

**Boise Treasure Valley Phase 1 Alternatives Analysis
Order of Magnitude Capital Cost Methodology
August 14, 2009**

Introduction

The Treasure Valley High Capacity Transit Priority Corridor Phase 1 Alternatives Analysis is being prepared in order to identify a set of promising high capacity transit (HCT) alternatives to be studied in more detail in the Phase 2 Alternatives Analysis (AA). During the Phase 1 AA, a wide range of HCT alternatives has been identified and are being evaluated at a general planning level of analysis. This planning level analysis will be used to narrow the wide range of alternatives down to the set of most promising HCT alternatives for further study.

This paper describes the planning level methodology being used to develop order of magnitude capital cost estimates that can be used to compare among the range of HCT alternatives being considered during Phase 1. At this early planning stage, the HCT concepts are not being developed in any significant detail and as such *the order of magnitude costs should be used only for comparison among the alternatives and to provide a very general sense of the magnitude of the potential costs associated with each alignment and mode alternative being considered.*

Methodology Overview

The order of magnitude capital cost methodology uses a general project description and data on average cost per mile from a range of comparable HCT systems to estimate a range of capital cost that would be representative of the various HCT modes.

Description of the Alternatives

The range of alternatives has been reviewed with the RTAC Subgroup and the preliminary analysis is proceeding on the following HCT alternatives:

Fairview/Cherry

- Bus Rapid Transit – Exclusive
- Bus Rapid Transit – Mixed Traffic
- Light Rail

Boise Cutoff Railroad

- Commuter Rail
- Bus Rapid Transit – Exclusive
- Light Rail

Franklin

- Bus Rapid Transit – Exclusive

- Bus Rapid Transit – Mixed Traffic
- Light Rail

I-84

- Bus Rapid Transit – Express Bus in Mixed Traffic

Overland

- Bus Rapid Transit – Exclusive
- Bus Rapid Transit – Mixed Traffic
- Light Rail

The Phase 1 study of these options includes aerial maps of the alignments, right-of-way delineation, representative cross-sections, representative crossing treatments, major traffic signal modifications and identification of the need for structures, tunnels, etc. The description of the alternatives does not include any conceptual engineering beyond a generic description of a few key capital elements.

HCT Cross-Sections

The roadway cross-sections included on the aerial maps help to define the potential cost and the range of potential impacts with adding HCT on the arterial roadways and along the Boise Cutoff rail alignment. The I-84 transit treatments are location-specific and will be presented as sketch designs rather than as alignment maps.

The arterial roadways will include all widening projects included in the COMPASS 2035 financially constrained model. For the three major east/west arterials this means the following:

- Fairview/Cherry – 7-lanes Cole to Locust Grove, 5-lanes all other sections.
- Franklin – 5-lanes all sections
- Overland/Airport – 5-lanes east of Black Cat, 3-lanes Black Cat to Southside

All of the other arterial routes maintain the existing number of lanes.

The following assumptions will be used to identify the cross-sections associated with each arterial. These assumptions are key to estimating whether and how much additional right of way would be required in order to accommodate exclusive HCT.

- Ada County roads - we assume that we will be adding HCT elements into the cross-sections that are defined in the Draft Livable Street Design Guide.
- Canyon County roads - we will assume that the 2035 cross-sections on Franklin, Overland/Airport and Fairview/Cherry between the county line and Idaho Center Blvd./Southside will include the same elements as shown in the ACHD Design Guide.

From Idaho Center/Southside through Nampa and Caldwell there are no major widening projects identified and as such all roads will assume the existing cross-sections - meaning that they will include sidewalks, bike lanes, etc. only where they exist today.

As we look at adding HCT to the cross-sections (existing or planned) we will maintain flexibility with cross-section elements in order to avoid unnecessary property impacts. We will assume that if a cross-section with HCT is less than 5 feet wider than the base (non-HCT) cross-section, we assume the ability to squeeze those 5 feet out of the elements of the base cross-section (sidewalk reductions, lane widths, etc.). If the HCT cross-section is more than 5 feet wider than the available ROW, we assume the need to acquire additional ROW. The only exception to this would be in locations that include on-street parking - listed at 7.5' on each side of the street. In these areas we will assume the ability to eliminate on-street parking on both sides which would provide 15 foot of additional available right of way.

Average Cost per Mile

URS has completed research into the average cost per mile for various commuter rail, light rail, BRT-exclusive and BRT-mixed traffic projects completed in the United States in the past 10 to 15 years. Our research focused on the western part of the country, paying particular attention to metropolitan regions located in Rocky Mountain states such as Denver, Salt Lake City and Albuquerque.

URS determined the cost per mile for various completed projects using each mode and escalated that value to 2009 dollars using the average annual CPI. In addition to the cost per mile, the context for the project was noted (i.e. urban versus suburban, arterial median versus railroad right-of-way, etc.). The findings from this research are summarized in the attached Table 1.

Applying the Average Cost per Mile

Each HCT mode (light rail, BRT, Commuter Rail) was broken out by the alignment characteristics/environment in order to reflect the unique costs associated with each style. The grouping by modal type is summarized in Table 2 which includes two styles of light rail (arterial median, separate ROW), three styles of BRT (arterial median, separate ROW and mixed traffic)

Table 2 includes projects that were selected in order to provide the most appropriate general cost per mile for each type of HCT mode. The average cost per mile is provided for each type of mode grouping (e.g. light rail in arterial median, BRT-Mixed Traffic, etc.). The most appropriate average cost per mile was identified and applied to each aerial map sheet.

Cost per Mile Adjustments

Adjustments will be made to the standard cost per mile based on any unique features identified on the aerial map sheets. These adjustments will reflect significant design elements that would be expected to significantly increase or decrease the cost for each mode concept. It is important to note that the average cost per mile from recent projects is an average for the full alignment which already accounts for the full range of cost elements.

Table 1
Treasure Valley Phase 1 AA
Example Capital Cost Per Mile by Mode

Light Rail Transit (LRT)

Name	Location	Description	Total Cost (Actual)	Cost per mile (actual)	Cost per mile (2009 \$)
TRAX Sandy Line	Salt Lake City	<ul style="list-style-type: none"> • 15 miles • 16 stations • Suburban to urban • Arterial running downtown, then follows existing UP corridor 	\$312 million (1999)	\$20.8 million	\$26.6 million
TRAX University Line	Salt Lake City	<ul style="list-style-type: none"> • 2.5 miles • 7 stations • Urban to university • Median arterial – 3 lane street in each direction 	\$118.5 million (2001)	\$47.4 million	\$58 million
Central Corridor LRT	Denver	<ul style="list-style-type: none"> • 5.3 miles • 14 stations • Urban • Partially arterial-running, partially in railroad ROW 	\$116.5 million (1994)	\$22 million	\$31.8 million
Central Platte Valley LRT	Denver	<ul style="list-style-type: none"> • 1.8 miles • 4 stations • urban 	\$47.8 million (2002)	\$26.2 million	\$31.3 million
Southwest Corridor LRT	Denver	<ul style="list-style-type: none"> • 8.7 miles • 5 stations • Suburban to urban 	\$177.7 million (2002)	\$46.3 million	\$55.4 million
Southeast Corridor LRT	Denver	<ul style="list-style-type: none"> • 19 miles • 5 stations • Suburban to urban 	\$879 million (2006)	\$46.3 million	\$50 million
Link Light Rail	Seattle	<ul style="list-style-type: none"> • 15.6 miles • 13 stations • Outer urban, city center, airport 	\$2.339 billion (2009)	\$150 million	\$150 million
Tacoma Link	Tacoma	<ul style="list-style-type: none"> • 1.6 miles • 5 stations • Downtown distributor 	\$78.2 million (2003)	\$48.9 million	\$57 million
Phoenix Light Rail	Phoenix	<ul style="list-style-type: none"> • 20 miles • 28 stations • urban/suburban • Median arterial 	\$1.4 billion (2008)	\$70 million	\$72 million
MAX Green Line	Portland	<ul style="list-style-type: none"> • 8.3 miles • 24 stations • Suburban to urban • Freeway 	\$575.7 million (2009)	\$69.4 million	\$69.4 million

Name	Location	Description	Total Cost (Actual)	Cost per mile (actual)	Cost per mile (2009 \$)
MAX Yellow Line	Portland	<ul style="list-style-type: none"> • 5.8 miles • 10 stations • Urban • Median arterial 	\$350 million (2004)	\$60.3 million	\$68.6 million
MAX Red Line	Portland	<ul style="list-style-type: none"> • 5.5 miles • 4 stations • Urban to airport • Freeway & exclusive ROW 	\$125 million (2001)	\$22.7 million	\$27.8 million
MAX Blue Line - Eastside	Portland	<ul style="list-style-type: none"> • 15 miles • 30 stations • Suburban to urban • Mix - freeway and median arterial 	\$214 million (1986)	\$14.3 million	\$26.8 million
MAX Blue Line – Westside	Portland	<ul style="list-style-type: none"> • 18 miles • 32 stations • Suburban to urban • Mix freeway and railroad ROW 	\$963 million (1998)	\$53.5 million	\$69.6 million

Bus Rapid Transit (BRT) in Mixed Traffic

Name	Location	Description	Total Cost (Actual)	Cost per mile (actual)	Cost per mile (2009 \$)
3500 South Bus Rapid Transit	Salt Lake City	<ul style="list-style-type: none"> • 10 miles • 23 bus stops 	\$7 million (2008)	\$700,000	\$718,200
Rapid Ride Blue Line	Albuquerque	<ul style="list-style-type: none"> • 15 miles • 12 stations • Suburban, urban, university 	\$6 million (2007)	\$400,000	\$421,000
Metro Rapid; Wilshire-Whittier and Ventura Corridor	Los Angeles	<ul style="list-style-type: none"> • 42.4 miles 	\$8.3 million (2000)	\$195,000	\$244,000

Bus Rapid Transit (BRT) in Exclusive Lanes

Name	Location	Description	Total Cost (Actual)	Cost per mile (actual)	Cost per mile (2009 \$)
EmX Franklin Corridor/Green Line	Eugene	<ul style="list-style-type: none"> • 4 miles • 10 stations • Urban and suburban • 60% exclusive ROW 	\$24 million (2007)	\$6 million	\$6.3 million
Euclid Corridor	Cleveland	<ul style="list-style-type: none"> • 9 miles • 34 stations • Urban • Arterial median – total reconstruction 	\$240 million (2008)	\$25.5 million	\$26.2 million
Metro Orange Line	Los Angeles	<ul style="list-style-type: none"> • 14 miles • Connects North Hollywood to Warner Center 	\$350 million (2005)	\$25 million	\$27.7 million

Commuter Rail

Name	Location	Description	Total Cost (Actual)	Cost per mile (actual)	Cost per mile (2009 \$)
FrontRunner North	Salt Lake City	<ul style="list-style-type: none"> • 44 miles • 16 stations • Exurban/suburban to downtown 	\$630 million (2008)	\$14.3 million	\$14.7 million
Sounder	Seattle	<ul style="list-style-type: none"> • 83 miles • 13 stations • Suburban/Urban to downtown 	\$1,429 million (2009)	\$17.2	\$17.2 million
WES Commuter Rail	Portland	<ul style="list-style-type: none"> • 14.7 miles • 5 stations • Suburban to suburban 	\$166 million (2009)	\$11.3 million	\$11.3 million
Rail Runner Express Phase 1 (Belen to Bernalillo)	Albuquerque	<ul style="list-style-type: none"> • 46 miles • Run on BNSF tracks • Exurban to downtown 	\$135 million (2006)	\$3 million	\$3.2 million
Rail Runner Express Phase 2 (Santa Fe to Albuquerque)	Albuquerque	<ul style="list-style-type: none"> • 50 miles • Run on mix of new tracks and existing BNSF tracks • City to city 	\$255 million (2009)	\$5.1 million	\$5.1 million

Table 2
Treasure Valley Phase 1 AA
Representative Capital Costs per Mile by Type of HCT Mode Application

	Representative Projects	Cost Per Mile (2009\$)	Average Cost Per Mile (2009\$)	Notes
Light Rail				
Arterial Median	<ul style="list-style-type: none"> • Salt Lake City – University Line • Portland Interstate MAX • Phoenix Light Rail 	\$58.0M \$68.6M \$72.0M	\$66.2M	These projects may be more urban than Treasure Valley. Phoenix may be most comparable with sections through Tempe and Mesa.
Separate ROW	<ul style="list-style-type: none"> • Denver Central Corridor • Denver Southwest Corridor • Salt Lake Sandy Line 	\$31.8M \$55.4M \$26.6M	\$37.9M	These projects all have significant portions in railroad ROW.
BRT				
Arterial Median	<ul style="list-style-type: none"> • Eugene EMX • Cleveland Euclid Corridor 	\$6.3M \$26.2M	\$16.3M	Eugene is a mix of single-lane exclusive median and in-street operation. Cleveland is exclusive 2-lane median in an urban arterial.
Separate ROW	<ul style="list-style-type: none"> • LA Metro Orange Line 	\$27.7M	\$27.7M	Exclusive busway alignment built on old rail bed – project required preparing and paving roadbed and unique signals at street crossings.
Mixed Traffic	<ul style="list-style-type: none"> • Salt Lake South BRT • Albuquerque Blue Line • Los Angeles Metro Rapid 	\$0.7M \$0.4M \$0.2M	\$0.4M	SLC – mix of signal priority, bypass lanes. Albuquerque has wider station spacing and signal priority. LA has wider station spacing and signal priority.
Commuter Rail				
	<ul style="list-style-type: none"> • Salt Lake FrontRunner • Portland WES • Seattle Sounder • Albuquerque RailRunner (Ph 1) • Albuquerque RailRunner (Ph 2) 	\$14.7M \$11.3M \$17.2M \$3.2M \$5.5M	\$10.4M	SLC – New rail in existing UP ROW. Portland – New rail on existing short line. Seattle – upgraded BN main line – some new double-tracking – high payment to BN for operating rights. Albuquerque – cost doesn't include state purchase of ROW for Phase 1. Mostly uses existing track – some sections of new track in Phase 2. URS's 2003 study estimated a range of \$4 to \$8 million per mile in 2003\$.

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