MovingAhead

STREETS AND PLACES REIMAGINED

DRAFT FINAL Operating and Maintenance Costs Technical Report

Lane Transit District
City of Eugene

In cooperation with
Lane Council of Governments
Lane County
Oregon Department of Transportation

December 2016

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Operating and Maintenance Costs Technical Report

MovingAhead Project

Prepared in accordance with the
National Environmental Policy Act of 1969, as amended 42 U.S.C. 4322
and the
Federal Transit Act of 1964, as amended 49 U.S.C. 1601 eq. seq.

April 2017

Prepared for
Federal Transit Administration
Lane Transit District
City of Eugene

Prepared by
Lane Transit District

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S1. Operating and Maintenance Costs Estimating Summary

S1.1 Introduction

This Operation and Maintenance (O&M) Cost Estimating Report presents the results of the operating and maintenance cost assessment for the Lane Transit District (LTD) and City of Eugene's MovingAhead Project in Eugene, Oregon (OR). The purpose of MovingAhead is to determine which high-capacity transit corridors identified in the adopted *Emerald Express (EmX) System Plan* (LTD, 2014) and the Frequent Transit Network (FTN) are ready to advance to capital improvements programming in the near term. The City of Eugene (City) and LTD initiated the MovingAhead Project in 2014 to identify and examine alternatives for improving multimodal safety, mobility, and accessibility in key transit corridors in the City. A main theme of the City's vision is to concentrate new growth along and near the City's key transit corridors and within core commercial areas while protecting neighborhoods and increasing access to services for everyone. The City and LTD are jointly conducting the project to facilitate a more streamlined and cost-efficient process through concurrent planning, environmental review, and design and construction of multiple corridors.

The City and LTD examined multimodal transit alternatives in five key transit corridors identified in the Draft *Envision Eugene Comprehensive Plan* (City of Eugene, 2016) and the *Eugene 2035 Transportation System Plan* (Eugene TSP) (Central Lane MPO, 2016):

- Highway 99 Corridor
- River Road Corridor
- 30th Avenue to Lane Community College (LCC) Corridor
- Coburg Road Corridor
- Martin Luther King, Jr. Boulevard Corridor

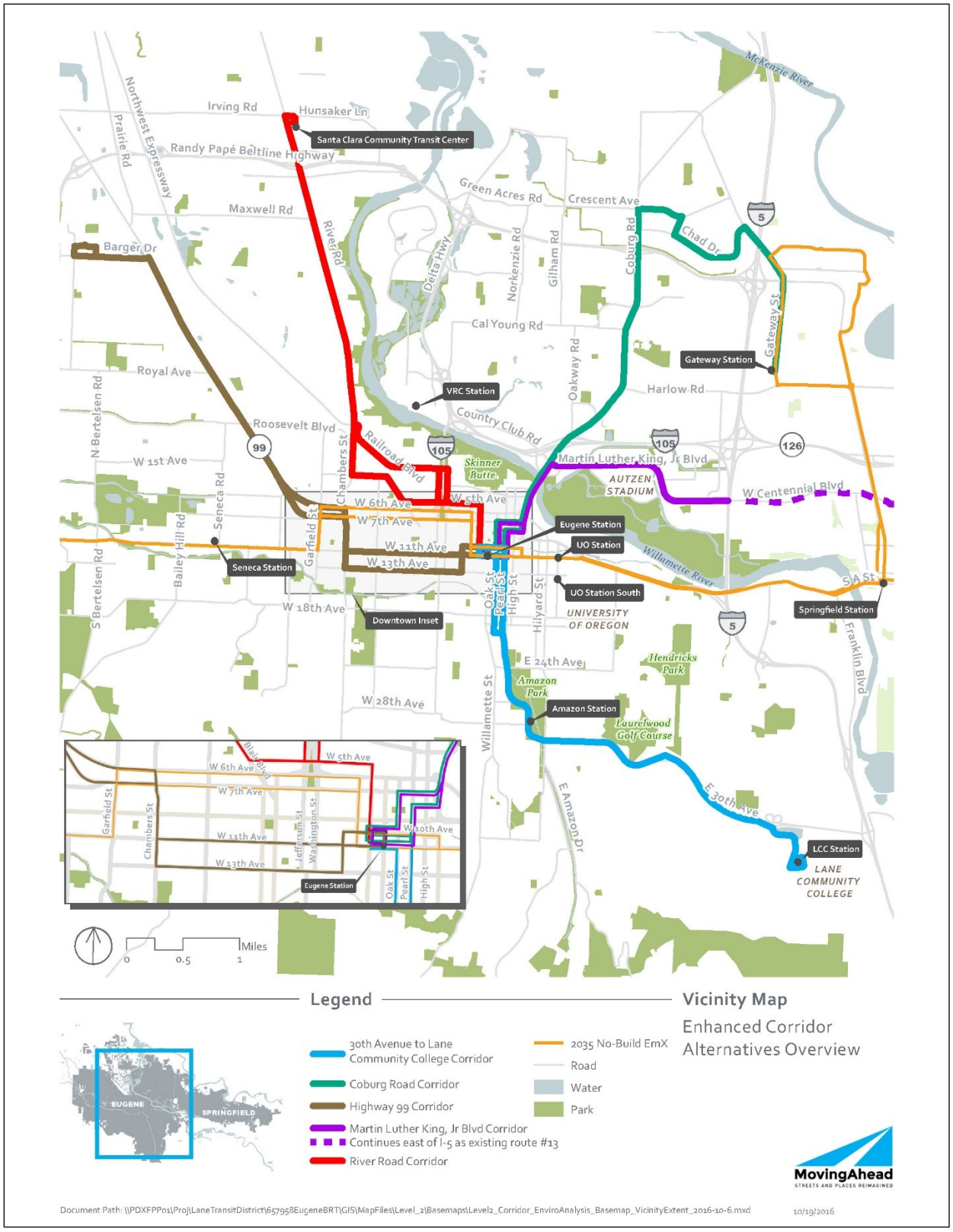
No-Build, Enhanced Corridor, and EmX Alternatives were developed for each corridor, except the Martin Luther King, Jr. Boulevard Corridor, for which only No-Build and Enhanced Corridor Alternatives were developed. Figure S.1-1 shows the proposed corridors for the Enhanced Corridor Alternatives and Figure S.1-2 shows the proposed corridors for the EmX Alternatives.

The *Level 2 Definition of Alternatives* (CH2M et al., 2016) contains a detailed description of the project alternatives. The following items summarize the project alternatives evaluated.

- The **No-Build Alternatives** serve as a reference point to gauge the benefits, costs, and effects of the Enhanced Corridor and EmX Alternatives in each corridor. Each No-Build Alternative is based on the projected conditions in 2035. Capital projects are derived from the financially constrained project lists in the Eugene TSP, *Lane County Transportation System Plan* (LCPW, 2004), *Lane Transit District Capital Improvement Plan* (LTD, 2015), and *Lane Transit District Long-Range Transit Plan* (LTD, 2014b).
- **Enhanced Corridor Alternatives** are intended to address the project's Purpose, Need, Goals, and Objectives without major transit capital investments, instead focusing on lower-cost capital improvements, operational improvements, and transit service refinements. Features can include transit queue jumps (lanes for buses that allow the bus to "jump" ahead of other traffic at intersections using a separate signal phase), stop consolidation, and enhanced shelters. These features can improve reliability, reduce transit travel time, and increase passenger comfort, making transit service along the corridor more attractive.
- **EmX Alternatives** are characterized by sections of exclusive guideway, branded multi-door 60-foot-long bus rapid transit (BRT) vehicles, and enhanced stations with level boarding platforms

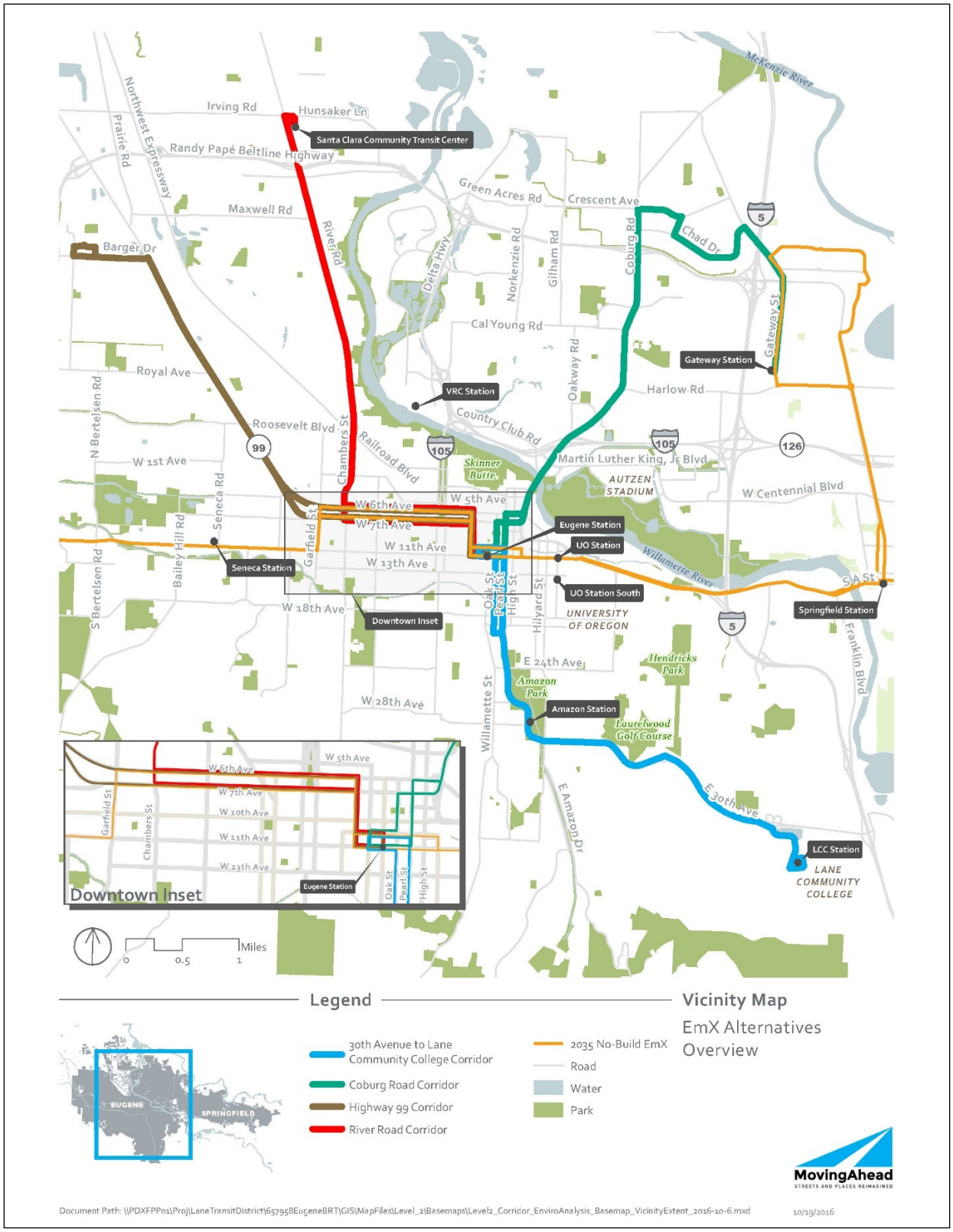
instead of bus stops; off-board fare collection; transit signal priority; wider stop spacing; and 10-minute service frequencies. In general, EmX is a transit mode positioned between fixed-route bus service operating in mixed traffic and urban rail service operating in a separate right of way (ROW). EmX service is intended to improve transit speed, reliability, and ridership.

Figure S.1-1. Enhanced Corridor Alternatives Overview



Source: CH2M. 2016.

Figure S.1-2. EmX Alternatives Overview



Source: CH2M. 2016.

This technical report provides the results of the O&M Cost Estimating analysis and enumerates the methods and data used to arrive at corridor costs at this level of design. A separate report, *Capital Cost Estimating* (Draft) (CH2M 2016), details the estimated capital costs for each alternative. The cost of operating and maintaining each corridor alternative affects the capability of an agency to sustainably maintain service over time even after identifying the required capital costs for a given alternative. O&M cost therefore is considered during the selection of corridor preferred alternatives.

S.2 Affected Environment

The project's five corridors are primarily located within the City of Eugene, with a portion of the 30th Avenue to LCC Corridor located within unincorporated Lane County, and a portion of the Coburg Road Corridor located in the City of Springfield.

The MovingAhead Project encompasses five corridors in the City of Eugene. The area of potential impact (API) encompasses proposed construction within the construction footprint of the build alternatives within each corridor and the proposed expansion of an existing maintenance facility owned by LTD to accommodate its expanded fleet as a result of potential construction of multiple corridors.

S.3 Results by Corridor Alternative

Table S.3-1 displays forecasts of revenue service levels and associated costs for the base year (FY 2016) and all MovingAhead alternatives. Total system-wide annual O&M costs are the sum of costs related to three service categories forecasted for each alternative: revenue hours, revenue miles, and peak buses. The Federal Transit Administration defines revenue service (revenue hours, revenue miles) as the time and/or distance traveled "when a vehicle is available to the general public and there is an expectation of carrying passengers" (FTA, National Transit Database Glossary). Typically, this definition may include time or distance traveled during layovers or recovery time (on average about 15% of total vehicle hours for LTD), but for the purposes of modeling the corridor alternatives for this study, revenue service refers exclusively to in-service time when the bus is serving passengers. Revenue service also excludes the time or distance traveled as a vehicle is switching routes, traveling to or from the fleet yard to begin or end a route, or any time when there is no expectation of carrying revenue passengers. Peak buses are the number of vehicles necessary to support service during peak periods. These are standard metrics in the transit industry and serve to represent the major cost drivers of operating transit service. The final column in Table S.3-1 shows how the total forecasted cost of each MovingAhead alternative compares to the No-Build Alternative.

Table S.3-1. Annual System-Wide Operation & Maintenance Costs and Service Levels by Alternative[1]

Alternative	Annual Revenue Hours		Annual Revenue Miles		Peak Buses[2]		Total Cost	Change from No-Build[3]
	No.	Cost	No.	Cost	No.	Cost		
Existing O&M (2016)[4]	206,100	$17.5M	3,337,300	$7.4M	81	$15.9M	**$40.8M**	-
No-Build (2035)	278,600	$23.6M	4,520,200	$10.5M	93	$18.7M	**$52.8M**	-
Highway 99 Corridor								
Hwy. 99 EC (2035)	277,500	$23.5M	4,600,800	$10.7M	92	$18.5M	**$52.7M**	-$0.1M
Hwy. 99 EmX (2035)	292,400	$24.8M	4,864,800	$11.6M	95	$19.3M	**$55.6M**	$2.8M
River Road Corridor								
River Rd. EC (2035)	277,500	$23.5M	4,547,400	$10.6M	90	$18.1M	**$52.2M**	-$0.6M
River Rd. EmX (2035)	285,600	$24.2M	4,744,400	$11.3M	95	$19.3M	**$54.8M**	$2.0M
30th Avenue to LCC Corridor								
30th Ave./LCC EC (2035)	277,500	$23.5M	4,565,400	$10.6M	90	$18.1M	**$52.3M**	-$0.5M
30th Ave./LCC EmX (2035)	282,000	$23.9M	4,674,100	$11.2M	90	$18.3M	**$53.3M**	$0.5M
Coburg Road Corridor								
Coburg Rd. EC (2035)	274,100	$23.2M	4,487,800	$10.5M	95	$19.1M	**$52.8M**	$0.0M
Coburg Rd. EmX (2035)	282,900	$24.0M	4,633,400	$11.2M	96	$19.5M	**$54.6M**	$1.8M
Martin Luther King, Jr. Boulevard Corridor								
MLK, Jr. Blvd (2035)	285,800	$24.2M	4,653,000	$10.8M	94	$18.9M	**$53.9M**	$1.1M

Source: MovingAhead O&M Cost Estimates (LTD: April 2017)

Notes:

[1]Forecasts in Table S.3-1 are the product of a fully allocated cost model (methodology detailed in Section 3). In general, transportation costs are allocated on a per revenue hour basis, fleet maintenance costs are allocated per revenue mile, and all other administrative and support costs are allocated per peak vehicle.

[2]Peak buses are the number of vehicles necessary to support service during peak periods. A fully allocated cost model uses peak vehicles as a proxy for the overall size of the system, and allocates all expenses for the administration and support of the transit system outside of Operations, Operations Training, and Maintenance departments. In addition, costs related to transfers to support LTD's paratransit and rural services, and insurance for the district are allocated to peak vehicles. A full list of departmental budgets allocated to peak vehicles is outlined in Section 3.2.1.1.

[3]Positive numbers indicate an increase in total O&M costs compared to the No-Build Alternative. Negative numbers show that total O&M costs would be lower than the No-Build Alternative.

[4]Existing O&M (2016) service levels and costs are rounded from actuals from that year and are the only numbers in Table S.3-1 that are not forecasts. The allocation of LTD's base year FY2016 budget to FY2016 service levels determine cost factors for each category which are then applied to the three service variables modeled for each alternative.

In general, differences in O&M costs between the build alternatives and the No-Build Alternative are directly related to the system-wide revenue service levels and peak buses of each alternative, which differ depending on the details of each corridor alternative.

O&M costs for all Enhanced Corridor Alternatives, except for the Martin Luther King, Jr. Enhanced Corridor Alternative, result in O&M costs that are lower than or equal to the O&M costs of the No-Build Alternative. The primary reason for this is that as vehicle cycle-time (the time it takes for a vehicle to make a round-trip) is decreased (due to shorter layover times and faster travel times) the number of peak buses required to serve the system as a whole is decreased. This scenario also results in more revenue miles per revenue hour.

Under Enhanced Corridor Alternatives, capital improvements are operational in their focus and are intended to protect travel times while providing 15 minute service frequency. With higher service frequency, in some cases the Enhanced Corridor Alternatives are able to eliminate redundant service or align routes to better serve their markets. This may lead to passengers having to transfer more but these transfers will take place at stations with improved amenities between routes with increased frequencies leading to faster and more comfortable cross-town connections.

The benefits of EmX investments would extend beyond operational considerations, providing a permanence for economic development and a level of transit service frequency and reliability that is expected to increase transit system ridership. These capital investments (including sections of bus-only lanes) would protect LTD's investment in travel times and increased service by ensuring that as congestion on these key corridors increases, O&M costs do not also go up in a struggle to maintain headways. The EmX Alternatives may also lead to increased transfer activity, but by offering EmX stations that provide a protected place to wait for no more than 10 minutes due to enhanced frequency the intent is to provide faster trips and improved cross-town connections.

EmX Alternatives require larger O&M increases over the No-Build Alternative because they involve larger increases to service levels than Enhanced Corridor Alternatives (10 minute EmX vs. 15 minute EC service frequencies). O&M cost increases over the No-Build Alternative for EmX Alternatives range from a low of -$0.5 million (30th Avenue to LCC Corridor EmX Alternative) to a high of $2.8 million (Highway 99 Corridor EmX Alternative).

Table S.3-2. Percent Change of O&M Cost and Service Levels for Build Alternatives vs. No-Build Alternative

Alternative	% Change Revenue Hours from 2035 No-Build	% Change Revenue Miles from 2035 No-Build	% Change Peak Vehicles from 2035 No-Build	% Change Annual O&M Cost from 2035 No-Build	% Change Annual O&M Cost from FY2016 Base Year (Delta between 2035 No-Build and FY2016 Base Year)
No-Build (2035)	-	-	-	**-**	+ 29.41%
Highway 99 Corridor					
Hwy. 99 EC (2035)	-0.39%	+ 1.78%	-1.08%	**-0.19%**	29.17%; (-0.25%)
Hwy. 99 EmX (2035)	+ 4.95%	+ 7.62%	+ 2.15%	**+ 5.30%**	36.27%; (+6.86%)
River Road Corridor					
River Rd. EC (2035)	-0.39%	+ 0.60%	-3.23%	**-1.14%**	27.94%; (-1.47%)
River Rd. EmX (2035)	+ 2.51%	+ 4.96%	+ 2.15%	**+ 3.79%**	34.31%; (+4.90%)
30th Avenue to LCC Corridor					
30th Ave./LCC EC (2035)	-0.39%	+ 1.00%	-3.23%	**-0.95%**	28.19%; (-1.23%)
30th Ave./LCC EmX (2035)	+ 1.22%	+ 2.50%	-3.23%	**+ 0.95%**	30.64%; (+1.23%)
Coburg Rd. Corridor					
Coburg Rd. EC (2035)	-1.62%	-0.72%	+ 2.15%	**0.00%**	29.41%; (-0.00%)
Coburg Rd. EmX (2035)	+ 1.54%	+ 2.50%	+ 3.23%	**3.41%**	33.82%; (+4.41%)
Martin Luther King, Jr. Corridor					
MLK, Jr. Blvd EC (2035)	+ 2.28%	+ 2.94%	+ 1.08%	**2.08%**	32.11%; (+2.70%)

Source: MovingAhead O&M Cost Estimates (LTD: April 2017)

Table S.3-2 shows the percentage changes in revenue hours, revenue miles, peak vehicles and annual cost for each corridor alternative compared to the No-Build Alternative. It also compares the total cost

of each alternative to the FY2016 base year and shows the cost delta between the 2035 No-Build Alternative and the FY2016 base year. FTA requires a cost plan to be implemented for any project that increases annual O&M costs more than 5% over the base year (shown in bold numbers in Table S.3-2. The only single corridor to reach that level is the Highway 99 Corridor EmX Alternative.

S3.1 No-Build Alternative

Total O&M costs for the 2035 No-Build Alternative are estimated to be $52.8M. Service assumptions for the 2035 No-Build Alternative account for an increase in total O&M costs of $12.0 million, which represents a 29.41% increase in O&M costs over the 2016 base year. The No-Build Alternative assumes additional EmX service will be added by 2035 (see Section 3.1.1), resulting in significant increases to revenue hours, revenue miles, and peak vehicles compared to base year 2016 conditions.

S3.2 Highway 99 Corridor

Service level changes for the Highway 99 Corridor Enhanced Corridor Alternative shown in Table S.3-2 reflect the operational efficiencies gained from capital and service design improvements that allow for more revenue miles per revenue hour (revenue hours decrease by 0.39% and revenue miles are increased by 1.78% over the system-wide total). This improved cycle time allows the required number of peak vehicles to drop from 93 under the No-Build Alternative to 92 under the Enhanced Corridor Alternative. These efficiencies could result in more daily trips serving the corridor at slightly less O&M cost overall (about $0.1 million less).

For the Highway 99 Corridor EmX Alternative, revenue hours would increase by 4.95% and revenue miles would increase by 7.62%. Peak vehicles would increase from 93 under the No-Build Alternative to 95 under the EmX Alternative. These changes would lead to total O&M costs of $55.6M, or an increase of $2.8M over the 2035 No-Build Alternative. This is the largest increase in corridor service of any of the MovingAhead alternatives.

S3.3 River Road Corridor

Service level changes for the River Road Corridor Enhanced Corridor Alternative shown in Table S.3-2 reflect the operational efficiencies gained from capital and service design improvements that allow for more revenue miles per revenue hour (revenue hours decrease by 0.39% and revenue miles are increased by 0.60% over the system-wide total). This improved cycle time allows the required number of peak vehicles to drop from 93 under the No-Build Alternative to 90 under the Enhanced Corridor Alternative. These efficiencies could result in more daily trips serving the corridor at less O&M cost overall (about $0.6 million less).

For the River Road Corridor EmX Alternative, revenue hours would increase by 2.51% and revenue miles would increase by 4.96%. Peak vehicles would increase from 93 under the No-Build Alternative to 95 under the EmX Alternative. These changes would lead to total O&M costs of $54.8M, or an increase of $2.0M over the 2035 No-Build Alternative.

S3.4 30th Avenue to Lane Community College Corridor

Service level changes for the 30th Avenue to Lane Community College Corridor Enhanced Corridor Alternative shown in Table S.3-2 reflect the operational efficiencies gained from capital and service design improvements that allow for more revenue miles per revenue hour (revenue hours decrease by 0.39% and revenue miles are increased by 1.0% over the system-wide total). This improved cycle time

allows the required number of peak vehicles to drop from 93 under the No-Build Alternative to 90 under the Enhanced Corridor Alternative. These efficiencies could result in more daily trips serving the corridor at less O&M cost overall (about $0.5 million less).

For the 30th Avenue to Lane Community College Corridor EmX Alternative, revenue hours would increase by 1.22% and revenue miles would increase by 2.5%. Due to improved efficiencies, peak vehicles would also decrease in this alternative from 93 under the No-Build Alternative to 90 under the EmX Alternative. These changes would lead to total O&M costs of $53.3M, or an increase of $0.5M over the 2035 No-Build Alternative. This alternative would result in the lowest additional O&M cost required for any of the EmX alternatives.

S3.5 Coburg Road Corridor

Both build alternatives (Enhanced Corridor Alternative and EmX Alternative) for the Coburg Road Corridor would require conventional service to continue to serve the Valley River Center area. Additionally, both the Enhanced Corridor Alternative and the EmX Alternative would have a service design improvement for Route 12 that would connect Valley River Center, Gateway Mall and the Springfield Station with one route, eliminating the need for a transfer and/or out-of-direction travel.

Service level changes for the Coburg Road Corridor Enhanced Corridor Alternative shown in Table S.3-2 reflect the operational efficiencies gained from capital and service design improvements that allow for slightly more revenue miles per revenue hour (revenue hours decrease by 1.62% and revenue miles decrease by 0.72%). Unlike other Enhanced Corridor alternatives, peak vehicles would increase from 93 under the No-Build Alternative to 95 under the Enhanced Corridor Alternative. Taken together, these changes could result in more daily trips serving the corridor with a similar O&M cost (costs are not significantly changed from the No-Build).

For the Coburg Road Corridor EmX Alternative, revenue hours would increase by 1.54% and revenue miles would increase by 2.5%. Peak vehicles would also increase in this alternative, from 93 under the No-Build Alternative to 96 under the EmX Alternative. These changes would lead to total O&M costs of $54.6M, or an increase of $1.8M over the 2035 No-Build Alternative.

S3.6 Martin Luther King, Jr. Corridor

Martin Luther King, Jr. Enhanced Corridor Alternative includes the largest net increase in revenue service of any Enhanced Corridor alternative (although not of any EmX alternative), with the addition of 7,200 revenue hours, which is a 2.58% increase from the No-Build Alternative. Revenue miles are increased by 132,000, which is a 2.94% increase from the No-Build Alternative. The number of peak vehicles also increase by 1 vehicle, which when combined with the increase to revenue service, results in a system-wide increase of $1.10 million over the 2035 No-Build Alternative.

S3.7 Implications of Multiple Corridors

One of the primary goals of the MovingAhead project has been to facilitate a streamlined and cost-efficient process to select one or more corridors for near-term investment. LTD has modeled the threshold at which service increases would require an expansion of LTD's maintenance facilities at its Glenwood location. It is assumed that Enhanced Corridor Alternatives would be serviced by 60-foot buses and EmX Alternatives would be serviced by 60-foot BRT vehicles. As of FY2016, LTD's maintenance facility has four (4) existing bays with hoists that can serve 60-foot buses and BRT vehicles and one additional bay will have a hoist added (assumed in existing LTD plans) to make a total of five (5) bays

with hoists that can serve 60-foot buses and BRT vehicles. Each bay can serve approximately twenty-one (21) 60-foot buses or seven (7) BRT vehicles. The maintenance facility footprint could be expanded to add at least two (2) and possibly three (3) additional bays with hoists that could serve 60-foot buses and BRT vehicles. There is no concern about capacity for maintenance of 40-foot buses because although LTD is currently close to capacity for these vehicles, LTD does not expect to add 40-foot vehicles under any MovingAhead alternatives. Additionally, 40-foot vehicles could be serviced in 60-foot bays, but the reverse is not possible.

As described above, most of the Enhanced Corridor Alternatives with the exception of the Coburg Rd and Martin Luther King, Jr. Enhanced Corridor Alternatives reduce the required number of peak vehicles and can therefore be accommodated with LTD's existing maintenance facility capacity.

As can be seen in Table S3.7-1, the available maintenance capacity with five (5) bays is sufficient for the No-Build Alternative and leaves additional capacity for some combination of EmX Alternatives. If all four EmX Alternatives (Highway 99 Corridor EmX Alternative, River Road Corridor EmX Alternative, 30th Avenue to Lane Community College Corridor EmX Alternative, and Coburg Road Corridor EmX Alternative) and the Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative were selected for a full system build out, the existing five bay maintenance capacity would not be sufficient. However, if two additional bays were added to the existing facility, LTD's Glenwood location could accommodate the full MovingAhead EmX system build-out.

Table S3.7-1. Maintenance Facility Needs and Capacity for MovingAhead Alternatives

Vehicles	FY2016 Vehicle Count[1]	Five Bay Maintenance Capacity	Expected Maintenance Capacity with 2 Bay Expansion[3]	Vehicles Required under No-Build Alternative[4]	Vehicles Required for Full EmX Build-Out[5]
40-Foot Buses	69	70	70	69	61
60-Foot Vehicles[2]	33	49	63	44	56

Source: MovingAhead O&M Cost Estimates (LTD.: October 2016)

Notes:

[1]Vehicle counts includes spares. These figures include vehicles owned and operated by LTD during the base year of FY2016. Figures include the BRT vehicles required for WEE but not Main Street.

[2]60-Foot Vehicles includes both buses used for fixed route conventional service and BRT EmX branded vehicles. The split between 40- foot buses, 60-foot buses, and BRT vehicles is a rough estimate and would likely be modified based on service needs.

[3]Converting existing 40-foot maintenance bays to 60-foot maintenance bays is not preferred because the existing 40-foot bays cannot be converted to drive-through bays. The maintenance facility footprint can be expended to add at least two additional bays with hoists that can serve 60-foot buses and/or BRT vehicles. This would not impact the number of 40-foot vehicles the maintenance facility could serve.

[4]The number of vehicles required under the No-Build Alternative is based on the service assumptions outlined in Section 2.1.

[5]The numbers reported here include the required vehicles if all four EmX Alternatives (Highway 99 Corridor EmX Alternative, River Road Corridor EmX Alternative, 30th Avenue to Lane Community College Corridor EmX Alternative and Coburg Road Corridor EmX Alternative) and the Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative were built. This is the most conservative possible future scenario to determine the maximum maintenance facility needs.

1. Introduction

1.1 MovingAhead Technical Reports

A total of 20 technical reports have been prepared for the MovingAhead project. The technical reports have been prepared to support the selection of preferred alternatives for the MovingAhead project and subsequent environmental documentation. The technical reports assume that any corridors advanced for environmental review will require a documented categorical exclusion under the National Environmental Policy Act (NEPA). Any corridors requiring a higher level of environmental review would be supported by the technical evaluation but may not be fully covered by the technical evaluation.

Technical reports have been prepared for the following disciplines:

- Acquisitions and Displacements
- Air Quality
- Capital Cost Estimating
- Cultural Resources
- Ecosystems (Biological, Fish Ecology, and Threatened and Endangered Species, Wetlands and Waters of the U.S. and State)
- Energy and Sustainability
- Financial Analysis
- Geology and Seismic
- Hazardous Materials
- Land Use and Prime Farmlands
- Noise and Vibration
- Operating and Maintenance Cost Estimating
- Parklands, Recreation Areas, and Section 6(f)
- Section 4(f)
- Street and Landscape Trees
- Socioeconomics, Environmental Justice, Neighborhoods, Community Facilities, and Public Services
- Transportation and Travel Demand Forecasting.
- Utilities
- Visual and Aesthetic Resources
- Water Quality and Hydrology

In general, each technical report includes the following information for identifying effects:

- Relevant laws and regulations

- Contacts and coordination
- Summary of data sources and analysis methods described in the Methods and Data Reports (CH2M et al., June 2015)
- Affected environment
- Adverse and beneficial effects including short-term, direct, indirect and cumulative
- Mitigation measures
- Permits and approvals
- References

1.2 Operating and Maintenance Costs Technical Report and Purpose

The purpose of this technical report is to present a transparent application of "state-of-the-practice" approaches in forecasting operation and maintenance costs for each MovingAhead alternative. Consistent with the approach of each discipline expert for the project, a No-Build (2035) alternative is utilized for a common comparison with build alternatives. Forecasts for all alternatives are evaluated in terms their service levels, and their associated EmX service, conventional (fixed-route) service, and system-wide cost totals.

1.3 Discipline Experts

Discipline experts who contributed to the preparation of this report are identified in Table 2.3-1 including their area of expertise, affiliated organization, title and years of experience.

Table 1.3-1. Discipline Experts

Discipline	Technical Expert	Affiliated Organization	Title / Years of Experience
Operating and maintenance costs	Hart Migdal	LTD	Associate Planner / 3 yrs
	Kelly Hoell		Development Planner / 12 yrs
Editors			
	Lynda Wannamaker	Wannamaker Consulting	President / 33 yrs
	Tom Schwetz	LTD	Director of Planning and Development / 34 yrs
	Tim Simon	LTD	Transit Service Planner / 6 yrs
	Sasha Luftig	LTD	Development Project Manager / 9 yrs

Source: MovingAhead Project Team. 2016.

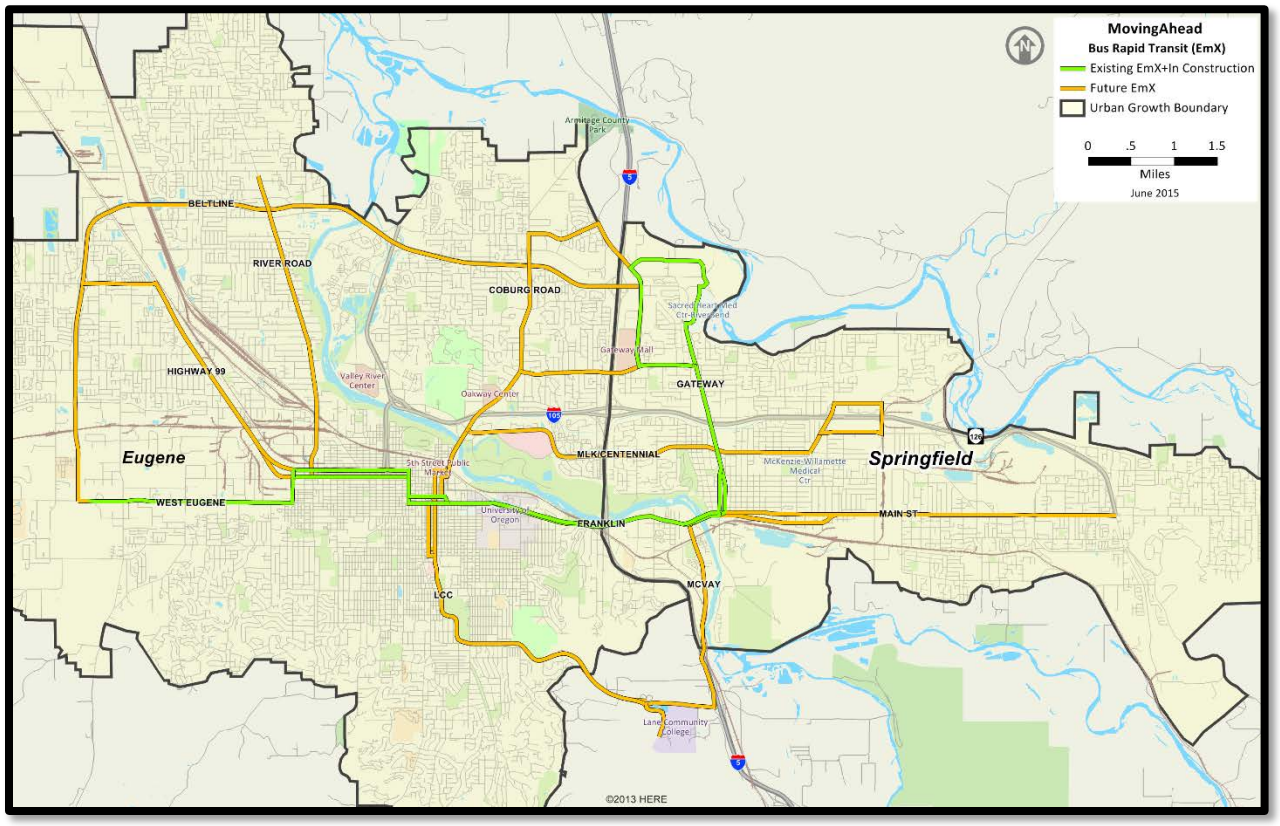
1.4 Study Background

The purpose of the MovingAhead project is to determine which high-capacity transit corridors identified in the adopted Central Lane Metropolitan Planning Organization's *Regional Transportation Plan* (Lane Council of Governments, 2011) and LTD's *Long Range Transit Plan* (LTD, 2014) as part of the Frequent Transit Network (FTN)are ready to advance to capital improvements programming in the near term. The study is being conducted jointly with the City of Eugene and Lane Transit District (LTD) to facilitate a

streamlined and cost-efficient process through concurrent planning, environmental review, and design and construction of multiple corridors. The study area includes Eugene and portions of unincorporated Lane County.

LTD's *Long-Range Transit Plan (*LTD, 2014*)* identifies the full Martin Luther King, Jr. Boulevard / Centennial Boulevard corridor as a future part of the FTN. Initially, MovingAhead considered options on Centennial Boulevard to serve Springfield as part of this corridor. Because Springfield does not have the resources available to consider transit enhancements on Centennial Boulevard at this time, MovingAhead will only develop EmX and Enhanced Corridor options within Eugene. Figure 2.4-1 presents LTD's existing and future bus rapid transit (BRT) system.

Figure 1.4-1. Lane Transit District's Bus Rapid Transit (BRT) System



Source: LTD. 2015.

1.5 Screening and Evaluation of Multimodal Options

The MovingAhead project process includes two phases. This first phase has three discrete but closely related tasks: identifying transit improvements; identifying improvements for bicyclists, pedestrians, and users of mobility devices; and preparing a NEPA-compliant evaluation of alternatives focused on the region's transportation system. Corridor options identified as part of the first phase were developed using multimodal cross sections that include variations on automobile, truck, and bus travel lanes; bicycle lanes; landscaping strips; and sidewalks. At the end of the first phase, the City of Eugene and LTD will select the corridors most ready for near-term capital improvements. Those selected corridors will be advanced to the second phase, which will focus on preparing NEPA environmental reviews (Documented

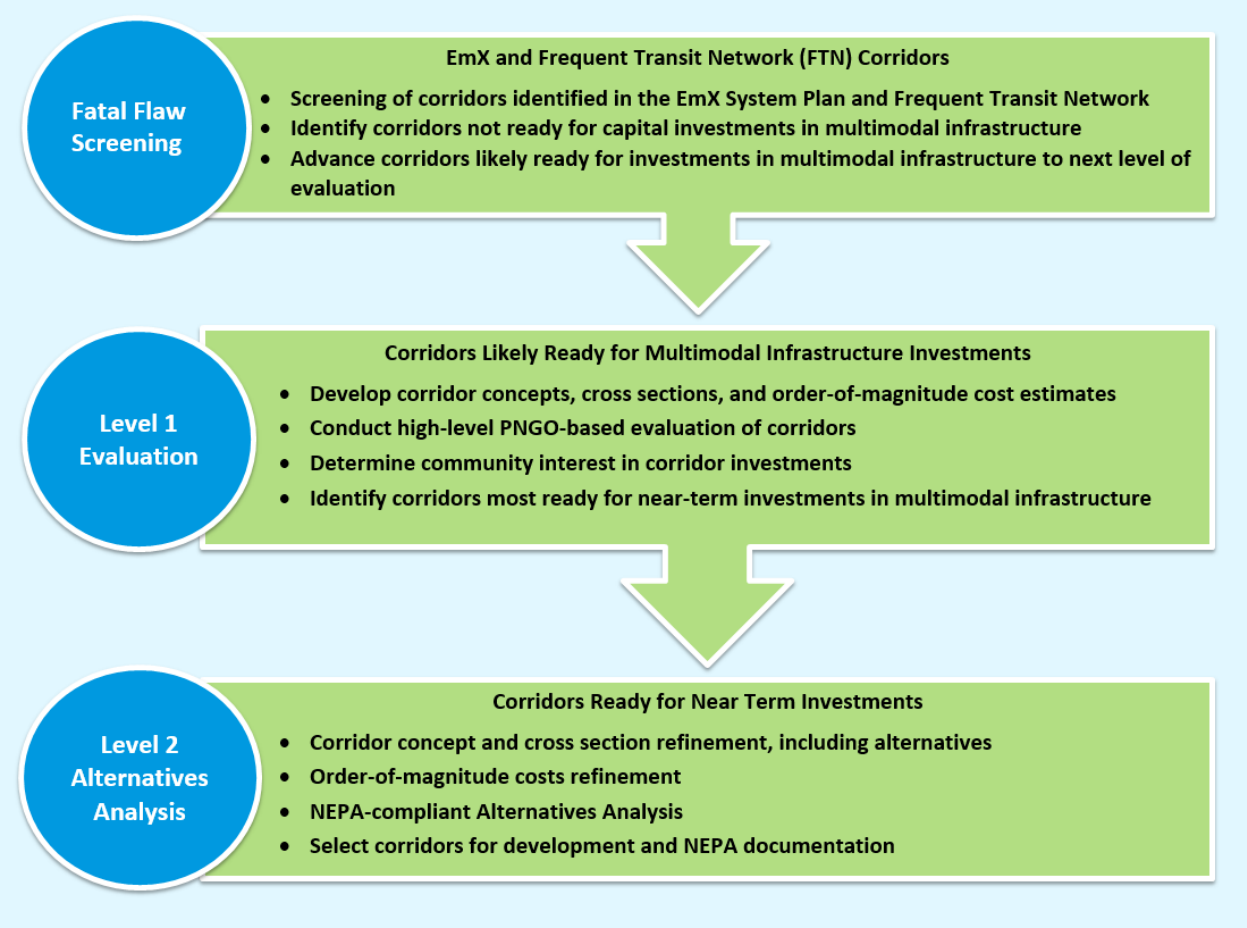
Categorical Exclusions), prioritizing corridors for funding, and initiating the Federal Transit Administration project development process.

1.5.1 Fatal Flaw Screening

The project team conducted a fatal flaw screening in February 2015 to identify which of the 10 corridors should not move forward to the Level 1 Screening Evaluation (Figure 2.5-1). This high-level evaluation used criteria based on MovingAhead's Purpose, Need, Goals, and Objectives document (LTD, 2015) and existing data to determine which corridors will not be ready for capital investment in BRT or multimodal infrastructure in the next 10 years. The screening was conducted with local, regional, and state agency staff. Of the 10 corridors identified, the following 3 corridors were not advanced from the fatal flaw screening to the Level 1 Screening Evaluation: 18th Avenue, Bob Straub Parkway, and the Randy Papé Beltline Highway. Table 2.5-1 shows the results of the fatal flaw screening.

Although originally advanced from the fatal flaw screening, the Main Street-McVay Highway Corridor was also not advanced to the Level 1 Screening Evaluation because the Springfield City Council (on May 18, 2015) and LTD Board (on May 20, 2015) determined that the corridor is ready to advance to a study to select a locally preferred transit solution. At this time, the Main Street-McVay Highway Corridor will continue to be studied on a schedule that is ahead of the MovingAhead project schedule. If the Main Street-McVay Highway Corridor study schedule is delayed and its progress coincides with this project, the corridor could be reincorporated back into MovingAhead.

Figure 1.5-1. MovingAhead Phase 1 Steps



Source: Wannamaker Consulting, 2015.

Table 1.5-1. Results of the Fatal Flaw Screening

Corridor	Advanced to Level 1	Consider Later
Highway 99	✓	
River Road	✓	
Randy Papé Beltline		✓
18th Avenue		✓
Coburg Road	✓	
Martin Luther King Jr. Boulevard/Centennial Boulevard	✓	
30th Avenue/Lane Community College	✓	
Main Street-McVay Highway	✓	
Valley River Center	✓	
Bob Straub Parkway		✓

Source: MovingAhead Technical Team. 2016.

The six remaining multimodal corridors were advanced to the Level 1 Screening Evaluation to determine how they compared with each other in meeting the Purpose, Need, Goals, and Objectives.

1.5.2 Level 1 Screening Evaluation

The Level 1 Screening Evaluation from Spring 2016 assessed how each corridor would perform according to the Purpose, Need, Goals, and Objectives of MovingAhead. The Level 1 Screening Evaluation used existing studies and readily available data to evaluate each corridor. Based on community input and technical analysis, the following corridors and alternatives were advanced from the Level 1 Screening Evaluation to the Level 2 AA (Table 2.5-2):

- EmX and Enhanced Corridor Alternatives:
  - Highway 99 Corridor
  - River Road Corridor
  - Coburg Road Corridor
  - 30th Avenue/Lane Community College (LCC) Corridor

- Enhanced Corridor Alternative:
  - Martin Luther King Jr. Boulevard Corridor

- No-Build Alternatives: all corridors

The Valley River Center corridor received the least public support during public outreach and was not carried forward to the Level 2 AA.

Table 1.5-2. Corridors and Transit Alternatives Advanced to the Level 2 Alternatives Analysis

Corridor	EmX	Enhanced Corridor	No-Build
Highway 99	✓	✓	✓
River Road	✓	✓	✓
30th Avenue to LCC	✓	✓	✓
Coburg Road	✓	✓	✓
Martin Luther King Jr. Boulevard		✓	✓

Source: MovingAhead Technical Team. 2016.

For a detailed discussion of alternatives and design options considered for each corridor, but not carried forward to the Level 2 AA, please refer to the *Alternatives and Design Options Considered but Eliminated Technical Memorandum* (CH2M 2016a).

1.5.3 Level 2 Alternatives Analysis

To guide the Level 2 AA, LTD prepared new ridership forecasts and related evaluation measures using the LCOG regional model. Base-year and future-year forecasts were prepared for corridor alternatives based upon updated inputs and transit networks specific to each corridor. The planning horizon year used for the Level 2 AA is 2035. The built and natural environments, transit operations, traffic, finance, historical resources, and other areas were also evaluated as part of the Level 2 AA. The findings from the Level 2 AA will aid LTD and the City of Eugene in determining how corridors should be prioritized for capital investments over the next 5 years. Selected corridors will be advanced to Phase 2.

1.6 Purpose and Need

The prioritization of capital investments in multimodal transit corridors is a powerful tool for implementing local and regional comprehensive land use and transportation plans, agency strategic plans, and other community planning documents. Capital investments in multimodal transit corridors can have a substantial impact on patterns of growth and development. By coordinating the timing of and prioritizing the funding for strategic multimodal capital investments, the MovingAhead project, a multimodal transit corridor study, helps ensure that future development is consistent with our region's plans and vision.

The Purpose and Need Statement was refined based on public and agency input.

1.6.1 Purpose

The purpose of the MovingAhead project is to:

- Develop a Capital Improvements Program that forecasts and matches projected revenues and capital needs over a 10-year period.
    - Balance desired multimodal transit corridor improvements with the community's financial resources.
    - Ensure the timely and coordinated construction of multimodal transit corridor infrastructure.
    - Eliminate unanticipated, poorly planned, or unnecessary capital expenditures.
- Identify the most economical means of financing multimodal transit corridor capital improvements.
- Establish partnerships between Lane Transit District (LTD), City of Eugene, and other local agencies that prioritize multimodal transit infrastructure needs and promote interagency cooperation.
- Ensure that multimodal transit corridor investments are consistent with local comprehensive land use and transportation plans

1.6.2 Need

The need for the MovingAhead project is based on the following factors:

- LTD's and the region's commitment to implementing the region's vision for bus rapid transit in the next 20 years consistent with the RTP that provide the best level of transit service in a cost effective and sustainable manner.
- Need for streamlined environmental reviews to leverage system-wide analysis.
- Need to build public support for implementation of the system-wide vision.
- Selection of the next EmX/Frequent Transit Network (FTN) corridors is based on long-range operational and financial planning for LTD's service.

1.6.3 Goals and Objectives

Goal 1: Improve multimodal transit corridor service

Objective 1.1: Improve transit travel time and reliability

Objective 1.2: Provide convenient transit connections that minimize the need to transfer

Objective 1.3: Increase transit ridership and mode share in the corridor

Objective 1.4: Improve access for people walking and bicycling, and to transit

Objective 1.5: Improve the safety of pedestrians and bicyclists accessing transit, traveling in and along the corridor, and crossing the corridor

Goal 2: Meet current and future transit demand in a cost-effective and sustainable manner

Objective 2.1: Control the increase in transit operating cost to serve the corridor

Objective 2.2: Increase transit capacity to meet current and projected ridership demand

Objective 2.3: Implement corridor improvements that provide an acceptable return on investment

Objective 2.4: Implement corridor improvements that minimize impacts to the environment and, where possible, enhance the environment

Objective 2.5: Leverage funding opportunities to extend the amount of infrastructure to be constructed for the least amount of dollars

Goal 3: Support economic development, revitalization and land use redevelopment opportunities for the corridor

Objective 3.1: Support development and redevelopment as planned in other adopted documents

Objective 3.2: Coordinate transit improvements with other planned and programmed pedestrian and bicycle projects

Objective 3.4: Coordinate transit improvements with other planned and programmed roadway projects

Objective 3.5: Minimize adverse impacts to existing businesses and industry

Objective 3.6: Supports community vision for high capacity transit in each corridor

Objective 3.7: Improve transit operations on state facilities in a manner that is mutually beneficial to vehicular and freight traffic flow around transit stops and throughout the corridor

Objective 3.8: Improve transit operations in a manner that is mutually beneficial to vehicular traffic flow for emergency service vehicles

1.6.4 Evaluation Criteria

Evaluation criteria are used during the Trade-off Analysis, which is part of the Alternatives Analysis to aid in determining how well each of the corridor alternatives would meet the project's purpose, needs, goals and objectives. The evaluation criteria require a mix of quantitative data and qualitative assessment. The resulting data will be used to measure the effectiveness of each proposed corridor alternative and to assist in comparing and contrasting the alternatives and options. In Table 2.6-1 evaluation criteria are listed for each of the project's objectives. Some objectives have only one criterion for measuring effectiveness while others require several criteria.

The following evaluation criteria were prepared by LTD and the City of Eugene and will be reviewed by the community.

Table 1.6-1. Evaluation Criteria

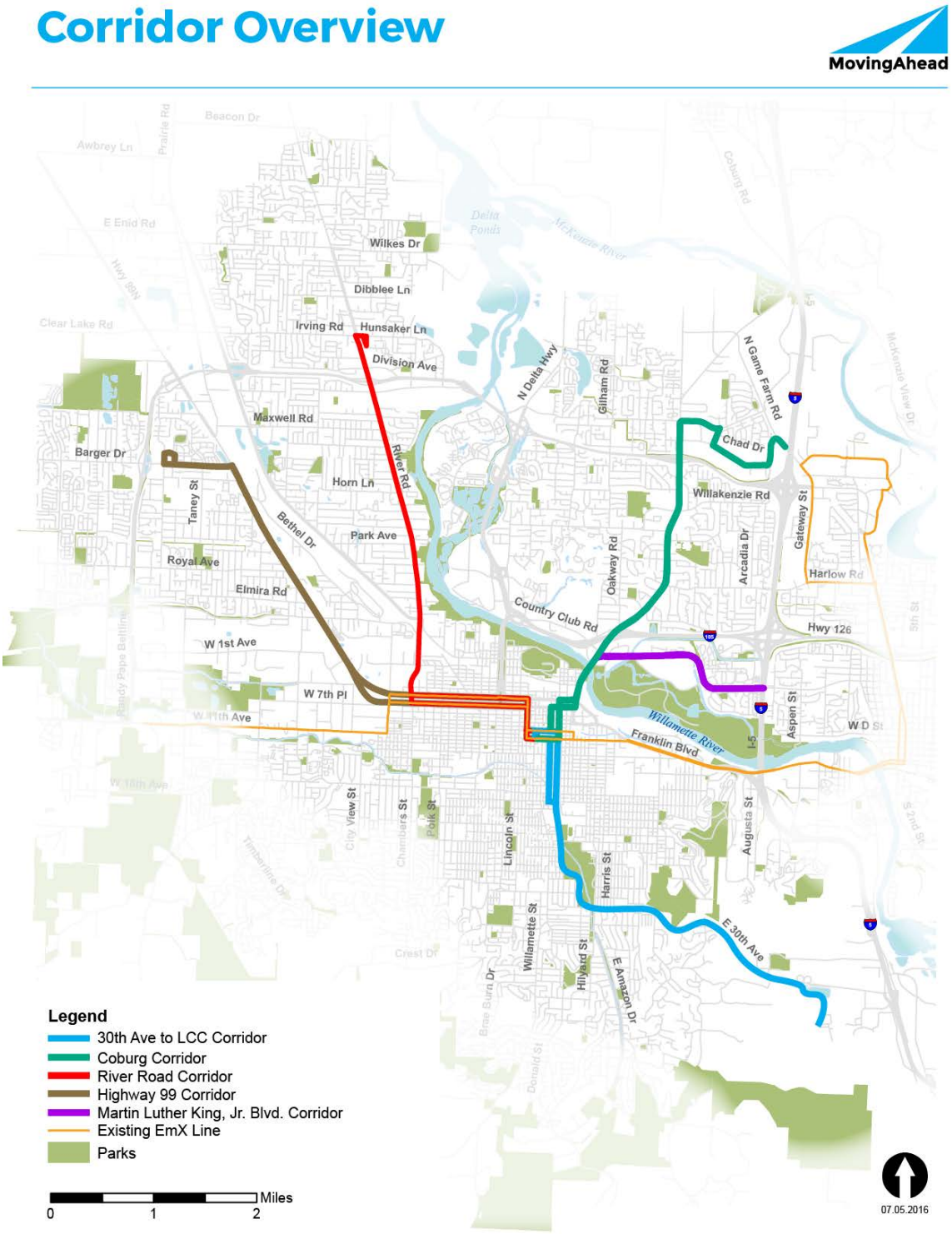
Goals and Objectives		Evaluation Criteria
Goal 1: Improve multimodal transit corridor service		
Objective 1.1:	Improve transit travel time and reliability	• Round trip pm peak transit travel time between select origins and destinations • On-time performance (no more than 4 minutes late) of transit service
Objective 1.2:	Provide convenient transit connections that minimizes the need to transfer	• Number of transfers required between heavily used origin-destination pairs
Objective 1.3:	Increase transit ridership and mode share in the corridor	• Average weekday boardings on corridor routes • Transit mode share along the corridor • Population within 1/2 mile of transit stop • Employment within 1/2 mile of transit stop
Objective 1.4:	Improve access for people walking and bicycling, and to transit	• Connectivity to existing pedestrian facilities • Connectivity to existing bicycle facilities
Objective 1.5:	Improve the safety of pedestrians and bicyclists accessing transit, traveling in and along the corridor, and crossing the corridor	• Opportunity to provide a safe and comfortable environment for pedestrians and bicyclists in the corridor
Goal 2: Meet current and future transit demand in a cost-effective and sustainable manner		
Objective 2.1:	Control the increase in transit operating cost to serve the corridor	• Cost per trip • Impact on LTD operating cost • Cost to local taxpayers
Objective 2.2:	Increase transit capacity to meet current and projected ridership demand	• Capacity of transit service relative to the current and projected ridership
Objective 2.3:	Implement corridor improvements that provide an acceptable return on investment	• Benefit/cost assessment of planned improvements
Objective 2.4:	Implement corridor improvements that minimize impacts to the environment and, where possible, enhance the environment	• Results of screening-level assessment of environmental impacts of transit solutions
Objective 2.4:	Leverage funding opportunities to extend the amount of infrastructure to be constructed for the least amount of dollars	• Number and dollar amount of funding opportunities that could be leveraged • Meet FTA's Small Starts funding requirements

Goals and Objectives		Evaluation Criteria
Goal 3: Support economic development, revitalization and land use redevelopment opportunities for the corridor		
Objective 3.1:	Support development and redevelopment as planned in other adopted documents	• Consistent with the BRT System Plan and Frequent Transit Network (FTN) concept • Consistent with the regional Transportation System Plan • Consistent with local comprehensive land use plans
Objective 3.2:	Coordinate transit improvements with other planned and programmed pedestrian and bicycle projects	• Capability of transit improvement to coordinate with other planned and programmed pedestrian and bicycle projects identified in adopted plans and CIPs
Objective 3.3:	Coordinate transit improvements with other planned and programmed roadway projects	• Capability of transit improvement to coordinate with other planned and programmed roadway projects identified in adopted plans and CIPs
Objective 3.4:	Minimize adverse impacts to existing businesses and industry	• Impacts to businesses along the Corridor measured in number and total acres of properties acquired, parking displacements, and access impacts. • Impact on freight and delivery operations for Corridor businesses
Objective 3.6:	Supports community vision for high capacity transit in corridor	• Community vision includes high capacity transit in corridor
Objective 3.7:	Improve transit operations on state facilities in a manner that is mutually beneficial to vehicular and freight traffic flow around transit stops and throughout the corridor	• Impact on current and future year intersection Level of Service (LOS) on state facilities • Impact on current and future year PM peak hour auto / truck travel times on state facilities
Objective 3.8:	Improve transit operations in a manner that is mutually beneficial to vehicular traffic flow for emergency service vehicles	• Qualitative assessment of potential impacts to emergency service vehicle traffic flow and access

2. Alternatives Considered

This section briefly reviews the major features of the alternatives considered in the Level 2 AA. For full details on each alternative, refer to the *Detailed Definition of Alternatives* (CH2M et al., 2016 July).

Figure 2-1. MovingAhead Corridor Overview



Source: CH2M. 2016.

2.1 No-Build Alternative Transit Network

This section describes the No-Build Alternative, which is based on projected conditions in the year 2035, the project's environmental forecast year. For each corridor, the No-Build Alternative serves as a reference point to gauge the benefits, costs, and effects of the build alternatives.

2.1.1 Capital Improvements

Under the No-Build Alternative, the following capital improvements are anticipated by 2035:

- **West Eugene EmX Line**. Currently under construction, the West Eugene EmX Extension Project (WEEE) line and its associated capital improvements will be completed in 2017.

- **Santa Clara Community Transit Center**. The existing River Road Station is located at the southeast corner of the River Road/Randy Papé Beltline Highway interchange between the eastbound on-ramp and River Avenue. To meet growing demand and avoid the impacts of increasing congestion, LTD plans to relocate the River Road Station to a site north of the Randy Papé Beltline Highway at the southeast corner of River Road and Hunsaker Lane. Once relocated to the new site, the River Road Station would be renamed the Santa Clara Community Transit Center. This new transit center is planned to include a mix of uses including a park and ride lot, residential housing, community space, and commercial uses. The River Road Station relocation to the new site is anticipated to be completed by the end of 2018.

- **Main Street EmX Extension**. Included in the 2035 Regional Transportation Plan (RTP) and currently under study, the extension of the existing Franklin EmX line on Main Street from Springfield Station to Thurston Station and associated capital improvements (e.g., stations, bicycle and pedestrian facilities, signal modifications) is anticipated to be completed within the 20-year planning horizon (2035). The No-Build Alternative transit network assumes EmX service on Main Street; however, the outcome of this study, and the ultimate improvements chosen, are uncertain at this time.

- **McVay Highway Enhanced Corridor**. Included in the 2035 Regional RTP and currently under study, Enhanced Corridor service from Springfield Station on McVay Highway to Lane Community College and associated capital improvements (e.g., improved stops, transit queue jumps, and improved bicycle and pedestrian crossings) is anticipated to be completed within the 20-year planning horizon (2035).

2.1.2 Transit Operations

The No-Build Alternatives for each corridor include changes to transit service anticipated as a result of the WEEE, Main Street EmX Extension project, development of the Santa Clara Community Transit Center, and other changes to fixed route service. The following changes to the existing 2016 fixed route services are anticipated by 2035:

- Eliminated routes:

  - Route 11 (replaced by Main Street EmX service)
  - Route 32 (replaced by WEEE service)
  - Route 76 (replaced by WEEE service)
  - Route 85 (replaced by Enhanced Corridor service on the McVay Highway)

- Route 43 (replaced by WEEE service)

- Other route modifications:

- Add WEEE service (replaces Route 43 service on W. 11th Avenue) as extension of existing EmX service
- Add Main Street EmX service from Springfield Station to Thurston Station
- Add Route 2 with service from Barger Drive/Echo Hollow Road to Eugene Airport
- Add Route 16 to connect north and south of Main Street with EmX service
- Add Enhanced Corridor service on McVay Highway from Springfield Station to LCC (replaces Route 85)
- Reroute Route 33 and extend to Amazon Parkway
- Reroute Route 36 to extend north of W. 11th Avenue to Barger Drive (replaces Route 43)
- Reroute Route 41 via Highway 99/Royal Avenue/W. 11th Avenue
- Reroute Route 40 via Royal Avenue/Elmira Road/Roosevelt Boulevard/Chambers Street/ W. 2nd Avenue/Oak and Pearl Streets
- Add Route 44 paralleling Route 40 above to serve West Eugene
- Reroute Route 55 to extend to Santa Clara Community Transit Center
- Reroute Route 93 with service continuing to Eugene Station via Seneca Station and service terminating at the West Eugene EmX terminus

- Change in service frequencies:

- Increase service on Route 24 from 30-minute peak frequencies to 15-minute peak frequencies.
- Increase service on Route 28 from approximately 30-minute peak frequencies (varying 20- to 30-minute intervals) to 15-minute peak frequencies.
- Increase service on Route 41 from 30- and 15-minute peak frequencies to 15-minute peak frequencies.
- Increase service on Route 51 from 60-minute off-peak frequencies to 30-minute off-peak frequencies.
- Increase service on Route 52 from 60-minute off-peak frequencies to 30-minute off-peak frequencies.
- Increase service on Route 66 from 30- and 15-minute weekday a.m. peak, off-peak, and p.m. peak frequencies to 15-minute weekday a.m. peak, off-peak, and p.m. peak frequencies.
- Increase service on Route 67 from approximately 30-minute weekday a.m. peak, off-peak, and p.m. peak frequencies to 15-minute weekday a.m. peak, off-peak, and p.m. peak frequencies.
- Increase service on Route 78 from approximately 60-minute frequencies from 8 a.m. to 6 p.m. to 30-minute weekday a.m. peak, off-peak, and p.m. peak frequencies.
- Increase service on Route 79x from 30-minute peak frequencies to 10-minute peak frequencies, and modify off peak frequencies to 15 minutes from between 10 and 30 minutes currently.
- Service on Route 93 would decrease from 60-minute a.m. peak frequencies to 120-minute frequencies during a.m. peak hours, and increase from no service between Veneta and WEEE terminus to 120-minute frequencies during p.m. peak hours (off-peak service is 120-minute frequencies between Veneta and West Eugene EmX terminus).
- Service on Route 96 would decrease a.m. peak service from 30-minute to 60-minute frequencies, and increase off-peak service from no service between 8:20 a.m. to 3:40 p.m. to 60-minute off-peak frequencies.

Key transportation improvements specific to each corridor are described under each corridor's No-Build Alternative.

2.2 Enhanced Corridor Alternatives

Enhanced Corridor Alternatives are intended to address the project's Purpose, Need, Goals, and Objectives without major transit capital investments, instead focusing on lower-cost capital improvements, operational improvements, and transit service refinements. Features can include transit queue jumps (lanes for buses that allow the bus to "jump" ahead of other traffic at intersections using a separate signal phase), stop consolidation, enhanced shelters, and redesigned service to improve cross-town connectivity. These features improve reliability, reduce transit travel time, and increase passenger comfort.

Enhanced Corridor service would run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 15 minutes during all periods.

2.3 EmX Corridor Alternatives

EmX (BRT) Alternatives are characterized by exclusive guideways (business access and transit lanes or bus-only lanes); branded, multi-door 60-foot-long BRT vehicles; enhanced stations with level boarding platforms instead of stops; off-board fare collection; signal priority; wider stop spacing; frequent and redesigned service to improve cross-town connectivity.

EmX service is assumed to run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 10 minutes during all periods.

3. Methods and Data

This section describes the analysis methodologies and data used for the Operating and Maintenance Costs Estimating analysis for the MovingAhead project.

3.1 Approach

Annual O&M costs were estimated for each alternative within each corridor. The No-Build Alternative was used for a consistent comparison across alternatives. For each, service levels were calibrated to meet transit demand based on forecasted land use, employment, and population levels for the year 2035. Anticipated system-wide service design changes are reflected in the O&M costs for all alternatives (see Section 3.1.2 for service characteristics of the 2035 No-Build Alternative). Forecasted O&M costs are based on FY2016 operating and maintenance costs for LTD, and are distinguished between EmX (bus rapid transit) service and conventional or fixed-route bus service (Enhanced Corridor service falls into this category). Though costs are based on service levels needed to meet transit demand in the forecast year (2035), all costs are stated in current dollars (2016).

A fully allocated cost model was used to determine annual O&M costs of the transit service alternatives. This approach differs somewhat from the O&M costing methodology outlined in the MovingAhead Methods and Data Report (CH2M et al., 2015 June), but it is consistent with past efforts to forecast O&M costs used for the West Eugene EmX Extension (WEEE) project. This approach is also consistent with O&M costing guidance from the FTA's Procedures in Technical Methods for Transit Project Planning for New Starts Projects (FTA 2011). The methodology outlined in the MDR (CH2M et al., 2015, June) breaks LTD costs into categories including service, fixed infrastructure, and other costs, while this approach allocates the entire LTD budget into cost categories that are tied to hours, miles, and vehicles used in peak service.

Outputs from the cost model were analyzed in the next sections in terms of their service characteristics (miles, hours, and peak vehicles), and service type cost totals (Conventional and EmX). System-wide totals from the alternatives were assessed as a percentage of the base year (FY2016) O&M budget.

3.2 Operating and Maintenance Costs Estimate Development

The fully allocated cost model approach used LTD's FY2016 budget to create a base year allocation of O&M funds to transit revenue service levels from the same year. Revenue service refers to all scheduled time a transit vehicle spends serving passengers (Revenue Hours), as well as all distance traveled while providing that service (Revenue Miles). In this case, revenue service is confined to in-service time (excluding layovers, which are included in "Revenue Service" figures reported to the National Transit Database (NTD)) in order to relate to model outputs which are also values describing only when buses serve passengers. Revenue service increments from the base year provided by LTD were used to create an allocation of O&M costs from the same year. According to the model, the number of vehicles in operation to meet maximum demand was used to allocate base year expenses for administrative costs that were not directly linked to service levels.

The base year allocation of funds to service levels was used to create annual O&M cost predictions based on estimated service levels for the alternatives. Forecasts of Vehicle Hours Traveled (VHT) and Vehicle Miles Traveled (VMT) for the alternatives generated by the Lane Council of Governments Regional Travel Demand Forecasting model were calibrated as revenue service increments. The number of peak vehicles (conventional and EmX) for each alternative were determined by the Maintenance and Service Planning departments based on historical knowledge of LTD fleet size requirements necessary to

meet peak demand levels. Peak vehicle numbers are directly related to VHT and VMT forecasts for peak service in each of the design alternatives.

To forecast O&M costs for each alternative, each cost category in the LTD budget was subdivided into cost factors based on vehicle hours, vehicle miles, and peak buses. In general, transportation costs were allocated on a per vehicle hour basis, fleet maintenance costs were allocated per vehicle mile, and other administrative and support costs were allocated to the number of buses used in peak service for each service type. For each budget item, a percentage allocation between conventional bus and EmX service was determined, and those costs were totaled.

3.2.1.1 Variable Cost Categories

- **Revenue Hours.** The largest single budget item related to revenue hours used in the fully allocated cost model was driver wages, which made up 87% of all costs estimated using VHT and just over 37% of all O&M costs in the FY2016 base year. The remaining costs in this category were operations department supervisory and support staff personnel costs and the cost of materials and services related to those roles. Altogether, revenue hours were linked to nearly 43% of overall O&M expenses in the base year. According to the model, VHT forecasts were the single largest determinant of overall O&M cost predictions for the alternatives.
- **Revenue Miles.** Maintenance worker wages, supervisory and support personnel costs, and the cost of materials and services for those roles made up 75% of FY2016 base year costs related to revenue miles according to the model. Fuel costs made up the remaining 25% of costs allocated to revenue miles. Taken together costs associated with revenue miles were almost 18% of the LTD's total O&M budget.
- **Peak Vehicles.** Utilization of a fully allocated cost model for long term planning (more than 20 years) calls for peak vehicle numbers to serve as a proxy for the overall size of a transit system. According to the model, costs involved in providing LTD's administrative services that are either directly or indirectly tied to service levels made up the majority of base year expenses related to peak vehicles. These included personnel as well as materials and services costs for all the remaining departments in the FY2016 budget: Human Resources, IT, Finance, Internal Audit, Executive Office, Government Relations, Facilities, Marketing, Planning and Development, Service Planning, Transit Training, Intelligent Transportation Services, Customer Service, and Accessible Services. Costs associated with those departments constitute about 59% of peak vehicle related expenses and nearly 23% of overall O&M costs from the FY 2016 base year. The remaining costs in this category are related to materials and services for operator training, transfers to rural service providers, paratransit services, and insurance for the district. Altogether, more than 39% of LTD's total O&M budget was allocated to the number of peak vehicles in the FY2016 base year.

3.2.1.2 Allocation of Cost Categories to Service Type

LTD's conventional service is composed of a combination of 40-foot and 60-foot (articulated) buses. Articulated buses are used on specific routes during peak service periods with the highest ridership. Because ridership varies significantly by route and by time of day, many routes use a combination of bus types throughout the day.

During work completed for the West Eugene EmX Extension Project (WEEE), LTD examined whether bus size has a significant impact on overall O&M costs. Since operator pay is not differentiated by bus size, and passenger and support facilities are used commonly by all conventional service, it was concluded that maintenance costs, including fuel, were the only likely source of actual cost differences between

bus sizes in the conventional service. Given that the fleet is mixed throughout the service, one formula for all conventional service was used in this analysis.

In order to calculate cost totals associated with each service type, EmX (BRT) and conventional (fixed route), percentages for each cost item from the base year budget were determined and applied before allocating those funds to the cost categories described above. When available, actual service levels, number of vehicles, fuel quantities used, or security and fleet maintenance costs from the base year (FY2016) that are separated by service type were used to determine percentages used to allocate expenses between EmX and conventional service categories. The allocated amounts (to service type and corresponding cost category) were then applied to the variables for the alternatives to calculate totals for EmX and conventional service. Percentages for service cost allocations are an approximation based on available data. Because of uncertainty inherent in these approximations, the cost totals associated with each service type do not necessarily reflect the actual cost of each service- although it is important to note that the totals of each service add to 100% of O&M costs from the base year and can be considered highly accurate.

3.2.1.3 Formula for Calculating System-wide Operating and Maintenance Costs

Figure 3.2-1. Formula for Calculating System-wide Operating and Maintenance Costs

$$\text{LTD Total Annual O\&M cost} =$$

$$(Conventional\ Service\ Revenue\ Hours) \times \left(\frac{Conventional\ service\ operations\ cost}{hour}\right)$$

$$+$$

$$(EmX\ service\ Revenue\ Hours) \times \left(\frac{EmX\ service\ operations\ cost}{hour}\right)$$

$$+$$

$$(Conventional\ service\ Revenue\ Miles) \times \left(\frac{Conventional\ service\ fleet\ maintenance\ cost}{mile}\right)$$

$$+$$

$$(EmX\ service\ Revenue\ Miles) \times \left(\frac{EmX\ service\ fleet\ maintenance\ cost}{mile}\right)$$

$$+$$

$$(\#\ Conventional\ Peak\ Vehicles) \times \left(\frac{Conventional\ Peak\ Vehicle\ fully\ allocated\ cost}{vehicle}\right)$$

$$+$$

$$(\#\ EmX\ Peak\ Vehicles) \times \left(\frac{EmX\ Peak\ Vehicle\ fully\ allocated\ cost}{vehicle}\right)$$

Source: LTD, 2016.

FY2015-16 (Base Year) Example

The factors that appear in the formulas below are the same as those used to generate numbers in the corridor sections of this report (Sections 6-10), and are the result of an application of the best methods for allocating LTD's FY2016 O&M costs to service types (conventional and EmX service). With that context in mind, the values of those numbers should not be considered an exact value of providing the service described. Taken together, the totals from applying those factors to each service type and level

(levels are actual from FY2016) can be summed to reach an accurate system-wide total of O&M expenses for the base year.

$(173{,}700\ Conventional\ Revenue\ Hours) \times \left(\frac{\$84.78}{hour}\right)$	=	$14,726,874 (Conventional service operations cost)
+		
$(32{,}400\ EmX\ Revenue\ Hours) \times \left(\frac{\$84.73}{hour}\right)$	=	$2,745,126 (EmX service operations cost)
+		
$(2{,}901{,}200\ Conventional\ Revenue\ Miles) \times \left(\frac{\$2.10}{hour}\right)$	=	$6,092,105 (Conventional fleet maintenance cost)
+		
$(436{,}100\ EmX\ Revenue\ Miles) \times \left(\frac{\$3.06}{hour}\right)$	=	$1,333,295 (EmX fleet maintenance cost)
+		
$(73\ Conventional\ Peak\ Vehicles) \times \left(\frac{\$192{,}211.91}{vehicle}\right)$	=	$16,439,350 (Conventional fully allocated cost)
+		
$(8\ EmX\ Peak\ Vehicles) \times \left(\frac{\$196{,}518.16}{vehicle}\right)$	=	$1,886,502 (EmX fully allocated cost)
Total O&M Cost FY2016	**=**	**$40,815,000**

3.2.1.4 Growth of LTD Administrative Capacity

Some growth represented in the fully allocated and fully variable approach has already occurred. Staffing at LTD has undergone significant growth during the period between the base year (FY2016) and the time of this writing (FY2017), and LTD is nearing service levels reached before the (2008) recession. A high-level look at budgets from FY2016 and FY2017 reveal an average increase of 10% for personnel expenses (all departments) as well as for total operating requirements. A large portion of this expense is the result of adding service (LTD added 14,000 hours in FY2017, a 5% increase from FY2016), though the difference between service expansion increase and the overall budget increase likely represents a growth of administrative capacity in advance of the opening of WEEE, one of the largest capital investments and service expansions for the LTD system to date. The capacity of the administration is greatly increased since the base year, including those departments indirectly tied to service. It is likely that the recent growth of staff at LTD is appropriate to sustain some portion of expansion to personnel necessary to support system-level expansion of MovingAhead.

3.2.1.5 Application of Fully Variable Costing Methods for the MovingAhead context

There are potential limitations to using the fully variable approach which may result in an overestimation of LTD's O&M costs in the MovingAhead context. Possible reasons for overestimation include: the likelihood of a near term (< 20 years) implementation for one or more alternatives, an ongoing increase in LTD administrative staff capacity occurring between the base year (FY2016) used in the cost model and the present day (see Section 3.2.1.4 above), and the relatively small size of the LTD system, whose staff has historically supported a large variation in service levels without a direct correlation to staffing levels. This subsection is intended to take a closer look at the first of those issues,

which is directly related to cost model design. The goal of exploring design issues in the cost model is to create a context for the numbers used to compare alternatives.

MovingAhead modeling and assumptions are based on a planning horizon of 20 years (2035), though it is possible that the implementation of one or more Locally Preferred Alternatives (LPAs) for MovingAhead will occur in the shorter term (the project team is exploring 2022 as a potential opening year for the highest priority LPA). Incremental costing models for transit projects are often used to forecast costs for projects in the near term, and in those cases, cost models are often based on the concept that some expenses that are considered "fixed costs" remain constant over very large increments of service and, therefore do not vary with small changes in the level of transit service. Variable costs, on the other hand, are directly linked to the amount of service provided. Fixed costs used in an incremental approach are comprised of expenses that are directly linked with transportation such as Customer Service and Service Planning, as well as those that are indirectly tied to service such as LTD's Government Relations or Finance departments. In the short term, it is usually appropriate to assume that variable costs (usually those linked to hours and miles) are sufficient to provide the associated level of service described for design alternatives, while fixed costs, that are primarily made up of administrative costs not directly involved in operating or maintaining the fleet of a system, are considered to be held constant across the alternatives. Approximately 35% ($14.1M) of LTD's operating expenses for 2016 may be considered fixed costs in the short-term, however, all costs are considered variable for the purposes of this long-term forecast.

The fully variable approach used in this memorandum, by contrast, accounts for the overall growth of LTD's administrative capacity by allocating costs associated with those departments as well as insurance expenses to the number of peak vehicles in the base year and for the alternatives. According to the fully variable method, the number of peak vehicles in each alternative is intended as a proxy for measuring change in the size of the LTD system across alternatives.

3.2.2 Level 1 Screening

Order-of-magnitude cost estimates were developed for the Level 1 Screening based on cost factors (cost per revenue hour, per revenue mile) created for LTD's WEEE project. While those factors adequately measure the magnitude of difference in service between alternatives analyzed in the Level 1 Screening, they do not capture the full scale of administrative costs involved (described above in section 3.2) in operating and maintaining the service described in each alternative for the Level 2 Alternatives Analysis.

3.2.3 Level 2 Alternatives Analysis

The fundamental cost factors (cost per revenue mile, per revenue hour) have been revised (from the Level 1 Screening) for this report based on the outputs of a fully allocated cost model with a 2016 base year. In addition to transit operations and maintenance costs, the model incorporates a full range of facility and administrative costs on a per-vehicle basis to arrive at a forecast for a full O&M budget for each alternative that is separated by vehicle type: EmX and conventional service.

4. Overview of Costs for all Corridors

Table 4-1 displays forecasts of revenue service levels and associated costs for the base year (FY2016) and all MovingAhead alternatives. Total system-wide annual O&M costs are the sum of costs related to three service categories forecasted for each alternative: revenue hours, revenue miles, and peak buses. The Federal Transit Administration defines revenue service (revenue hours, revenue miles) as the time and/or distance traveled "when a vehicle is available to the general public and there is an expectation of carrying passengers" (FTA, National Transit Database Glossary). This can include the time or distance traveled during layovers or recovery time but it excludes the time or distance traveled as a vehicle is switching routes, traveling to or from the fleet yard to begin or end a route, or any time when there is no expectation of carrying revenue passengers. Peak Buses are the number of vehicles necessary to support service during peak periods. These are standard metrics in the transit industry and serve to represent the major cost drivers of operating transit service. The final column in Table 4-1 shows how the total forecasted cost of each MovingAhead alternative compares to the No-Build Alternative.

Table 4-1. Annual System-Wide Operation & Maintenance Costs and Service Levels by Alternative[1]

Alternative	Annual Revenue Hours		Annual Revenue Miles		Peak Buses[2]		Total Cost	Change from No-Build[3]
	No.	Cost	No.	Cost	No.	Cost		
Existing O&M (2016)[4]	206,100	$17.5M	3,337,300	$7.4M	81	$15.9M	**$40.8M**	-
No-Build (2035)	278,600	$23.6M	4,520,200	$10.5M	93	$18.7M	**$52.8M**	-
Highway 99 Corridor								
Hwy. 99 EC (2035)	277,500	$23.5M	4,600,800	$10.7M	92	$18.5M	**$52.7M**	-$0.1M
Hwy. 99 EmX (2035)	292,400	$24.8M	4,864,800	$11.6M	95	$19.3M	**$55.6M**	$2.8M
River Road Corridor								
River Rd. EC (2035)	277,500	$23.5M	4,547,400	$10.6M	90	$18.1M	**$52.2M**	-$0.6M
River Rd. EmX (2035)	285,600	$24.2M	4,744,400	$11.3M	95	$19.3M	**$54.8M**	$2.0M
30th Avenue to LCC Corridor								
30th Ave./LCC EC (2035)	277,500	$23.5M	4,565,400	$10.6M	90	$18.1M	**$52.3M**	-$0.5M
30th Ave./LCC EmX (2035)	282,000	$23.9M	4,674,100	$11.2M	90	$18.3M	**$53.3M**	$0.5M
Coburg Road Corridor								
Coburg Rd. EC (2035)	274,100	$23.2M	4,487,800	$10.5M	95	$19.1M	**$52.8M**	$0.0M
Coburg Rd. EmX (2035)	282,900	$24.0M	4,633,400	$11.2M	96	$19.5M	**$54.6M**	$1.8M
Martin Luther King, Jr. Boulevard Corridor								
MLK, Jr. Blvd (2035)	285,800	$24.2M	4,653,000	$10.8M	94	$18.9M	**$53.9M**	$1.1M

Source: MovingAhead O&M Cost Estimates (LTD: April 2017)

Notes:

[1]Forecasts in Table 4-1 are the product of a fully allocated cost model (methodology detailed in Section 3). In general, transportation costs are allocated on a per revenue vehicle hour basis, fleet maintenance costs are allocated per revenue vehicle mile, and all other administrative and support costs are allocated per peak vehicle.

[2]Peak buses are the number of vehicles necessary to support service during peak periods. A fully allocated cost model uses peak vehicles as a proxy for the overall size of the system, and allocates all expenses for the administration and support of the transit system outside of Operations, Operations Training, and Maintenance departments. In addition, costs related to transfers to support LTD's paratransit and rural services, and insurance for the district are allocated to peak vehicles. A full list of departmental budgets allocated to peak vehicles is outlined in Section 3.2.1.1.

[3]Positive numbers indicate an increase in total O&M expenses compared to the No-Build Alternative. Negative numbers show that total O&M expenses would be lower than the No-Build Alternative.

[4]Existing O&M (2016) service levels and costs are rounded from actuals from that year and are the only numbers in Table 4-1 that are not forecasts. The allocation of LTD's base year FY2016 budget to FY2016 service levels determine cost factors for each category which are then applied to the three service variables modeled for each alternative.

In general, differences in O&M costs between the build alternatives and the No-Build Alternative are directly related to the system-wide revenue service levels and peak buses of each alternative, which differ depending on the details of each corridor alternative.

Service assumptions for the 2035 No-Build Alternative (described in detail in Section 2.1) account for an increase in total O&M costs of $12.0M, which represents a 29.41% increase in O&M costs over the 2016 base year. The No-Build Alternative assumes West Eugene EmX operations start in the fall of 2017 and Main Street EmX operations begin by 2035, resulting in significant increases to revenue hours, revenue miles, and peak vehicles compared to base year 2016 conditions.

O&M costs for all Enhanced Corridor Alternatives, except for the Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative, result in O&M costs that are lower than or equal to the O&M costs of the No-Build Alternative. The primary reason for this is that as vehicle cycle-time (the time it takes for a vehicle to make a round-trip) is decreased (due to shorter layover times and faster travel times) the number of peak buses required to serve the system as a whole is decreased. This scenario also results in more revenue miles per revenue hour.

Under the Enhanced Corridor Alternatives, capital improvements are operational in their focus and are intended to protect travel times while providing 15 minute service frequency. With higher service frequency, in some cases the Enhanced Corridor Alternatives are able to eliminate redundant service or align routes to better serve their markets. This may lead to passengers having to transfer more but these transfers will take place at stations with improved amenities between routes with increased frequencies leading to faster and more comfortable cross-town connections.

The benefits of EmX investments would extend beyond operational considerations, providing a permanence for economic development and a level of transit service frequency and reliability that is expected to increase transit system ridership. These capital investments (including sections of bus-only lanes) would protect LTD's investment in travel times and increased service by ensuring that as congestion on these key corridors increases, O&M costs do not also go up in a struggle to maintain headways. The EmX Alternatives may also lead to increased transfer activity but by offering EmX stations that provide a protected place to wait for no more than 10 minutes due to enhanced frequency the EmX Alternatives would provide faster trips and improved cross-town connections.

The EmX Alternatives require larger O&M increases over the No-Build Alternative because they involve larger increases to service levels than the Enhanced Corridor Alternatives (10 minute EmX service frequency vs. 15 minute EC service frequency). O&M cost increases over the No-Build Alternative for the EmX Alternatives range from a low of $0.5 million (30th Avenue to LCC Corridor EmX Alternative) to a high of $2.8 million (Highway 99 Corridor EmX Alternative).

Table 4-2 shows the percentage changes in revenue hours, revenue miles, peak vehicles and annual cost for each corridor alternative compared to the No-Build Alternative. It also compares the total cost of each alternative to the FY2016 base year and shows the cost delta between the 2035 No-Build Alternative and the FY2016 base year. FTA requires a cost plan to be implemented for any project that increases annual O&M costs more than 5% over the base year (shown in bold numbers in Table 4-2. The only single corridor to reach that level is the Highway 99 Corridor EmX Alternative.

Table 4-2. Percent Change of O&M Cost and Service Levels for Build Alternatives vs. No-Build Alternative

Alternative	% Change Revenue Hours from 2035 No-Build	% Change Revenue Miles from 2035 No-Build	% Change Peak Vehicles from 2035 No-Build	% Change Annual O&M Cost from 2035 No-Build	% Change Annual O&M Cost from FY2016 Base Year (Delta between 2035 No-Build and FY2016 Base Year)
No-Build (2035)	-	-	-	-	+ 29.41%
Highway 99 Corridor					
Hwy. 99 EC (2035)	-0.39%	+ 1.78%	-1.08%	**-0.19%**	29.17%; (-0.25%)
Hwy. 99 EmX (2035)	+ 4.95%	+ 7.62%	+ 2.15%	**+ 5.30%**	36.27%; **(+6.86%)**
River Road Corridor					
River Rd. EC (2035)	-0.39%	+ 0.60%	-3.23%	**-1.14%**	27.94%; (-1.47%)
River Rd. EmX (2035)	+ 2.51%	+ 4.96%	+ 2.15%	**+ 3.79%**	34.31%; (+4.90%)
30th Avenue to LCC Corridor					
30th Ave./LCC EC (2035)	-0.39%	+ 1.00%	-3.23%	**-0.95%**	28.19%; (-1.23%)
30th Ave./LCC EmX (2035)	+ 1.22%	+ 2.50%	-3.23%	**+ 0.95%**	30.64%; (+1.23%)
Coburg Rd. Corridor					
Coburg Rd. EC (2035)	-1.62%	-0.72%	+ 2.15%	**0.00%**	29.41%; (-0.00%)
Coburg Rd. EmX (2035)	+ 1.54%	+ 2.50%	+ 3.23%	**3.41%**	33.82%; (+4.41%)
Martin Luther King, Jr. Corridor					
MLK, Jr. Blvd EC (2035)	+ 2.28%	+ 2.94%	+ 1.08%	**2.08%**	32.11%; (+2.70%)

Source: MovingAhead O&M Cost Estimates (LTD: April 2017)

5. No-Build Alternative

5.1 Affected Environment

As described in Section 2.1, the No-Build Alternative includes the entirety of the LTD system including the list of capital improvements anticipated by 2035. The most notable of these in terms of service changes and their associated O&M costs are the West Eugene EmX (WEEE) Line, the Main Street EmX Extension, and the McVay Highway Enhanced Corridor service. Changes to transit operations from existing services that are generally related to those anticipated improvements are detailed in Section 2.1.2.

5.2 Alternative Analysis

This section explores service characteristics and their associated O&M costs for the No-Build Alternative. LTD's total O&M costs can be evaluated in terms of two service types: EmX service and conventional (fixed route) service, which are described in Table 5.2-1 in terms of revenue hours, revenue miles and peak vehicles and how they compare to the FY2016 base year.

System-wide O&M costs for the No-Build Alternative total $52.8M, which is a $12.0M (29.41%) increase over O&M costs for the FY2016 base year. This is the result of the large scale service increase under the No-Build Alternative. Table 5.2-1 describes service levels for the No-Build Alternative and their associated costs. Compared to the FY2016 base year, the No-Build Alternative includes a 115.74% increase in EmX service revenue hours, a 20.15% increase in conventional service revenue hours, and a 35.18% increase in total service hours. System-wide revenue miles increase at a slightly greater percentage than the total system-wide revenue hours (35.44%), which is the result of the improved efficiency and speed (more revenue miles per revenue hour) of expanded EmX service under the No-Build Alternative. The EmX peak vehicles are increased by 11 vehicles under the No-Build Alternative, from 8 peak EmX vehicles in FY2016 to 19. Total peak vehicles under the No-Build Alternative are 93, up from 81 in the FY2016 base year.

Table 5.2-1. No-Build Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from FY2016 Base Year	Conventional (Fixed Route) Service	Change from FY2016 Base Year	Total	Change from FY2016 Base Year
Revenue VHT (hours)	69,900	37,500	208,700	72,500	278,600	37,500
Revenue VMT (miles)	1,076,900	640,800	3,443,300	542,100	4,520,200	1,182,900
Peak Vehicles (# of vehicles)	19	11	74	1	93	12
Total O&M Cost	**$14.6M**	$7.7M	**$46.9M**	**+$4.2M**	**$52.8M**	**+$12.0M**

Source: MovingAhead O&M Cost Estimates (LTD.: April 2017)

6. Highway 99 Corridor Operations and Maintenance Costs

6.1 Affected Environment

The Highway 99 Corridor begins at the Eugene Station, travels through downtown, then extends northwest along Highway 99 to Barger Drive, turning west at Barger Drive to terminate on Cubit Street north of the intersection of Barger Drive and Cubit Street east of the Randy Papé Beltline Highway. This corridor is approximately 10.5 round trip miles.

6.1.1 No-Build Alternative

The No-Build Alternative includes existing roadway, bicycle, pedestrian, and transit facilities in the corridor, as well as planned improvements in the 2035 Eugene Transportation System Plan (TSP). The No-Build Alternative would not include capital improvements on Highway 99. As part of the 2035 Eugene TSP, the following transportation improvements are planned along or adjacent to the corridor:

- Upgrade Bethel Drive, from Highway 99 to Roosevelt Boulevard, to a two-lane urban facility with sidewalks on both sides of the road, bicycle lanes, and planting strips.
- Widen Barger Drive immediately west of the Randy Papé Beltline Highway interchange to include an additional travel lane in each direction.
- Add a shared-use path on the west side of Highway 99 from Roosevelt Boulevard south to the intersection of W. 7th Avenue (Highway 99) and Garfield Street (the section of this project from Roosevelt to W. 5th Avenue has been completed).
- Add bicycle lanes on Garfield Street from Roosevelt Boulevard south to W. 6th Avenue.
- Add a bicycle lane on W. 6th Avenue from Garfield Street to W. 5th Avenue.
- Complete sidewalk network on Highway 99 from Roosevelt Boulevard south to Garfield Street.
- Add a shared-use path on Roosevelt Boulevard from Maple Street to Highway 99.
- Add a bicycle lane on Roosevelt Boulevard from Highway 99 east to railroad tracks.

Under the No-Build Alternative, Highway 99 Corridor service would remain at 15 minute headways during peak periods and 30 minutes during off-peak periods and evenings. Under the No-Build Alternative, a slight change is also made to Route 93, which would stop at the Pearl Buck Center in the absence of Route 44.

6.1.2 Enhanced Corridor Alternative

Capital improvements under the Highway 99 Corridor Enhanced Corridor Alternative would include enhanced bicycle and pedestrian crossings; improvements to existing bus stops and the construction of new stops; construction of queue jumps at some intersections; traffic signal reconstruction; construction of bus-only left turn lanes; and roadway widening at some locations in the corridor.

Existing conventional fixed-service routes would remain the same as the No-Build Alternative, with the exception of the elimination of Route 41. Service west of WinCo would also remain the same or be improved. As mentioned in Section 3.2, Enhanced Corridor service would run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 15 minutes during all periods.

6.1.3 EmX Alternative

The Highway 99 Corridor EmX Alternative would include Business Access and Transit (BAT) lanes on segments of West 7th Avenue and Highway 99; reconstructing the Highway 99 / Roosevelt Boulevard intersection (traffic signal, turn lanes, and queue jump); completing other intersection modifications in the corridor; roadway widening at some locations; and constructing nine new enhanced pedestrian and bicycle crossings, new sidewalks, and a pedestrian bridge across the railroad line from Highway 99 to the TrainSong neighborhood. Four existing bus stop locations would be improved to EmX stations, in addition to constructing new stations. Some existing EmX stations would be used for the Highway 99 Corridor EmX service.

Route 44 is a conventional service line added to this alternative only, providing coverage on 11th and 13th Avenues as well as service to the Pearl Buck Center on W. 1st Avenue, with 30 minute headways during all periods. This would be a decrease in service for the 11th and 13th Avenue corridors that currently have 15-minute peak service. Route 44 is primarily intended to replace conventional service lost with the removal of the existing Route 41. Route 41 would be replaced with the Highway 99 EmX service described in this alternative.

As mentioned in Section 2.3, EmX service is assumed to run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 10 minutes during all periods.

6.2 Analysis of Operations and Maintenance Costs and Service Differences

This section reports service characteristics and their associated O&M costs for each alternative for the Highway 99 Corridor. Total O&M costs are evaluated in terms of two service types: EmX service and conventional (fixed route) service, which are described in Tables 6.2-1, 6.2-2, and 6.2-3 in terms of revenue hours, revenue miles, and peak vehicles.

6.2.1 No-Build Alternative

With 93 peak vehicles, 278,600 revenue hours, and 4,520,200 revenue miles, system-wide O&M costs for the No-Build Alternative total $52.8M.

6.2.2 Enhanced Corridor Alternative

System-wide O&M costs for the Highway 99 Corridor Enhanced Corridor Alternative total $52.7 million, a decrease of $0.1M from the No-Build Alternative. This represents a decrease in total O&M costs of 0.19%. Table 6.2-2 describes service levels under the Enhanced Corridor Alternative, the associated costs, and how they compare with the No-Build Alternative. EmX service levels and peak vehicles are exactly the same for both alternatives because this alternative does not add EmX service to the LTD system, while conventional service hours decrease and revenue miles increase resulting in more revenue miles per revenue hour. The number of peak vehicles decreases from 93 under the No-Build Alternative to 92 under this alternative. The primary reason for this is that as vehicle cycle-time (the time it takes for a vehicle to make a round-trip) is decreased due to shorter layover times and faster travel times, the number of peak buses required to serve the system as a whole is decreased. Generally, under Enhanced Corridor Alternatives, capital improvements are operational in their focus and are intended to protect travel times while providing 15 minute service frequency. With higher service frequency, in some cases the Enhanced Corridor Alternatives could eliminate redundant service or align routes to better serve their markets. This could lead to passengers having to transfer more but these

transfers would take place at stations with improved amenities between routes with increased frequencies leading to faster and more comfortable cross-town connections. An increase in service frequency would contribute to more reliable transfers and shorter wait times along this corridor and at the WinCo station.

6.2.3 EmX Alternative

System-wide O&M costs for the Highway 99 Corridor EmX Alternative are estimated to be $55.6M, up $2.8M from the No-Build Alternative. This represents a 5.30% increase. Table 6.2-3 describes service levels of the Highway 99 Corridor EmX Alternative, the associated costs, and how they compare with the No-Build Alternative. EmX service hours, miles, and peak vehicles increase while the revenue hours, miles and peak vehicles of conventional service decrease. This is primarily because the new EmX service replaces the conventional service with the route alignment changes noted in Section 6.1.3 above. The net changes amount to a 4.95% increase in revenue hours with a 7.62% increase in revenue miles, showing that the Highway 99 EmX Alternative also results in more revenue miles per revenue hour. Total peak vehicles go up from 93 under the No-Build Alternative to 95 under this alternative. The benefits of EmX investments would extend beyond operational considerations, providing a permanence for economic development and a level of transit service frequency and reliability that is expected to increase transit system ridership. These capital investments (including sections of bus-only lanes) would protect LTD's investment in travel times and increased service by ensuring that as congestion on these key corridors increases, O&M costs do not also go up in a struggle to maintain headways. Like the Enhanced Corridor Alternatives, the EmX Alternatives could also lead to increased transfer activity but by offering EmX stations that provide a protected place to wait for no more than 10 minutes due to enhanced frequency, the EmX Alternatives would provide faster trips and improved cross-town connections.

Table 6.2-1. No-Build Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from FY2016 Base Year	Conventional (Fixed Route) Service	Change from FY2016 Base Year	Total	Change from FY2016 Base Year
Revenue VHT (hours)	69,900	37,500	208,700	72,500	278,600	37,500
Revenue VMT (miles)	1,076,900	640,800	3,443,300	542,100	4,520,200	1,182,900
Peak Vehicles (# of vehicles)	19	11	74	1	93	12
Total O&M Cost	**$14.6M**	+$7.7M	**$46.9M**	**+$4.2M**	**$52.8M**	**+$12.0M**

Source: MovingAhead O&M Cost Estimates (LTD.: April 2017)

Table 6.2-2. Highway 99 Enhanced Corridor Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from No-Build (2035)	Conventional (Fixed Route) Service	Change from No-Build (2035)	Total	Change from No-Build (2035)
Revenue VHT (hours)	69,900	-	207,600	(1,100)	277,500	(1,100)
Revenue VMT (miles)	1,076,900	-	3,523,900	80,600	4,600,800	80,600
Peak Vehicles (# of vehicles)	19	-	73	(1)	92	(1)
Total O&M Cost	**$13.7M**	-	**$39.0M**	**-$.1M**	**$52.7M**	**-$0.1M**

Source: MovingAhead O&M Cost Estimates (LTD.: April 2017)

Table 6.2-3. Highway 99 EmX Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from No-Build (2035)	Conventional (Fixed Route) Service	Change from No-Build (2035)	Total	Change from No-Build (2035)
Revenue VHT (hours)	85,500	15,600	206,900	(1,800)	292,400	13,800
Revenue VMT (miles)	1,411,700	334,800	3,453,100	9800	4,864,800	344,600
Peak Vehicles (# of vehicles)	23	4	72	(2)	95	2
Total O&M Cost	**$17.0M**	**+ $3.3M**	**$38.6M**	**-$.5M**	**$55.6M**	**+ $2.8M**

Source: MovingAhead O&M Cost Estimates (LTD.: April, 2017)

7. River Road Corridor Operations and Maintenance Costs

7.1 Affected Environment

The River Road Corridor begins at the Eugene Transit Center, travels through downtown and then north to the Santa Clara Community Transit Center (intersection of Hunsaker Lane and River Road). This corridor is approximately 10.3 round trip miles.

7.1.1 No-Build Alternative

The No-Build Alternative would include existing roadway, bicycle, pedestrian, and transit facilities in the corridor, as well as planned improvements in the 2035 Eugene TSP. There would be no additional major bus capital improvements under the No-Build Alternative.

As part of the 2035 Eugene TSP, the following transportation improvements are planned adjacent to and along the River Road Corridor:

- Upgrade the Hunsaker Lane/Beaver Street intersection to urban collector standards, including two travel lanes, a center turn lane, bicycle lanes, sidewalks on both sides of the road, and planting strips from River Road to Division Avenue.
- Bicycle boulevards on Ruby Avenue, Horn Lane, Arbor Drive, and Park Avenue.
- Sidewalks on Hunsaker Lane, Howard Avenue, and Hilliard Lane.
- Protected bicycle lanes on River Road from the Northwest Expressway to Division Avenue.

Under the No-Build Alternative, River Road Corridor service would remain at 30 minute headways for both Routes 51 and 52 which together effectively provide 15 minute service during peak periods, and off-peak periods. After 6:15 p.m. there is no longer a combined 15-minute frequency and headways return to 30 minutes.

7.1.2 Enhanced Corridor Alternative

Capital improvements constructed as part of the River Road Corridor Enhanced Corridor Alternative would include BAT lanes on River Road approaching the Randy Papé Beltline Highway and other roadway improvements, like traffic signal reconstruction at certain locations along the corridor. Improvements to existing bus stops and the construction of new stops would also occur.

Routes 51 and 52 would be eliminated, and Enhanced Corridor service for River Road includes a split alignment in order to serve portions covered by those routes at 30 minute headways. In this arrangement, the area from Railroad Boulevard to 1st Avenue is served by one EC service as a replacement for the 51 while the area along Blair Boulevard and 2nd Avenue. are served by the other alignment to replace service lost with removal of Route 52. Those alignments meet at Railroad Boulevard and River Road to serve the River Road corridor with consistent 15 minute headways.

As mentioned in Section 2.2, Enhanced Corridor service would run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 15 minutes during all periods.

7.1.3 EmX Alternative

New construction under the River Road Corridor EmX Alternative would include lane repurposing on River Road for BAT lanes, constructing short sections of exclusive bus lanes near the Randy Papé Beltline Highway, traffic signal and intersection reconstruction at several locations, construction of new bicycle and pedestrian crossings, improvement of existing stops to EmX stations, and construction of new stations. Some existing EmX stations would be used with the River Road EmX service.

Transit service changes would also include modifying headways on Route 40 during the a.m. and p.m. peak hours to 15 minutes, developing a new Route 50 "River Road Connector" with 30-minute headways all day, and eliminating Routes 51, 52, and 55. These replacements ensure no loss in existing coverage or service.

As mentioned in Section 2.3, EmX service is assumed to run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 10 minutes during all periods.

7.2 Analysis of Operations and Maintenance Costs and Service Differences

This section explores service characteristics and their associated O&M costs for each alternative for the River Road Corridor. LTD's total O&M costs can be evaluated in terms of two service types: EmX service and conventional (fixed route) service, which are described in Tables 7.2-1, 7.2-2, and 7.2-3 in terms of revenue hours, revenue miles and peak vehicles.

7.2.1 No-Build Alternative

With 93 peak vehicles, 278,600 revenue hours, and 4,520,200 revenue miles, system-wide O&M costs for the No-Build Alternative total $52.8M.

7.2.2 Enhanced Corridor Alternative

System-wide O&M costs for the River Road Corridor Enhanced Corridor Alternative total $52.2M, a decrease of $0.6M from the No-Build Alternative. This represents a decrease in total O&M costs of 1.14%. Table 7.2-2 describes service levels of the Enhanced Corridor Alternative, their associated costs, and how they compare with the No-Build Alternative. EmX service levels and peak vehicles are exactly the same for both alternatives because this alternative does not add EmX service to the LTD system, while conventional service hours decrease by 0.39% and revenue miles increase by 0.6% resulting in more revenue miles per revenue hour. The number of peak vehicles decreases from 93 under the No-Build Alternative to 90 under this alternative. The primary reason for this is that as vehicle cycle-time (the time it takes for a vehicle to make a round-trip) is decreased due to shorter layover times and faster travel times, the number of peak buses required to serve the system as a whole is decreased. Generally, under Enhanced Corridor Alternatives, capital improvements are operational in their focus and are intended to protect travel times while providing 15 minute service frequency. With a higher service frequency, in some cases the Enhanced Corridor Alternatives could eliminate redundant service or align routes to better serve their markets. This could lead to passengers having to transfer more but these transfers would take place at stations with improved amenities between routes with increased frequencies leading to faster and more comfortable cross-town connections.

7.2.3 EmX Alternative

System-wide O&M costs for the River Road EmX Alternative go up to $54.8M, up $2.0M from the No-Build Alternative. This represents a 3.79% increase from the No-Build Alternative. Table 7.2-3 describes service levels of the EmX Alternative, their associated costs, and how they compare with the No-Build Alternative. EmX service hours, miles, and peak vehicles increase while the revenue hours, miles and peak vehicles of conventional service decreases. This is primarily because the new EmX service replaces the conventional service accounting for the route changes outlined in Section 7.1.3 above. The net changes amount to a 2.51% increase in revenue hours with a 4.96% increase in revenue miles showing that the River Road EmX Alternative also results in more revenue miles per revenue hour. Peak vehicles go up from 93 under the No-Build Alternative to 95 under this alternative. The benefits of EmX investments would extend beyond operational considerations, providing a permanence for economic development and a level of transit service frequency and reliability that is expected to increase transit system ridership. These capital investments (including sections of bus-only lanes) would protect LTD's investment in travel times and increased service by ensuring that as congestion on these key corridors increases, O&M costs do not also go up in a struggle to maintain headways. Like the Enhanced Corridor Alternatives, the EmX Alternatives could also lead to increased transfer activity but by offering EmX stations that provide a protected place to wait for no more than 10 minutes due to enhanced frequency, the EmX Alternatives would provide faster trips and improved cross-town connections.

Table 7.2-2. River Road Enhanced Corridor Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from FY2016 Base Year	Conventional (Fixed Route) Service	Change from FY2016 Base Year	Total	Change from FY2016 Base Year
Revenue VHT (hours)	69,900	37,500	208,700	72,500	278,600	37,500
Revenue VMT (miles)	1,076,900	640,800	3,443,300	542,100	4,520,200	1,182,900
Peak Vehicles (# of vehicles)	19	11	74	1	93	12
Total O&M Cost	**$14.6M**	$7.7M	**$46.9M**	**$4.2M**	**$52.8M**	**$12.0M**

Source: MovingAhead O&M Cost Estimates (LTD.: April 2017)

Table 7.2-3. River Road EmX Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from No-Build (2035)	Conventional (Fixed Route) Service	Change from No-Build (2035)	Total	Change from No-Build (2035)
Revenue VHT (hours)	85,900	16,000	199,700	(9,000)	285,600	7,000
Revenue VMT (miles)	1,407,900	331,000	3,336,500	(106,800)	4,744,400	224,200
Peak Vehicles (# of vehicles)	23	4	72	(2)	95	2

Total O&M Cost	**$17.0M**	+ $3.3M	**$37.8M**	-$1.3M	**$54.8M**	+ $2.0M

Source: MovingAhead O&M Cost Estimates (LTD.: April 2017)

8. 30th Avenue to Lane Community College Corridor Operations and Maintenance Costs

8.1 Affected Environment

The 30th Avenue to LCC Corridor begins at Eugene Station and travels south along Pearl Street (outbound) and north along Oak Street (inbound) to Amazon Parkway, then on E. 30th Avenue to its terminus at the LCC Station. This corridor is approximately 10.2 round trip miles.

8.1.1 No-Build Alternative

The No-Build Alternative would include existing roadway, bicycle, pedestrian, and transit facilities in the corridor, as well as planned improvements in the 2035 Eugene TSP. There would be no additional major bus capital improvements to the 30th Avenue to Lane Community College Corridor under the No-Build Alternative.

The 2035 Eugene TSP identifies the following transportation improvements along or adjacent to the corridor:

- Bicycle boulevard on Alder Drive

For the portion of East 30th Avenue in unincorporated Lane County, Lane County does not plan to improve bicycle facilities along the road.

Under the No-Build Alternative, 30th Avenue to Lane Community College Corridor service would remain at 30 minute headways on Route 81. The Route 82 service would remain at 10 minute headways during the morning peak, 15 minute headways during off-peak periods and 20 minute headways during the afternoon peak with no weekend service.

8.1.2 Enhanced Corridor Alternative

Capital improvements as part of the 30th Avenue to LCC Corridor Enhanced Corridor Alternative would include the construction of new bus stops, capital improvements to some existing bus stops, a new traffic signal on Amazon Parkway at East 20th Avenue, and new bike facilities on Oak and Pearl Streets.

Under the 30th Avenue to LCC Corridor Enhanced Corridor Alternative, service to Lane Community College provided by Routes 81 and 82 would be eliminated and replaced by Enhanced Corridor service. The direct connection between Lane Community College and the University of Oregon Station along the Route 81 would be eliminated. It would be replaced by connecting the 30th Avenue to LCC Corridor Enhanced Corridor Alternative to the Franklin EmX line with a transfer at Eugene Station. As mentioned in Section 2.2, Enhanced Corridor service would run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 15 minutes during all periods.

8.1.3 EmX Alternative

The 30th Avenue to LCC Corridor EmX Alternative would include repurposing parking and general-purpose lanes to BAT lanes on Oak and Pearl Streets, constructing queue jumps, extending E. 20th Avenue, adding a new traffic signal on Amazon Parkway and adding a new cycle track on High Street. In addition to constructing new EmX stations, existing bus stops would be improved to EmX stations in certain locations.

Service to Lane Community College provided by Routes 81 and 82 would be replaced with EmX service. The direct connection between Lane Community College and the University of Oregon Station along the Route 81 would be eliminated. It would be replaced by connecting the 30th Avenue to LCC Corridor EmX Alternative to the Franklin EmX line with a transfer at Eugene Station. As mentioned in Section 2.3, EmX service is assumed to run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 10 minutes during all periods.

8.2 Analysis of Operations and Maintenance Costs and Service Differences

This section reports service characteristics and their associated O&M costs for each alternative for the 30th Avenue to Lane Community College Corridor. LTD's total O&M costs can be evaluated in terms of two service types: EmX service and conventional (fixed route) service, which are described in Tables 8.2-1, 8.2-2, and 8.2-3 in terms of revenue hours, revenue miles and peak vehicles.

8.2.1 No-Build Alternative

With 93 peak vehicles, 278,600 revenue hours, and 4,520,200 revenue miles, system-wide O&M costs for the No-Build Alternative total $52.8M.

8.2.2 Enhanced Corridor Alternative

System-wide O&M costs for the 30th Avenue to Lane Community College Corridor Enhanced Corridor Alternative total $52.3M, a decrease of $0.5M from the No-Build Alternative. This represents a decrease in total O&M costs of 0.95%. Table 8.2-2 describes service levels of the Enhanced Corridor Alternative, their associated costs, and how they compare with the No-Build Alternative. EmX service levels and peak vehicles are exactly the same for both alternatives because this alternative does not add EmX service to the LTD system, while conventional service hours decrease by 0.39% and revenue miles increase by 1.0% resulting in more revenue miles per revenue hour. The number of peak vehicles decreases from 93 under the No-Build Alternative to 90 under this alternative. The primary reason for this is that as vehicle cycle-time (the time it takes for a vehicle to make a round-trip) is decreased due to shorter layover times and faster travel times, the number of peak buses required to serve the system as a whole is decreased. Generally, under Enhanced Corridor Alternatives, capital improvements are operational in their focus and are intended to protect travel times while providing 15 minute service frequency. With higher service frequency, in some cases the Enhanced Corridor Alternatives are able to eliminate redundant service or align routes to better serve their markets. This could lead to passengers having to transfer more but these transfers would take place at stations with improved amenities between routes with increased frequencies leading to faster and more comfortable cross-town connections.

8.2.3 EmX Alternative

System-wide O&M costs for the 30th Avenue to LCC Corridor EmX Alternative are $53.3M, up $0.5M from the No-Build Alternative. This represents a 0.95% increase from the No-Build Alternative. Table 8.2-3 describes service levels of the 30th Avenue to LCC Corridor EmX Alternative, their associated costs, and how they compare with the No-Build Alternative. EmX service hours, miles, and peak vehicles increase while the revenue hours, miles and peak vehicles of conventional service decreases. This is primarily because the new EmX service replaces the conventional service accounting for the route changes outlined in Section 8.1.3 above. The net changes amount to a 1.22% increase in revenue hours with a 3.4% increase in revenue miles showing that the 30th Avenue to LCC Corridor EmX Alternative also results in more revenue miles per revenue hour. These efficiency gains allow peak vehicles to go

down from 93 under the No-Build Alternative to 90 under this alternative. This is the only EmX Alternative where peak vehicles decrease compared to the No-Build Alternative. The benefits of EmX investments would extend beyond operational considerations, providing a permanence for economic development and a level of transit service frequency and reliability that is expected to increase transit system ridership. These capital investments (including sections of bus-only lanes) would protect LTD's investment in travel times and increased service by ensuring that as congestion on these key corridors increases, O&M costs do not also go up in a struggle to maintain headways. Like the Enhanced Corridor alternatives, the EmX alternatives could also lead to increased transfer activity but by offering EmX stations that provide a protected place to wait for no more than 10 minutes due to enhanced frequency, the EmX Alternative would provide faster trips and improved cross-town connections.

Table 8.2-1. No-Build Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from FY2016 Base Year	Conventional (Fixed Route) Service	Change from FY2016 Base Year	Total	Change from FY2016 Base Year
Revenue VHT (hours)	69,900	37,500	208,700	72,500	278,600	37,500
Revenue VMT (miles)	1,076,900	640,800	3,443,300	542,100	4,520,200	1,182,900
Peak Vehicles (# of vehicles)	19	11	74	1	93	17
Total O&M Cost	**$14.6M**	$7.7M	**$46.9M**	**$4.2M**	**$52.8M**	**$15.0M**

Source: MovingAhead O&M Cost Estimates (LTD: April 2017)

Table 8.2-2. 30th Avenue to LCC Enhanced Corridor Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from No-Build (2035)	Conventional (Fixed Route) Service	Change from No-Build (2035)	Total	Change from No-Build (2035)
Revenue VHT (hours)	69,900	-	207,600	(1,100)	277,500	(1,100)
Revenue VMT (miles)	1,076,900	-	3,488,500	45,200	4,565,400	45,200
Peak Vehicles (# of vehicles)	19	-	71	(3)	90	(3)
Total O&M Cost	**$13.7M**	-	**$38.6M**	**-$.5M**	**$52.3M**	**-$.5M**

Source: MovingAhead O&M Cost Estimates (LTD: April 2017)

Table 8.2-3. 30th LCC EmX Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from No-Build (2035)	Conventional (Fixed Route) Service	Change from No-Build (2035)	Total	Change from No-Build (2035)
Revenue VHT (hours)	84,500	14,600	197,500	(11,200)	282,000	3,400
Revenue VMT (miles)	1,403,200	326,300	3,270,900	(172,400)	4,674,100	153,900
Peak Vehicles (# of vehicles)	22	3	68	(6)	90	(3)
Total O&M Cost	**$16.6M**	**+ $2.9M**	**$36.7M**	**-$2.4M**	**$53.3M**	+$.5M

Source: MovingAhead O&M Cost Estimates (LTD: April, 2017)

9. Coburg Road Corridor Operations and Maintenance Costs

9.1 Affected Environment

The Coburg Road Corridor begins at Eugene Station and continues to Coburg Road using the Ferry Street Bridge. The corridor continues north on Coburg Road to Crescent Avenue, east on Crescent Avenue and Chad Drive to N. Game Farm Road, and south on N. Game Farm Road and Gateway Street to the existing Gateway Station at the Gateway Mall. Although service extends from N. Game Farm Road to the Gateway Station, capital improvements for the corridor terminate at I-5. This corridor is approximately 11.2 round trip miles.

9.1.1 No-Build Alternative

The No-Build Alternative includes existing roadway, bicycle, pedestrian, and transit facilities in the corridor, as well as planned improvements in the 2035 Eugene TSP. There would be no additional major transportation improvements to the Coburg Road Corridor under the No-Build Alternative.

Under the No-Build Alternative, the Coburg Road Corridor service would remain at 15 minute headways on Routes 66 and 67 at all weekday times, 30 minute headways on Saturdays and 60 minute headways on Sundays.

9.1.2 Enhanced Corridor Alternative

The Coburg Road Corridor Enhanced Corridor Alternative would include new traffic signal construction, intersection reconstruction at several locations on Coburg Road, the addition of queue jumps, and the addition of BAT lanes south of the I-105 interchange. New crossings for bicyclists and pedestrians would be constructed. Existing bus stops would be improved and new stops would also be constructed.

Route 12 would be altered to serve Valley River Center and Marcola Road. A new route, Route 60VRC would be added to serve Valley River Center, and Routes 66 and 67 would be eliminated. This change would provide new service and coverage to the Cal Young neighborhood and along Hayden Bridge Way in Springfield. It would require current passengers along Harlow Road to transfer in order to get downtown. As mentioned in Section 2.2, Enhanced Corridor service would run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 15 minutes during all periods.

9.1.3 EmX Alternative

Improvements to the corridor under the EmX Alternative would include construction of exclusive transit lanes at several locations on Coburg Road and intersection reconstruction at multiple locations in the corridor. New bicycle and pedestrian crossings and EmX stations would be constructed and some existing bus stops would be improved to EmX stations.

As in the Coburg Road Corridor Enhanced Corridor Alternative, Route 12 would be altered to serve Valley River Center and Marcola Road and Route 60VRC would be added to serve Valley River Center while Routes 66 and 67 would be eliminated. This change would provide new service and coverage to the Cal Young neighborhood and along Hayden Bridge Way in Springfield. It would require current passengers along Harlow Road to transfer in order to get downtown. As mentioned in Section 2.3, EmX service is assumed to run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 10 minutes during all periods.

9.2 Analysis of Operations and Maintenance Costs and Service Differences

This section reports service characteristics and their associated O&M costs for each alternative for the Coburg Road Corridor. LTD's total O&M costs can be evaluated in terms of two service types: EmX service and conventional (fixed route) service, which are described in Tables 9.2-1, 9.2-2, and 9.2-3 in terms of revenue hours, revenue miles and peak vehicles.

9.2.1 No-Build Alternative

With 93 peak vehicles, 278,600 revenue hours, and 4,520,200 revenue miles, system-wide O&M costs for the No-Build Alternative total $52.8M.

9.2.2 Enhanced Corridor Alternative

System-wide O&M costs for the Coburg Road Corridor Enhanced Corridor Alternative total $52.8M, which is the same as under the No-Build Alternative. Table 9.2-2 describes service levels of the Coburg Road Corridor Enhanced Corridor Alternative, their associated costs, and how they compare with the No-Build Alternative. EmX service levels and peak vehicles are exactly the same for both alternatives because this alternative does not add EmX service to the LTD system, while conventional service hours decrease by 1.62% and revenue miles decrease by 0.72%. As revenue miles decrease less than revenue hours this still results in more revenue miles per revenue hour than under the No-Build Alternative. The number of peak vehicles increase from 93 under the No-Build Alternative to 95 under this alternative. Unlike the previously discussed Enhanced Corridor Alternatives that resulted in a decrease in peak vehicles, the high level of conventional service from Route 60VRC needed to serve Valley River Center causes the increase in peak vehicles for the Coburg Road Corridor Enhanced Corridor Alternative. Generally, under Enhanced Corridor Alternatives, capital improvements are operational in their focus and are intended to protect travel times while providing 15 minute service frequency. With higher service frequency, in some cases the Enhanced Corridor Alternatives are able to eliminate redundant service or align routes to better serve their markets. This could lead to passengers having to transfer more but these transfers would take place at stations with improved amenities between routes with increased frequencies leading to faster and more comfortable cross-town connections.

9.2.3 EmX Alternative

System-wide O&M costs for the Coburg Road Corridor EmX Alternative are $54.6M, up $1.8M from the No-Build Alternative. This represents a 3.41% increase from the No-Build Alternative. Table 9.2-3 describes service levels of the Coburg Road Corridor EmX Alternative, their associated costs, and how they compare with the No-Build Alternative. EmX service hours, miles, and peak vehicles increase while the revenue hours, miles and peak vehicles of conventional service decreases. This is primarily because the new EmX service replaces the conventional service accounting for the route changes outlined in Section 9.1.3 above. The net changes amount to a 1.54% increase in revenue hours with a 2.5% increase in revenue miles showing that the Coburg Road Corridor EmX Alternative also results in more revenue miles per revenue hour. Peak vehicles go up from 93 under the No-Build Alternative to 96 under this alternative. The benefits of EmX investments would extend beyond operational considerations, providing a permanence for economic development and a level of transit service frequency and reliability that is expected to increase transit system ridership. These capital investments (including sections of bus-only lanes) would protect LTD's investment in travel times and increased service by ensuring that as congestion on these key corridors increases, O&M costs do not also go up in a struggle to maintain headways. Like the Enhanced Corridor Alternatives, the EmX Alternatives could also lead to

increased transfer activity but by offering EmX stations that provide a protected place to wait for no more than 10 minutes due to enhanced frequency, the EmX Alternative would provide faster trips and improved cross-town connections.

Table 9.2-1. No-Build Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from FY2016 Base Year	Conventional (Fixed Route) Service	Change from FY2016 Base Year	Total	Change from FY2016 Base Year
Revenue VHT (hours)	69,900	37,500	208,700	72,500	278,600	37,500
Revenue VMT (miles)	1,076,900	640,800	3,443,300	542,100	4,520,200	1,182,900
Peak Vehicles (# of vehicles)	19	11	74	1	93	12
Total O&M Cost	**$14.6M**	$7.7M	**$46.9M**	**$4.2M**	**$52.8M**	**$12.0M**

Source: MovingAhead O&M Cost Estimates (LTD.: April, 2017)

Table 9.2-2. Coburg Road Corridor Enhanced Corridor Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from No-Build (2035)	Conventional (Fixed Route) Service	Change from No-Build (2035)	Total	Change from No-Build (2035)
Revenue VHT (hours)	69,900	-	204,200	(4,500)	274,100	(4,500)
Revenue VMT (miles)	1,076,900	-	3,410,900	(32,400)	4,487,800	(32,400)
Peak Vehicles (# of vehicles)	19	-	76	2	95	2
Total O&M Cost	**$13.7M**	**$ 0**	**$39.1M**	**$ 0**	**$52.80M**	**$ 0**

Source: MovingAhead O&M Cost Estimates (LTD.: April 2017)

Table 9.2-3. Coburg Road Corridor EmX Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from No-Build (2035)	Conventional (Fixed Route) Service	Change from No-Build (2035)	Total	Change from No-Build (2035)
Revenue VHT (hours)	93,300	23,400	189,600	(19,100)	282,900	4,300
Revenue VMT (miles)	1,499,100	422,200	3,134,300	(309,000)	4,633,400	113,200
Peak Vehicles (# of vehicles)	24	5	72	(2)	96	3
Total O&M Cost	**$18.1M**	**+ $4.4M**	**$36.50M**	**-$2.6M**	**$54.6M**	**+ $1.8M**

Source: MovingAhead O&M Cost Estimates (LTD.: April, 2017)

10. Martin Luther King, Jr. Boulevard Corridor Operations and Maintenance Costs

10.1 Affected Environment

The Martin Luther King, Jr. Boulevard Corridor begins at Eugene Station and travels through downtown Eugene on Oak and Pearl Streets and 7th and 8th Avenues. The corridor uses the Ferry Street Bridge to reach Martin Luther King, Jr. Boulevard and continues east past Autzen Stadium to Centennial Boulevard. Although transit service continues along Centennial Boulevard, capital improvements for the corridor terminate at I-5. The corridor is approximately 6.0 round trip miles.

10.1.1 No-Build Alternative

The No-Build Alternative includes existing roadway, bicycle, pedestrian, and transit facilities in the corridor, as well as planned improvements in the 2035 Eugene TSP. The 2035 Eugene TSP identifies the following transportation improvements along or adjacent to the Martin Luther King, Jr. Corridor:

- Add a center turn lane along sections of Martin Luther King, Jr. Boulevard from Club Road to Leo Harris Parkway.

Under the No-Build Alternative, the Martin Luther King, Jr. Boulevard Corridor service would remain at 30 minute headways.

10.1.2 Enhanced Corridor Alternative

Capital improvements associated with the Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative would include the reconstruction of traffic signals at the intersections of Coburg Road and Martin Luther King, Jr. Boulevard and Martin Luther King, Jr. Boulevard and Centennial Loop; the repurposing of existing outside general-purpose lanes to BAT lanes on Martin Luther King, Jr. Boulevard; adding a new traffic signal at the intersection of Martin Luther King, Jr. Boulevard and Leo Harris Parkway; enhancing pedestrian crossings; and constructing new bus stops and improving existing bus stops. Existing Route 13 would be eliminated.

As mentioned in Section 3.2, Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative service would run from 6:45 a.m. to 11:30 p.m. weekdays, 7 a.m. to 11 p.m. Saturdays, and 8 a.m. to 8 p.m. Sundays. Service frequencies are assumed to be 15 minutes during all periods.

10.2 Analysis of Operations and Maintenance Costs and Service Differences

This section reports service characteristics and their associated O&M costs for each alternative for the Martin Luther King, Jr. Boulevard Corridor. LTD's total O&M costs can be evaluated in terms of two service types: EmX service and conventional (fixed route) service, which are described in Tables 10.2-1 and 10.2-2 in terms of revenue hours, revenue miles and peak vehicles.

10.2.1 No-Build Alternative

With 93 peak vehicles, 278,600 revenue hours, and 4,520,200 revenue miles, system-wide O&M costs for the No-Build Alternative total $52.8M.

10.2.2 Enhanced Corridor Alternative

System-wide O&M costs for the Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative total $53.9M, up $1.1M from the No-Build Alternative. This represents a 2.08 increase. Table 10.2-2 describes service levels of the Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative, the associated costs, and how they compare with the No-Build Alternative. EmX service levels and peak vehicles are exactly the same for both alternatives because this alternative does not add EmX service to the LTD system, while conventional service hours increase by 3.45% and revenue miles increase by 2.94%. The Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative shows the highest percentage increase in O&M costs compared to other MovingAhead Enhanced Corridor Alternatives. This is because the service changes proposed for the Martin Luther King, Jr. Boulevard Corridor are the most significant by cutting headways in half from 30 minute service under the No-Build Alternative to 15 minute service under the Enhanced Corridor Alternative. This is the most significant increase in service across all five MovingAhead Enhanced Corridor Alternatives. The number of peak vehicles increases from 93 under the No-Build Alternative to 94 under this alternative. Generally, under the Enhanced Corridor Alternatives, capital improvements are operational in their focus and are intended to protect travel times while providing 15 minute service frequency. With higher service frequency, in some cases the Enhanced Corridor Alternatives are able to eliminate redundant service or align routes to better serve their markets. This could lead to passengers having to transfer more but these transfers would take place at stations with improved amenities between routes with increased frequencies leading to faster and more comfortable cross-town connections.

Table 10.1-1. No-Build Alternative (2035) Operation & Maintenance Annual Cost by Service Type

	EmX (BRT) Service	Change from FY2016 Base Year	Conventional (Fixed Route) Service	Change from FY2016 Base Year	Total	Change from FY2016 Base Year
Revenue VHT (hours)	69,900	37,500	208,700	70,500	278,600	37,500
Revenue VMT (miles)	1,076,900	640,800	3,443,300	542,100	4,520,200	1,182,900
Peak Vehicles (# of vehicles)	19	11	74	1	93	12
Total O&M Cost	**$14.6M**	$7.7M	**$46.9M**	**$4.2M**	**$52.8M**	**$12.0M**

Source: MovingAhead O&M Cost Estimates (LTD.: April, 2017)

Table 10.2-2. MLK Jr. Blvd. Enhanced Corridor Alternative (2035) Operation & Maintenance Cost by Service Type

	EmX (BRT) Service	Change from No-Build (2035)	Conventional (Fixed Route) Service	Change from No-Build (2035)	Total	Change from No-Build (2035)
Revenue VHT (hours)	69,900	-	215,900	7,200	285,800	7,200
Revenue VMT (miles)	1,076,900	-	3,576,100	132,800	4,653,000	132,800
Peak Vehicles (# of vehicles)	19	-	75	1	94	1
Total O&M Cost	**$13.7M**	**$ 0**	**$40.2M**	**+$1.1M**	**$53.9M**	**+ $1.1M**

Source: MovingAhead O&M Cost Estimates (LTD.: April, 2017)

11. Consequences of Implementing Multiple Corridors

11.1 Additional Financial Analysis

One of the primary goals of the MovingAhead project has been to facilitate a streamlined and cost-efficient process to select one or more corridors for near-term investment in improved transit service and other multimodal improvements. If more than one corridor is selected for investments, the system-level impacts of implementing two or more alternatives would need to be considered. As each MovingAhead corridor is unique and does not share alignments with any other corridor, O&M costs for multiple corridors may be calculated by adding O&M costs of two or more alternatives.

FTA requires a cost plan to be implemented for any project that increases annual O&M costs more than 5% over the base year. The only single corridor to reach that level is the Highway 99 Corridor EmX Alternative. Table 11.1-1 shows the percentage change to system-wide annual O&M costs associated with implementing any two corridor combinations of alternatives compared to the base year FY 2016 O&M costs. Two-corridor alternative combinations that would reach or surpass this 5% threshold are indicated in bold numbers. If this threshold is met, FTA requires an additional financial analysis to be conducted. As it would be impossible to build both an Enhanced Corridor Alternative and an EmX Alternative for the same corridor, the cells In Table 11.1-1 showing the intersection of such options are left blank. Negative percentages are two-corridor alternative combinations that lower O&M costs compared to the FY 2016 base year. Combinations of two Enhanced Corridor Alternatives (with the exception of the Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative) tend to be lower than base year O&M costs. Combinations of EmX Alternatives that include the 30th Avenue to LCC Corridor EmX Alternative tend to be the lowest cost.

Table 11.1-1. Multiple Corridor O&M Cost Matrix: Percent Change in O&M Costs vs. Base Year FY2016

	Hwy. 99 EmX	Hwy. 99 EC	River Rd. EmX	River Rd. EC	30th/LCC EmX	30th/LCC EC	Coburg Rd EmX	Coburg Rd EC	MLK Jr. Blvd. EC
Hwy. 99 EmX	-	-	**11.76%**	5.39%	**8.09%**	5.64%	**11.27%**	**6.86%**	**9.56%**
Hwy. 99 EC	-	-	3.76%	-1.72%	0.98%	-1.47%	4.17%	-0.25%	2.45%
River Rd. EmX	**11.76%**	4.66%	-	-	6.13%	3.67%	**9.31%**	4.90%	**7.60%**
River Rd. EC	5.39%	-1.72%	-	-	-0.25%	-2.70%	2.94%	-1.47%	1.23%
30th/LCC EmX	**8.09%**	0.98%	6.13%	-0.25%	-	-	5.64%	1.23%	3.92%
30th/LCC EC	5.64%	-1.47%	3.67%	-2.70%	-	-	3.19%	-1.23%	1.47%
Coburg Rd EmX	**11.27%**	4.17%	**9.31%**	2.94%	5.64%	3.19%	-	-	**7.11%**
Coburg Rd EC	**6.86%**	-0.25%	4.90%	-1.47%	1.23%	-1.23%	-	-	2.70%
MLK Jr. Blvd. EC	**9.56%**	2.45%	**7.60%**	1.23%	3.92%	1.47%	**7.11%**	2.70%	-

Source: MovingAhead O&M Cost Estimates (LTD.: April, 2017)

11.2 Maintenance Facility Expansion

Additionally, LTD has modeled the threshold at which service increases would require an expansion of LTD's maintenance facilities at its Glenwood location. It is assumed that the Enhanced Corridor

Alternatives would be serviced by 60-foot buses and the EmX Alternatives would be serviced by 60-foot BRT vehicles. As of base year FY 2016, LTD's maintenance facility has four (4) existing bays with hoists that can serve 60-foot buses and BRT vehicles and one (1) additional bay will have a hoist added (assumed in existing LTD plans) to make a total of five (5) bays with hoists that can serve 60-foot buses and BRT vehicles. Each bay can serve approximately twenty-one (21) 60-foot buses or seven (7) BRT vehicles. The maintenance facility footprint could be expanded to add at least two (2) and possibly three (3) additional bays with hoists that could serve 60-foot buses and BRT vehicles. There is no concern about capacity for maintenance of 40-foot buses because although LTD is currently close to capacity for these vehicles, LTD does not expect to add 40-foot vehicles under any MovingAhead alternatives. Additionally, 40-foot vehicles could be serviced in 60-foot bays, but the reverse is not possible.

As described above, all of the Enhanced Corridor Alternatives with the exception of the Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative, reduce the required number of peak vehicles and can therefore be accommodated with LTD's existing maintenance facility capacity.

As can be seen in Table 11.1-2, the available maintenance capacity with five (5) bays is sufficient for the No-Build Alternative and leaves additional capacity for some combination of EmX Alternatives. If all four EmX alternatives (Highway 99 Corridor EmX Alternative, River Road Corridor EmX Alternative, 30th Avenue to LCC Corridor EmX Alternative, and Coburg Road Corridor EmX Alternative) and the Martin Luther King, Jr. Enhanced Corridor Alternative were selected for a full system build out, the existing five bay maintenance capacity would not be sufficient. However, if two additional bays were added to the existing facility, LTD's Glenwood location could accommodate the full MovingAhead EmX system build-out.

Table 11.1-2. Maintenance Facility Needs and Capacity for MovingAhead Alternatives

Vehicles	FY 2016 Vehicle Count[1]	Five Bay Maintenance Capacity	Expected Maintenance Capacity with 2 Bay Expansion[3]	Vehicles Required under No-Build Alternative[4]	Vehicles Required for Full EmX Build-Out[5]
40-Foot Buses	69	70	70	69	61
60-Foot Vehicles[2]	33	49	63	44	56

Source: MovingAhead O&M Cost Estimates (LTD.: October 2016)

Notes:

[1]Vehicle counts includes spares. These figures include vehicles owned and operated by LTD during the base year of FY2016.Figures include the BRT vehicles required for WEE but not Main Street.

[2]60-Foot Vehicles includes both buses used for fixed route conventional service and BRT EmX-branded vehicles. The split between 40- foot buses, 60-foot buses, and BRT vehicles is a rough estimate and would likely be modified based on service needs.

[3]Converting existing 40-foot maintenance bays to 60-foot maintenance bays is not preferred because the existing 40-foot bays cannot be converted to drive-through bays. The maintenance facility footprint can be expended to add at least two additional bays with hoists that can serve 60-foot buses and/or BRT vehicles. This would not impact the number of 40-foot vehicles the maintenance facility could serve.

[4]The number of vehicles required under the No-Build Alternative is based on the service assumptions outlined in section 2.1.

[5]The numbers reported here include the required vehicles if all four EmX Alternatives (Highway 99 Corridor EmX Alternative, River Road Corridor EmX Alternative, 30th Avenue to LCC Corridor EmX Alternative and Coburg Road Corridor EmX Alternative) and the Martin Luther King, Jr. Boulevard Corridor Enhanced Corridor Alternative were built. This is the most conservative possible future scenario to determine the maximum maintenance facility needs.

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Appendix A: Glossary and Naming Conventions

This appendix includes a detailed list of acronyms, abbreviations and technical terms used throughout this report. It also includes naming conventions used in the MovingAhead project.

Acronyms and Abbreviations

Acronyms and Abbreviations	Definitions
AA	Alternatives Analysis
AAI	All Appropriate Inquiry
ADA	Americans with Disabilities Act
AEO	Annual Energy Outlook
APE	Area of Potential Effect
API	Area of Potential Impact
BAT	Business Access and Transit
BMP	Best Management Practices
BRT	Bus Rapid Transit
CIP	Capital Improvements Program
CO	Carbon Monoxide
COGP	County Government Grant Program
Corps	U.S. Army Corps of Engineers
dB	Decibel
dBA	A-weighted decibel
DBE	Disadvantaged Business Enterprise
DEQ	Oregon Department of Environmental Quality
DOT	Department of Transportation
Draft EIS	Draft Environmental Impact Statement. Also referred to as DEIS.
DSL	Oregon Department of State Lands
EA	Environmental Assessment
EE	Envision Eugene, City of Eugene's Comprehensive Plan; latest draft or as adopted
EIS	Environmental Impact Statement
EJ	Environmental Justice
EmX	Emerald Express, Lane Transit District's Bus Rapid Transit System
EPA	U. S. Environmental Protection Agency
ESA	Endangered Species Act or Environmental Site Assessment
Eugene TSP	Eugene Transportation System Plan
EWEB	Eugene Water & Electric Board
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
Final EIS	Final Environmental Impact Statement. Also referred to as FEIS.
FTA	Federal Transit Administration
FY	Fiscal Year

Acronyms and Abbreviations	Definitions
HGM	Hydro-geomorphic
ISTEA	Intermodal Surface Transportation Efficiency Act
LCOG	Lane Council of Governments
Ldn	Day-night Sound Level
L_{eq}	Equivalent Sound Level
LGGP	Local Government Grant Program
L_{max}	Maximum Sound Level
L_{min}	Minimum Sound Level
LOS	Level of Service
LPA	Locally Preferred Alternative
LRAPA	Lane Regional Air Protection Agency
LRFP	LTD's Long-Range Financial Plan
LRTP	LTD's Long-Range Transit Plan
LTD	Lane Transit District
LUST	Leaking Underground Storage Tank
LWCF	Land and Water Conservation Fund
MAP-21	Moving Ahead for Progress in the 21st Century
MetroPlan	Eugene-Springfield Metropolitan Area General Plan
MOE	Measures of Effectiveness
MPC	Metropolitan Policy Committee
MPH	Miles per hour
MPO	Metropolitan Planning Organization
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NHRP	National Register of Historic Places
NO_2	Nitrous Dioxide
NO_x	Nitrous Oxides
NPS	Department of Interior's National Park Service
NRHP	National Register of Historic Places
O_3	Ozone
O&M	Operations and maintenance
OAR	Oregon Administrative Rule
ODFW	Oregon Department of Fish and Wildlife
ODOE	Oregon Department of Energy
ODOT	Oregon Department of Transportation
OHP	Oregon Highway Plan
PEM	Palustrine Emergent Wetland
PM	Particulate matter
PM_{10}	Particulate matter – 10 microns in diameter

Acronyms and Abbreviations	Definitions
$PM_{2.5}$	Particulate matter – 2.5 microns in diameter
PPE	Personal Protective Equipment
Ppm	Parts Per Million
ROW	Right of way
RTP	Central Lane Metropolitan Planning Organization Regional Transportation Plan (adopted November 2007). (The RTP includes the Financially Constrained Roadway Projects List)
SCC	Standard Cost Categories
SHPO	Oregon State Historic Preservation Office
SO_2	Sulfur Dioxide
STA	Special Transportation Area
TDM	Transportation Demand Management
TESCP	Temporary Erosion and Sediment Control Plan
TMDL	Total Maximum Daily Load
TransPlan	Eugene-Springfield Transportation System Plan (adopted 2001)
TPAU	Department of Transportation – Transportation Planning Analysis Unit
TRP	Transportation Planning Rule
TSM	Transportation System Management
UGB	Urban Growth Boundary
USFWS	U.S. Fish and Wildlife Service
VMT	Vehicle Miles Traveled
VOCs	volatile organic compounds
WEEE	West Eugene EmX Extension
YOE	Year of Expenditure

Source: MovingAhead Project Team. March 2015.

Terms

Terms	Definitions
Accessibility	The extent to which facilities are barrier free and useable for all persons with or without disabilities.
Action	An “action,” a federal term, is the construction or reconstruction, including associated activities, of a transportation facility. For the purposes of this Handbook, the terms “project”, “proposal” and “action” are used interchangeably unless otherwise specified. An action may be categorized as a “categorical exclusion” or a “major federal action.”
Alignment	Alignment is the street or corridor that the transit project would be located within.
Alternative Fuels	Low-polluting fuels which are used to propel a vehicle instead of high-sulfur diesel or gasoline. Examples include methanol, ethanol, propane or compressed natural gas, liquid natural gas, low-sulfur or "clean" diesel and electricity.
Alternatives Analysis	The process of evaluating the costs, benefits and impacts of a range of transportation alternatives designed to address mobility problems and other locally-defined objectives in a defined transportation corridor, and for determining which particular investment strategy should be advanced for

Terms	Definitions
	more focused study and development. The Alternatives Analysis (AA) process provides a foundation for effective decision making.
Area of Potential Effect	A term used in Section 106 to describe the area in which historic resources may be affected by a federal undertaking.
Auxiliary Lanes	Lanes designed to improve safety and reduce congestion by accommodating cars and trucks entering or exiting the highway or roadway, and reducing conflicting weaving and merging movements.
Base Period	The period between the morning and evening peak periods when transit service is generally scheduled on a constant interval. Also known as "off-peak period."
Base Fare	The price charged to one adult for one transit ride; excludes transfer charges, and reduced fares.
Business Access and Transit Lane (BAT)	In general, a BAT lane is a concrete lane, separated from general-purpose lanes by a paint stripe and signage. A BAT lane provides BRT priority operations, but general-purpose traffic is allowed to travel within the lane to make a turn into or out of a driveway or at an intersecting street. However, only the BRT vehicle is allowed to use the lane to cross an intersecting street.
Boarding	Boarding is a term used in transit to account for passengers of public transit systems. One person getting on a transit vehicle equals one boarding. In many cases individuals will have to transfer to an additional transit vehicle to reach their destination and may well use transit for the return trip. Therefore a single rider may account for several transit boardings in one day.
Bus Rapid Transit (BRT)	A transit mode that combines the quality of rail transit and the flexibility of buses. It can operate on bus lanes, HOV lanes, expressways, or ordinary streets. The vehicles are designed to allow rapid passenger loading and unloading, with more doors than ordinary buses.
Busway	Exclusive freeway lane for buses and carpools.
Capital Improvements Program	A Capital Improvement Plan or Program (CIP) is a short-range plan, usually four to 10 years, which identifies capital projects and equipment purchases, provides a planning schedule and identifies options for funding projects in the program.
Categorical Exclusion	A Categorical Exclusion (CE) means a category of actions which do not individually or cumulatively have a significant effect on the human environment and for which, therefore, neither an environmental assessment nor an environmental impact statement is required.
Clean Air Act Amendments of 1990 (CAAA)	The comprehensive federal legislation which establishes criteria for attaining and maintaining the federal standards for allowable concentrations and exposure limits for various air pollutants; the act also provides emission standards for specific vehicles and fuels.
Collector Streets	Collector streets provide a balance of both access and circulation within and between residential and commercial/industrial areas. Collectors differ from arterials in that they provide more of a citywide circulation function, do not require as extensive control of access and are located in residential neighborhoods, distributing trips from the neighborhood and local street system.
Commuter Rail	Commuter rail is a transit mode that is a multiple car electric or diesel propelled train. It is typically used for local, longer-distance travel between a central city and adjacent suburbs, and can operate alongside existing freight or passenger rail lines or in exclusive rights of way.
Compressed Natural Gas (CNG)	An alternative fuel; compressed natural gas stored under high pressure. CNG vapor is lighter than air.
Conformity	The ongoing process that ensures the planning for highway and transit systems, as a whole and over the long term, is consistent with the state air quality plans for attaining and maintaining health-based air quality standards; conformity is determined by metropolitan planning organizations (MPOs) and

Terms	Definitions
	the U.S. Department of Transportation (U.S. DOT), and is based on whether transportation plans and programs meet the provisions of a State Implementation Plan.
Cooperating Agency	Regulations that implement NEPA define a cooperating agency as any Federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment.
Coordination Plan	Required under MAP-21, the coordination plan contains procedures aimed at achieving consensus among all parties in the initial phase of environmental review and to pre-empt disagreements that can create delays later on in a project.
Congestion Mitigation and Air Quality (CMAQ)	Federal funds available for either transit or highway projects which contribute significantly to reducing automobile emissions which cause air pollution.
Corridor	A broad geographical band that follows a general directional flow connecting major sources of trips that may contain a number of streets, highways and transit route alignments.
Demand Responsive	Non-fixed-route service utilizing vans or buses with passengers boarding and alighting at pre-arranged times at any location within the system's service area. Also called "Dial-a-Ride."
Diesel Multiple Unit (DMU)	Each unit carries passengers and can be self-powered by a diesel motor; no engine unit is required.
Documented Categorical Exclusion (DCE)	A Documented Categorical Exclusion (DCE) means a group of actions that may also qualify as CEs if it can be demonstrated that the context in which the action is taken warrants a CE exclusion; i.e., that no significant environmental impact will occur. Thus, these actions are referred to as Documented Categorical Exclusions. Such actions require some NEPA documentation, but not an Environmental Assessment or a full-scale Environmental Impact Statement. DCEs documentation must demonstrate that in the context(s) in which these actions are to be performed, they will have no significant environmental impact or that such impacts will be mitigated.
Draft Environmental Impact Statement (DEIS)	The DEIS is the document that details the results of the detailed analysis of all of the projects alternatives. The DEIS contains all information learned about the impacts of a project and alternatives.
Electrical Multiple Unit (EMU)	The EMU is heavier than a light rail vehicle, but it is powered in the same way by an overhead electrical system.
Earmark	A federal budgetary term that refers to the specific designation by Congress that part of a more general lump-sum appropriation be used for a particular project; the earmark can be designated as a minimum and/or maximum dollar amount.
Effects	Effects include ecological, aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial. Effects include: (1) direct effects that are caused by the action and occur at the same time and place, and (2) indirect effects that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use; population density or growth rate; and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8).
EmX	Lane Transit District's Bus Rapid Transit System, pronounced "MX", short for Emerald Express.

Terms	Definitions
Envision Eugene	The City of Eugene's Comprehensive Plan (latest draft or as adopted). Envision Eugene includes a determination of the best way to accommodate the community's projected needs over the next 20 years.
Environmental Assessment (EA)	A report subject to the requirements of the National Environmental Policy Act (NEPA) demonstrating that an Environmental Impact Statement (EIS) is not needed for a specific set of actions. The EA can lead to a Finding of No Significant Impact (FONSI).
Environmental Impact Statement (EIS)	A comprehensive study of likely environmental impacts resulting from major federally-assisted projects; statements are required by the National Environmental Policy Act (NEPA).
Environmental Justice	A formal federal policy on environmental justice was established in February 1994, with Executive Order 12898 (EO 12898), "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations." There are three fundamental environmental justice principles: To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations. To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process. To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.
Evaluation Criteria	Evaluation criteria are the factors used to determine how well each of the proposed multimodal alternatives would meet the project's Goals and Objectives. The Evaluation Criteria require a mix of quantitative data and qualitative assessment. The resulting data are used to measure the effectiveness of proposed multimodal alternatives and to assist in comparing and contrasting each of the alternatives to select a preferred alternative.
Exclusive Right of Way	A roadway or other facility that can only be used by buses or other transit vehicles.
Fatal Flaw Screening	The purpose of a Fatal Flaw Screening is to identify alternatives that will not work for one reason or another (e.g., environmental, economic, community) By using a Fatal Flaw Screening process to eliminate alternatives that are not likely to be viable, a project can avoid wasting time or money studying options that are not viable and focus on alternatives and solutions that have the greatest probably of meeting the community's needs (e.g., environmentally acceptable, economically efficient, implementable).
Finding of No Significant Impact (FONSI)	A document prepared by a federal agency showing why a proposed action would not have a significant impact on the environment and thus would not require preparation of an Environmental Impact Statement (EIS). A FONSI is based on the results of an Environmental Assessment (EA).
Fixed Guideway System	A system of vehicles that can operate only on its own guideway constructed for that purpose (e.g., rapid rail, light rail). Federal usage in funding legislation also includes exclusive right of way bus operations, trolley coaches and ferryboats as "fixed guideway" transit.
Fixed Route	Service provided on a repetitive, fixed-schedule basis along a specific route with vehicles stopping to pick up and deliver passengers at set stops and stations; each fixed-route trip serves the same origins and destinations, unlike demand responsive and taxicabs.
Geographic Information System (GIS)	Data management software tool that enables data to be displayed geographically (i.e., as maps).
Goals and Objectives	Goals and objectives define the project's desired outcome and reflect community values. Goals and objectives build from the project's Purpose and Need Statement. Goals are overarching principles that guide decision making. Goals are broad statements.

Terms	Definitions
	Objectives define strategies or implementation steps to attain the goals. Unlike goals, objectives are specific and measurable.
Guideway	A transit right of way separated from general purpose vehicles.
Headway	Time interval between vehicles passing the same point while moving in the same direction on a particular route.
Hydrology	Refers to the flow of water including its volume, where it drains and how quickly it flows.
Impacts	A term to describe the positive or negative effects upon the natural or built environments as a result of an action (i.e., project).
Independent Utility	A project or section of a larger project that would be a usable and reasonable expenditure even if no other projects or sections of a larger project were built and/or improved.
Intergovernmental Agreement	A legal pact authorized by state law between two or more units of government, in which the parties contract for, or agree on, the performance of a specific activity through either mutual or delegated provision.
Intermodal	Those issues or activities which involve or affect more than one mode of transportation, including transportation connections, choices, cooperation and coordination of various modes. Also known as "multimodal."
Joint Development	Ventures undertaken by the public and private sectors for development of land around transit stations or stops.
Key Transit Corridors	Key Transit Corridors are mapped in Envision Eugene and are anticipated to be significant transit corridors for the City and the region
Kiss & Ride	A place where commuters are driven and dropped off at a station to board a public transportation vehicle.
Layover Time	Time built into a schedule between arrival at the end of a route and the departure for the return trip, used for the recovery of delays and preparation for the return trip.
Lead Agency	The organization that contracts and administers a study. For transit projects, FTA would typically fill this role. The lead agency has the final say about the project's purpose and need, range of alternatives to be considered, and other procedural matters.
Level of Detail	The amount of data collected, and the scale, scope, extent, and degree to which item-by-item particulars and refinements of specific points are necessary or desirable in carrying out a study.
Level of Service (LOS)	Level of service (LOS) is a measure used by traffic engineers to determine the effectiveness of elements of transportation infrastructure. LOS is most commonly used to analyze highways, but the concept has also been applied to intersections, transit, and water supply.
Limited (or Controlled) Access	Restricted entry to a transportation facility based upon facility congestion levels or operational condition. For example, a limited access roadway normally would not allow direct entry or exit to private driveways or fields from said roadway.
Light Rail Transit (LRT)	Steel wheel/steel rail transit constructed on city streets, semi-private right of way, or exclusive private right of way. Formerly known as "streetcar" or "trolley car" service, LRT's major advantage is operation in mixed street traffic at grade. LRT vehicles can be coupled into trains, which require only one operator and often are used to provide express service.
Liquefaction	A phenomenon associated with earthquakes in which sandy to silty, water saturated soils behave like fluids. As seismic waves pass through saturated soil, the structure of the soil distorts, and spaces between soil particles collapse, causing ground failure.
Liquefied Natural Gas (LNG)	An alternative fuel; a natural gas cooled to below its boiling point of 260 degrees Fahrenheit so that it becomes a liquid; stored in a vacuum bottle-

Terms	Definitions
	type container at very low temperatures and under moderate pressure. LNG vapor is lighter than air.
Local Streets	Local streets have the sole function of providing direct access to adjacent land. Local streets are deliberately designed to discourage through traffic movements.
Locally Preferred Alternative (LPA)	The Locally Preferred Alternative is the alternative selected through the Alternatives Analysis process completed prior to or concurrent with NEPA analysis. This term is also used to describe the proposed action that is being considered for New Starts or Small Starts funds.
Maintenance area	An air quality designation for a geographic area in which levels of a criteria air pollutant meet the health-based primary standard (national ambient air quality standard, or NAAQS) for the pollutant. An area may have on acceptable level for one criteria air pollutant, but may have unacceptable levels for others. Maintenance/attainment areas are defined using federal pollutant limits set by EPA.
Maintenance facility	A facility along a corridor used to clean, inspect, repair and maintain rail vehicles, as well as to store them when they are not in use.
Major Arterial	Major arterial streets should serve to interconnect the roadway system of a city. These streets link major commercial, residential, industrial and institutional areas. Major arterial streets are typically spaced about one mile apart to assure accessibility and reduce the incidence of traffic using collectors or local streets for through traffic in lieu of a well-placed arterial street. Access control, such as raised center medians, is a key feature of an arterial route. Arterials are typically multiple miles in length.
Major Investment Study (MIS)	An alternatives analysis study process for proposed transportation investments which a wide range of alternatives is examined to produce a smaller set of alternatives that best meet project transportation needs. The purpose of the study is to provide a framework for developing a package of potential solutions that can then be further analyzed during an Environmental Impact Statement (EIS) process.
Metropolitan Planning Organization (MPO)	The organization designated by local elected officials as being responsible for carrying out the urban transportation and other planning processes for an area.
Minimum Operable Segment	A stand-alone portion of the alternative alignment that has independent utility, allowed by FTA to be considered as interim termini for a project. A minimum operable segment (MOS) provides flexibility to initiate a project with available funding while pursuing additional funding to complete the remainder of the project.
Minor Arterial	Minor arterial street system should interconnect with and augment the urban major arterial system and provide service to trips of moderate length at a somewhat lower level of travel mobility than major arterials. This system also distributes travel to geographic areas smaller than those identified with the higher system. The minor arterial street system includes facilities that allow more access and offer a lower traffic mobility. Such facilities may carry local bus routes and provide for community trips, but ideally should not be located through residential neighborhoods.
Mitigation	A means to avoid, minimize, rectify, or reduce an impact, and in some cases, to compensate for an impact.
Mode	A particular form or method of travel distinguished by vehicle type, operation technology and right of way separation from other traffic.
Modal Split	A term which describes how many people use alternative forms of transportation. Frequently used to describe the percentage of people using private automobiles as opposed to the percentage using public transportation. Modal split can also be used to describe travelers using other modes of transportation. In freight transportation, modal split may be measured in mass.

Terms	Definitions
Moving Ahead for Progress in the 21st Century (MAP-21)	Moving Ahead for Progress in the 21st Century (MAP-21) was signed by President Obama on July 6, 2012, reauthorizing surface transportation programs through FY 2014. Includes new and revised program guidance and regulations with planning requirements related to public participation, publication, and environmental considerations.
MovingAhead Project	The City of Eugene and LTD are working with regional partners and the community to determine which improvements are needed on some of our most important transportation corridors for people using transit, and facilities for people walking and biking. MovingAhead will prioritize transit, walking and biking projects along these corridors so that they can be funded and built in the near-term. The project will focus on creating active, vibrant places that serve the community and accommodate future growth. During Phase 1, currently underway, the community will weigh in on preferred transportation solutions for each corridor and help prioritize corridors for implementation. When thinking about these important streets, LTD and the City of Eugene refer to them as corridors because several streets may work as a system to serve transportation needs.
Multimodal	Multimodal refers to various modes. For the MovingAhead project, multimodal refers to Corridors that support various transportation modes including vehicles, buses, walking and cycling.
National Environmental Policy Act of 1969 (NEPA)	A comprehensive federal law requiring analysis of the environmental impacts of federal actions such as the approval of grants; also requiring preparation of an Environmental Impact Statement (EIS) for every major federal action significantly affecting the quality of the human environment.
New Starts	Federal funding granted under Section 3(i) of the Federal Transit Act. These discretionary funds are made available for construction of a new fixed guideway system or extension of any existing fixed guideway system, based on cost-effectiveness, alternatives analysis results and the degree of local financial commitment.
No Action or No-Build Alternative	An alternative that is used as the basis to measure the impacts and benefits of the other alternative(s) in an environmental assessment or other National Environmental Policy Act (NEPA) action. The No-Build alternative consists of the existing conditions, plus any improvements which have been identified in the Statewide Transportation Improvement Program (STIP).
Nonattainment Area	Any geographic region of the United States that the U.S. Environmental Protection Agency (EPA) has designated as not attaining the federal air quality standards for one or more air pollutants, such as ozone and carbon monoxide.
Notice of Intent	A Federal announcement, printed in the Federal Register, advising interested parties that an environmental impact statement will be prepared and circulated for a given project
Off-Peak Period	Non-rush periods of the day when travel activity is generally lower and less transit service is scheduled. Also called "base period."
Park and Ride	Designated parking areas for automobile drivers who then board transit vehicles from these locations.
Participating Agency	A federal or non-federal agency that may have an interest in the project. These agencies are identified and contacted early-on in the project with an invitation to participate in the process. This is a broader category than "cooperating agency" (see cooperating agency).
Passenger Miles	The total number of miles traveled by passengers on transit vehicles; determined by multiplying the number of unlinked passenger trips times the average length of their trips.
Peak Hour	The hour of the day in which the maximum demand for transportation service is experienced (refers to private automobiles and transit vehicles).

Terms	Definitions
Peak Period	Morning and afternoon time periods when transit riding is heaviest.
Peak/Base Ratio	The number of vehicles operated in passenger service during the peak period divided by the number operated during the base period.
Preferred Alternative	An alternative that includes a major capital improvement project to address the problem under investigation. As part of the decision making process, the Preferred Alternative is compared against the No Action or No-Build Alternative from the standpoints of transportation performance, environmental consequences, cost-effectiveness, and funding considerations.
Purpose and Need	The project Purpose and Need provides a framework for developing and screening alternatives. The purpose is a broad statement of the project's transportation objectives. The need is a detailed explanation of existing conditions that need to be changed or problems that need to be fixed.
Queuing	Occurs when traffic lanes cannot fit all the vehicles trying to use them, or if the line at an intersection extends into an upstream intersection.
Record of Decision (ROD)	A decision made by FTA as to whether the project sponsor receives federal funding for a project. The Record of Decision follows the Draft EIS and Final EIS.
Regulatory Agency	An agency empowered to issue or deny permits.
Resource Agency	A Federal or State agency or commission that has jurisdictional responsibilities for the management of a resource such as plants, animals, water or historic sites.
Revenue Hours	Hours of transit service available for carrying paying riders.
Ridesharing	A form of transportation, other than public transit, in which more than one person shares the use of the vehicle, such as a van or car, to make a trip. Also known as "carpooling" or "vanpooling."
Ridership	The number of rides taken by people using a public transportation system in a given time period.
Right of Way	Publicly owned land that can be acquired and used for transportation purposes.
Safe, Accountable, Flexible, Efficient Transportation Equity Act	Safe, Accountable, Flexible, Efficient Transportation Equity Act - A Legacy for Users (SAFETEA-LU) Passed by Congress July 29, 2005, signed by the President August 10, 2005. Includes new and revised program guidance and regulations (approximately 15 rulemakings) with planning requirements related to public participation, publication, and environmental considerations. SAFETEA-LU covers FY 2005 through FY 2009 with a total authorization of $45.3 billion.
Scoping	A formal coordination process used to determine the scope of the project and the major issues likely to be related to the proposed action (i.e., project).
Screening Criteria	Criteria used to compare alternatives.
Shuttle	A public or private vehicle that travels back and forth over a particular route, especially a short route or one that provides connections between transportation systems, employment centers, etc.
Springfield 2030	Currently underway, this update to the City of Springfield's Comprehensive Plan will guide and support attainment of the community's livability and economic prosperity goals and redevelopment priorities.
Springfield Transportation System Plan (TSP)	The City of Springfield's Transportation System Plan looks at how the transportation system is currently used and how it should change to meet the long-term (20-year) needs of the City of Springfield's residents, businesses, and visitors. The Plan identified improvements for all modes of transportation, will serve as the City of Springfield's portion of the Regional Transportation System Plan prepared by LCOG and was prepared in coordination with ODOT, LCOG and the Oregon Department of Land Conservation and Development. The TSP was adopted March 11, 2014.

Terms	Definitions
State Implementation Plan (SIP)	A state plan mandated by the Clean Air Act Amendments of 1990 (CAAA) that contains procedures to monitor, control, maintain and enforce compliance with national standards for air quality.
Strategy	An intended action or series of actions which when implemented achieves the stated goal.
Study Area	The area within which evaluation of impacts is conducted. The study area for particular resources will vary based on the decisions being made and the type of resource(s) being evaluated.
Title VI	This title declares it to be the policy of the United States that discrimination on the ground of race, color, or national origin shall not occur in connection with programs and activities receiving Federal financial assistance and authorizes and directs the appropriate Federal departments and agencies to take action to carry out this policy.
Throughput	The number of users being served at any time by the transportation system.
Transit Oriented Development (TOD) or Nodal Development	A strategy to build transit ridership, while discouraging sprawl, improving air quality and helping to coordinate a new type of community for residents. TODs are compact, mixed-use developments situated at or around transit stops. Sometimes referred to as Transit Oriented Communities, or Transit Villages.
Transit System	An organization (public or private) providing local or regional multi-occupancy-vehicle passenger service. Organizations that provide service under contract to another agency are generally not counted as separate systems.
Transitway	A BRT priority lane generally with a concrete lane, with or without concrete tracks with grass-strip divider, and a curb separation, traversable by general-purpose vehicles at signalized intersections.
Transportation Demand Management (TDM)	Strategies to attempt to reduce peak period automobile trips by encouraging the use of high occupancy modes through commuter assistance, parking incentives and work policies which alter the demand for travel in a defined area in terms of the total volume of traffic, the use of alternative modes of travel and the distribution of travel over different times of the day.
Transportation Improvement Program (TIP)	A program of intermodal transportation projects, to be implemented over several years, growing out of the planning process and designed to improve transportation in a community. This program is required as a condition of a locality receiving federal transit and highway grants.
Travel Shed	Synonymous with “corridor” (see corridor). Sub area in which multiple transportation facilities are experiencing congestion, safety or other problems.
Vehicle Hours of Delay	Cumulative delay experience by transit vehicles during high traffic periods.
v/c ratio	Used as a principal measure of congestion. The “V” represents the volume or the number of vehicles that are using the roadway at any particular period. The “C” represents the capacity of a roadway at its adopted LOS. If the volume exceeds the capacity of the roadway (volume divided by capacity exceeds 1.00), congestion exists.
Water Quality	Refers to the characteristics of the water, such as its temperature and oxygen levels, how clear it is, and whether it contains pollutants.
WEEE	West Eugene EmX Extension

Source: MovingAhead Project Team. March 2015.

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Appendix B: Construction Activities

This section of the Environmental Disciplines MDR addresses the methods and data that will be used to assess potential direct and indirect short-term construction-related impacts of the alternatives for the MovingAhead project's AA. This section first outlines how construction-related activities for the alternatives will be determined and documented and second which disciplines will address potential construction-related impacts and any specific methodologies and/or data that will be used.

Description of Construction-Related Activities

The MovingAhead project engineer will use the project's *Conceptual Engineering Plan Set* and capital cost estimating documents to develop a general description of construction activities that would occur under each alternative or under groups of alternatives. The description will address the following: general types and locations of construction activities; duration of types of construction activities (i.e., days of week, time of day, weeks/months/years); general geographic scope of construction activities; known staging area requirements; significant fill/excavation requirements.

Specific construction-related issues that will be addressed include:

- In-water construction
- Activities under, across or over freight rail lines
- Street, highway, bicycle facility and/or pedestrian facility detours/closures
- Transit line and facility detours
- Property access closures
- Noise-generating activities
- Runoff-generating activities
- Dust-generating
- Known best management practices that will or may be implemented during construction

The draft description of construction-related activities for the MovingAhead project will be reviewed and commented on by construction project management staff for the MovingAhead project. Specific areas of concern (e.g., the potential for a significant short-term construction related impact) may require additional detail to be included within the description of construction-related activities for one or more of the discipline areas.

Specific Methodologies

Specific methodologies used to address potential impacts due to project construction activities are addressed under the discipline sections of the Environmental Disciplines MDR (LTD, October2015).

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