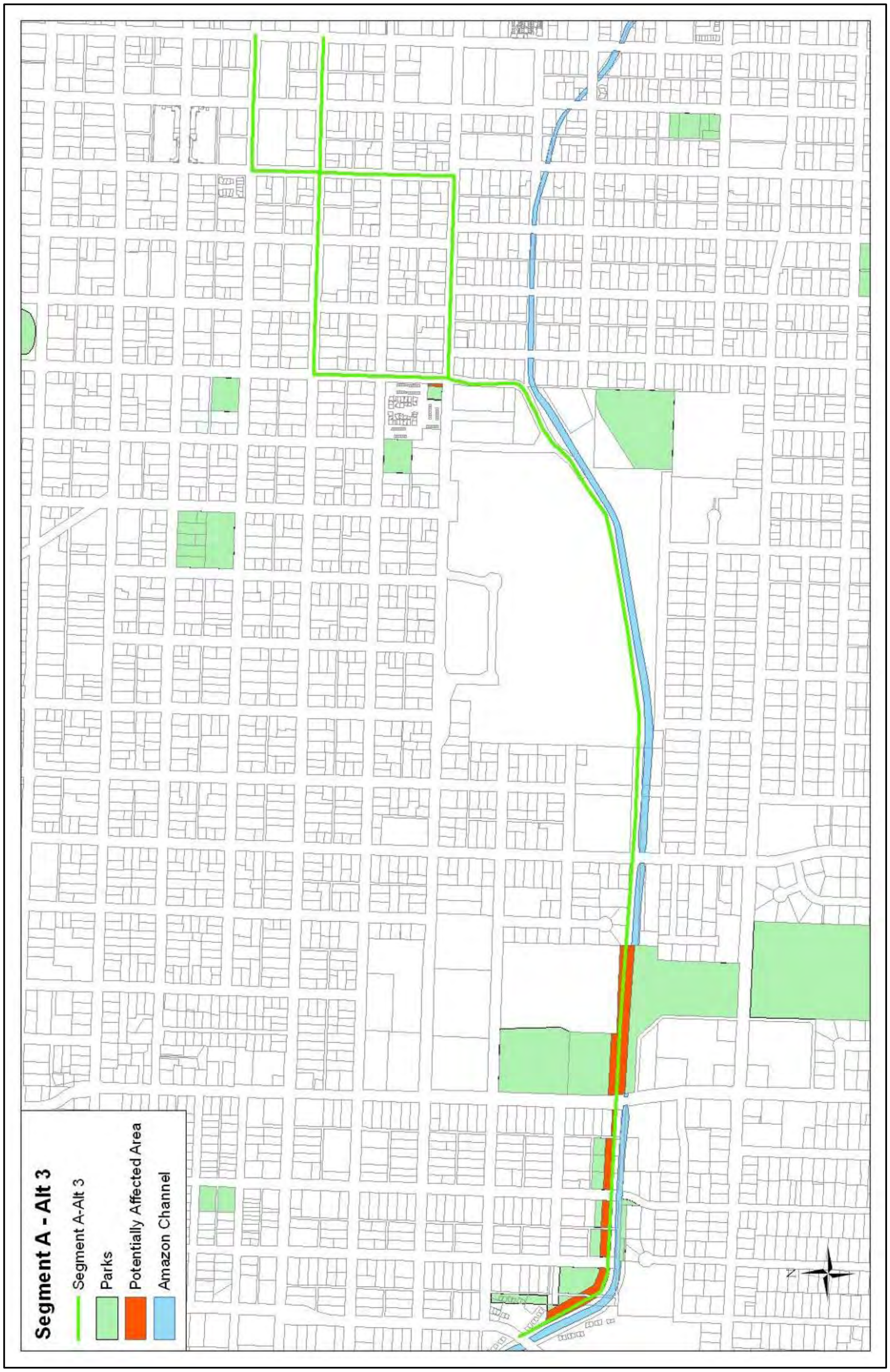


Figure 5.9-22 Alternative SA-A4: Potential Effects to Parks and Open Space within 1/3 Mile

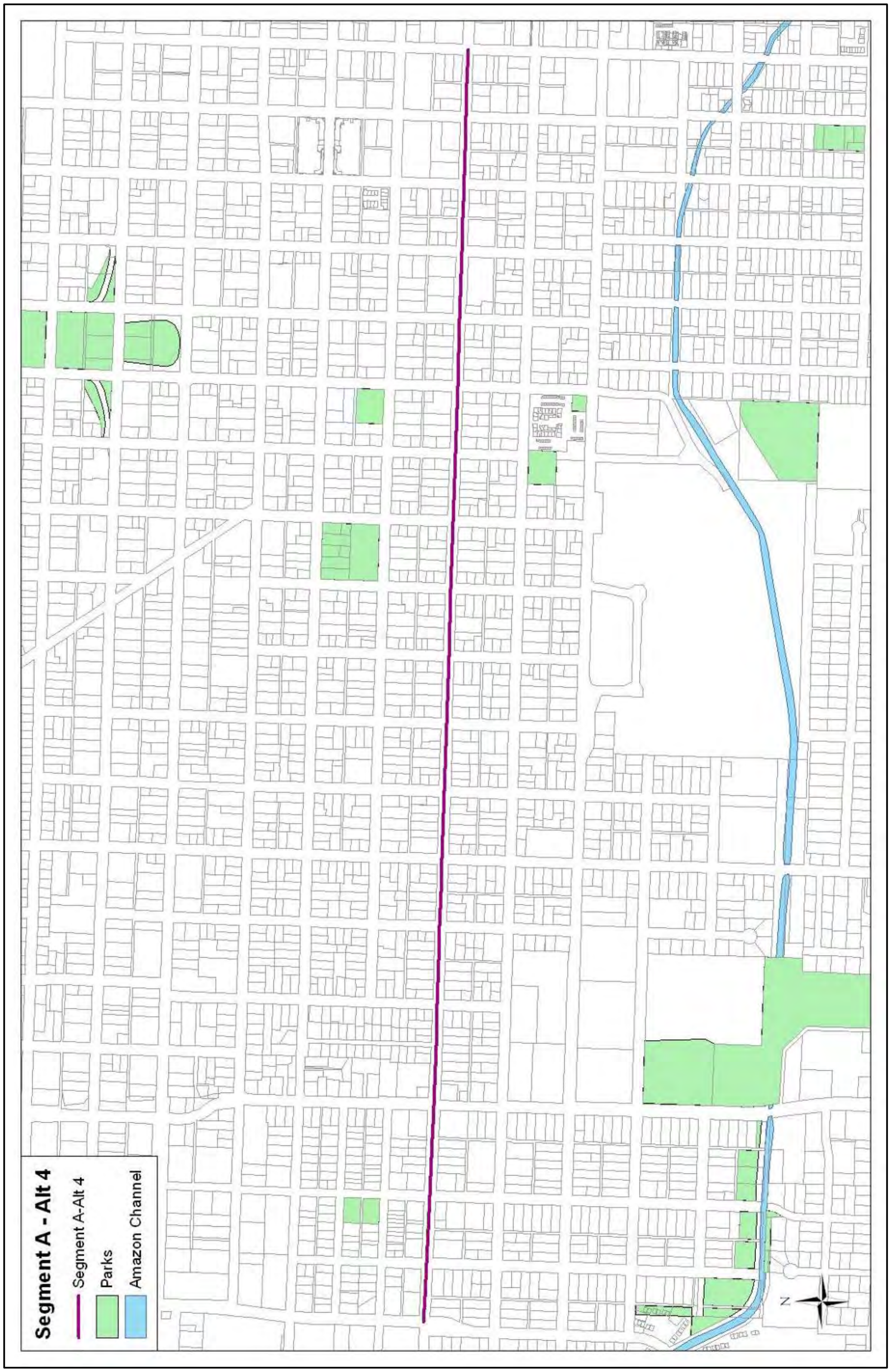


Figure 5.9-23 Alternative SB-A1: Potential Effects to Parks and Open Space within 1/3 Mile

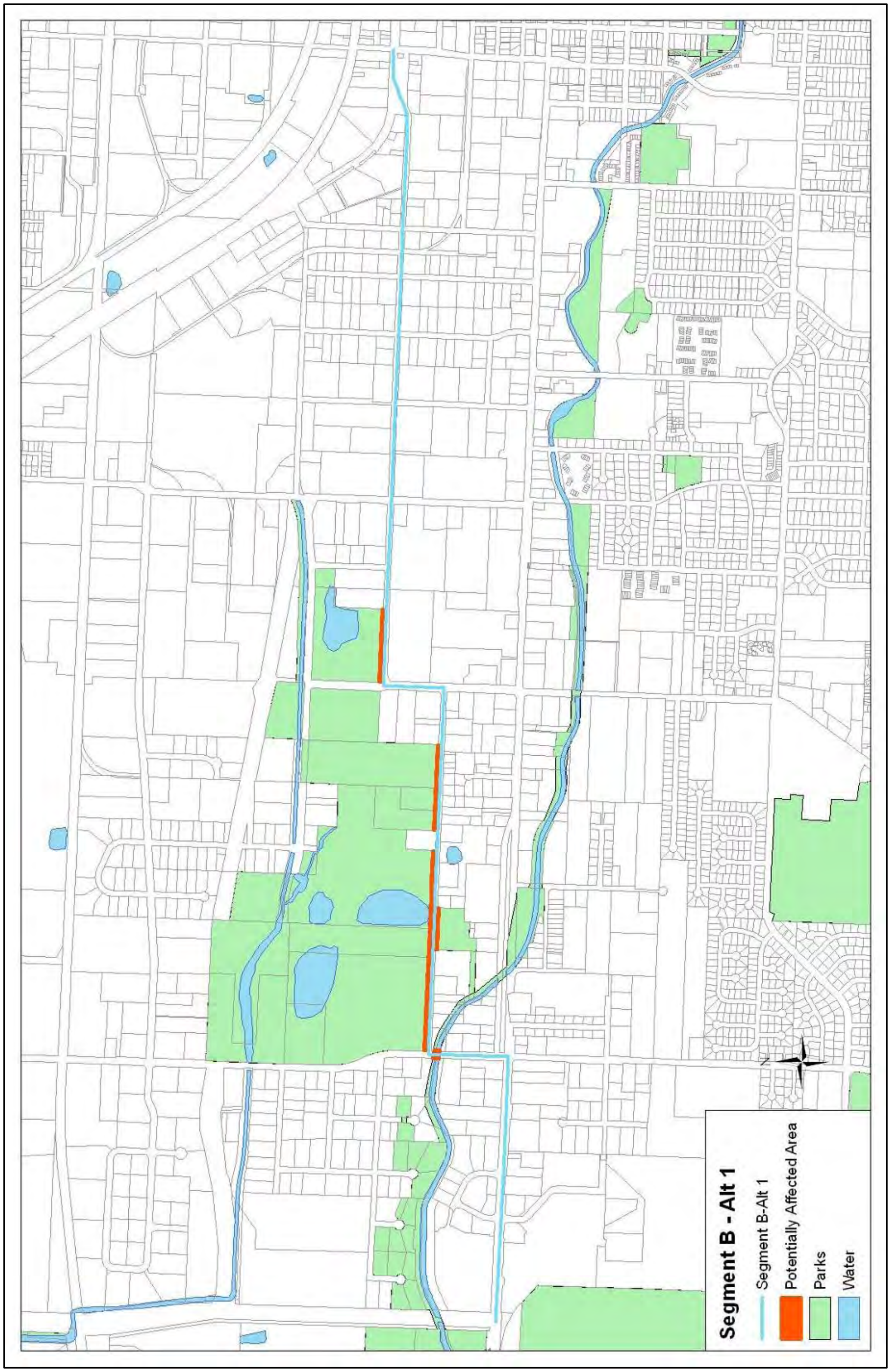


Figure 5.9-24 Alternative SB-A2: Potential Effects to Parks and Open Space within 1/3 Mile

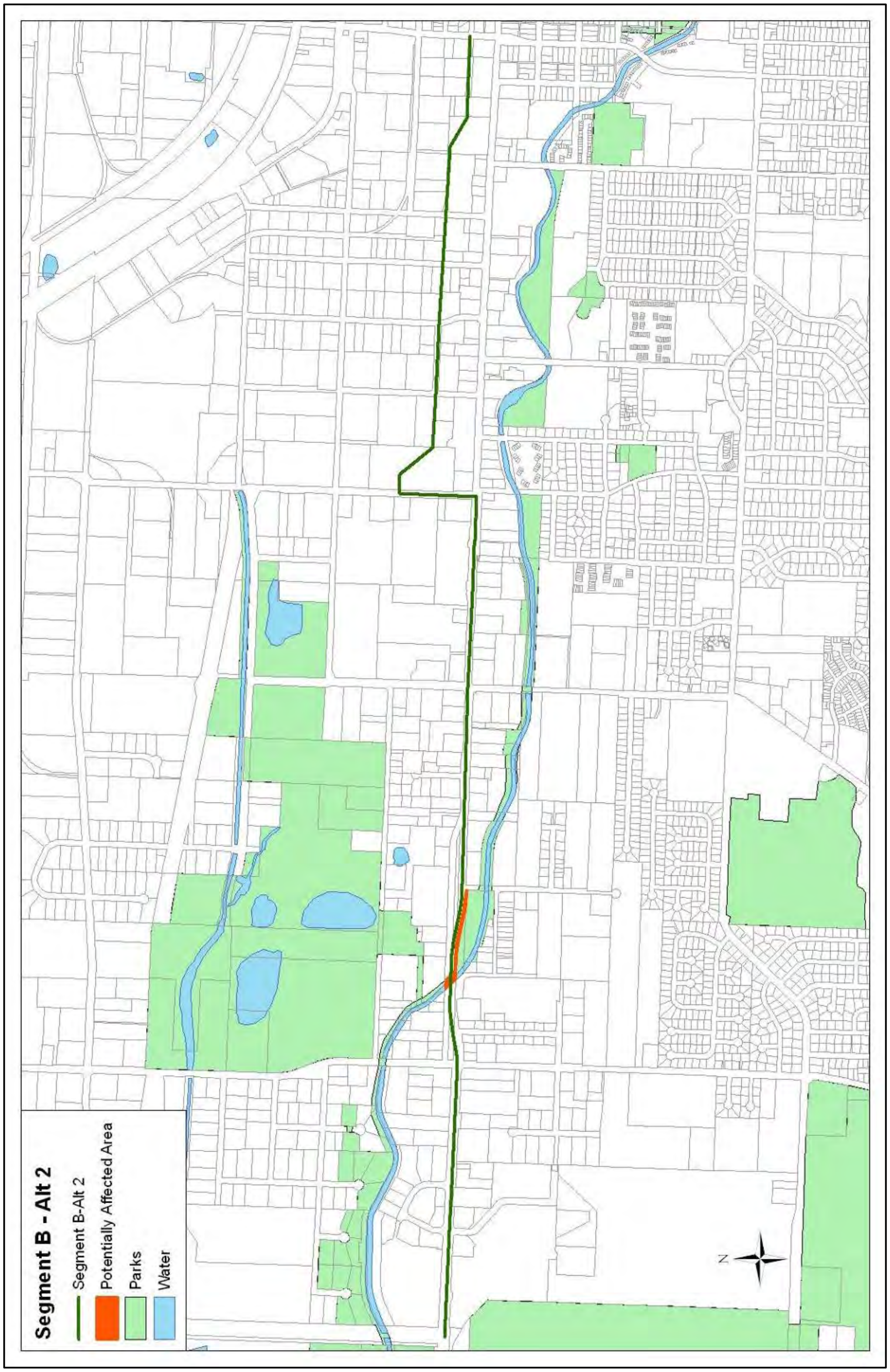


Figure 5.9-25 Alternative SB-A3: Potential Effects to Parks and Open Space within 1/3 Mile

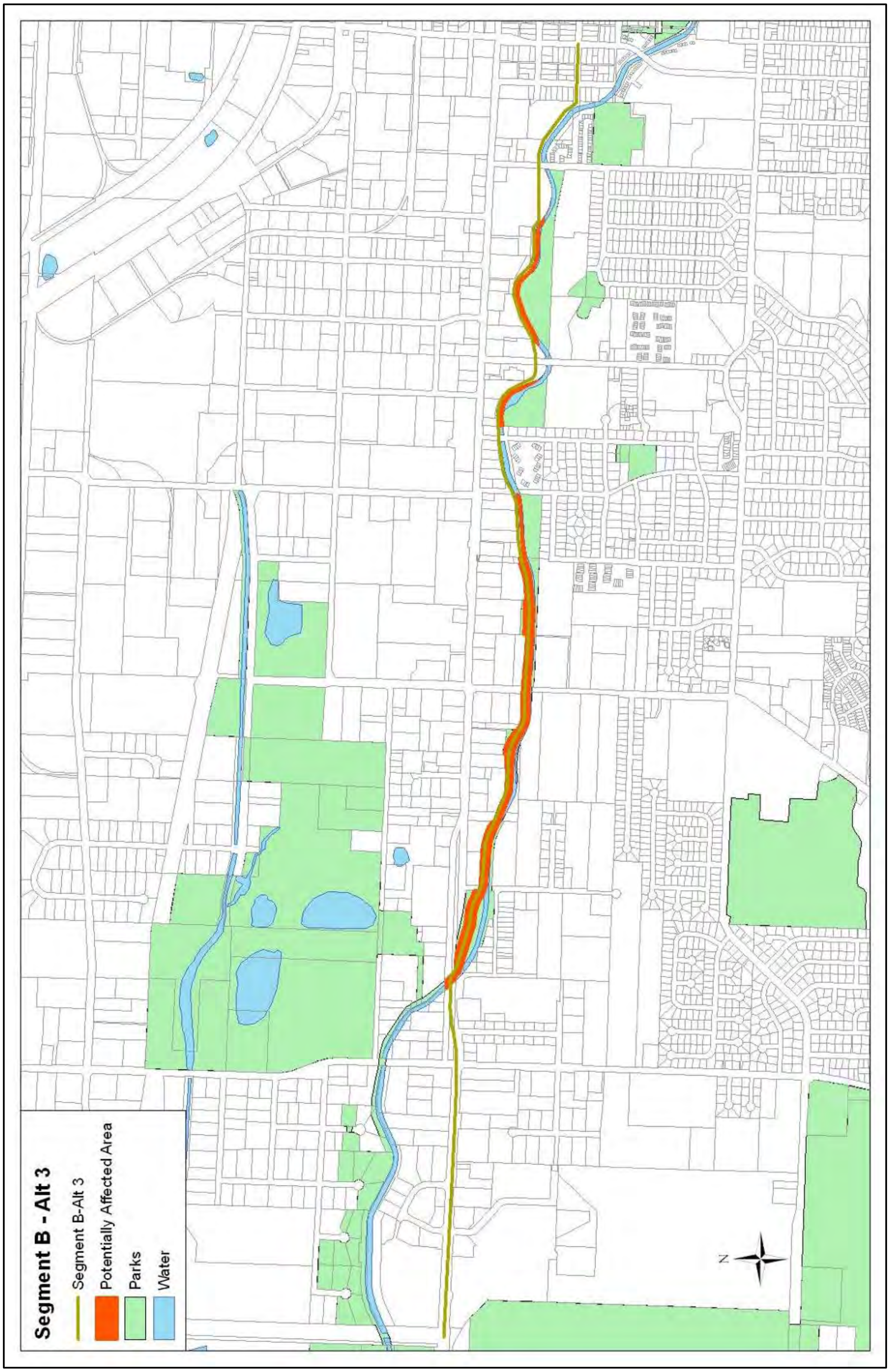


Figure 5.9-26 Alternative SB-A4: Potential Effects to Parks and Open Space within 1/3 Mile

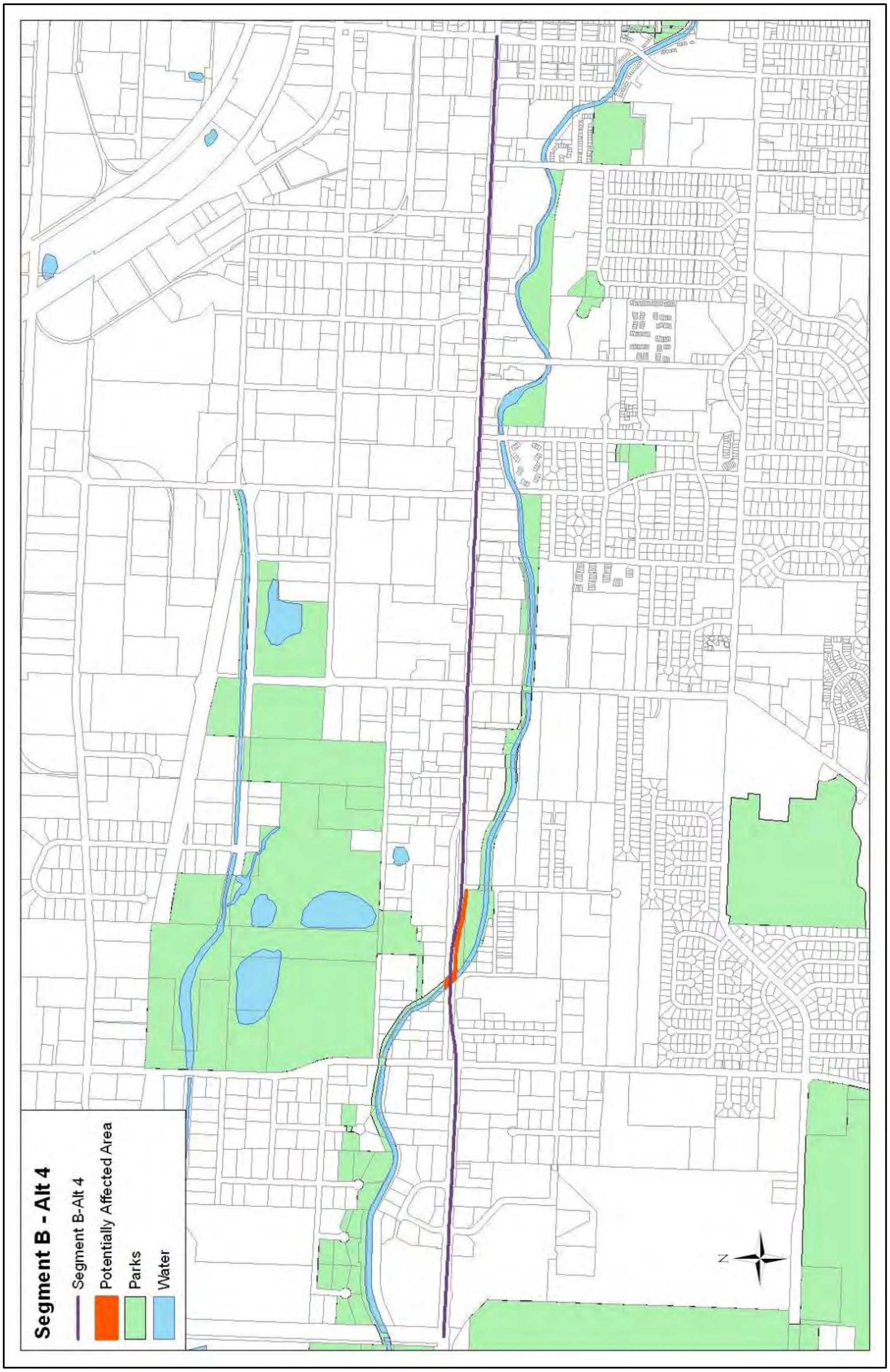
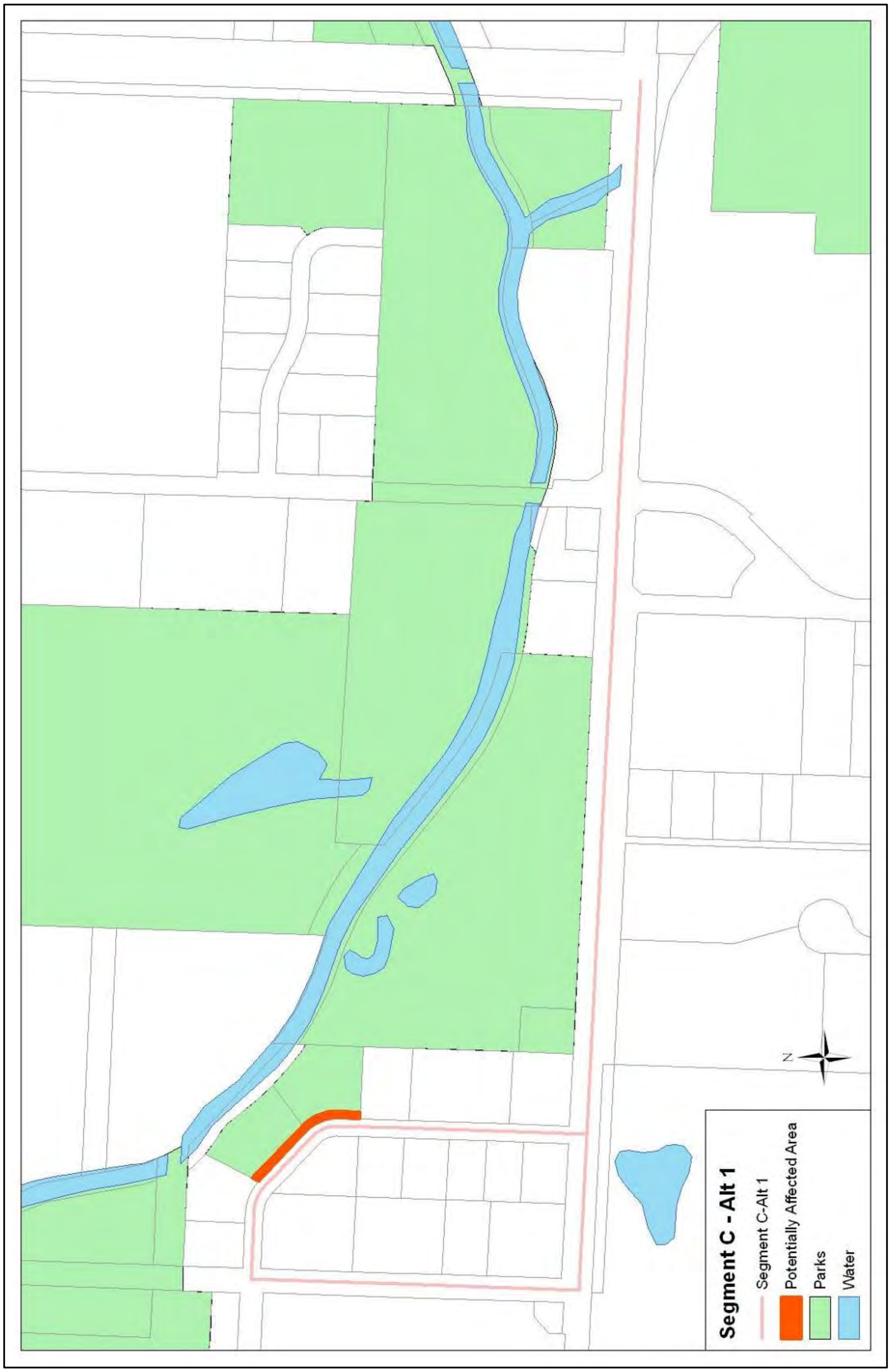


Figure 5.9-27 Alternative SC-A1: Potential Effects to Parks and Open Space within 1/3 Mile



5.8.4.2.3 Findings: Consistent with Laws Related to Resources in Natural and Built Environment

This criterion is based on the project's objective to design the project in a way that is consistent with laws related to resources in the natural and built environment. For the purposes of this screening evaluation, consistency with laws related to natural and built environment resources was measured by evaluating the potential of each alternative to impact designated parks and open spaces. Fewer impacts to designated parks and open spaces were considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

- In Segment A, Alternative 3 (Amazon Channel) has the potential to affect the highest amount of designated parks and open spaces (approximately 3.3 acres) and Alternative 4 (11th Avenue) has potentially no effect to designated parks and open spaces.
- In Segment B, Alternative 3 (Amazon Channel) has the potential to affect the highest amount of designated parks and open spaces (approximately 9.7 acres) and Alternatives 2 (10th Avenue / Seneca Road) and 4 (11th Avenue) have the potential to affect the least amount of designated parks and open spaces (approximately 0.5 acres).
- In Segment C, Alternative 1 (11th Avenue / Terry Street Loop) has the potential to affect 0.2 acres of designated parks and open spaces and Alternative (11th Avenue / Veneta) is not anticipated to have any effect on designated parks and open spaces. The segment from Fisher Road to Territorial Highway passes adjacent to Perkins Peninsula Park. Widening of this street segment could potentially affect this park.

5.8.4.3 Critical Habitat

This criterion measures the potential of the proposed alternatives to impact designated critical habitat areas.

5.8.4.3.1 Rationale / Methods

Central Lane MPO maps were reviewed showing Designated Critical Habitat for Threatened and Endangered Species (Non-Fish). Central Lane MPO maps of Designated Critical Habitat for Federally Listed Threatened and Endangered Fish Species were also reviewed.

The Designated Critical Habitat (Non-Fish) map shows areas of Willamette Daisy, Kincaid's Lupine, and Fender's Blue Butterfly. The source data is from US Fish & Wildlife Service. The fish habitat map shows Bull Trout and Upper Willamette Chinook Critical Habitat. The source data is from USFW and NMFS.

The linear distance an alignment alternative runs through or adjacent to designated habitat was estimated using the map scale.

There was no GIS data available for this analysis.

5.8.4.3.2 Data Tables and Figures

Table 5.9-8 Designated Critical Habitat (Non-Fish)

Alternative	Potential Impact	Area of Potential Impact
SA-A1	No	None
SA-A2	No	None
SA-A3	No	None
SA-A4	No	None
SB-A1	Yes	western terminus at Beltline is just before eastern edge of critical habitat area
SB-A2	Yes	western terminus at Beltline is just before eastern edge of critical habitat area
SB-A3	Yes	western terminus at Beltline is just before eastern edge of critical habitat area
SB-A4	Yes	western terminus at Beltline is just before eastern edge of critical habitat area
SC-A1	Yes	0.7 linear miles of alignment abut critical habitat area (includes north and south sides of alignment)
SC-A2	Yes	1.2 linear miles of alignment abut critical habitat area (includes north and south sides of alignment)

Figure 5.9-28 Designated Critical Habitat (Non-Fish)

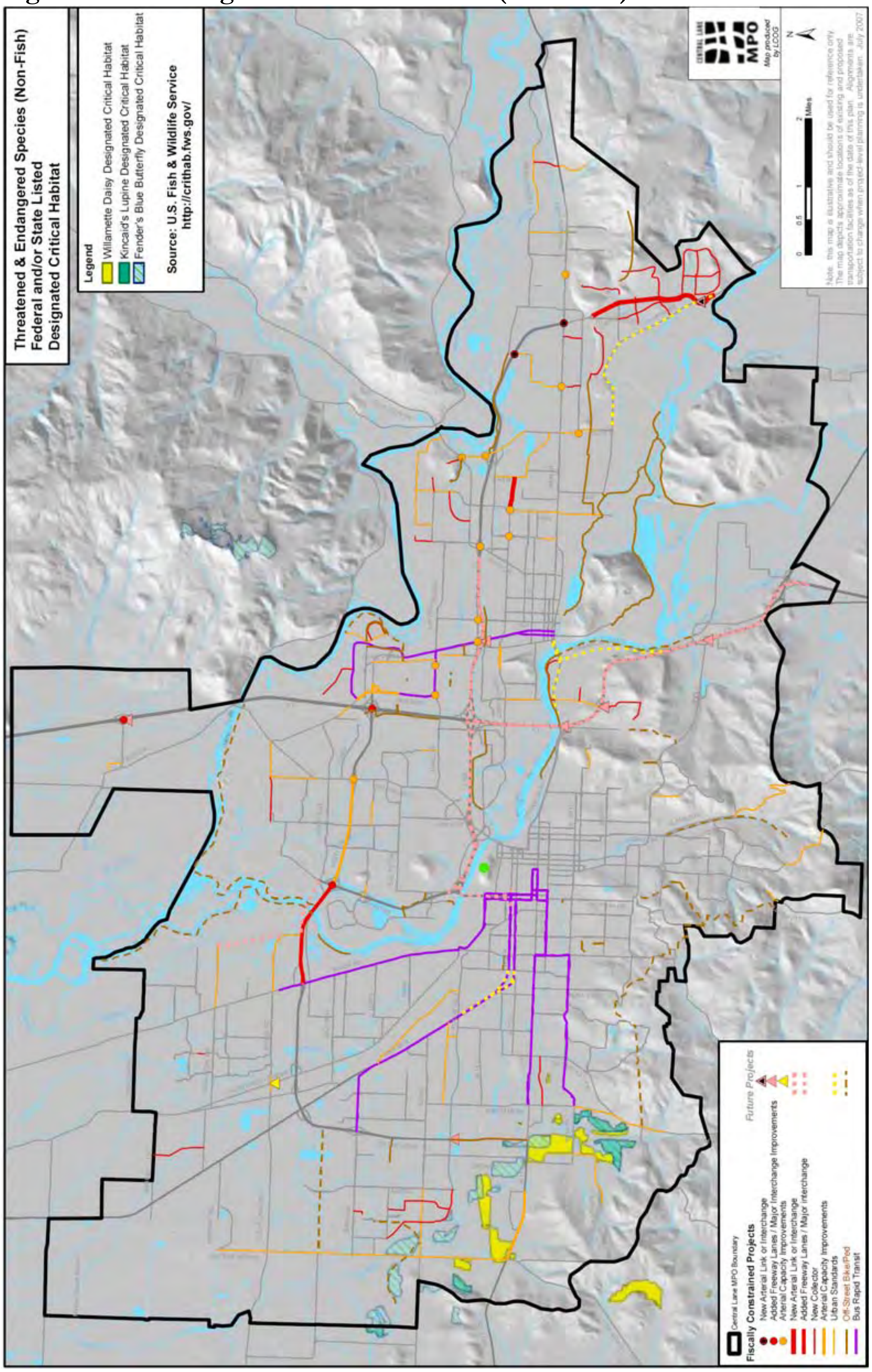
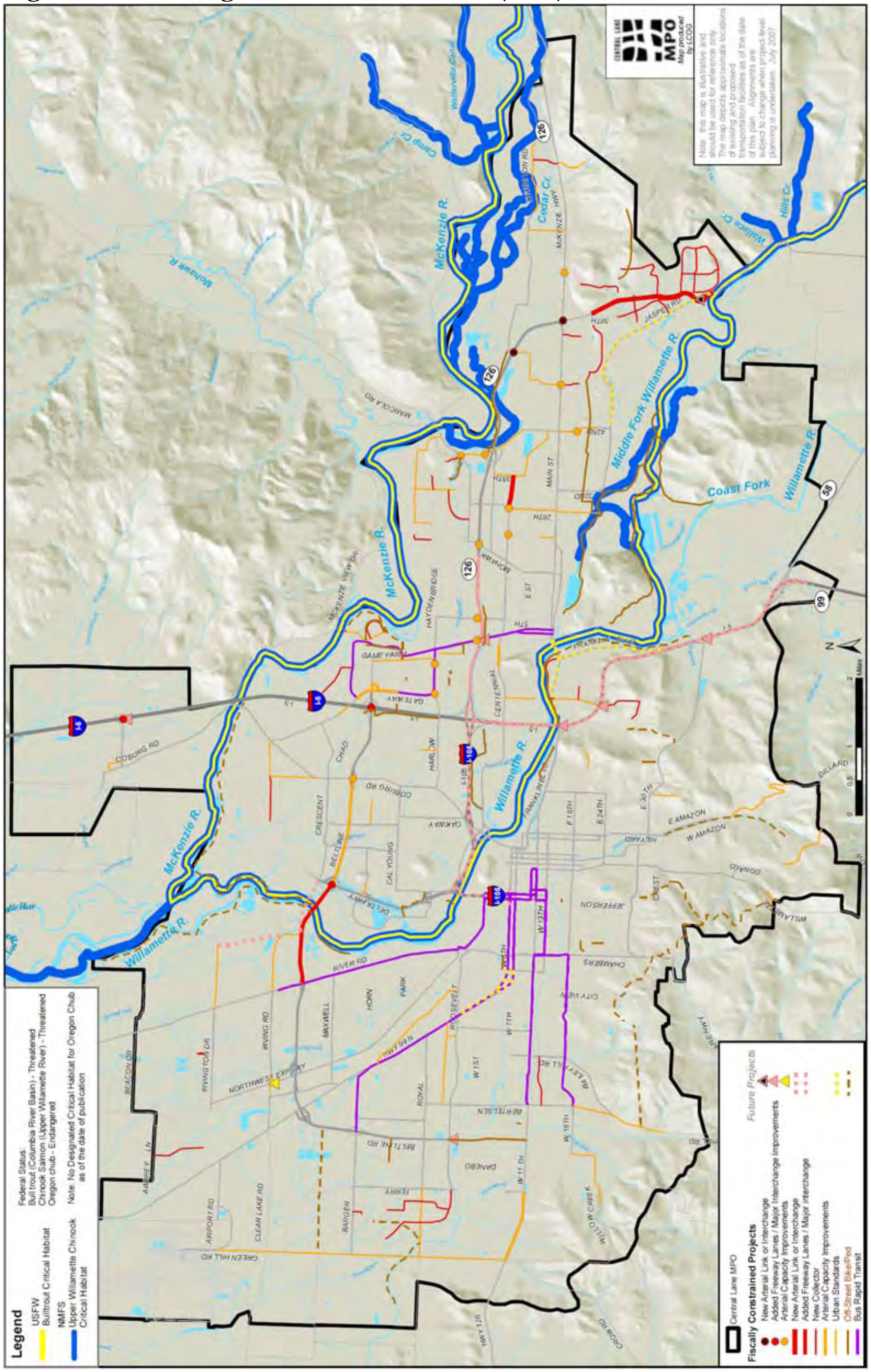


Figure 5.9-29 Designated Critical Habitat (Fish)



5.8.4.3.3 Findings: Consistent with Laws Related to Resources in Natural and Build Environment

This criterion is based on the project's objective to design the project in a way that is consistent with laws related to resources in the natural and built environment. For the purposes of this screening evaluation, consistency with laws related to natural and built environment resources was measured by evaluating the potential of each alternative to impact designated critical habitat areas. Fewer impacts to designated critical habitat areas were considered more favorable.

Based on the data described above, relative comparisons of the alternatives have been made and are summarized below.

- There is no Designated Critical Fish Habitat near any of the alignment alternatives. The rest of the findings in this section refer to non-fish critical habitat.
- The Segment A alternatives do not have the potential to affect critical habitat. There is no Designated Critical Habitat in the vicinity of these alignments.
- The Segment B alternatives terminate at the eastern edge of Designated Critical Habitat at Beltline. As such, there is some potential for impact to these resources.
- Segment C alternatives have the greatest potential for impact. Moving west from Beltline, these alternatives are aligned on roadways that pass through and adjacent to Willamette Daisy and Fender's Blue Butterfly Designated Critical Habitat. SC-A1 runs adjacent to approximately 0.7 miles of habitat. The SC-A2 alternative travels further west to Veneta, potentially affecting 1.2 miles of adjacent habitat within the metro boundary. Critical Habitat data was not readily available for the section west of Fisher Road, so it is unknown if additional resources may be affected by SC-A2.

5.9 Support Sustainability and Reduce Greenhouse Gas Emissions.

This criterion is based on the project's objective to support LTD and the City of Eugene's sustainability policies, including efforts to reduce greenhouse gas emissions. Using the results from other screening level criteria, a qualitative assessment was made to determine if alternatives had the potential to support LTD's Sustainability Policy.

5.9.1 Alternative's Ability to Support LTD's Sustainability Policy

This section addresses the alignment alternatives' ability to support LTD's sustainability policy, particularly the reduction in energy used and greenhouse gases generated to operate the transit system and ability of the transit district to attract riders to transit services and away from single-occupant vehicles (i.e., a reduction in regional vehicle miles traveled), which in general would lead to reduced energy use and greenhouse gas production.

5.9.1.1 Rationale / Methods

The measures that the WEEE Project Tier II Evaluation uses as an indicator of sustainability are the differences in round trip travel times (see Section 5.2.1) and the differences in transit operating hours. These two measures generally address the energy needed and greenhouse gases needed to produce transit service within the West 11th Corridor and the relative ability of the alignment alternatives to attract single-occupant automobile users to transit, thereby reducing energy consumption and the production of greenhouse gases. A more detailed a comprehensive approach to addressing sustainability and the production of greenhouse gases will be developed and implemented for the AA/DEIS phase of the project.

5.9.1.2 Data Tables

The data tables for this measure are tables 5.2-1 through 5.2-4 (for round trip transit travel time) and Table 5.3-1 (for improved operating efficiencies).

5.9.1.3 Findings

In general, those alternatives that perform better as measured by round trip transit travel times (i.e., the shortest travel times) and the improved transit operating efficiencies (i.e., the lowest operating costs) would perform the best in meeting LTD's sustainability policy.

A. Round Trip Transit Travel Times

Overall

- The West 11th Avenue alignment would offer the shortest travel times for all origin-destination pairs. This route is the most direct route.
- The West 13th Avenue and the Amazon Channel alignments would be the next best alignments with travel times approximately three minutes longer than the West 11th Avenue travel time. The West 6th / 7th Avenue and West 10th Place alignment would have the longest travel time.

Eugene Station to Garfield Street

- The West 11th Avenue alignment would be the most direct and shortest route.
- Average speeds on each of the alignments would be relatively similar (14 mph).
- Travel times would vary from 13 minutes to 17 minutes. The West 11th Avenue alignment would have the shortest travel time and the West 6th / 7th Avenue alignment would have the longest travel time.
- The number of traffic signals would play a significant role in the length of travel time for West 6th / 7th Avenue alignment.

Garfield Street to Beltline Road

- The West 11th Avenue alignment would be the most direct and shortest route.
- Average speeds on each of the alignments would vary from 14-18 mph. The West 7th Place/Stewart alignment would be the fastest, owing to the large sections with posted speeds of 40mph.

Beltline Road to West Terminus

- Higher posted speeds would allow for shorter travel times in this section.
- It is likely that fewer EmX stations would be initially developed in this section of the corridor as there are few destinations.

B. Improve Operating Efficiencies

Overall

- The West 11th Avenue alignment would have the lowest relative daily service cost of the origin-destination pairs. As the route length increases, naturally the daily service cost increases.
- The West 13th Avenue and the Amazon Channel alignments to West 11th Avenue would be the next best alignments in terms of daily service cost due to travel times that would be approximately three minutes longer than the West 11th Avenue alignment travel time. There would be a small service cost advantage to the West 13th/West 11th Avenue alignment (SA-A1 and SB-A4).
- The highest service costs would be for the West 6th/7th Avenue and West 10th Place alignment (SA-A2 and SB-A2).

Eugene Station to Garfield Street

- The West 11th Avenue alignment would be the most direct and shortest route and, therefore, would have the lowest operating cost (SA-A4). Because it would be the shortest segment in the evaluation, this section would have the lowest daily service cost for all the alignments.

Eugene Station to Beltline Road

- Again, costs are a factor of distance and travel time. The West 11th Avenue alignment would offer the lowest daily service cost, while the highest would be the West 6th/7th Avenue and West 10th Place alignment (SA-A2 and SB-A2).
- The West 13th Avenue/11th Avenue alignment would have the next lowest service cost compared to the direct West 11th Avenue alignment.

Eugene Station to West Terminus

- Generally, there would be some gains in travel time in this segment due to higher travel speeds at the west end of the project area. However, services costs would be the highest from Eugene Station to the western project terminus because it would encompass the greatest travel distance.
- The SA-A4 and SB-A4 alignment along West 11th Avenue would have the lowest relative service costs.

Appendix A –
Characteristics of Streetcars and Light Rail Systems in the USA

Characteristics of Streetcars and Light Rail Systems in the USA

STREETCAR and VINTAGE TROLLEYS

Metropolitan City Area	Urbanized Area Population	Start of Service	Route Miles	Revenue Vehicles	Annual Boardings (000)	Annual Operating Expense (000)	Annual Cost Per Boarding	Annual Boardings per Route Mile	Comments
Galveston, TX	60,000	1988	5.0	4	41	$355	$8.75	8,120	Primarily tourist-oriented. Received $10 M from UMTA Federal funds with local match from state and two private foundations.
Kenosha, WI	90,000	2000	1.9	5	59	$302	$5.12	31,000	Operating hours vary by season.
LTD (BRT)	*260,000*	*2007*	*8.0*	*4*	*1,439*	*$2,054*	*$1.43*	*179,875*	
Little Rock, AR	650,000	2004	2.5	3	45	$224	$5.04	17,800	Primarily tourist-oriented.
New Orleans, LA	1,000,000	1893	26.0	66	8,920	$14,275	$1.60	343,065	Capital expenses are skewed by damage from Hurricane Katrina in 2005
Memphis, TN	1,300,000	1993	7.0	18	983	$3,577	$3.64	140,357	
Philadelphia, PA	1,518,000	2005	8.2	17	NA	NA	NA	NA	Boarding and expense information is not readily available. Scheduled trips are 45 to 60 minutes long at 10-20 minute headways 24/7.
Portland, OR	2,200,000	2001 / 2005	5.0	4	1,350	NA	NA	NA	Boarding and expense information is not readily available.
Tampa, FL	2,700,000	2003	3.2	8	520	$1,626	$3.13	162,375	
Seattle, WA	3,300,000	2003	1.8	3	795	$2,544	$3.20	441,444	
Seattle, WA	3,300,000	1982	2.1	5	399	$1,427	$3.58	189,810	
San Francisco, CA	4,200,000	1988	5.8	44	NA	NA	NA	NA	Muni upgraded their original electric railway system (streetcars) to LRT and have since implemented a route that features vintage and restored streetcars along the Embarcardero.
Dallas, TX	6,000,000	1989	2.8	4	NA	NA	NA	NA	Vintage Trolley, tourist-oriented. Received $2.5 M from UMTA Federal funds with contributions from local businesses and supporters of $2.5 M.

Sources: Railway Preservation Resources website http://www.railwaypreservation.com/vintagetrolley/vintagetrolley.htm

LIGHT RAIL

Metropolitan City Area	Urbanized Area Population	Start of Service	Round-Trip Route Miles	Revenue Vehicles	Annual Boardings (000)	Annual Operating Expense (000)	Annual Cost Per Boarding	Annual Boardings per Route Mile	Comments
LTD (BRT)	*260,000*	*2007*	*8.0*	*4*	*1,439*	*$2,054*	*$1.43*	*179,875*	
Charlotte, NC	630,478	2007	19.2	NA	NA	NA	NA	NA	The light rail system in Charlotte opened in November 2007. Projected ridership is 8,900 passengers per day.
Buffalo, NY	1,100,000	1985	14.1	27	5,478	$18,271	$3.34	388,511	
Salt Lake City, UT	1,100,000	1999	37.3	46	10,020	$20,013	$2.00	268,630	
Philadelphia, PA	1,518,000	2005	132.0	141	25,158	$46,088	$1.83	190,591	SEPTA retired most of their streetcars and switched to LRT in 1992. In 2005 operation began of 17 restored streetcars on about 8 miles of the service area.
San Jose, CA	1,800,000	1987	71.5	80	5,473	$45,753	$8.36	76,545	
Cleveland, OH	2,100,000	1936 /1996	33.0	17	2,561	$12,766	$4.99	77,597	
Sacramento, CA	2,100,000	1987	62.6	72	11,022	$35,226	$3.20	176,070	
Portland, OR	2,200,000	1986	92.9	105	31,516	$56,966	$1.81	339,249	
Denver, CO	2,400,000	1994/2000	32.1	49	10,029	$21,689	$2.16	312,414	

LIGHT RAIL

Metropolitan City Area	Urbanized Area Population	Start of Service	Round-Trip Route Miles	Revenue Vehicles	Annual Boardings (000)	Annual Operating Expense (000)	Annual Cost Per Boarding	Annual Boardings per Route Mile	Comments
Pittsburgh, PA	2,400,000	1987	44.8	55	6,655	$35,590	$5.35	148,540	
Baltimore, MD	2,700,000	1992/1997	54.0	53	6,067	$33,688	$5.55	112,354	
St. Louis, MO	2,800,000	1993	81.0	65	14,510	$36,294	$2.50	179,130	
San Diego, CA	2,900,000	1981	97.0	123	26,538	$41,831	$1.58	273,590	The light rail system in San Diego is called "San Diego Trolley, Inc." It is not a streetcar.
Minneapolis, MN	3,200,000	2006	24.2	22	2,939	$8,368	$2.85	121,438	
San Francisco, CA	4,200,000	1912	72.9	181	45,187	$105,900	$2.34	619,849	
Boston, MA	4,500,000	1897	78.0	185	70,558	$107,082	$1.52	904,591	
Houston, TX	5,500,000	2004	20.0	18	5,350	$14,135	$2.64	267,485	
Philadelphia, PA	5,800,000	1908	171.0	141	25,158	$46,088	$1.83	147,123	
Dallas, TX	6,000,000	1996	98.4	95	16,376	$57,023	$3.48	166,423	
Los Angeles, CA	13,000,000	1990	116.3	121	32,852	$111,654	$3.40	282,479	
New York, NY	18,900,000	1910	67.1	55	9,869	$54,714	$5.54	147,077	Operating area is New Jersey (not New York City)

Sources: APTA website http://www.apta.com/research/stats/

System Comparison: Streetcar vs. Light Rail vs. BRT

Item	Streetcars	Light Rail (LRT)	BRT
Operating Units	Single cars	Trains of up to 4 cars	Single vehicles
Construction Cost Averages	$25 to $50 M per mile	$50 to $100 M per mile	$3 to $25 M per mile
Passenger Capacity	44 seated, 44 standing	64 seated, 86 standing per unit	40 seated, 60 standing per unit
Vehicle Size	66' or less, 8' wide	80' or longer, 8.75' to 9.5' wide	63' long, 8'3" wide
Alignment Location	Mostly in-street, shared lanes	Mostly private ROW, some street	shared lanes, dedicated lanes
Route Lengths	Under 5 miles	10 to 20 miles	5 to 20 miles
Service Function	Local circulation	Regional connectivity	Intra Urban

Sources: Table developed using Street Smart: Streetcars and Cities in the 21st Century (page 11) and Lane Transit District

Appendix B –

Applicability of Rail in the Eugene-Springfield Metropolitan Area

Applicability of Rail in the Eugene-Springfield Metropolitan Area

There are several different types of urban rail systems in use in the United States. Although not all systems fall neatly into a specific category, it is possible to categorize rail systems. The following definitions are generally accepted within the industry:

- Streetcar: Streetcars typically operate on city streets in mixed traffic and provide circulator or connector service in central business districts or tourist areas. They have slow speeds (the Portland Streetcar averages seven miles per hour), and can be self-propelled or electric with an overhead catenary system. Streetcar lines are typically less than five miles in length. Stations are often spaced every couple of blocks, similar to a city bus line. Construction costs average between $25 and $50 million per mile

- Light Rail: Light rail is typically a corridor-based service that operates on exclusive rights-of-way, but has at-grade crossings. Most light rail systems use electric propulsion with an overhead catenary system. Light rail lines are typically five to twenty miles long, and stations are spaced at least 1/3 mile apart. Construction costs average between $50 and $100 million per mile.

- Bus Rapid Transit (BRT): BRT combines the quality of rail transit and the flexibility of buses. It can operate on bus lanes, high-occupancy vehicle (HOV) lanes, expressways, or ordinary streets. The vehicles are designed to allow rapid passenger loading and unloading, with more doors than ordinary buses. Construction costs average between $3 and $25 million per mile (depending on design constraints).

- Commuter Rail: Commuter rail usually provides high-speed service between an outlying community and an employment center. Crossings are normally gate-controlled, so the train never has to stop except at stations. Commuter rail lines are typically at least 20 miles long. Stations are usually spaced several miles apart. Construction costs (assuming new rail) average between $100 and $150 million per mile.

- Subway: Subways provide high-speed, underground service within major metropolitan areas. The grade separation enables the system to operate efficiently, though the underground lines and stations add significantly to the construction costs of the system. Stations are typically at least one mile apart. Subways use electric power provided through a "third rail". Construction costs are more than $100 million per mile.

- Monorail: Monorail is a single-rail overhead system. The grade separation eliminates conflicts with other vehicles, though it also greatly increases construction costs. The only operating monorail systems in the United States are located in Seattle, Las Vegas, and Disney amusement parks. Construction costs are more than $100 million per mile.

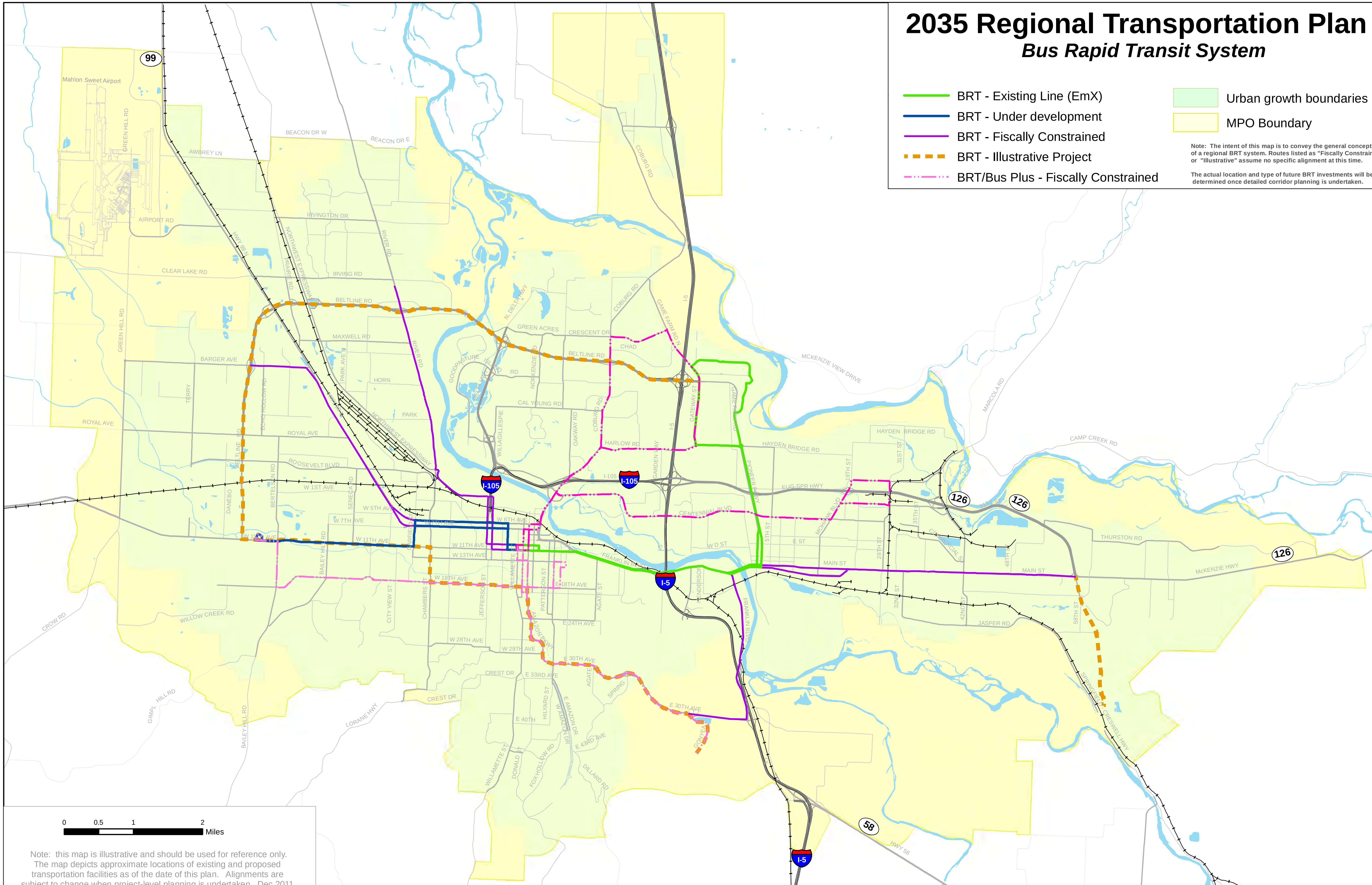
- Streetcar and light rail have been mentioned most often for possible application within the Eugene-Springfield area. The attached table lists streetcar and light rail systems currently in operation in the United States.

Streetcars are in operation in a wide range of communities--from Galveston, Texas (population 60,000) to Dallas, Texas (population 6 million). It should be noted, however, that streetcars in the three smallest communities: Galveston, Texas; Kenosha, Wisconsin; and Little Rock, Arkansas; have very low ridership (less than 5 percent of the ridership on the EmX Green Line). Streetcars have often been pursued as an economic development strategy, and their track record in generating economic development in some communities is strong. Streetcars have not typically been able to compete well for federal funding when projects are judged on cost-effectiveness as a transportation mode. Consequently, streetcar advocates have been encouraging the Federal Transit Administration (FTA) to judge projects based on economic development benefits rather than mobility benefits.

Light rail lines are typically corridor based and occur in larger communities. With the exception of a new system getting started in Charlotte, North Carolina, the smallest metropolitan areas to have light rail are Buffalo, New York, and Salt Lake City, Utah, each of which has an urban area population of 1.1 million people.

In conclusion, the data indicate that the LTD EmX Green Line compares favorably with both streetcar and light rail systems. LTD EmX has a lower cost per boarding than the streetcar or light rail system examples. The EmX also is rated in the middle in terms of boardings per route mile, even though light rail systems generally have higher capacities. Overall, evidence does not support the suggestion that light rail has lower operating costs as compared to bus rapid transit.

Appendix D



2035 Regional Transportation Plan
Bus Rapid Transit System
BRT - Existing Line (EmX)
BRT - Under development
BRT - Fiscally Constrained
BRT - Illustrative Project
BRT/Bus Plus - Fiscally Constrained
Urban growth boundaries
MPO Boundary
Note: The intent of this map is to convey the general concept of a regional BRT system. Routes listed as "Fiscally Constrained" or "Illustrative" assume no specific alignment at this time.
The actual location and type of future BRT investments will be determined once detailed corridor planning is undertaken.
0 0.5 1 2 Miles
Note: this map is illustrative and should be used for reference only. The map depicts approximate locations of existing and proposed transportation facilities as of the date of this plan. Alignments are subject to change when project-level planning is undertaken. Dec 2011.
Mahlon Sweet Airport
99
126
58
I-105
I-5
BELTLINE RD
ROYAL AVE
BARGER AVE
CLEAR LAKE RD
AIRPORT RD
IRVING RD
MAXWELL RD
W 11TH AVE
W 18TH AVE
FRANKLIN BLVD
MAIN ST
THURSTON RD
McKENZIE HWY
JASPER RD
HAYDEN BRIDGE RD
CENTENNIAL BLVD
HARLOW RD
CREST DR
WILLOW CREEK RD