

# Task 6 Final Report

# FINAL

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## Acronyms and Abbreviations

<b>ADCOGC</b> – Adams County Government Center	<b>FHWA</b> – Federal Highway Administration	<b>OSMP</b> – City of Boulder Open Space and Mountain Parks
<b>APE</b> – Annual Program Evaluation	<b>FISA</b> – FasTracks Internal Savings Account	<b>PnR</b> – Park-n-Ride
<b>ARRA</b> – American Recovery and Rehabilitation Act	<b>FTA</b> – Federal Transit Administration	<b>PAC</b> – Policy Advisory Committee
<b>AVL</b> – Automatic Vehicle Location	<b>GIS</b> – Geographical Information System	<b>RAM</b> – Risk Allocation Matrix
<b>BOCO</b> – Boulder County	<b>GPL</b> – General Purpose Lane	<b>ROW</b> – Right-of-Way
<b>BOS</b> – Bus on Shoulder	<b>HPTE</b> – High Performance Transportation Enterprise	<b>RTA</b> – Regional Transportation Authority
<b>BRT</b> – Bus Rapid Transit	<b>ICS</b> – Inter-regional Connectivity Study	<b>RTD</b> – Regional Transportation District
<b>BSP</b> – Bus Signal Priority	<b>ITS</b> – Intelligent Transportation Systems	<b>RTP</b> – Regional Transportation Plan
<b>CAD</b> – Computer Aided Dispatch	<b>LSG</b> – LS Gallegos	<b>STP</b> – Surface Transportation Program
<b>CBD</b> – Central Business District	<b>MCC</b> – Mayors/Commissioners Coalition	<b>TAC</b> – Technical Advisory Committee
<b>CDOT</b> – Colorado Department of Transportation	<b>ML</b> – Managed Lane	<b>TAZ</b> – Traffic Analysis Zone
<b>CMAQ</b> – Congestion Mitigation and Air Quality	<b>MPO</b> – Metropolitan Planning Organization	<b>TIGER</b> – Transportation Investment Generating Economic Recovery
<b>DMU</b> – Diesel Multiple Unit	<b>NAMS</b> – Northwest Area Mobility Study	<b>TOD</b> – Transit Oriented Development
<b>DRCOG</b> – Denver Regional Council of Governments	<b>NATA</b> – North Area Transportation Alliance	<b>TSP</b> – Traffic Signal Priority
<b>DUS</b> – Denver Union Station	<b>NRHP</b> – National Register of Historic Places	<b>TIF</b> – Tax Increment Financing
<b>EE</b> – Environmental Evaluation	<b>NWI</b> – National Wetlands Inventory	<b>USFWS</b> – U.S. Fish and Wildlife
<b>EIS</b> – Environmental Impact Study	<b>NWR</b> – Northwest Rail	<b>USGS</b> – U.S. Geological Survey
<b>EMU</b> – Electric Multiple Unit	<b>O&amp;M</b> – Operating and Maintenance	<b>YOE</b> – Year-of-Expenditure
<b>FASTER</b> – Funding Advancement for Surface Transportation & Economic Recovery		

## ES 1.0 Executive Summary

The Northwest Area Mobility Study (NAMS) was a 13-month effort that developed a prioritized list of mobility improvements for the Northwest area of the Regional Transportation District's (RTD) service area. This collaborative effort included RTD, the Colorado Department of Transportation (CDOT), the Denver Regional Council of Governments (DRCOG) and the Northwest Area Stakeholders: 36 Commuting Solutions, City of Arvada, City of Boulder, Boulder County, City and County of Broomfield, City of Lafayette, City of Longmont, City of Louisville, North Area Transportation Alliance (NATA), Town of Superior, University of Colorado, and City of Westminster.

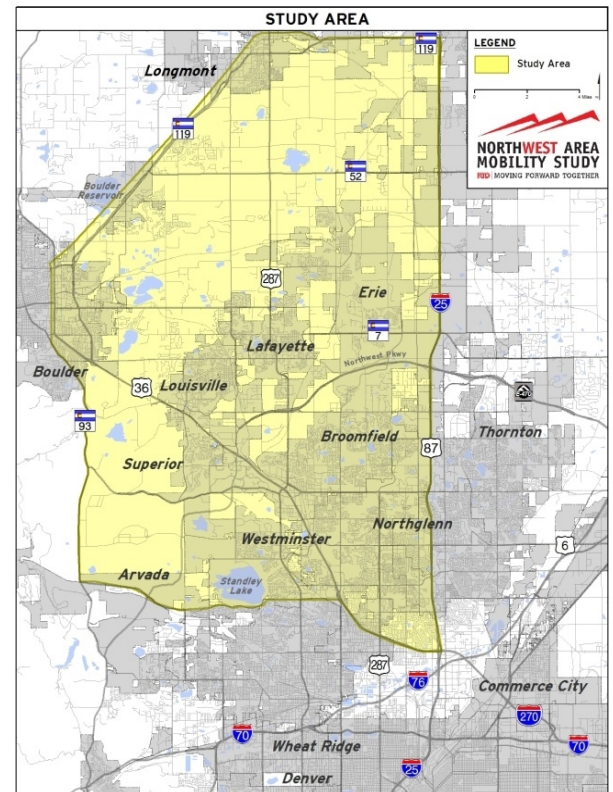
This report was finalized after the RTD Board of Directors action to reflect the Board's concurrence with the project stakeholders' Final Consensus Statement.

### ES 1.1 Study Overview

Utilizing a collaborative decision-making process RTD, CDOT and the Northwest Area Stakeholders agreed upon study goals, objectives and performance measures to evaluate five key areas:

- Phased Construction of Northwest Rail:** The study evaluated operational/service options and construction phasing options along the Northwest Rail line from the South Westminster/71st Avenue end-of-line station currently under construction as part of the Eagle P3 project to Longmont. Phasing segments evaluated included 116th Ave/Broomfield, Louisville, Boulder Junction and Downtown Longmont.
- Feasibility of Extending North Metro Rail Line to Longmont:** As an alternative to providing commuter rail service to Longmont on the Northwest Rail through Boulder, the study evaluated the feasibility of providing commuter rail service to Longmont along various alignments by extending the North Metro Rail Line from the currently planned end of line at 162nd Avenue.
- US 36 Bus Rapid Transit (BRT) Commitments:** The study determined the remaining final commitments for the US 36 BRT line that is currently under construction and planned to open in 2016. The study confirmed the capital and operating and maintenance (O&M) costs, the final operating plan for opening day, as well as the service levels and fleet requirements needed for the 2035 full service plan.

Figure ES 1-1 Study Area



- **Feasibility of New Arterial BRT Lines:** Candidate arterial BRT routes were evaluated as part of the study. The final alternatives evaluated included:
  - o SH 119 (Longmont Diagonal) between Boulder and Longmont,
  - o US 287 between Longmont and Broomfield/US 36 Corridor,
  - o 120th Avenue (East/West Connections: Broomfield to Thornton),
  - o South Boulder Road (Including System Improvements in Boulder),
  - o Arapahoe/SH 7 (East/West Connections: Boulder, Lafayette, and to Brighton, and
  - o SH 42 (New Service)
- Analysis of the Reverse-Commute between Denver Union Station and US 36: The study examined the current and future reverse-commute challenges between Denver Union Station (DUS) and the US 36 corridor. Both short and long term improvements to the current North Interstate-25 (I-25) Managed Lanes or other connections between the Denver Central Business District (CBD) and the US 36 corridor to accommodate bidirectional travel were identified.

## ES 2.0 Stakeholder and Public Outreach and Coordination

NAMS followed a comprehensive, collaborative and milestone-based stakeholder and public involvement program aimed at keeping the public informed and engaged while successfully achieving consensus among RTD, local jurisdictions and CDOT on a prioritized list of mobility improvements for the northwest area.

The stakeholder and public involvement strategy for the Northwest Area Mobility Study (NAMS) was driven by the need to create an open, collaborative and transparent process by which RTD, local jurisdictions and CDOT could achieve consensus on the recommendations of the study. At the same time, it was essential to keep those individuals living, working and interested in the future of the northwest part of the Denver-metro area informed about the study and able to provide input.

Specifically, the strategy focused on achieving three overarching goals:

1. Facilitating the creation of timely and lasting consensus among RTD, local jurisdictions and CDOT,
2. Ensuring openness and transparency throughout the analysis and decision-making process, and
3. Providing ample opportunities for the public to remain informed about the study and provide input that would help RTD, local jurisdictions and CDOT achieve consensus.

Given the importance of collaboration to the study's success, a Policy Advisory Committee (PAC) and Technical Advisory Committee (TAC) were formed. Comprised of elected officials representing the interests of their constituents, the PAC was the study's consensus-building group. The role of the PAC was to consider input from the consultant team, the TAC and the public in order to establish consensus on each decision. Comprised of technical/managerial staff from the participating entities, the role of the TAC was to provide input and analysis on a range of technical and operational issues to support the PAC's ability to develop informed consensus.

Central to achieving the study's goals of openness and transparency was a public involvement program that ensured study information was readily available for review at key milestones and that the public had opportunities to provide input for consideration by the PAC and TAC.

The study's multi-tiered public information and public involvement program included:

- Public Meetings and Telephone Town Halls – More than 10,000 northwest area residents participated in two live telephone town hall meetings in June 2013 and May 2014. Three public meetings were also held in January 2014 in geographically diverse areas of the corridor (Westminster, Boulder and Longmont) to inform the public about the study's draft recommendations and gather input. More than 168 individuals attended the public meetings.
- Study Website ([www.rtd-fastracks.com/nams\\_1](http://www.rtd-fastracks.com/nams_1)) – A NAMS website was established and regularly updated with study information and meeting details. It also included opportunities for the public to submit comments and questions about the study that were shared with the PAC and TAC for their consideration.
- Study Materials – Fact sheets and email blasts were developed to help educate the public about NAMS. These materials were distributed to RTD's entire northwest area stakeholder list, leveraged in all public involvement activities and made available to PAC and TAC members for their own use in engaging constituents.
- Community Partnership Program – Study updates were distributed to community, business and civic organizations in the study area at key milestones with information about engagement/input opportunities. The organizations were encouraged to share these updates with their members through their newsletters, websites and other communications.
- Media Briefings – The project team and RTD staff conducted two media briefings at key project milestones. The intent of these briefings was to broaden public awareness and understanding of the project by helping the media develop accurate and informative articles about the project.

## ES 3.0 Study Key Area Findings

The following summarize key area findings for each of the five areas of the study.

### ES 3.1 North I-25 Reverse Commute

The North I-25 Reverse Commute examined the current and future challenges between Denver Union Station and US 36. The current configuration of I-25 provides general purpose lanes with a reversible managed lane system within the median during the peak commute (travel into downtown Denver in the morning and out of downtown Denver in the evening). The study reviewed congestion levels in the reverse commute direction (travel out of downtown Denver in the morning and into downtown Denver in the evening). The study noted an increase in traffic congestion in the reverse commute direction to downtown Denver in the evening. Buses in the reverse commute direction must travel within the congestion of mixed traffic.

**Short Term Solutions:**

Short-term improvement concepts considered were improvements that could generally be implemented within the existing infrastructure footprint without incurring excessive construction impacts and costs, while still providing relief for existing reverse commute traffic operations. See **Table ES 3-1** below for a summary of short term solutions.

**Table ES 3-1 Short Term Reverse PM Commute Concepts**

Description	Travel Time Savings (Min)	Reliability Benefits	Operational Considerations	Cost Estimate
<b>Bus-on-Shoulder</b>	Maximum: NB: 0.32 SB: 1.32	Ability to bypass congestion for improved reliability	<ul style="list-style-type: none"> <li>• Only during congestion</li> <li>• Limited to 15 mph over mainline</li> <li>• Maximum speed of 35 mph</li> <li>• SB I-70 off-ramp weave</li> <li>• NB inside shoulder</li> <li>• SB outside shoulder</li> </ul>	Lane Shift: \$500,000 to \$600,000 Reconstruct: \$5M to \$20M
<b>Downtown Circulation</b>	NB: 0.01 SB: 0.10	Reduced delay at traffic signals	<ul style="list-style-type: none"> <li>• Implement signal priority system at intersections</li> <li>• Implement right-turn lane from Park to Wewatta</li> <li>• Impacts to EB Park traffic</li> <li>• Impacts to intersection operations</li> </ul>	Implement Signal Priority: \$150,000 Convert Right Lane: \$50,000

As reverse commute traffic continues to grow in the future, the study findings predicted that travel delays will increase and the reliability of travel will further suffer. At some point in the future, systematic improvements to the I-25 corridor could provide more comprehensive benefits for the reverse commute, thereby providing exclusive travel and reliability benefits for the full travel path between Downtown and US 36. There are a number of system improvement concepts that could be considered in the long-term as summarized in **Table ES 3-2** on the next page.

Table ES 3-2 Long Term Reverse Commute Concepts

Description	Travel Time Savings (Min)	Reliability Benefits	Operational Considerations	Cost Estimate
<b>Option 1 – Convert to 3-Lane</b>	NB: -1:28 SB: 1:00  (Peak would be reduced)	Reduced due to no ML shoulders and increased travel path in Downtown	<ul style="list-style-type: none"> <li>• Reversible middle lane</li> <li>• Narrow or no shoulders</li> <li>• Bi-directional ramps</li> <li>• Reduced posted speed</li> <li>• Peak commute impacted</li> <li>• Eliminate NB DUS ramp</li> <li>• Increased Downtown travel</li> <li>• Safety issues</li> </ul>	\$70M to \$100M
<b>Option 2 – Add Bi-directional</b>	NB: 0:23 SB: 1:25	Improved with dedicated bus lane but adequate shoulders required	<ul style="list-style-type: none"> <li>• Maintain 2-lane reversible lanes and 1-lane ramps</li> <li>• Access to ML from GPL</li> <li>• Weaves required from ramps</li> <li>• Separate system operations</li> </ul>	\$80M to \$150M
<b>Option 3 – Replace with Bi-directional</b>	NB: -0:26 SB: 2:01	Reduced due to increased travel path in Downtown	<ul style="list-style-type: none"> <li>• Bi-directional ramps</li> <li>• Four-lane section</li> <li>• Barrier or buffer separated</li> </ul>	\$200M to \$500M
<b>Option 4 – Alternate Route</b>	NB: -4:10 to -8:20 SB: -2:30 to -7:30	Reduced due to arterial street operations	<ul style="list-style-type: none"> <li>• Impacts to traffic signal operations</li> <li>• If exclusive lane, roadway through capacity impacted</li> </ul>	\$1.0M to \$1.25M

\*ML = Managed Lane, GPL = General Purpose Lane

## ES 3.2 US 36 BRT Commitments

The Northwest Area Mobility Study determined a number of important final remaining capital commitments for the US 36 BRT line currently under construction and planned to open in 2016. The study also confirmed the capital and operating and maintenance (O&M) costs, the final operating plan for opening day, as well as the service levels and fleet requirements needed for the 2035 full service plan. For more information on these elements please refer to the *Task 2 Report – US 36 Bus Rapid Transit Summary Report*.

Confirmation of US 36 BRT final operating and maintenance plan, service levels and costs were important to the Northwest Area Stakeholders. The following is a summary of the key elements of the US 36 BRT operating plan:



- Operating Plan and Service Levels - Opening Day 2016 and Future 2035 – For both Opening Day and 2035, RTD's operating plan is to provide Peak and Off Peak Service – Peak Service will be provided in the AM between 6am -9am; PM between 3pm-6pm; the total span of service will be between 4:15am and 12:59pm. Tables ES 3-3 and ES 3-4 Provide US 36 BRT Peak and Off-Peak Service Levels by Station for Opening Day and 2035:

**Table ES 3-3 US 36 BRT Peak and Off-Peak Service Levels by Station (2016)**

Station	2016 Arrivals			2016 Arrivals (reverse direction)		
	Headways (min)			Headways (min)		
	EB/SB	WB/NB	1-way	WB/NB	EB/SB	1-way
	AM Peak	PM Peak	Off-Peak	AM Peak	PM Peak	Off-Peak
<b>Table Mesa</b>	2:51	2:51	12:00	4:37	4:37	12:00
<b>McCaslin</b>	2:51	2:51	12:00	4:37	4:37	12:00
<b>Flatiron</b>	6:19	6:19	20:00	15:00	15:00	20:00
<b>Broomfield</b>	3:26	3:26	13:03	7:04	7:04	13:03
<b>Church Ranch</b>	6:19	6:19	20:00	15:00	15:00	20:00
<b>Westminster</b>	3:38	3:38	13:03	7:04	7:04	13:03

**Table ES 3-4 US 36 BRT Peak and Off-Peak Service Levels by Station (2035)**

Station	2035 Arrivals			2035 Arrivals (reverse direction)		
	Headways (min)			Headways (min)		
	EB/SB	WB/NB	1-way	WB/NB	EB/SB	1-way
	AM Peak	PM Peak	Off-Peak	AM Peak	PM Peak	Off-Peak
<b>Table Mesa</b>	1:35	1:35	6:40	1:52	1:52	6:40
<b>McCaslin</b>	1:35	1:35	6:40	1:52	1:52	6:40
<b>Flatiron</b>	3:32	3:32	10:00	4:17	4:17	10:00
<b>Broomfield</b>	1:51	1:51	7:54	2:47	2:47	7:54
<b>Church Ranch</b>	2:37	2:37	10:00	3:45	3:45	10:00
<b>Westminster</b>	1:54	1:54	7:54	2:47	2:47	7:54

- Fleet Requirements - For US 36 BRT opening day, RTD estimates that 59 vehicles (including spares) will be required. It is assumed that the fleet will include 43 base system buses (36 plus seven spares in the existing fleet) with the 16 remaining buses as expansion vehicles through the FasTracks program. A total of 97 buses (102 buses including spares) will be needed for 2035.
- Operating and Maintenance (O&M) Costs - RTD's current estimate of O&M costs for Opening Day 2016 is \$9.5m (in inflated dollars); for 2035 O&M costs are estimates at \$44.1m (in inflated dollars).

## Remaining Capital Commitment

A primary purpose of this element of the study was to determine the remaining capital commitments for the US 36 BRT Corridor for both opening day and post-opening day. On July 30th, 2013 at the joint Policy and Technical Advisory Committee, stakeholders accepted the study findings and recommendations for the US 36 BRT Remaining Capital Commitments. Opening day commitments were confirmed for station amenities and security, passenger communications, transit signal priority treatments and the acquisition of BRT fleet to provide opening day service. For post-opening day, the remaining major capital commitments were also agreed to by the stakeholders and are outlined in **Table ES 3-5** below:

Major BRT Element	Cost Range
Broomfield north side park-n-Ride 870 spaces	\$21.1M for structured spaces; \$2.5M for ped bridge extension
Westminster Pedestrian Bridge	\$2.3M
Relocation of Church Ranch Platforms	\$4.1M

On September 17th, 2013 the RTD Board took action on the study recommendations for the US 36 BRT opening day and post-opening day Remaining Capital Commitments (Please see **Appendix F** for the September 17, 2013 RTD Board of Directors report for the Approval of Final Scope Elements for US 36 Bus Rapid Transit).

On April 9, 2014, based on internal discussions, the US 36 Mayors/Commissioners Coalition (US 36 MCC) with the City of Longmont and the North Area Transportation Alliance (NATA), endorsed the NAMS process and provided approval of Final Scope Elements for US 36 Bus Rapid Transit, consistent with RTD Board of Directors Report (September 17th, 2013).

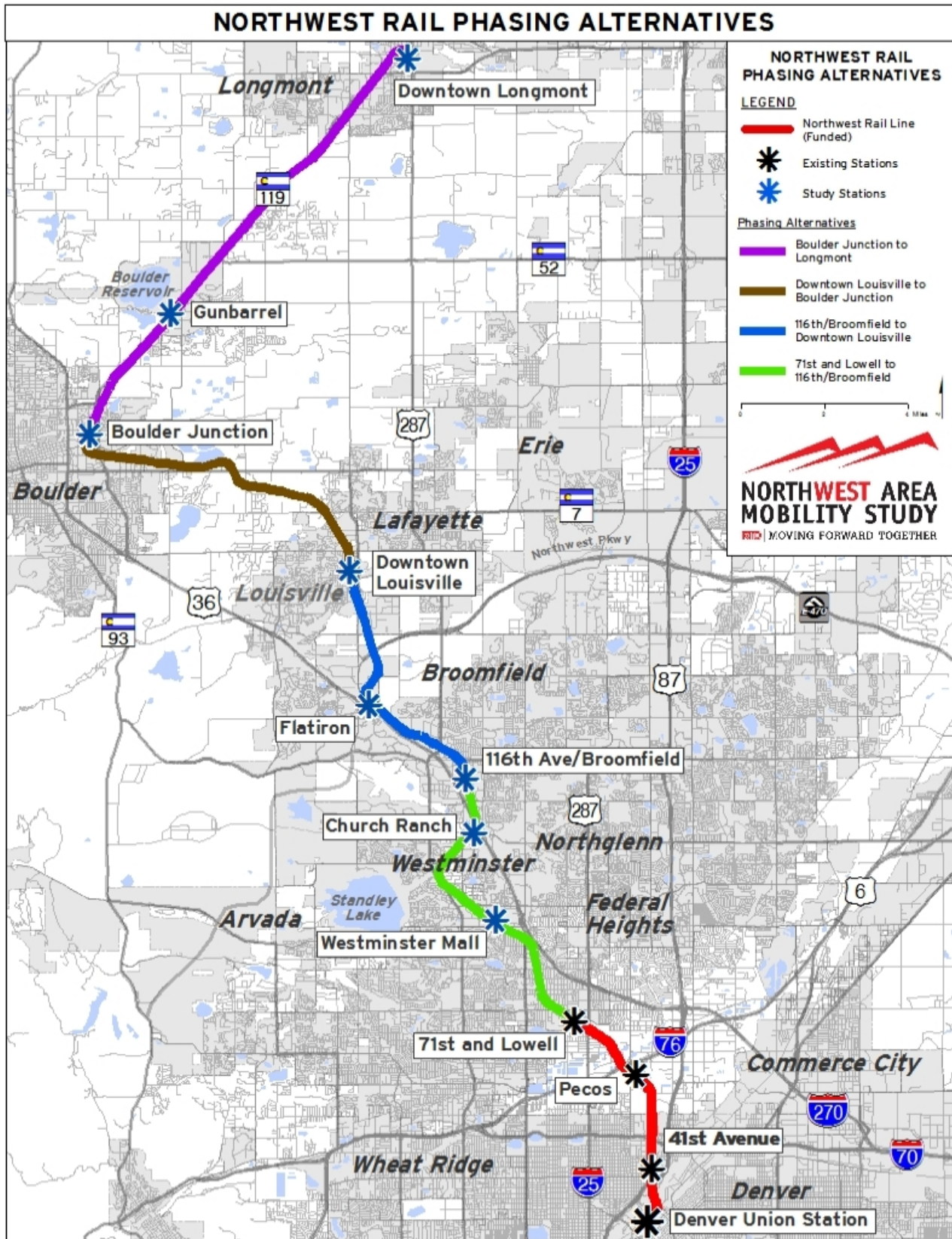
### ES 3.3 Phased Construction of Northwest Rail

The study evaluated the possibility of operational/service and construction phasing options along the Northwest Rail Line from the South Westminster/71st Avenue end-of-line station, currently under construction as part of the Eagle P3 project, to Longmont. Phasing segments that were evaluated included:

- 116th Ave/Broomfield,
- Louisville,
- Boulder Junction and
- Downtown Longmont.

Please see **Figure ES 3-1** for the location of the Northwest Rail Phasing alternatives.

Figure ES 3-1 Northwest Rail Phasing Alternatives



These segments were selected based on a careful examination of technical considerations including an understanding of BNSF technical requirements to co-exist in this corridor. These phasing considerations included:

- Avoiding excessive grades of >1%
- Favoring extending service vs building grade separations
- Avoiding impacts to BNSF, including accommodating their need to have 10,000 feet of “chambering” or storage track at the end of the phased segment of commuter rail

The phases outlined are reasonable segments for building the NW Rail project at some point in the future. BNSF Railway, owner of the corridor and operator of the existing freight rail service in the corridor, while not an active participant in the study has provided a list of conditions for their further engagement in regard to allowing for the necessary rail infrastructure construction and agreements which would allow RTD to provide commuter rail service on the BNSF alignment to Longmont. The operating plan for this phasing analysis assumed a 30 minute peak and 60 minute peak service plan. Refer to **Appendix A** for correspondence between RTD and BNSF.

The study also analyzed capital and operating costs, ridership and travel times for each of the designated phases.

**Table ES 3-6** summarizes those findings:

**Table ES 3-6 Northwest Rail Phasing: Summary of Capital Cost, Cost Per Trip and Ridership**

	Westminster to 116 <sup>th</sup> Avenue Broomfield	Broomfield to Louisville	Louisville to Boulder	Westminster to Longmont (Full Corridor)
<b>Weekday Ridership (2035)</b>	2,100 – 3,400	1,700 – 1,800	2,000 – 2,100	9,300 – 10,800
<b>Capital Cost in millions of 2013 dollars</b>	\$557 - \$681	\$159 - \$194	\$241 - \$295	\$1,156 - \$1,413
<b>Annual cost per trip (Operating and Capital Cost)</b>	\$36.19	\$15.34	\$26.10	\$23.42
<b>Travel time from DUS</b>	27 min	38 min	52 min	71 min

As part of the study, a funding analysis was conducted by RTD to determine the availability of FasTracks revenue to support a phased build-out. The analysis indicated that any FasTracks funding was beyond the 2035 timeframe. The Northwest Area stakeholders and RTD, after careful consideration of study results determined that given present funding challenges and accompanying near-term inability to secure a railroad agreement the completion of NW Rail is a longer term goal. On an annual basis, RTD will explore and update Northwest Rail implementation strategies and report to the stakeholders and the public. This conclusion was reached with RTD and the Northwest Area Stakeholders as part of the Final Consensus Statement dated May 1, 2014 and is included as **Appendix G** of this report.

## ES 3.4 Feasibility of Extending the North Metro Line to Longmont

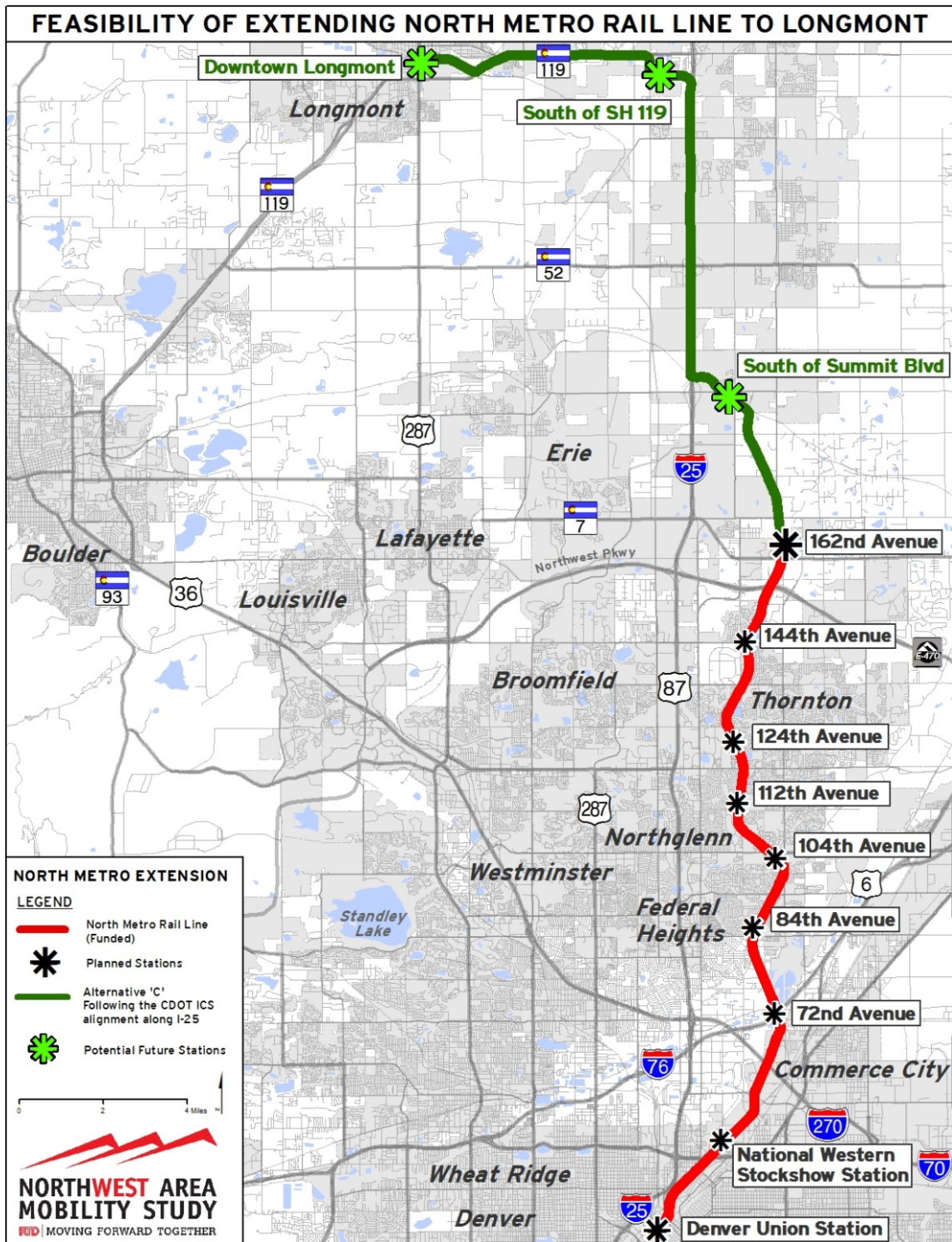
As an alternative to providing commuter rail service to Longmont on Northwest Rail through Boulder, the study evaluated the feasibility of providing commuter rail service to Longmont along various alignments by extending the North Metro Rail Line from the FasTracks currently planned end of line at 162nd Avenue. Four alignments were studied with Alignment “C” selected for detailed analysis. Alignment “C” extends from the North Metro end-of-line at 162nd Avenue west along the Boulder Branch and into the I-25 right-of-way until it reaches SH 119 then precedes west to Longmont. This alignment was chosen for analysis as it would require considerably less right-of-way acquisition as 7 miles of this 19.5 mile alignment is in CDOT, public, right-of-way and there would be limited environmental impacts along this alignment as well. **Figure ES 3-2** describes the North Metro Extension “C” alignment.

The study identified three station locations, South of Summit Boulevard, West of I-25 (inside the RTD District), South of SH 119, West of SH 7 (outside of RTD District) and downtown Longmont. The operating plan used was consistent with that of the Northwest Rail phasing plan, 30 minute peak and 60 minute off-peak. This alignment was evaluated consistent with the NAMS Study Evaluation Process and the following major results are summarized in **Table ES 3-7**.

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Figure ES 3-2 North Metro Extension – Alignment “C”



**Table ES 3-7 North Metro Extension: Summary of Capital Cost, Cost Per Trip and Ridership**

	North Metro Extension to Longmont
<b>Weekday Ridership (2035)</b>	840-900
<b>Capital Cost (in millions of 2013 dollars)</b>	\$682 - \$834
<b>Yearly cost per trip</b>	\$138.82
<b>Travel time from DUS</b>	59 min

The projected ridership of the North Metro Extension is less than 1,000 riders per day. The estimated cost combined with projected low ridership yields an annual cost per rider that is nearly six times as high as the cost per rider for NW Rail. Therefore, the study team recommended and the NAMS PAC and RTD concurred, not to proceed with any action related to this corridor at this time. However, the corridor should be re-evaluated in the future if population densities or other conditions change. This recommendation was adopted as part of the NAMS Final Consensus Statement dated May 1, 2014 and included as **Appendix G** to this report.

### ES 3.5 Feasibility of New Arterial BRT Lines

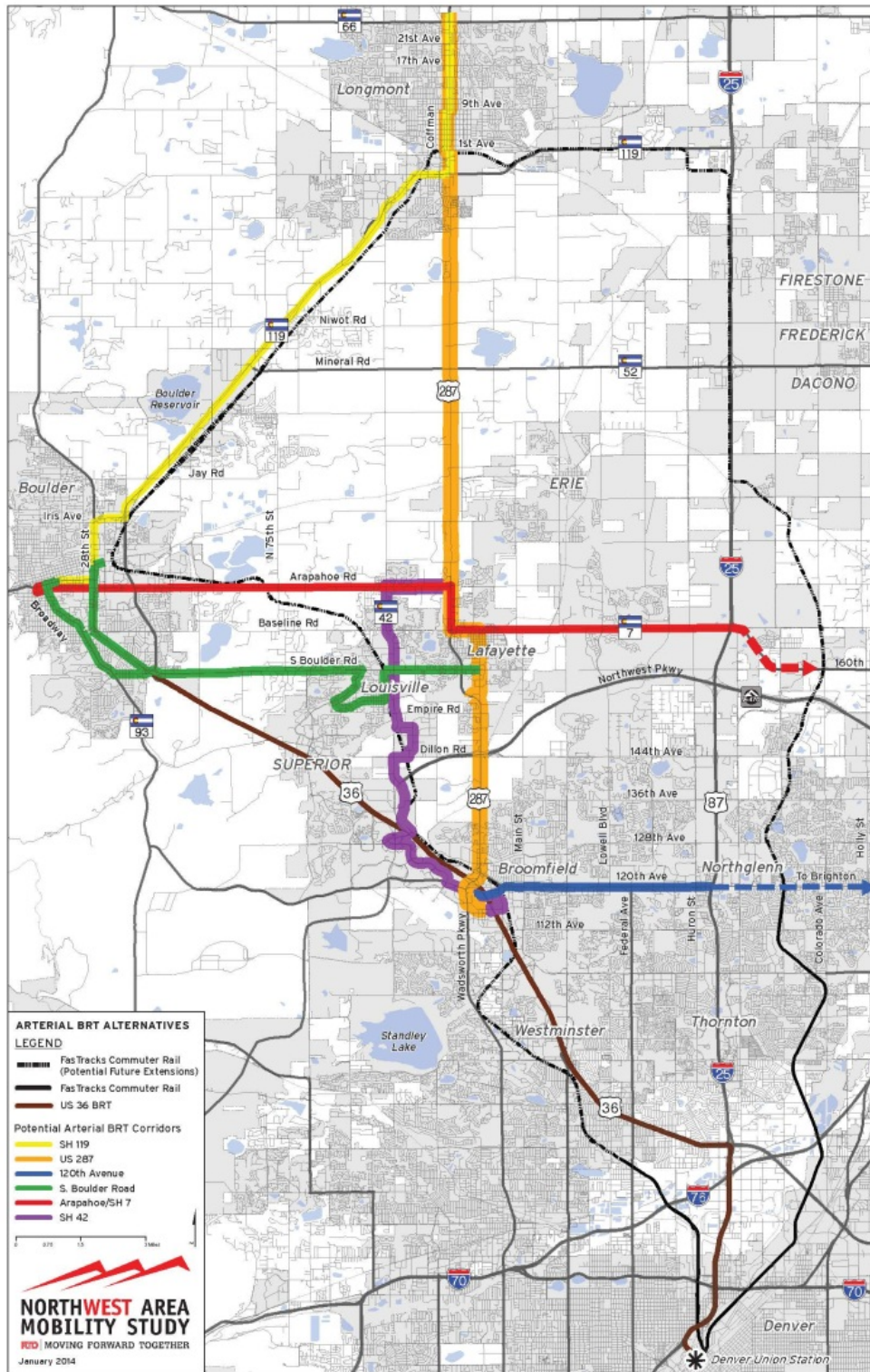
The NAMS study also looked at the feasibility of new arterial BRT lines within the Northwest Area. Arterial BRT often operates along corridors equipped with transit priority elements, such as Transit Signal Priority (TSP) and queue jump lanes, and utilizes a headway-based schedule. Arterial BRT requires a lower level of capital investment than highway/expressway BRT, especially if the Right-of-Way (ROW) or lane already exists.

Over 20 corridors were originally identified, however, six corridors were determined to be potentially viable BRT candidates based on an initial high-level screening process that including an evaluation of ridership, associated capital improvements, potential operating plans, estimated capital and operations and maintenance (O&M) costs, a high level environmental evaluation as well as input from RTD and Northwest Area stakeholders. The six candidate corridors identified included:

- SH 119 (Longmont Diagonal) between Boulder and Longmont;
- US 287 between Longmont and Broomfield/US 36 Corridor;
- 120th Avenue (East/West Connection: Broomfield to Thornton);
- South Boulder Road (includes Boulder System Improvements);
- Arapahoe/State Highway (SH 7) (East/West Connection: Boulder, Lafayette, and to Brighton); and,
- SH 42 (New Service).



Figure ES 3-3 Candidate Arterial BRT Corridors



**Table ES 3-8** below provides an overview of each BRT candidate and identifies: (1) termini, (2) length, (3) number of stations and (4) capital costs in 2013 dollars. It should be noted that a vehicle storage and maintenance facility would be needed if all six corridors were implemented. No costs or share of the cost for this facility has been assigned to any of the corridors. **Table ES 3-8 Summary of Candidate Arterial BRT Improvements by Route**

Project Definition	1	2	3	4	5	6
	SH 119	US 287	120th Avenue	South Boulder Road	Arapahoe/SH 7	SH 42
<b>North / West Terminus</b>	Main Street and SH 66 pnR in Longmont	Main Street and SH 66 pnR in Longmont	Broomfield pnR at Transit Way and Uptown Avenue Parking Garage (off of Wadsworth Parkway)	Boulder Transit Center (using Broadway) and the Boulder Junction (using 28th Street)	Boulder Transit Center	US 287 and Arapahoe
<b>South / East Terminus</b>	Boulder Transit Center (using Canyon) and the Boulder Junction (using 28th Street)	Broomfield pnR at Transit Way and Uptown Avenue Parking Garage (off of Wadsworth Parkway)	Adams County Government Center (ADCOGC)	South Boulder Road at South Public Road	Baseline Road (SH 7) at I-25 (Terminus)	Broomfield pnR at Transit Way and Uptown Avenue Parking Garage (off of Wadsworth Parkway)
<b>Major Stations</b>	30	22	18	33	24	15
<b>Minor Stations</b>	27	16	0	32	22	12
<b>Station Totals</b>	57	38	18	65	46	27
<b>Route Miles</b>	18.5	21.8	16.3	17.4	17.9	13

Project Definition	1	2	3	4	5	6
	SH 119	US 287	120th Avenue	South Boulder Road	Arapahoe/ SH 7	SH 42
<b>TOTAL PROJECT ESTIMATE - 2013 Dollars</b> (does not include operating dollars)	\$57,200,000	\$56,400,000	\$31,800,000	\$31,700,000* Plus Boulder System Improvements Share of \$4,900,000 Total \$36,600,000	\$45,400,000	\$27,400,000

*Does not include capital costs for new Vehicle Maintenance Facility of \$50.9 million.*

*\* The Boulder System Improvements are estimated at \$22.2 million.*

The Arterial BRT Candidate Corridors were evaluated, consistent with the NAMS Study Evaluation Process, as to their capital and operating costs, boardings (ridership), annual cost per boarding, annual subsidy per boarding and travel time performance along with other measures. **Table ES 3-9** summarizes the major performance measures and results for each of the six arterial BRT corridors:

**Table ES 3-9 Comparison of Arterial BRT Routes**

	Arterial BRT Corridors					
	S Boulder Rd + Share of Bway & 28th	120 <sup>th</sup> Ave	Arapahoe / SH 7	SH 42	US 287	SH 119
Daily Boardings (2035)	3,300	5,000	4,600	900	9,000	5,000
Capital Costs	\$36.6M*	\$31.8M	\$45.4M	\$27.4M	\$56.4M	\$57.2 M
Annual Cost Per Boarding	\$10.01	\$3.97	\$4.33	\$11.14	\$3.82	\$6.27
Annual Subsidy per Boarding	\$6.53	\$1.35	\$1.25	\$4.54	\$1.19	\$2.80
Travel Time with Arterial BRT	21m	41m	34m	38m	39m	36m

*Costs in 2013 dollars. Does not include capital costs of \$50.9 million for a new Vehicle Maintenance Facility. Annual cost per rider and annual subsidy per boardings calculated by RTD (\$2013).*

*\*The Boulder System Improvements are estimated at \$21.5 million. S. Boulder Rd share \$4.8m.*

The study found that Arterial BRT program is a viable, cost effective way to increase mobility within the Northwest Area. The projected ridership is based on two key components. The first component includes technology improvements (traffic signal priority, real time information), and capital improvements (bus priority lanes, yielding travel time savings over roadway congestion) that allow transit to take priority in heavily traveled corridors. This would demonstrate the interest, demand, and willingness of area residents to consider alternative modes of transportation. The second component is more frequent service for the Arterial BRT mode and establishment of reliable, timely service to provide users confidence and certainty. It is to be noted that the NAMS study provided an overall conceptual review of implementation of Arterial BRT in the Northwest Area. Further study and analysis is needed to define capital infrastructure, capital and operating costs and funding before any final plans are implemented.

The Policy Advisory Committee (PAC) recommended that all six Arterial BRT projects be implemented including system-wide service improvements (along Broadway and 28th St) in Boulder. The Final Consensus Statement at the conclusion of the NAMS process identified the SH 119 corridor as the number one priority to advance with more detailed planning and environmental review with a second corridor US 287 to also be advanced. Both of these corridors were submitted for a DOT TIGER Planning Grant in April 2014. This conclusion was reached with RTD and the Northwest Area Stakeholders as part of the Final Consensus Statement dated May 1, 2014 and is included as **Appendix G** of this report.

### ES 4.0 Opportunities for Funding

Current financial forecasting by RTD indicates that local Base System funding for transit capital projects will not be available until at least 2020, with FasTracks funding fully committed until after 2035. Completion of any of the unfunded potential transit projects proposed for the study area will require additional RTD revenues if available or other creative funding strategies, such as a sub-regional RTA, federal funding, or increased assistance at the state level. Realistically, a combination of multiple funding sources will likely be necessary. **Table ES 4-1** below summarizes funding sources and applicability to NW area potential improvements.

**Table ES 4-1 Funding Summary Matrix**

Source	Northwest Rail			Arterial BRT (various Corridors)		
	Applicability	Magnitude	Probability of Funding	Applicability	Magnitude	Probability of Funding
Legend: Good (●), Average (◐), Fair (◑), Low (○)						
Federal						
New Starts	●	● \$75M +	○ Full project unlikely to qualify for funding	◐ Fixed guideway required	● \$75M +	◐ Depends on project ratings
Small Starts	● Project Cost >\$250M, Federal share < \$75M	◐ Up to \$75M	◑ Requires a phased approach to manage costs	● "Corridor-based BRT" <\$75M federal share	◐ Up to \$75M	◐ Depends on project ratings
TIGER Funding	◐ Station area and ROW upgrades	◐ Up to \$20M	◐ Highly competitive	● US 36 BRT upgrades received \$4.8M	◐ Up to \$20M	◐ Highly competitive

Source	Northwest Rail			Arterial BRT (various Corridors)		
	Applicability	Magnitude	Probability of Funding	Applicability	Magnitude	Probability of Funding
DRCOG TIP (STP - Metro and CMAQ)	● Capital projects need to be included in 2040 RTP	◐	●	● Capital projects need to be included in 2040 RTP	◐	◐ DRCOG funding depends on other applications submitted
<b>State</b>						
MPACT64	● Transit set-aside	● \$100M - \$120M/yr	● New Initiative	● Transit set-aside	● \$100M - \$120M/yr	● New Initiative
FASTER	◐ Ancillary improvements	○ Insufficient for substantial project	◐ Dozens of statewide grantees	● Bus purchases and station improvements	◐ Up to \$3M	◐ Dozens of statewide grantees
<b>Local/Regional</b>						
Innovative Funding / Value Capture	● Applicable to small area projects	○ Depends on project scale	○	●	◐ Depends on project scale	◐
Subregional RTA	●	◐	○ Would require voter referendum	●	●	○ Would require voter referendum
RTD Local Sales Tax Funds (FasTracks NWR/ Base System Art. BRT)	●	●	● NWR Remains in Plan	●	◐	◐

Federal funding is unlikely for Northwest Rail due to the modest demonstrated benefits of the program and the need for a substantial local match that is currently unfunded. Federal funding for arterial BRT may be feasible if a local match can be identified. Stronger arterial BRT corridors such as SH 119, US 287 and Arapahoe Road / SH7 should be pursued. With the concurrence of the NAMS Stakeholders, a TIGER grant application was submitted by RTD on April 28, 2014 to advance the planning for two of the arterial BRT projects, SH 119 and US 287.

## ES 5.0 Study Evaluation Process

This project team worked collaboratively with RTD and the Technical and Policy Committees to define a systematic process and methodology for evaluating the study alternatives –specifically to evaluate the Northwest Rail phasing alternatives, the North Metro Extension alternatives and the Arterial BRT Alternatives. This process included the identification of community goals and objectives as well as mode-specific quantitative and qualitative performance measures based on local and national best practices including the latest Federal Transit Administration’s (FTA) New and Small Starts Evaluation Rating Process Policy Guidance, August 2013.



The evaluation process was guided by community goals and objectives identified during a May 2013 Collaboration Summit that included RTD, CDOT and the Northwest Area Stakeholders. The four goals that were identified included:

- Goal 1: Provide a transparent and collaborative process.
- Goal 2: Provide a high quality, reliable transit system.
- Goal 3: Provide cost effective transit solutions.
- Goal 4: Respect and support local and regional planning efforts.

Following the Summit, the study team developed proposed performance measures linked to the community goals and objectives. The overall evaluation process was approved by RTD, CDOT and the Northwest Area Stakeholders at the July 30, 2013 joint Technical and Policy Committee meeting. The detailed Study Evaluation Summaries for Northwest Rail, North Metro Extension, Arterial BRT and the Financial Review are provided as part of **Appendix B** of this Final Report. A summary of the major findings of the evaluation process for Northwest Rail phasing options, North Metro Extension and Arterial BRT Corridors were provided previously as part of this Executive Summary. The findings were accepted by the Policy Advisory Committee on January 30, 2014. The evaluation process led to a consensus for priority list/package of improvements that the Northwest Area Stakeholders and RTD agreed to on May 1, 2014.

## ES 6.0 Northwest Area Mobility Study – Final Consensus Statement

The following prioritized list of improvements reflects the general consensus of the Policy Advisory Committee (PAC) and RTD on April 18, 2014 regarding the NAMS Study and are provided as a Recommendation to the RTD Board of Directors (the Final Consensus Statement is also provided as Appendix G of this Report):

- **An overarching theme serves as a basis from which consensus on the priorities is grounded:**
  - o The Northwest area remains committed to Northwest Rail as envisioned in FasTracks. Given the projected timing of Northwest Rail's implementation, Northwest stakeholders want to see mobility benefits sooner.
- **Projects on the prioritized list should not be considered absolutely sequential:**
  - o Nothing should preclude the pursuit or acceleration of any of these priorities should viable opportunities or partners become available.
  - o More than one priority can be pursued simultaneously.
  - o RTD should be proactive, aggressive and creative in monitoring these projects for any significant developments that help a project move forward (e.g. public or P3 funding opportunities, BNSF plans).
- **North Metro Rail Extension (SH 7 to Longmont)**
  - o Estimated cost combined with projected low ridership yields an annual cost per boarding almost six higher than Northwest Rail.
  - o It is recommended by the Study Team and accepted by the NAMS PAC not to proceed with any action on this corridor at this time. The corridor should be re-evaluated in the future if population densities or other conditions change.
- **1. Completion of the Remaining US 36 BRT Commitments (FasTracks):**
  - o Consistent with the NAMS Local Stakeholder Consensus Document (April 7th, 2014) (See **Appendix C**) and Approval of Final Scope Elements for US 36 Bus Rapid Transit, RTD Board of Directors Report, September 17th, 2013 (See **Appendix F**).

## 2. Arterial BRT/Enhanced Bus Service – (RTD Base System, State, Regional and Federal Funding)

### Short Term - next 3-10 years

- o Proceed into advanced planning/environmental/preliminary design via submittal of TIGER Planning Grant by 4-28-14:
  - SH 119 from Longmont to Boulder (1st priority)
  - Second Corridor - US 287 from Longmont to DUS
- o One or both corridors could be implemented following study based on further refinement of regional priorities, project scopes, funding availability and leveraging opportunities.
- o Arterial BRT/Enhanced Bus Service station investments should support anticipated bus ridership, and include station design features consistent with future rail service.

## 3. Interstate 25 Reverse Commute Solutions (Pecos to DUS) (Regional, State and Federal Funding – RTD Support)

### Short Term – next 3-10 years

- o Advance Bus-on-Shoulder concept with CDOT and RTD.
- o Investigate feasibility of downtown street/signal improvements.

### Long Term – next 7-20 years

- o Initiate advanced planning for systematic improvements along Interstate 25.
- o Develop regional managed lane system plan.
- o Initiate feasibility planning based on agreed priorities.

## 4. Northwest Rail (FasTracks):

- o Given present funding challenges and accompanying near-term inability to secure a railroad agreement, completion of Northwest Rail is a longer term goal.
- o On an annual basis, RTD will explore and update Northwest Rail implementation strategies and report to stakeholders and the public.

## 5. Remaining Arterial BRT/Enhanced Bus Service Corridors (RTD Base System, State, Regional and Federal Funding):

### Long Term - next 7-20 years

- o Could be implemented based on further refinement of regional priorities, project scopes, funding availability and leveraging opportunities:
  - SH 7
  - South Boulder Road
  - 28th Street/Broadway
  - 120th Avenue
  - SH42/95th Street
- o Arterial BRT/Enhanced Bus Service station investments should support anticipated bus ridership, and include station design features consistent with future rail service.



## ES 7.0 Northwest Area Mobility Study – RTD Board of Directors Approval of Final Consensus Statement

On June 24, 2014 the RTD Board of Directors approved Resolution No.6 to accept the Final Consensus Statement as developed by the Northwest Area Mobility Study stakeholders for priorities within the Northwest Study Area (See **Appendix H** to this Report). The resolution also noted that two high-priority Arterial BRT corridors, SH 119 and SH 287 were submitted for TIGER grants. This report was finalized after the RTD Board of Directors action to reflect the Board’s concurrence with the project stakeholders’ Final Consensus Statement.

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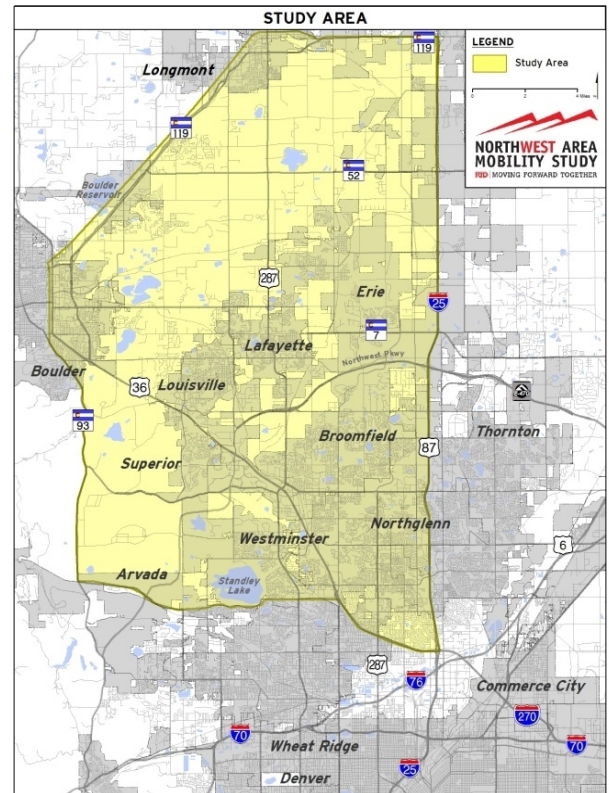
## 1.0 Introduction

The Northwest Area Mobility Study (NAMS) was a 13-month effort that developed a prioritized list of mobility improvements for the Northwest area of the Regional Transportation District's (RTD) service area. This collaborative effort included RTD, the Colorado Department of Transportation (CDOT), the Denver Regional Council of Governments (DRCOG) and the Northwest Area Stakeholders: 36 Commuting Solutions, City of Arvada, City of Boulder, Boulder County, City and County of Broomfield, City of Lafayette, City of Longmont, City of Louisville, North Area Transportation Alliance (NATA), Town of Superior, University of Colorado, and City of Westminster. This report was finalized after the RTD Board of Director's action to reflect the Boards concurrence with the project stakeholders' Final Consensus Statement.

Utilizing a collaborative decision-making process RTD, CDOT and the Northwest Area Stakeholders agreed upon study goals, objectives and performance measures to evaluate five key areas:

- **Phased Construction of Northwest Rail:** The study evaluated operational/service options and construction phasing options along the Northwest Rail line from the South Westminster/71st Avenue end-of-line station currently under construction as part of the Eagle P3 project to Longmont. Phasing segments evaluated included 116th Ave/Broomfield, Louisville, Boulder Junction and Downtown Longmont.
- **Feasibility of Extending North Metro Rail Line to Longmont:** As an alternative to providing commuter rail service to Longmont on the Northwest Rail through Boulder, the study evaluated the feasibility of providing commuter rail service to Longmont along various alignments by extending the North Metro Rail Line from the currently planned end of line at 162nd Avenue.
- **US 36 Bus Rapid Transit (BRT) Commitments:** The study determined the remaining final commitments for the US 36 BRT line that is currently under construction and planned to open in 2016. The study confirmed the capital and operating and maintenance (O&M) costs, the final operating plan for opening day, as well as the service levels and fleet requirements needed for the 2035 full service plan.
- **Feasibility of New Arterial BRT Lines:** Candidate arterial BRT routes were evaluated as part of the study. These final alternatives evaluated included:

**Figure 1-1 Study Area**



- o SH 119 (Longmont Diagonal) between Boulder and Longmont,
  - o US 287 between Longmont and Broomfield/US 36 Corridor,
  - o 120th Avenue (East/West Connections: Broomfield to Thornton),
  - o South Boulder Road (Including System Improvements in Boulder),
  - o Arapahoe/SH 7 (East/West Connections: Boulder, Louisville, and to Brighton, and
  - o SH 42 (New Service)
- Analysis of the Reverse-Commute between Denver Union Station and US 36: The study examined the current and future reverse-commute challenges between Denver Union Station (DUS) and the US 36 corridor. Both short and long term improvements to the current North Interstate-25 (I-25) Managed Lanes or other connections between the Denver Central Business District (CBD) and the US 36 corridor to accommodate bidirectional travel were identified.

## 2.0 Stakeholder and Public Outreach and Coordination

The stakeholder and public involvement strategy for the Northwest Area Mobility Study (NAMS) was driven by the need to create an open, collaborative and transparent process by which RTD, local jurisdictions and CDOT could achieve consensus on the recommendations of the study. At the same time, it was essential to keep those individuals living, working and interested in the future of the northwest part of the Denver-metro area informed about the study and able to provide input.

Specifically, the strategy focused on achieving three overarching goals:

- Facilitating the creation of timely and lasting consensus among RTD, local jurisdictions and CDOT,
- Ensuring openness and transparency throughout the analysis and decision-making process, and
- Providing ample opportunities for the public to remain informed about the study and provide input that would help RTD, local jurisdictions and CDOT achieve consensus.

### 2.1 Stakeholder Involvement Plan

The Stakeholder Involvement Plan for NAMS was drafted at the outset of the project, finalized and submitted to RTD in June 2013. Developed in partnership with local jurisdictions, the plan outlines a comprehensive approach to keeping the public informed and engaged at key study milestones while also laying the framework for the study's consensus-building and decision-making process. The consensus-building process was grounded in the work of a Policy Advisory Committee (PAC) comprised of elected officials from local jurisdictions and agencies, supported by a Technical Advisory Committee (TAC) comprised of their technical/managerial staff.

### 2.2 Collaboration Commitment

In May 2013, RTD, local jurisdictions, CDOT and the consultant team came together for a Collaboration Summit to establish a common understanding at the outset of the study and agree to the following set of commitments:

1. Support the Study Goal
2. Consider All Communities
3. Maintain Local and Regional Perspectives
4. Share Information and Feedback
5. Adhere to Deadlines
6. Support the Public Involvement Process

7. Identify Issues Early
8. Respect the Collaborative Spirit
9. Achieve Consensus and Acknowledge Dissent.

## 2.3 Technical and Policy Advisory Committees

Given the importance of collaboration to the study's success, a Policy Advisory Committee (PAC) and Technical Advisory Committee (TAC) were formed. Comprised of elected officials representing the interests of their constituents, the PAC was the study's consensus-building group. The role of the PAC was to consider input from the consultant team, the TAC and the public in order to establish consensus on each decision. Comprised of technical/managerial staff from the participating entities, the role of the TAC was to provide input and analysis on a range of technical and operational issues to support the PAC's ability to develop informed consensus. The following entities appointed one elected official to the PAC and two staff members to the TAC:

- 36 Commuting Solutions
- City of Arvada
- City of Boulder
- County of Boulder
- City and County of Broomfield
- Colorado Department of Transportation (CDOT)
- Denver Regional Council of Governments (DRCOG)
- City of Lafayette
- City of Longmont
- City of Louisville
- North Area Transportation Alliance (NATA)
- Town of Superior
- University of Colorado
- City of Westminster

The Regional Transportation District (RTD) was also represented on the PAC through four Board members whose districts include the northwest area region. RTD staff also participated in the TAC.

Through a series of facilitated meetings (dates noted below), the committees followed a highly collaborative evaluation and consensus-building process to develop the study's prioritized list of agreed-upon mobility improvements.

- May 23rd, 2013 (TAC) – Westminster City Hall
- May 29th, 2013 (Joint PAC/TAC) – Westminster City Park Rec Center (Collaboration Summit)
- June 6th, 2013 (TAC) – Broomfield City & County Building
- June 17th, 2013 (Joint PAC/TAC) – Westminster City Park Rec Center
- June 28th, 2013 (Expert Rail Panel Meeting With TAC) – Broomfield City & County Building
- July 9th, 2013 (Joint PAC/TAC) – Westminster City Park Rec Center
- July 17th, 2013 (TAC)– Broomfield City & County Building
- July 30th, 2013 (Joint PAC/TAC) – Broomfield Community Center
- August 20th, 2013 (TAC) – Broomfield City & County Building
- September 19th, 2013 (TAC) – Longmont Public Library
- October 3rd, 2013 (Expert Rail Panel Meeting with TAC) – Westminster City Park Rec Center
- October 7th, 2013 (PAC) – Westminster City Hall
- October 22nd, 2013 (Arterial BRT Workshop with TAC) – Boulder County Justice Center
- November 20th, 2013 (TAC) – Mamie Doud Eisenhower Public Library
- January 9th, 2014 (TAC) – Westminster City Hall
- January 30th, 2014 (PAC) – Westminster City Hall
- April 18, 2014 (PAC) - Broomfield City & County Building



### 2.3.1 Use of Web-based collaboration tool - DashPort

The consultant team utilized HNTB's DashPort, a web-based collaboration tool to share study materials and manage stakeholder comments on study documents. Important announcements were also posted to the site's home page. Each TAC member was given a username to access the site. Meeting agendas and other materials were posted on DashPort and distributed by email to the PAC and TAC in advance of every meeting.

## 2.4 Elected Official Outreach and Community-Leader Engagement

In addition to coordinating with local elected officials individually and through the PAC, the consultant team conducted one-on-one meetings with a number of state legislators and business/community leaders to keep them informed about the study, understand their issues/concerns and enable them to share factual information about the study in their own outside discussions. Individual meetings were held with PAC members throughout the study and group briefings were also given to the North Area Transportation Alliance (NATA) and the US 36 Mayors/Commissioners Coalition (MCC). Briefings were also held with the following key stakeholder groups/organizations beyond the PAC/TAC to provide updates and solicit feedback to be considered in the decision-making process:

- Colorado Rail Passenger Association
- Town of Erie
- Longmont Area Economic Development Council
- Northwest Denver Economic Development Partnership
- North Front Range Metropolitan Planning Organization

Offers for briefings were also made to Front Range OnTrack and Northern Colorado Commuter Rail.

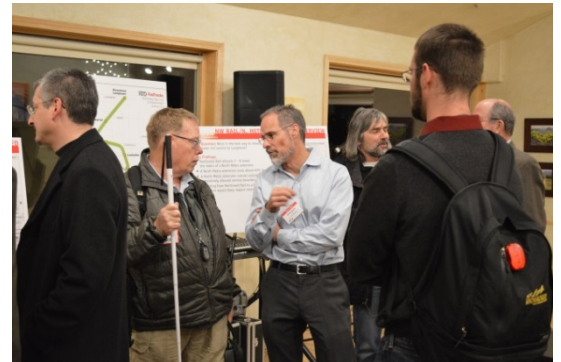
## 2.5 Public Information and Outreach

Central to achieving the study's goals of openness and transparency was a public involvement program that ensured study information was readily available for review at key milestones and that the public had opportunities to provide input for consideration by the PAC and TAC. The study's multi-tiered public information and public involvement program included:

**Public Meetings and Telephone Town Halls** – More than 10,000 northwest area residents participated in two live telephone town hall meetings in June 2013 and May 2014. Three public meetings were also held in January 2014 in geographically diverse areas of the corridor (Westminster, Boulder and Longmont) to inform the public about the study's draft recommendations for both the North I-25 Reverse Commute and US 36 BRT Remaining commitments, as well as to gather input on other study findings to date.

**Study Website ([www.rtd-fastracks.com/nams\\_1](http://www.rtd-fastracks.com/nams_1))** – A NAMS website was established and regularly updated with study information and meeting details. It also included opportunities for the public to submit comments and questions about the study that were shared with the PAC and TAC for their consideration.

**Study Materials** – Fact sheets and email blasts were developed to help educate the public about NAMS. These materials were distributed to RTD's entire northwest area stakeholder list, leveraged in all public involvement activities and made available to PAC and TAC members for their own use in engaging constituents.





**Community Partnership Program** – Study updates were distributed to community, business and civic organizations in the study area at key milestones with information about engagement/input opportunities. The organizations were encouraged to share these updates with their members through their newsletters, websites and other communications.

**Media Briefings** – The project team and RTD staff conducted two media briefings at key project milestones. The intent of these briefings was to broaden public awareness and understanding of the project by helping the media develop accurate and informative articles about the project.



## 2.6 Summary

NAMS followed a comprehensive, collaborative and milestone-based stakeholder and public involvement program aimed at keeping the public informed and engaged while successfully achieving consensus among RTD, local jurisdictions and CDOT on a prioritized list of mobility improvements for the northwest area.

## 3.0 North I-25 Reverse Commute

The North I-25 Reverse Commute examined the current and future challenges between Denver Union Station and US 36. The current configuration of I-25 provides general purpose lanes with a reversible managed lane system within the median during the peak commute (travel into downtown Denver in the morning and out of downtown Denver in the evening). The study reviewed congestion levels in the reverse commute direction (travel out of downtown Denver in the morning and into downtown Denver in the evening). The study noted an increase in traffic congestion in the reverse commute direction to downtown Denver in the evening. Buses in the reverse commute direction must travel within the congestion of mixed traffic.

### 3.1 Assessment Methodology

The evaluation of the reverse commute travel along I-25 and into Downtown compared the travel characteristics of the peak commute to the reverse commute. The system's performance during the current peak was considered a good predictor for the system's performance for the commute in the future due to the similar characteristics of each direction on I-25. Assessments for the reverse commute include: reverse commute travel characteristics, growth of traffic and congestion for the reverse commute, timing and need for consideration of exclusive facilities for the reverse commute based on characteristics of the current peak commute system, opportunities for exclusive service in the reverse commute direction during the off-peak period, and recommendations for the development of future improvement considerations.



## 3.2 Current System Description

Currently, the Northwest Area peak commute (i.e., travel into Downtown in the morning and out of Downtown in the evening) provides additional capacity above general purpose lanes with a two-lane reversible managed lane system within the median of I-25 between Downtown and the I-25/US 36 Interchange. This system includes single lane direct connect reversible ramps into the Downtown street system. Construction is currently underway to provide one-lane bi-directional managed lanes along US 36 to Table Mesa, thereby providing full-length exclusive peak commute service between Boulder and Downtown for buses and toll paying vehicles.. While this planned managed lane system will provide exclusive service for the peak commute between the Northwest Area and Downtown, this system will not provide exclusive service for the full reverse commute. Because the current configuration of the I-25 managed lanes operate in one direction only, buses in the reverse commute must travel in mixed traffic within the general purpose lanes for this segment of the system.

## 3.3 Problem Identification

The Study determined that traffic delays in the pm reverse commute currently exist along I-25 as traffic approaches Downtown. These delays are not systematic, but are caused by the constraints of the I-25 corridor through Downtown – tight urban section, horizontal curvature, multiple entry and exit ramps, and higher weaving activities.

Current typical delay for the pm reverse commute trip, between US 36 and the Park Avenue off-ramp generally occur south of 48th Avenue. Data showed that the combination of typical daily peak hour operations combined with the incurrence of non-recurring events, such as accidents, inclement weather or other congestion-causing events, resulted in roughly 4 out of 5 days per work week of travel speeds below 45 mph. While the pm reverse commute commonly experiences congestion, little to no delay currently occurs on a routine basis for the reverse commute in the am peak period. Only one out of ten days experiences excessive delays in the am reverse commute due to non-recurring events.

As regional traffic continues to grow, it is expected that the traffic operations in both the am and pm reverse commute will continue to worsen. According to traffic growth predictions, the reverse commute peak hour traffic volumes will reach the current levels of the peak commute sometime near or after 2045. The Study also predicted that travel delays for the reverse commute would be severe enough to warrant improvements to gain similar travel benefits currently provided by the reversible managed lane system.

## 3.4 Reverse Commute Concepts and Costs

Given the observed recurring travel problems in the pm period as traffic approaches Downtown, several improvement concepts were considered to improve the service provided for the reverse commute that potentially provide travel time and reliability benefits in both the short-term and long term. Tables 3.1 and 3.2 summarize concepts, costs and considerations for several solutions.

### 3.4.1 Short Term Solutions

Short-term improvement concepts considered were improvements that could generally be implemented within the existing infrastructure footprint without incurring excessive construction impacts and costs, while still providing relief for existing reverse commute traffic operations. See Table 3.1 for a summary.

**Table 3.1 Short Term Reverse Commute Concepts**

Description	Travel Time Savings (Min)	Reliability Benefits	Operational Considerations	Cost Estimate
<b>Bus-on-Shoulder</b>	Maximum: NB: 0.32 SB: 1.32	Ability to bypass congestion for improved reliability	<ul style="list-style-type: none"> <li>Only during congestion</li> <li>Limited to 15 mph over mainline</li> <li>Maximum speed of 35 mph</li> <li>SB I-70 off-ramp weave</li> <li>NB inside shoulder</li> <li>SB outside shoulder</li> </ul>	Lane Shift: \$500,000 to \$600,000 Reconstruct: \$5M to \$20M
<b>Downtown Circulation</b>	NB: 0.01 SB: 0.10	Reduced delay at traffic signals	<ul style="list-style-type: none"> <li>Implement signal priority system at intersections</li> <li>Implement right-turn lane from Park to Wewatta</li> <li>Impacts to EB Park traffic</li> <li>Impacts to intersection operations</li> </ul>	Implement Signal Priority: \$150,000 Convert Right Lane: \$50,000

### Bus on Shoulder

Bus on Shoulder (BOS) is a network of freeway shoulders available for travel by authorized transit buses under congested conditions to bypass mainline traffic and maintain transit schedules. BOS could be especially useful to improve bus travel times during nonrecurring traffic congestion.

### Downtown Street Circulation

To improve the reliability of travel between I-25 and DUS, minor roadway operational improvements may be considered to the existing street network to provide priority bus service for the reverse commute.

## 3.4.2 Long Term Solutions

As reverse commute traffic continues to grow in the future, the Study predicted that travel delays will increase and the reliability of travel will further suffer. At some point in the future, systematic improvements to the I-25 corridor could provide more comprehensive benefits for the reverse commute, thereby providing exclusive travel and reliability benefits for the full travel path between Downtown and US 36. There are a number of system improvement concepts that could be considered in the long-term as summarized below and in **Table 3.2**.

- Option 1 – Convert to 3-Lane – This option would convert the existing two-lane managed lane system to a three-lane system with no shoulders. One lane would travel in each direction continuously, and the middle lane would be reversible to follow the peak direction of traffic.
- Option 2 – Add Bi-directional lanes – This option would leave the existing reversible managed lane system as it currently exists and add one managed lane the inside shoulder of the general purpose lanes in each direction.
- Option 3 – Replace with Bi-directional – This option would completely remove the reversible managed lane system and instead have two managed lanes in each direction on the inside of the general purpose lanes.
- Option 4 – This option would use alternate routes other than I-25.

Table 3.2 Long Term Reverse Commute Concepts

Des.	Travel Time Savings (Min)	Reliability Benefits	Operational Considerations	Cost Estimate
<b>Option 1 – Convert to 3-Lane</b>	NB: -1:28 SB: 1:00  (Peak would be reduced)	Reduced due to no ML shoulders and increased travel path in Downtown	<ul style="list-style-type: none"> <li>• Reversible middle lane</li> <li>• Narrow or no shoulders</li> <li>• Bi-directional ramps</li> <li>• Reduced posted speed</li> <li>• Peak commute impacted</li> <li>• Eliminate NB DUS ramp</li> <li>• Increased Downtown travel</li> <li>• Safety issues</li> </ul>	\$70M to \$100M
<b>Option 2 – Add Bi-directional</b>	NB: 0:23 SB: 1:25	Improved with dedicated bus lane but adequate shoulders required	<ul style="list-style-type: none"> <li>• Maintain 2-lane reversible lanes and 1-lane ramps</li> <li>• Access to ML from GPL</li> <li>• Weaves required from ramps</li> <li>• Separate system operations</li> </ul>	\$80M to \$150M
<b>Option 3 – Replace with Bi-directional</b>	NB: -0:26 SB: 2:01	Reduced due to increased travel path in Downtown	<ul style="list-style-type: none"> <li>• Bi-directional ramps</li> <li>• Four-lane section</li> <li>• Barrier or buffer separated</li> </ul>	\$200M to \$500M
<b>Option 4 – Alternate Route</b>	NB: -4:10 to -8:20 SB: -2:30 to -7:30	Reduced due to arterial street operations	<ul style="list-style-type: none"> <li>• Impacts to traffic signal operations</li> <li>• If exclusive lane, roadway through capacity impacted</li> </ul>	\$1.0M to \$1.25M

\*ML = Managed Lane, GPL = General Purpose Lane

### 3.5 Summary and Recommendations

The North I-25 Reverse Commute examined the current and future challenges between Denver Union Station and US 36. The current configuration of I-25 provides additional capacity where general purpose lanes with a reversible managed lane system within the median during the peak commute (travel into downtown in the morning and out of downtown in the evening). However, due to an increase in traffic congestion in the reverse commute direction, buses in the reverse commute direction must travel within the congestion of mixed traffic. Based on the reverse commute challenges and the assessment of short-term and long-term improvement concepts that could be implemented, the following actions were recommended:

Monitor Reverse Commute System Operations – with the number of ongoing construction activities that will positively impact the reverse commute operations upon completion, it is recommended that these activities be completed while the reverse commute operations are continued to be monitored. These activities include: overall RTD bus service performance improvements, completion of the I-25 Valley Section construction by CDOT, completion of the US 36 and I-25 North Bi-directional Managed Lane System improvements by CDOT, HPTE and RTD, completion of the US 36 bus service improvements, and the completion of DUS.

Optimize CDOT Incident Management System for I-25 Downtown – coordinate the overall operational planning of CDOT’s incident management system to appropriately consider service to the reverse commute travel.

Coordinate DUS Operations Plan with Reverse Commute – coordinate the ongoing operational planning for DUS to appropriately address the needs of the reverse commute.

Advance Bus-on-Shoulder Concept with CDOT and RTD – continue to advance the conversation and planning of the BOS concept for the reverse commute, including the continued optimization of the planned BOS operations along US 36.

Investigate Feasibility of Downtown Street Improvements – coordinate the investigation of the possible feasibility of Downtown street improvements between I-25 and DUS with the City and County of Denver.

Initiate Advance-Planning for Systematic Improvements – begin the conceptual feasibility investigation of the long-term system improvement concepts for I-25, including: coordination with CDOT, RTD and HPTE, developing a regional managed lane system plan to provide a system context for the reverse commute improvements, and based on the priorities established in the regional managed lane system plan, advance the initial planning for the long-term improvements.

## 4.0 US 36 BRT Commitments

As part of the Northwest Mobility Study, the study effort summarized and assessed the major capital improvement elements for implementing Bus Rapid Transit (BRT) services along the US 36 Corridor between the City of Boulder and the Denver CBD for opening day. It confirmed the capital and operating and maintenance costs, the final operating plan for opening day, as well as the service levels and fleet requirements needed for the 2035 full service plan. It also provided an assessment and recommendation of the remaining capital elements to be funded.

### 4.1 US 36 BRT Program Description

With a service area covering more than 2,400 square miles, the RTD is challenged by a wide variety of transit market needs for which a one-size-fits-all approach to service does not work. RTD currently offers a family of services that addresses the diverse transportation needs of the region. Each type of service possesses distinctive characteristics that are designed to deliver mobility in a cost-effective manner while still meeting the goals and spirit of RTD’s mission.

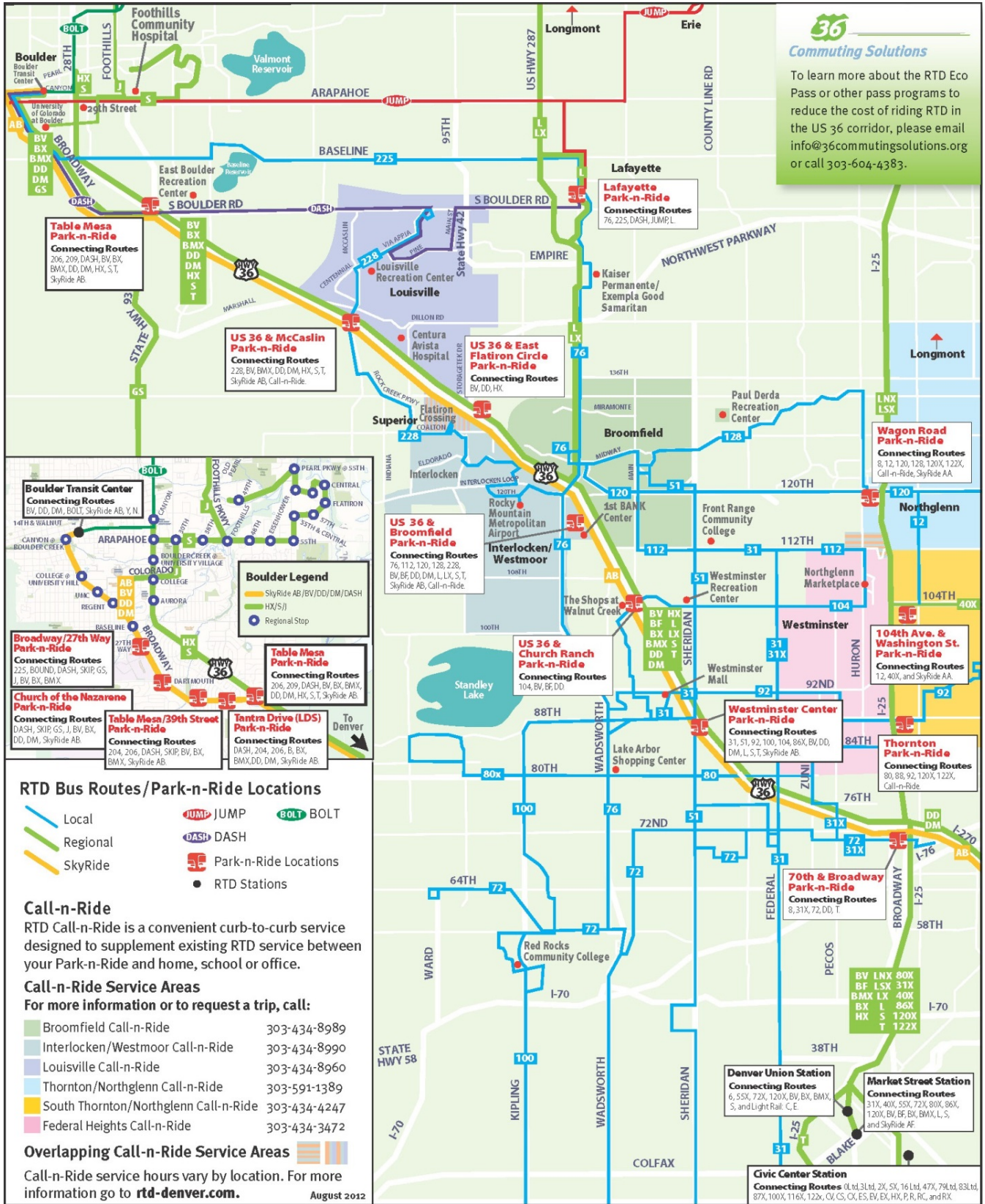
In an effort to maximize travel time savings in highly congested corridors in the regional transportation system, RTD will introduce a new class of service, known as Bus Rapid Transit or BRT. Bus Rapid Transit (BRT) has been considered as an alternative for rapid transit service on the US 36 Corridor since the completion of the US 36 Major Investment Study in 2001. Figure 4.1 on the following page defines the physical extent of this corridor and presents the primary bus services along US 36 and its bus feeder networks. The US 36 BRT Corridor is approximately 19 miles in length and including the Managed Lane section on I-25, the total length of the BRT corridor is 25 miles.

Consistent with the Federal Transit Administration’s (FTA) Characteristics of Bus Rapid Transit for Decision-making Report, BRT has seven generalized elements:

- Running way
- Stations
- Vehicles
- Fare Collection
- Intelligent Transportation Systems (ITS)
- Service and Operating Plans
- Branding Elements



Figure 4.1 US 36 BRT and RTD Feeder Network



## 4.2 Comparison to other U.S. BRT Systems

There are many different types of Bus Rapid Transit systems planned or in operation across the United States. They include exclusive lane or bus way BRT that are full separated alignments without traffic signals. There are also mixed traffic BRT systems that have a combination of exclusive lane and non-exclusive lanes and operate street running subject to traffic signalization.

US 36, currently under construction, will operate in an exclusive lane either in the managed lane or bus-on-shoulder application. Table 4.1 below provides a comparison of US 36 BRT to peer US BRT systems that operate or will operate with this similar feature – Roaring Fork Valley, CO; Santa Clara, CA; Los Angeles, CA; and San Diego, CA.

**Table 4.1 US 36 BRT Comparison to other Peer US BRT Systems Using Exclusive Lanes/Busways**

Name	Denver RTD	Roaring Fork Valley	Santa Clara	Los Angeles	San Diego
<b>Element</b>	Proposed US 36 BRT - Opening Day	VelociRFTA	El Camino (State Route 82)	Orange Line	I-15 BRT
<b>Guideway</b>					
<b>Guideway Type</b>	Managed Lanes	Highway Curb Lane, Dedicated HOV Lane in Peak Periods	Exclusive bus way	Exclusive bus way	Managed Lanes
<b>Guideway Priority Measures</b>					
<b>Queue Jumps</b>	Yes	Yes	No	No	No
<b>Guideway Length</b>	25 miles	40 miles	17.2 miles	14 miles	20 miles
<b>Stations</b>					
<b>Number of Stations</b>	6	9	16	14	5
<b>Design</b>	Enhanced Stations	New	Enhanced Stations	Enhanced Stations	Enhanced Stations
<b>Amenities</b>	TVMs Real time signs Benches Lighting Bike Lockers Parking	TVMs Real time signs Benches Recycling Bicycle Parking Lighting	TVM Real Time signs Benches	TVM Real time signs Benches Bicycle Parking Public Art Security Cameras Lighting	Parking Real Time signs Benches



Name	Denver RTD	Roaring Fork Valley	Santa Clara	Los Angeles	San Diego
<b>Vehicles</b>					
<b>Vehicle Description</b>	MCI 45 ft. Intercity Coaches	Gillig, 40 ft., CNG, Low-Floor	60 ft. articulated, hybrid buses, 4 doors (low floor)	NABI, 65 ft. articulated, low floor, 66 passenger	Over the road coach type vehicle and new flyer articulated (low floor)
<b>Number of Vehicles</b>	59 opening day 97 by 2035	16	TBD	28	20 Coach, 29 Articulated
<b>Boarding</b>	Front door boarding is assumed with a smart card fare system currently used by RTD.	Front door boarding; 9 inch platform height.	All door boarding	All door boarding	Front door boarding transition to all door boarding
<b>Level Boarding</b>	No	No	Level Boarding	No	No
<b>Fare Collection</b>					
<b>Type - smart card; on platform TVMs</b>	Smart-card fare collection; Off-Board	On-Board, Smart card	Off-Board	Automated fare machines for fare prepayment	On-Board
<b>Technology/ITS</b>					
<b>Real Time Information</b>	Stations will have a PID (Public Information Display)	Yes	Yes	Yes	Yes
<b>Signal Priority</b>	TSP will be implemented and provide 70 to 135 seconds of transit travel time savings.	Yes	Yes	Yes	Yes
<b>Wi-Fi, other</b>	Yes	Yes	Yes	Yes	No
<b>Service</b>					
<b>Span of Service</b>	20 hours	19 Hours	20 Hours	22 Hours	18 Hours

Name	Denver RTD	Roaring Fork Valley	Santa Clara	Los Angeles	San Diego
<b>Average Frequencies</b>	4 to 8 Minutes Peak; 15 to 20 minutes Off Peak	10 Minutes Peak, 15 Minutes Off Peak	10 Minute	4 to 5 minutes peak; 10 to 20 minutes Off Peak	10 - 15 Minutes Peak, 15 - 30 Minutes Off Peak
<b>Stop Spacing</b>	3 miles	9 miles to 7 blocks	4 Miles	One mile average	4 Miles
<b>Branding Elements</b>					
<b>Unique Identification</b>	Yes - Specific for US 36	Yes	Yes	Yes	Yes
<b>Marketing</b>	Yes	Yes	Yes	Yes	Yes
<b>Costs</b>					
<b>Capital Cost</b>	\$270.8 million*	\$46.1 million	\$216 million	\$304.6 million	\$246 million
<b>Funding</b>					
<b>Section 5309</b>	No	Yes	No	No	No
<b>Small Starts</b>	No	Yes, but Exempt	No	No	No
<b>Other</b>	RTD Sales Tax and CDOT, US DOT ARRA	Local Sales Tax and Bonding Authority for match	\$45 Million from State Prop 1B	State and Local Funds	Federal, State and TransNet
<b>*Represents RTD's total US 36 PH 2 budget in 2030-2031 dollars; these dollars would be reduced if paid out earlier.</b>					

### 4.3 U.S. 36 BRT Program

RTD's US 36 BRT FasTracks program includes two implementation phases. Phase 1, completed in May 2010, was the first FasTracks project to reach 100 percent completion. The \$19.0 million, US 36 Phase I Transit Improvements consisted of three separate projects along US 36 designed to improve park-n-Ride access and travel-time savings between Boulder and Denver. Improvements included pedestrian bridges and bus stops for McCaslin, Church Ranch, and Broomfield stations.

In late 2010, Phase 2 BRT improvements were initiated. This multi-modal project being constructed by RTD and CDOT will build an express lane in each direction to accommodate HOV, Bus Rapid Transit and tolled Single Occupancy Vehicles. CDOT, the Federal Highway Administration, DRCOG, and RTD are funding the \$312 million project (express lane and BRT components). On April 5th, 2013, a concessionaire was selected for the final completion of the US 36 improvements to the entire US 36 corridor between Denver and Boulder. The express lanes project is scheduled to be completed by the end of 2015.

### 4.4 Confirmation of Capital and Operating Commitments

The Northwest Area Mobility Study determined a number of important final remaining capital commitments for the US 36 BRT line currently under construction and planned to open in 2016. The study also confirmed operating and maintenance (O&M) costs, the final operating plan for opening day, as well as the service levels and fleet requirements needed for the 2035 full service plan.

For more information on these elements please refer to the *Task 2 Report – US 36 Bus Rapid Transit Summary Report*.

Confirmation of US 36 BRT final operating and maintenance plan, service levels and costs were important to the Northwest Area Stakeholders. The following is a summary of the key elements of the US 36 BRT operating plan:

- Operating Plan and Service Levels - Opening Day 2016 and Future 2035 – For both Opening Day and 2035, RTD's operating plan is to provide Peak and Off Peak Service – Peak Service will be provided in the AM between 6am -9am; PM between 3pm-6pm; the total span of service will be between 4:15am and 12:59pm. **Tables 4.2 and 4.3** provide US 36 BRT Peak and Off-Peak Service Levels by Station for Opening Day and 2035:

**Table 4.2 US 36 BRT Peak and Off-Peak Service Levels by Station (2016)**

Station	2016 Arrivals			2016 Arrivals (reverse direction)		
	Headways (min)			Headways (min)		
	EB/SB	WB/NB	1-way	WB/NB	EB/SB	1-way
	AM Peak	PM Peak	Off-Peak	AM Peak	PM Peak	Off-Peak
<b>Table Mesa</b>	2:51	2:51	12:00	4:37	4:37	12:00
<b>McCaslin</b>	2:51	2:51	12:00	4:37	4:37	12:00
<b>Flatiron</b>	6:19	6:19	20:00	15:00	15:00	20:00
<b>Broomfield</b>	3:26	3:26	13:03	7:04	7:04	13:03
<b>Church Ranch</b>	6:19	6:19	20:00	15:00	15:00	20:00
<b>Westminster</b>	3:38	3:38	13:03	7:04	7:04	13:03

**Table 4.3 US 36 BRT Peak and Off-Peak Service Levels by Station (2035)**

Station	2035 Arrivals			2035 Arrivals (reverse direction)		
	Headways (min)			Headways (min)		
	EB/SB	WB/NB	1-way	WB/NB	EB/SB	1-way
	AM Peak	PM Peak	Off-Peak	AM Peak	PM Peak	Off-Peak
<b>Table Mesa</b>	1:35	1:35	6:40	1:52	1:52	6:40
<b>McCaslin</b>	1:35	1:35	6:40	1:52	1:52	6:40
<b>Flatiron</b>	3:32	3:32	10:00	4:17	4:17	10:00
<b>Broomfield</b>	1:51	1:51	7:54	2:47	2:47	7:54
<b>Church Ranch</b>	2:37	2:37	10:00	3:45	3:45	10:00
<b>Westminster</b>	1:54	1:54	7:54	2:47	2:47	7:54

- Fleet Requirements - For US 36 BRT opening day, RTD estimates that 59 vehicles (including spares) will be required. It is assumed that the fleet will include 43 base system buses (36 plus seven spares in the existing fleet) with the 16 remaining buses as expansion vehicles through the FasTracks program. A total of 97 buses (102 buses including spares) will be needed for 2035.

- Operating and Maintenance (O&M) Costs - RTD's current estimate of O&M costs for Opening Day 2016 is \$9.5m (in inflated dollars); for 2035 O&M costs are estimates at \$44.1m (in inflated dollars).

### Remaining Capital Commitment

A primary purpose of this element of the study was to determine the remaining capital commitments for the US 36 BRT Corridor for both opening day and post-opening day. On July 30th, 2013 at the joint Policy and Technical Advisory Committee, stakeholders accepted the study findings and recommendations for the US 36 BRT Remaining Capital Commitments. Opening day commitments were confirmed for station amenities and security, passenger communications, transit signal priority treatments and the acquisition of BRT fleet to provide opening day service. For post-opening day, the remaining major capital commitments were also agreed to by the stakeholders and are outlined in **Table 4.4**.

**Table 4.4 US 36 BRT Additional Major Capital Elements with Remaining FasTracks Commitment**

Major BRT Element	Cost Range	Assessment of Need/Cost
<b>Broomfield north side park-n-Ride 870 spaces</b>	\$21.1m for structured spaces; \$2.5 for ped bridge extension	Development of north side PnR pending Broomfield construction of 120th Avenue ramp from WB US 36. Implementation phasing for PnR and ped bridge extension to be coordinated with ramp environmental approval and has been programmed. Recommended for funding with remaining FasTracks US 36 BRT Commitment for passenger convenience
<b>Westminster Pedestrian Bridge</b>	\$2.3m	Improvements for vertical circulation at Westminster Center Station. (This could involve constructing stairs on the south side of US 36 or constructing two elevators on each side of the ped bridge. Estimate provided includes elevators). Recommended for funding with remaining FasTracks US 36 BRT Commitment for passenger convenience.
<b>Relocation of Church Ranch Platforms</b>	\$4.1m	Currently, the walk from parking to boarding area is substantial. This improvement would make the BRT station more accessible by bringing it closer to both the parking area as well as the underpass for easier access to service in both directions. Recommended for funding with remaining FasTracks US 36 BRT Commitment for passenger convenience.

## 4.5 Overall US 36 BRT Assessment

In summary, the US 36 BRT system underway includes all of the features used by other similar sized transit agencies for BRT service that use a highway corridor. Dedicated lanes coupled with high frequency service levels (less than three minutes at most stops) that are proposed for this system exceeds the typical ten-minute peak headway frequency used by other BRT systems.

The US 36 BRT system, as proposed, takes advantage of all of the current technology tools available, including TSP, Queue Jumps, PID information, CAD/AVL and Smart Cards for fare collection to decrease travel times and dwelling times to provide a service schedule that is unmatched by other highway BRT systems. The US 36 BRT system provides shelters and amenities at every station that are comparable to other highway BRT systems as well.

## 4.6 Key Findings and Recommendations

On July 30th, 2013 at the joint Policy and Technical Advisory Committee, stakeholders accepted the study findings and recommendations for the US 36 BRT Remaining Capital Commitments as outlined above. RTD also committed to US 36 opening day elements including station amenities, station security upgrades, traffic signal priority improvements at key US 36 Station interchanges, passenger communications improvements (Wi-Fi, arrival time information) and sufficient fleet to meet the 2016 opening day service plan. On September 17, 2013 the RTD Board of Directors approved the final scope elements for US 36 Bus Rapid Transit. **Appendix F** of this report provides the complete September 17, 2013 RTD Board Action on the Approval of Final Scope Elements for US 36 Bus Rapid Transit.

On April 9, 2014, based on internal discussions, the US 36 Mayors/Commissioners Coalition (US 36 MCC) with the City of Longmont and the North Area Transportation Alliance (NATA), endorsed the NAMS process and provided approval of Final Scope Elements for US 36 Bus Rapid Transit, consistent with RTD Board of Directors Report (September 17th, 2013). The NAMS Final Consensus Statement dated May 1, 2014 is provided as **Appendix G** of this Final Report.

## 5.0 Northwest Rail and North Metro Extension

### 5.1 Northwest Rail

Northwest Rail (NW Rail) is an original element of the 2004 FasTracks Plan. NW Rail is proposed as commuter rail service utilizing the existing BNSF freight corridor between Denver Union Station and Longmont – connecting through Westminster, Broomfield, Louisville, and Boulder. This element of the NAMS Study evaluated operational/service and construction phasing options along the NW Rail line from the South Westminster/71st end-of-line station (currently under construction as part of the Eagle P3 project) to Longmont as possible early implementation options. Phasing segments evaluated included Westminster Center/88th Avenue, Church Ranch, Broomfield/116th Avenue, Louisville, Boulder Junction and Downtown Longmont.

#### 5.1.1 Review of Previous Northwest Rail Information

The Study Team utilized several existing data sources early in the Study to develop a comprehensive history of work done to date or in progress. Among the studies evaluated were:

- RTD's Northwest Rail Environmental Evaluation (EE)
- North I-25 Environmental Impact Statement (EIS)
- North Metro Environmental Impact Statement
- Draft information from CDOT's Inter-Regional Connectivity Study

### 5.1.1.1 Northwest Rail Environmental Evaluation

In 2010, the NW Rail EE was completed after evaluating eight rail alternatives. The preferred EE Alternative was Alternative B: double tracking from Denver to Longmont within the BNSF's existing right-of-way. This 41 mile corridor between Denver Union Station (DUS) and Longmont was to be a shared corridor between RTD's commuter trains and BNSF's freight trains. The commuter service would utilize diesel multiple unit (DMU) technology. The equipment was to be maintained at RTD's Commuter rail maintenance facility, now proposed to be located near I-70 and I-25.

The cost estimated in the EE for necessary rail improvements and proposed FasTracks stations (Church Ranch, Flatiron, Downtown Louisville, Boulder Junction, Gunbarrel and Longmont) was \$1.0 billion (in 2015 dollars). The cost also included the shared line between DUS and Pecos (currently under construction as part of the Eagle P3 project) and four unfunded stations located at Westminster (88th Ave.), Broomfield (116th Ave.), East Boulder, and Twin Peaks.

### 5.1.1.2 Key Track Criteria

A key assumption in terms of the potential segmenting of NW Rail commuter service was the need for BNSF to "chamber" freight trains during those times that RTD's commuter trains would be utilizing the corridor. In order to prevent these "waiting" freight trains from blocking vehicle traffic for significant amounts of time at street crossings, BNSF would require 10,000 feet of track without at-grade highway-rail crossings (unobstructed) to the north of the "end of line" station.

The following chambering track criteria were used to determine the location of the track:

- 10,000 feet of unobstructed track
- Double Track
- Avoiding grade crossings and/or minimizing the need for grade separations
- Stage freight trains as close to Denver as possible while avoiding impacts to commuter rail operations
- Chambering track would be incorporated into future segments of commuter rail

### 5.1.1.3 Phasing and Feasible End-of-Line Stations

The purpose of the study was to evaluate operational/service and construction phasing options. To begin this effort study team members reviewed BNSF's track charts as well as the previously submitted 30% drawings that BNSF developed in response to the RTD's operating scenario described in Section 5.1.2 below. These documents were reviewed to establish end of line sketches that were utilized to evaluate the feasibility of a particular segment's physical ability to accommodate an end of line station location capable of meeting BNSF's 10,000 foot chambering track requirement.

Construction phasing was evaluated assuming possible phasing to the following locations.

- Westminster Center (88th Avenue)
- Church Ranch
- Broomfield/Flatiron
- Downtown Louisville
- Boulder Junction
- Longmont



Other items discussed as part of the segmenting discussion for NW Rail were:

- Station location
- Available right-of-way
- Vehicle parking requirements
- Ease of access to stations
- Universal rail crossover placement
- BNSF chambering or storage track (10,000 feet) requirements
- Ridership impacts due to segmenting

#### 5.1.1.4 Recommendation of Phases

The criteria above were applied to the possible phasing locations. This analysis led to the specific identification of recommended phases for more detailed analysis. Material related to phasing was presented to the Joint Policy/Technical Committees on July 30th, 2013. At that meeting the following phasing recommendation was approved by the Policy Committee for further analysis:

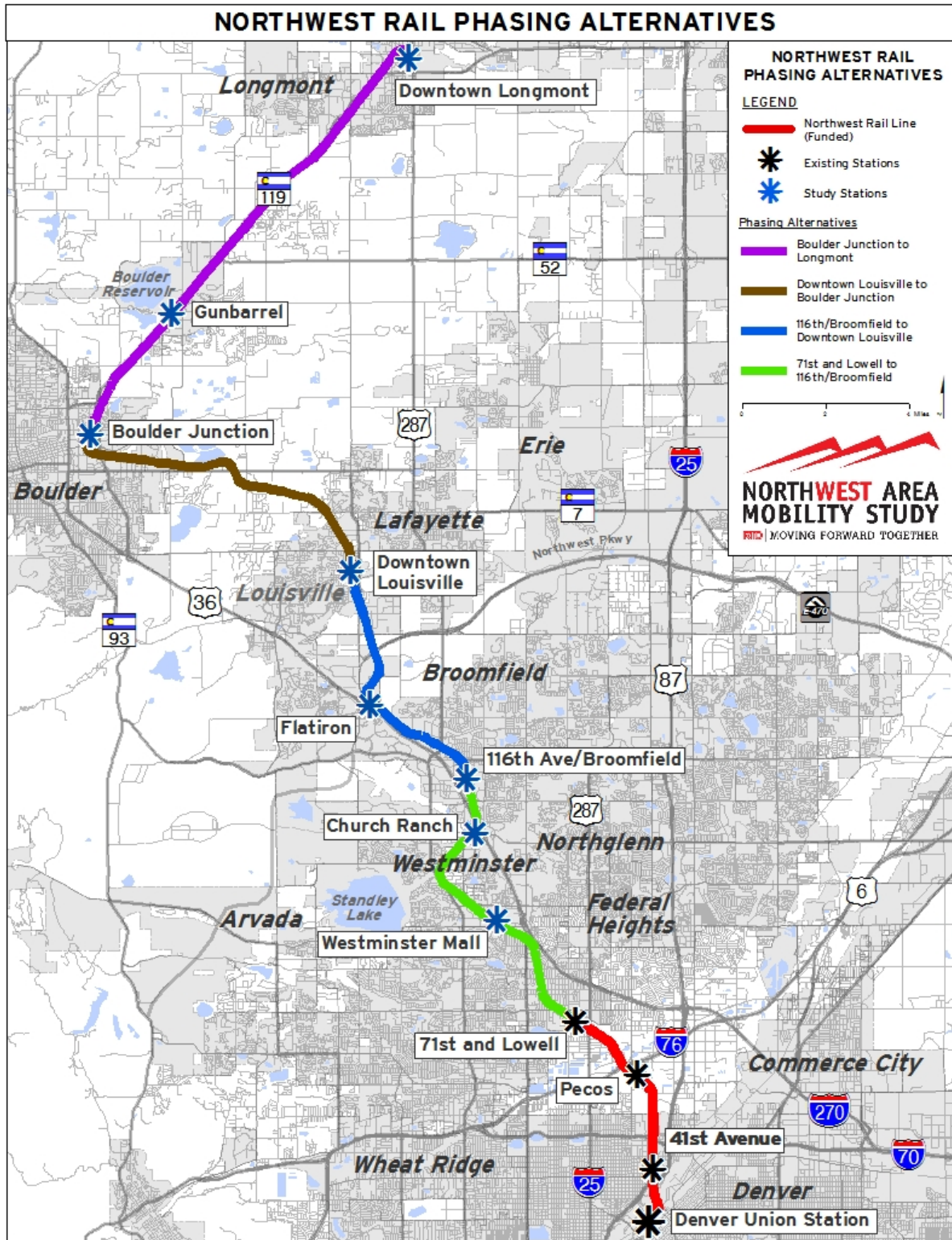
- Phase 1: 71st and Lowell (current end of line for NW Rail as part of Eagle P3 project) to Broomfield/116th Avenue
- Phase 2: Broomfield/116th Avenue to Downtown Louisville
- Phase 3: Downtown Louisville to Boulder Junction.
- In addition, the study team analyzed the remaining features of the Northwest rail line from Boulder Junction to the end-of-line in Longmont.

An analysis to determine the feasibility of the additional segment to Boulder Junction was also conducted. That analysis produced the following:

- The end of line for this segment would be at Boulder Junction: BNSF Milepost (MP) 31.4,
- It would require construction 10,000 feet of unobstructed chambering track for BNSF freight trains from MP 34 near SH 119 and Jay Road to MP 36, past proposed Gunbarrel Station location, and
- A new grade separation of North 63rd Street would be required to cross the BNSF tracks and the north bound lanes of SH 119.

Additional vehicular traffic concerns would occur at 47th Street and Independence Avenue depending on how the end of line track infrastructure is constructed. RTD would need to determine its operational characteristics for its end of line operations before design of the track improvements would be completed.

Figure 5.1 Northwest Rail Phasing Alternatives



### 5.1.1.5 Potential EMU Extension to Westminster Mall

In addition, the City of Westminster requested the project team to conduct an analysis of extending the existing segment of NW Rail electric multiple unit (EMU) technology (from Pecos Street to 71st Avenue and Lowell Boulevard as part of the Eagle P3 Project) an additional 3 miles to Westminster Mall. The analysis determined numerous issues would be involved in such an extension of EMU technology versus diesel multiple unit (DMU) technology. A listing of the issues and possible resolution are discussed below:

- BNSF Right-of-Way (ROW) limits BNSF's ability to expand capacity or share RTD track in the future
- Availability of electric power
- Maintenance facility/additional rail fleet
- Single track capacity
- Clearances (vertical and horizontal)
- Need for maintenance road(s)
- Negotiations with BNSF and Denver Transit Partners (DTP)
- Cost

The estimated cost for this electrified segment extension was \$193.5M to \$236.5M in 2013 dollars. The complete analysis including both advantages and disadvantages is included in the Task 3 Report – Northwest Rail and North Metro Extension – Technical Alternatives Report.

### 5.1.1.6 DMU Maintenance Facility

The proposed location for the maintenance facility for NW Rail is between the Church Ranch Station and the Broomfield/116th Avenue Station locations. The parcel of land is located on the northeast side of US 36 between the highway and the BNSF tracks to the east. The City of Westminster has indicated that it will donate this parcel of land for the DMU commuter rail maintenance facility.

## 5.1.2 Operational Assumptions

The assumed operations for NWR were as follows:

- Weekday service: 55 one-way trips per day between Denver and Longmont, 30 minute peak and 1 hour off peak. Peak hours are considered to be 6 – 9 a.m. and 3:30 – 6:30 p.m. No service between midnight and 4 a.m. weekdays.
- Weekend service: 36 one-way trips between Denver and Longmont, no more than hourly with hours of operation between midnight and 4 a.m.

The track throat at DUS and single track portion of NW Rail between Pecos and 71st and Lowell Stations would limit headways to not fewer than 30 minutes.

### 5.1.3 BNSF Railway Related Issues

The BNSF Railway (BNSF) is one of the two largest freight railroads operating in North America. BNSF owns and operates the line proposed for the operation of RTD's NW Rail. It is part of the BNSF's Front Range Subdivision within the Powder River Division, running freight trains from Wendover, Wyoming to Denver. This line is part of BNSF's main line network connecting the Pacific Northwest /Canada and the Northern Plains to the Texas Gulf Coast. Depending on business demands and availability of other north/south BNSF rail lines, BNSF currently operates a range of freight trains per day varying between six to eight trains per day to twelve to sixteen trains per day. BNSF was provided the initial operating plan of 55 one-way trips per weekday (peak period) with not under 30 minute headways in the peak hours and with hourly service at other times. BNSF previously provided 30% drawings of this double track option in August 2010. The estimated cost for this service was \$535 million for improvements within the BNSF Right-Of-Way.

BNSF was also asked to cost out a less frequent operating service (nine one-way trips each in the morning and afternoon peaks (6 – 9 a.m. and 3:30 – 6:30 p.m.)). There was no weekend service planned for this scenario and the cost was estimated at \$410 million. These costs assumed BNSF operation of the service and maintenance of the rail lines. While BNSF provided cost for capital and operating for both scenarios no detailed cost estimates were provided. The study team used the this generalized cost information from the BNSF to update RTD's current estimate. The estimated cost for all corridor related improvements to provide the initial operating plan of 55 one-way trips per weekday (peak period) with not more than 30 minute headways in the peak hours and with hourly service at other times was \$1.14 billion. This included \$535 million for BNSF improvements such as track, signal and other improvements within BNSF's right-of-way. It also included \$605 million for RTD improvements: Stations and park-and-rides (and associated additional right-of-way), rail vehicles and a rail maintenance facility.

#### 5.1.3.1 BNSF Response to Questions

RTD sent a letter to BNSF on August 14, 2013 (Appendix A – RTD Letter to BNSF dated August, 14, 2013 of the Task 3 Report – Northwest Rail and North Metro Extension – Technical Alternatives Report) which provided background on the Study as well as sought clarification of several assumptions being made in the Study. On September 12, 2013 BNSF provided a written response to that letter. (Appendix A – BNSF Response to RTD dated September 12, 2013 of the Task 3 Report – Northwest Rail and North Metro Extension – Technical Alternatives Report). The following summarizes the BNSF response:

In order to provide detailed answers to various questions, BNSF indicated in their letter that they need certainty from RTD on:

- Location of needed infrastructure improvements
- Proposed levels of commuter train service
- Specific timelines for improvements and dates of service start-up
- Identified funding for the commuter rail service project

BNSF noted that commuter service of the magnitude proposed by RTD will require extensive double track and other infrastructure improvements in order to protect its existing and future rail freight capacity, as well as RTD's commuter train service. BNSF indicated that the forecasting of capacity improvements required beyond a 2-5 year period is speculative due to changing costs and levels of BNSF's freight business.

## 5.1.4 Expert Rail Panel Summary

The study team used an Expert Rail Panel, comprised of senior rail project managers, from the consultant study team, for the purpose of reviewing previous work and progress of work to date on the Study and answering specific questions from the stakeholders. A key element of their work was to identify potential end of line stations for considering segments for NW Rail. A two-day meeting of the Expert Rail Panel was held in late June 2013 prior to their meeting with the Technical Advisory Committee on June 28, 2013. Meeting notes from the Expert Rail Panel discussions are included in the Task 2 Report - Northwest Rail and North Metro Rail – List of Improvements and Range of Alternatives.

A second meeting of the Expert Rail Panel was held on October 2, 2013 prior to their meeting with the Technical Advisory Committee on October 3, 2013. The purpose of this meeting was to review the work to-date on both Northwest Rail and North Metro Extension to Longmont to assure the accuracy of the scope and definition of the phasing effort for Northwest Rail and the development of the Alternatives for the North Metro Extension. Meeting notes from those Expert Rail Panel discussions are included in the Task 3 Report - Northwest Rail and North Metro Extension – Technical Alternatives Report.

## 5.1.5 Ridership and Travel Time Results

NAMS Focus Model (DRCOG 2035 model modified to model the Northwest Rail phasing) was used to calculate both ridership and travel time performance of the Northwest Rail segments. Table 5.1 provides a summary of AM Peak Travel Times for key origin and destination pairs. That model contains the full service plan for US 36 Bus Rapid Transit (BRT), all background bus service assumed in the RTP, and NW Rail from Denver Union Station (DUS) to 71st Avenue and Lowell Boulevard. When the ridership data was presented to the Technical Advisory Committee (TAC) at the August 20th, 2013 meeting, there were concerns about the inputs to the model in regard to DRCOG'S forecast of future population and employment. A sensitivity analysis was later conducted after the various jurisdictions in the Study area had an opportunity to review the Traffic Analysis Zone (TAZ) sub-area data used in the NAMS Focus Model (DRCOG 2035 model modified to model Northwest Rail Phasing). Changes were made "off-model" ('updated' data will NOT be incorporated into the model) to reflect local stakeholder's forecast of additional population and employment above and beyond the DRCOG regional forecast and to assess the impact of these changes on future rail ridership. The net change in population and employment (nearly 43,951) was converted to 175,804 daily person trips (4 trips/person/day). Four percent of these total trips were assumed to be transit trips. The assumption of 20% of these transit trips being potential NW Rail trips yielded an additional 1,400 commuter rail trips per day for NW rail. This would raise the projected 9,300 trips/day based on the full NW Rail model run to 10,700 rail trips/day. Table 5.2 provides a summary of 2035 daily boardings of the phased segments including completion of the corridor to Longmont. It is to be noted that DRCOG is held to a regional control total. This sensitivity analysis was done to estimate the impact of jobs and housing based on local stakeholders' current plans and forecasts, only. DRCOG land use data is a snapshot in time that cannot realistically account for development that was recently approved or is in the planning stage.



**Table 5.1 AM Peak Period Travel Time (For Key Origin-Destination Pairs in Northwest Corridor)**

US 36 BRT or Regional Bus Origin – Destination (DUS)	Travel Time in Minutes	NW Rail Origin – Destination (DUS)	Travel Time in Minutes
Longmont Station (via I-25)	53	Longmont Station	71
Boulder Junction	38	Boulder Junction	52
Table Mesa	26	N/A	N/A
McCaslin	22	Louisville	38
Broomfield / 116 <sup>th</sup> Avenue	19	Broomfield / 116 <sup>th</sup> Avenue	27
Westminster Center	13	South Westminster / 71 <sup>st</sup> Avenue	13

Note: NW Rail travel times include FasTracks and Non-FasTracks stations.

**Table 5.2 Northwest Rail Phased Ridership by Segment**

Corridor - Phase	2035 Daily Boardings	
	Low	High
71 <sup>st</sup> and Lowell to Broomfield/116 <sup>th</sup> Avenue	2,100	3,400
Broomfield/116 <sup>th</sup> Avenue to Louisville	1,700	1,800
Louisville to Boulder Junction	2,000	2,100
Boulder Junction to Longmont	1,500	1,600

*Ridership presented is incremental ridership between segments and does not reflect the total ridership between Longmont and DUS of 9,300 -10,700.*

### 5.1.6 Capital and Operating and Maintenance Cost Estimates

The following sections discuss the capital as well as operations and maintenance costs for the NW Rail corridor.

#### 5.1.6.1 Capital Cost Estimate Verification

The cost estimates previously developed by BNSF and RTD were reviewed by the Study Team to confirm that those costs can be utilized, generally on a per mile basis, for the purpose of this study. The analysis to determine an estimate of the costs of various segments for potentially building NW Rail incrementally included the following assumptions:

- Costs are in 2013 dollars
- Based on previously submitted BNSF 30% drawings and the above described segmenting of NW Rail
- Based on 30% Regional Transportation District (RTD) Station and Park-n-Ride plans
- RTD's updated Annual Program Evaluation (APE) cost estimate
- All segment costs include end of line improvements and chambering track for BNSF freight trains
- Rail vehicles and maintenance facility
- DMU equipment operating on double track
- 30 minute peak/60 minute off-peak service (55 trains/day)
- DMU performance model data as obtained from RTD



- Non-FasTracks funded stations (4) were included

The estimate of identifying BNSF's costs to provide time slots on their freight railroad for the operation of commuter trains was based on the following assumptions:

- BNSF previously quoted the cost for capital and operating rights (related to 55 trains per day) as \$535 million
- BNSF quoted the cost of \$410 million for capital and operating rights for 18 trains per day
- While BNSF did not provide any detailed cost breakdown of their estimate, it can be extrapolated that
  - o the difference in cost (\$125 million) divided by the difference in the number of trains per day (37) equals approximately \$4 million per train
  - o 55 trains per day multiplied by \$4 million per train totals \$220 million; or the cost to have the right to operate trains on BNSF's lines
  - o The capital cost estimate for BNSF related improvements is \$315 million (\$535 million - \$220 million).

### 5.1.6.1.1 Phasing cost estimates

The BNSF capital costs were then prorated to the various segments based on the rail mileage of the different segments. The study team developed several versions of the cost estimates as they were reviewed by members of the consultant team and RTD. These cost estimates were then placed into ranges (+ / - 10 %) for the purposes of this study.

It should be noted that these cost estimates have not been reviewed or approved by BNSF. Also, final negotiations with BNSF and a time certain implementation will have a direct impact on final costs. Costs for BNSF's operating rights may change over time.

**Table 5.3 Northwest Rail (38 miles) – Capital Cost Range Summary**

	<b>Segment 1 71<sup>st</sup> Lowell to 116<sup>th</sup> / Broomfield</b>	<b>Segment 2 116<sup>th</sup> / Broomfield to Louisville</b>	<b>Segment 3 Louisville to Boulder Junction</b>	<b>Boulder Junction to Longmont</b>	<b>Full Corridor</b>
Segment Totals	\$557-\$681	\$159-\$194	\$241-\$295	\$199-\$243	\$1,156- \$1,413
* <i>Costs in millions of dollars (\$ 2013) and includes non-FasTracks stations (\$140 million)</i>					
** <i>Costs for Segment 1 include the Maintenance Facility and BNSF Operating Rights for the entire NW Rail Corridor</i>					
*** <i>Costs per mile \$30.4M/mile to \$37.2M/mile</i>					

### 5.1.6.2 Operating and Maintenance Cost Estimates

The total estimated 2035 annual O&M cost in 2013 dollars for NW Rail between Denver Union Station and the City of Longmont was estimated to be \$23,236,014. O&M costs per Northwest Rail Segment were proportioned based on the mileage per segment. Embedded in this estimate was a cost risk for Maintenance-of-Way fees required by the BNSF. It was recommended that contingency should be added to the estimated value above to account for unanticipated costs prior to formal negotiations. Task 3 – North West Rail and North Metro Extension – Technical Alternatives Report describes the methodologies utilized to determine the O&M cost for Northwest Rail and the North Metro Extension.

## 5.2 North Metro Rail Extension

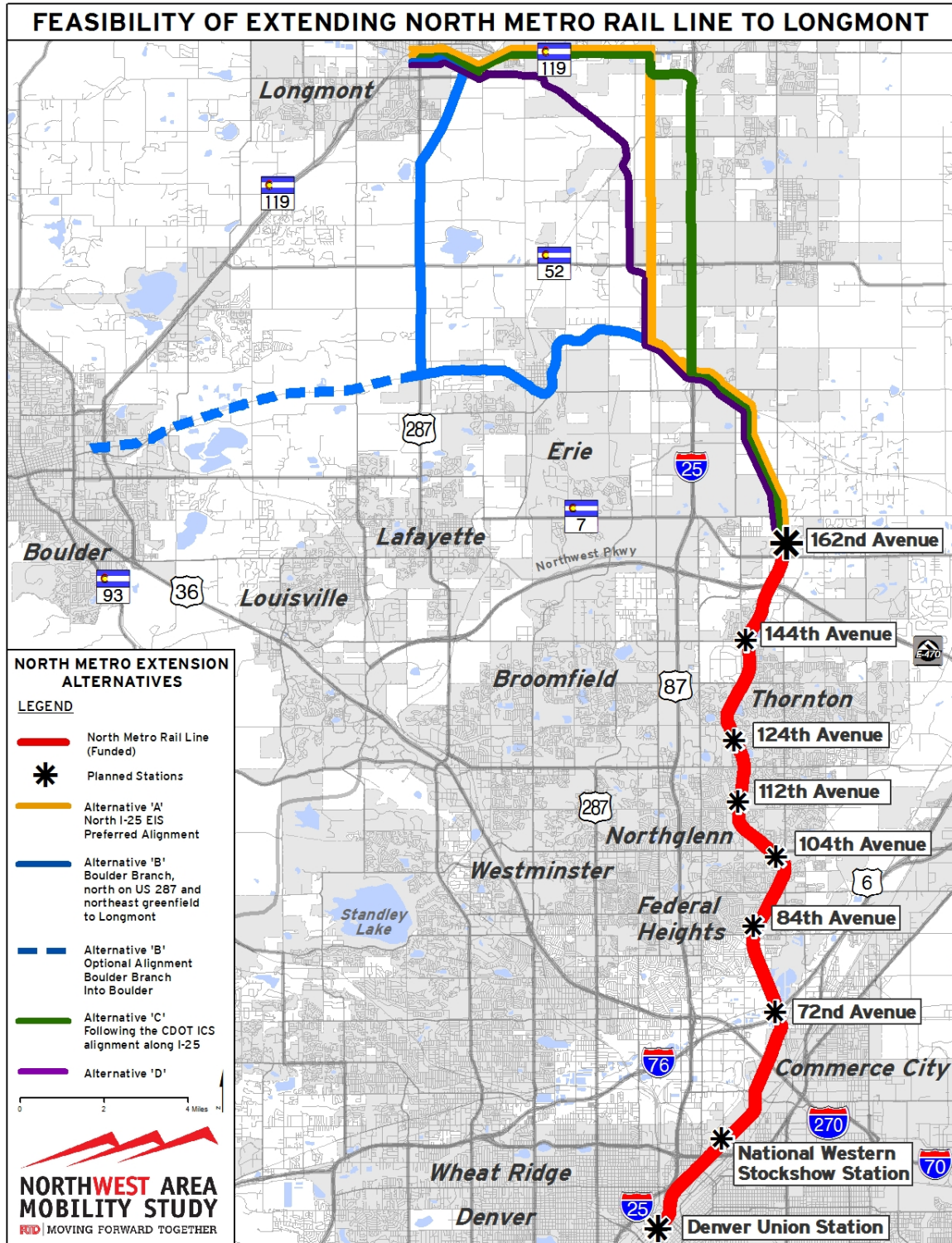
An additional element of the Study evaluated the feasibility of extending FasTracks' North Metro Line to Longmont as an alternative to providing commuter rail service to Longmont on NW Rail through Boulder. Four alternative alignments were evaluated in the Study to connect Longmont to the proposed end of line for the North Metro at 162nd Avenue.

### 5.2.1 Description of North Metro Rail Extension Alternatives

Four alternatives were developed for review by the Study stakeholders and for initial environmental analysis (See Figure 5.2 for a map of candidate alternatives):

- **Alternative A** - Alternative A is the CDOT North I-25 EIS's "Preferred Alignment" for commuter rail connecting the North Front Range area to the Denver metropolitan area. That 2006 Study evaluated various highway and rail transportation options. The alignment generally follows the SH 119 highway right-of-way east out of Longmont and then turns south at Weld County Road 7 and follows that alignment until it reaches the Boulder Branch, formerly owned by the Union Pacific Railroad but now owned by RTD. It then crosses over I-25 and follows the Boulder Branch to the North Metro end of line at 162nd Ave and Colorado.
- **Alternative B** - Alternative B alignment generally follows the SH 119 highway right-of-way east out of Longmont and then turns to the south and southwest through the Boulder County Open Space property until it reaches US 287 south of Longmont. It parallels US 287 until it reaches the Boulder Branch right-of-way and then turns east. It proceeds through Erie along the Boulder Branch right-of-way toward I-25 and then follows the same route as Alignment A to the North metro end of line station at 162nd Avenue and Colorado. Alternative B is a stub branch that utilizes the Boulder branch line and extends west from US 287 into Boulder.
- **Alternative C** - Alternative C is similar to Alternative A except that instead of following Weld County Road 7 as it proceeds from north to south east of Longmont, this Alternative follows the same I-25 right of way that is proposed to be used by the high speed rail corridor being studied in CDOT's Inter-regional Connectivity Study (ICS). It follows this alignment until it also reaches the Boulder Branch, where it crosses over I-25 and follows the Boulder Branch to the North Metro end of line at 162nd Avenue and Colorado.
- **Alternative D** -Alternative D is a variation of Alternative A that attempts to avoid some of the development that has and will occur along Weld County Road 7. The line leaves Longmont; generally following an old BNSF owned right-of way known as the Lafayette Branch. This alignment proceeds across the St. Vrain River in a southeasterly direction generally toward Weld County Road 7 before turning to the south and then southwest to avoid a large new housing development on County Road 7 just north of SH 52. After crossing SH 52 the alignment moves back to the east along Weld County Road 7 and then follows the same alignment as Alignment A to the north Metro end of line station at 162nd Avenue and Colorado

Figure 5.2 Alternatives for Extending North Metro Rail Line to Longmont



## 5.2.2 Preliminary Environmental Assessment of Alternatives

A preliminary environmental assessment of the North Metro extension alternatives was conducted to determine if there were any environmental impacts that could possibly reduce the number of alternatives considered for further analysis. Alignments A, B, C, and D as described above were evaluated on the following criteria: Wetlands (acres), Waterway Crossings (number of crossings), Future Land Use (residential, commercial, and parks and trails – acres), and Boulder County Open Space (acres).

At the conclusion of the preliminary environmental assessment, the following alignments were recommended to be eliminated from further analysis, due to the number of potential Wetland and open space impacts:

- Alignment B
- Alignment B (optional – included 8.5 mile spur into Boulder)
- Alignment D

From this analysis, Alignments A and C were recommended to be retained for further analysis. Specific results from the analysis are shown in detail in Task 4 Report – Study Evaluation Process, Results and Prioritization Recommendations.

## 5.2.3 Refinement of North Metro Extension Alternatives for Detailed Evaluation

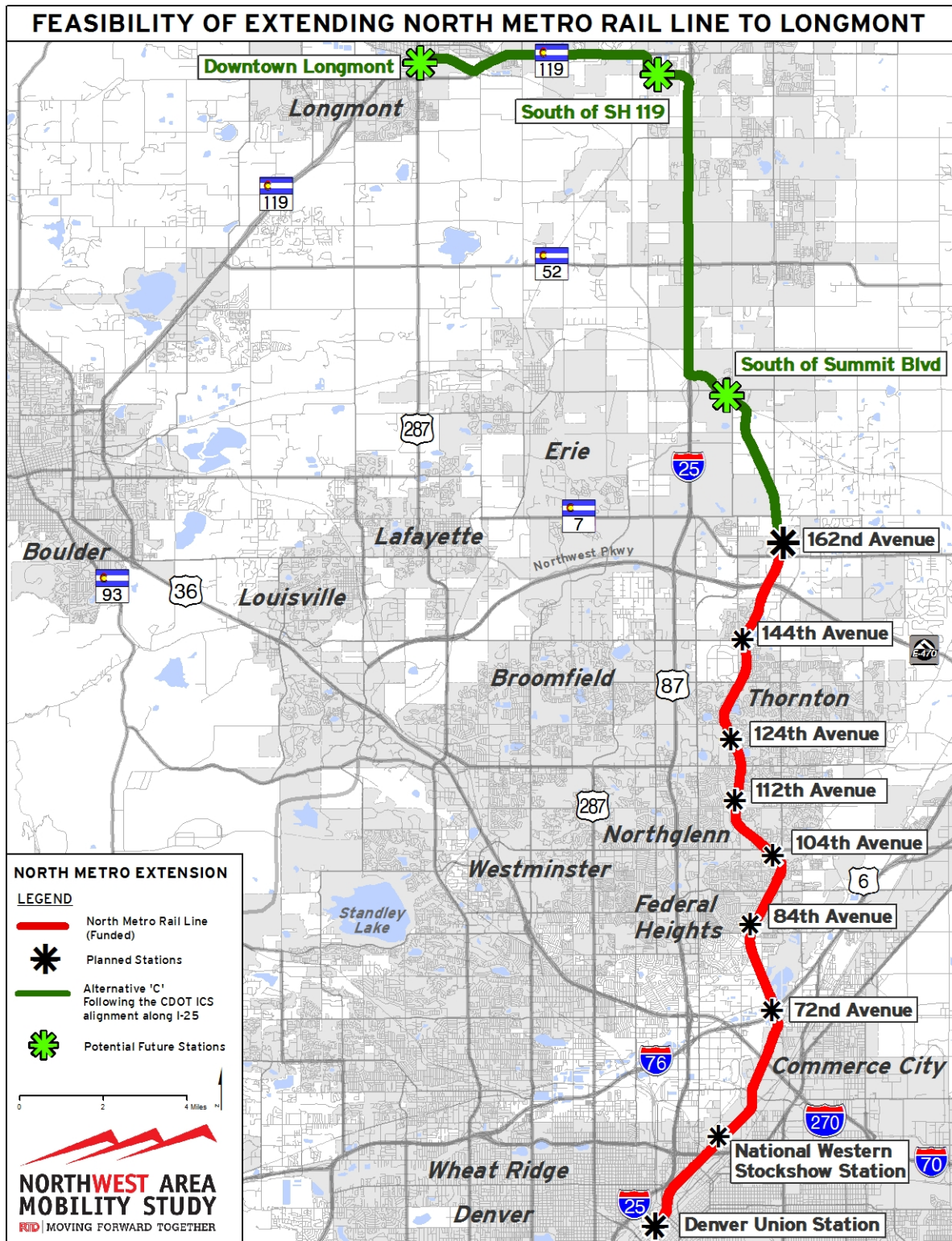
The determination was made early in detailed level evaluation to focus further analysis of cost and ridership on Alternative C. This is the alignment that would utilize the I-25 ROW for the north/south section instead of proceeding along Weld County Road 7 as was proposed in Alternative A. Alternative C would require considerably less ROW acquisition because approximately 7 miles of this alignment are in Colorado Department of Transportation (CDOT) I-25 ROW. There would be fewer environmental and other impacts in this section of I-25 ROW as well.

A preliminary concept sketch of the North Metro line's proposed interaction with the CDOT high speed rail alignment in the I-25 ROW was prepared and reviewed by the project team. Following approval of the concept, detailed drawings were created for the entire corridor from the North Metro end of line station at 162nd Avenue to the proposed Longmont Station site. These drawings are shown in the *Task 3 Report – Northwest Rail and North Metro Extension – Technical Alternatives Report*. Project team members met with Longmont city officials in August 2013 to discuss access issues into Longmont and also preferred station locations for commuter rail to Longmont utilizing a North Metro Rail extension. The drawings/mapping of the Longmont Station area was based on that meeting.

Working with the stakeholders, the study identified three station locations, South of Summit Boulevard, West of I-25 (inside the RTD District), South of SH 119, West of SH 7 (outside of RTD District) and downtown Longmont shown in **Figure 5.3**.



Figure 5.3 North Metro Extension – Alignment “C”



## 5.2.4 Operational Assumptions

The assumed operations for North Metro Extension to Longmont are the same as for NW Rail. This allowed for a reasonable comparison of commuter rail options from Denver Union Station to Longmont.

- Weekday service: 55 one-way trips per day, 30 minute peak and 1 hour off peak. Peak hours are considered to be 6 – 9 a.m. and 3:30 – 6:30 p.m. No service between midnight and 4 a.m. weekdays.
- Weekend service: 36 one-way trips between Denver and Longmont no more than hourly with hours of operation between 4 a.m. and midnight.

DMU technology is assumed for North Metro Extension from 162nd Ave. and Colorado, to Longmont.

**Table 5.4 Assumed Speeds for North Metro Travel Time Analysis**

Segment	Location	MPH Restrictions
South Segment	Between station at 162 <sup>nd</sup> Avenue and station just south of Weld County Road 8	<ul style="list-style-type: none"> <li>• 79 mph</li> <li>• 40 mph curve through St. Vrain Junction</li> </ul>
Middle Segment	Between County Road 8 Station and station southwest of I-25 and SH 119	<ul style="list-style-type: none"> <li>• 50 mph north of CR 8 station slowing to 25 mph entering curves at I-25 median</li> <li>• 79 mph until exiting median @ 40 mph and on into station southwest of I-25 and SH 119</li> </ul>
North Segment	Between station southwest of I-25 and SH 119 and Longmont end of line station	<ul style="list-style-type: none"> <li>• 35 mph leaving station until parallel to SH 119</li> <li>• 50 mph until entrance into Longmont at 30 mph</li> </ul>

## 5.2.5 Ridership and Travel Time Results

The detailed operating plan input (as previously outlined) was provided to RTD to model the North Metro alignment and service plan. The NAMS Focus Model (DRCOG 2035 model modified to model the North Metro Extension) assumed the following:

- US 36 BRT (service plan as previously discussed)
- NW Rail to 71st Avenue and Lowell Boulevard
- North Metro extended to Longmont (Alignment “C” for modeling purposes)
- RTP background bus service

Travel time results comparing regional bus, Northwest Rail and North Metro Extension from Longmont to Denver Union Station are shown on **Table 5.5**. Ridership for North Metro Extension from the NAMS Focus Model is shown in **Table 5.6**.



**Table 5.5 Travel Time Results (From Longmont to Denver Union Station)**

Route	Route End Points	Timeframe
Regional Bus	Longmont Station to DUS	53 minutes
NW Rail	Longmont to DUS	71 minutes
North Metro Extension	Longmont to DUS	59 minutes

**Table 5.6 North Metro Extension Ridership Review – NAMS Focus Model (DRCOG 2035 model modified to model North Metro Extension)**

North Metro – 30 Minute Frequencies: Average Weekday Boardings by Station	
Station	2035 Full North Metro (to Longmont)
South of Summit Boulevard – east side of I-25 (inside RTD District)	180
South of SH 119 – west side of CO 7 (out of RTD District)	335
Longmont	325
Total	840-900
* Increasing bus service frequencies on the LSX from Longmont from 6 peak trips per day and 3 off peak trips per day to every 15 minutes in the peak and 30 minutes in the off-peak generates 650 boardings per day. Total ridership was expressed in a range to adjust for stakeholder assumptions of future population and employment growth.	

## 5.2.6 Capital and Operating and Maintenance Cost Estimates

The following sections discuss the capital as well as operations and maintenance costs for the North Metro Extension corridor.

### 5.2.6.1 Capital –Methodology, Assumptions, Utilities, ROW

The analysis to determine an estimate of the costs for building North Metro from 162nd Avenue to Longmont included the following assumptions:

- Costs are in 2013 dollars
- 19.5 mile corridor between 162nd Avenue Station and Longmont Station
- Boulder Branch owned by RTD
- Concept design for Alternative C (shared ROW in I-25 median assumed to be “public” ROW)
- Utilized units costs provide by RTD and CDOT’s Inter-regional Connectivity Study (ICS)
- Similar assumptions for rail vehicles and maintenance facility as for NW Rail
- DMU equipment operating on double track
- 30 minute peak/60 minute off-peak service (55 trains/day)
- Three stations assumed beyond 162nd Avenue
- Includes detailed costs for major utilities and structures (see Appendix I – North Metro Extension Major Utility Table of the Task 3 Report – Northwest Rail and North Metro Extension – Technical Alternatives Report).

- Estimate does not include any North Metro improvements south of 162nd Avenue for DMU operating in the North Metro “EMU Corridor”
- Cost ranges are +/- 10% of the planning cost estimate

The ROW costs were identified independently by the study team and were incorporated into the overall costs. The methodology utilized in developing the ROW related cost estimate is shown in the *Task 3 Report – Northwest Rail and North Metro Extension – Technical Alternatives Report*. The cost range for the 19.5 mile North Metro from 162nd Avenue to Longmont was between \$682 million and \$834 million. This averages \$35 million to \$43 million per mile. The cost range for the 6.6 mile segment, included in the above estimate, (between CR 8 and SH 119) within the I-25 median, sharing ROW with the CDOT ICS high speed train, was between \$82 million and \$100 million.

### 5.2.6.2 Operating and Maintenance Costs

The total estimated 2035 annual O&M cost in 2013 dollars for the North Metro Extension was \$7,898,454. The Task 3 Report – Northwest Rail and North Metro Extension – Technical Alternatives Report for methodologies utilized to determine the O&M cost for the North Metro Extension.

## 5.3 Summary and Key Findings – Northwest and North Metro Rail

The projected ridership of the North Metro Extension, less than 1,000 riders per day, in addition to the capital costs of the project lead to an annual cost per rider that is nearly six times as high as the cost per rider for NW Rail. Therefore, the study team recommended to the PAC that there be no further action related to this corridor at this time. It was also recommended, the corridor should be re-evaluated in the future as conditions change related to future population densities and the potential for any future commuter rail development by CDOT in the Longmont to Fort Collins corridor. This recommendation was adopted as part of the NAMS Final Consensus Statement, dated May 1, 2014 and included as **Appendix G** to this report.

For the NW Rail corridor, reasonable phases (or segments) exist for building the NW Rail project at some point in the future. BNSF, owner of the corridor and operator of the existing freight rail service in the corridor, has listed the conditions for their further engagement in regard to allowing for the necessary rail infrastructure construction and necessary agreements which would allow RTD to provide commuter rail service on the BNSF alignment to Longmont at some point in the future if desired.

Considering the costs of the proposed project, RTD’s current lack of FasTracks funds, ridership projections, BNSF’s conditions, and other challenges within the corridor, the completion of NW Rail is considered to be a long term goal. RTD and the stakeholders should monitor the various future implementation strategies on an annual basis, as circumstances effecting costs, ridership, the status of BNSF’s freight operations, etc. evolve. This conclusion was reached with RTD and the Northwest Area Stakeholders as part of the Final Consensus Statement, dated May 1, 2014 and is included as Appendix G of this report.

A summary of both Northwest Rail phasing options and the North Metro Extension is provided below in **Table 5.7**.

**Table 5.7 Summary of Northwest Rail Phasing Options and North Metro Rail Extension**

	<b>Westminster to 116<sup>th</sup> Ave. Broomfield</b>	<b>Broomfield to Louisville</b>	<b>Louisville to Boulder</b>	<b>Westminster to Longmont (Full Corridor)</b>	<b>North Metro Extension to Longmont</b>
<b>Weekday Ridership (2035)</b>	2,100 – 3,400	1,700 – 1,800	2,000 – 2,100	9,300 – 10,800	840-900
<b>Capital Cost (1)</b>	\$557 - \$681(2)	\$159 - \$194	\$241 - \$295	\$1,156 - \$1,413	\$682 - \$834
<b>Annual cost per trip</b>	\$36.19	\$15.34	\$26.10	\$23.42	\$138.82
<b>Travel time from DUS</b>	27 min	38 min	52 min	71 min	59 min

<sup>1</sup> Costs in millions of dollars (\$ 2013) and include stations not planned for in FasTracks (\$140M).

<sup>2</sup> The cost for this segment includes the DMU Maintenance Facility and acquiring the full NWR Corridor Operating Rights from BNSF.

## 6.0 Arterial BRT

The NAMS study also explored the potential opportunities to establish arterial Bus Rapid Transit (BRT) service in the Northwest area that would connect to the US 36 BRT and the future rail services. Over 20 corridors were originally identified, however, six corridors were determined to be potentially viable BRT candidates based on an initial high-level screening process that including an evaluation of ridership, associated capital improvements, potential operating plans, high level environmental evaluation and estimated capital and operations and maintenance (O&M) costs. Specific input was provided by RTD and Northwest Area stakeholders to define the Arterial BRT Corridors. The objective was that Arterial BRT would provide a significant opportunity to increase mobility within the Northwest study area and provide amenities and a level of service that would increase transit ridership.

### 6.1 Definition of Arterial BRT

BRT is an approach to providing high quality rapid transit service with rubber-tire buses around the world. Vehicles are primarily standard 40-foot and articulated 60-foot buses. BRT systems offer many of the same features as rail transit — high frequency, high capacity, high quality, and high reliability, along with providing riders a sense of permanence — but with greater flexibility and comparatively lower costs.

#### 6.1.1 Arterial Bus Rapid Transit (BRT) Definition

Consistent with the Federal Transit Administration’s (FTA) Characteristics of Bus Rapid Transit for Decision-making Report and input from the area stakeholders, the study definition and elements of an Arterial BRT system considered for the Northwest area included:

- Corridor Definition – route location including termini;
- Service Characteristics – four-to-six buses/hour, higher frequencies if cost-effective;
- Ridership – illustrate growth with proposed increased service frequency and attract choice riders;
- Running Way – exclusive (bus on shoulder or dedicated travel lane) or non-exclusive (curb-running);
- ITS/TSP – queue jumps, signal priority where appropriate;
- Stations/Stops/Amenities - Dedicated boarding areas, TVMs, shelters, lighting and security equipment, infrastructure based on demand;
- Park-and-Ride (PnR) – parking reserved for transit users
- Vehicles – sized for demand, low-floor;
- Branding – established for BRT service; and

In addition, special local conditions were addressed including local jurisdiction input for station locations and how stations integrate into special streetscape conditions, joint development opportunities or other local needs. Special conditions cannot be compared to other corridors. However, one advantage of BRT is the flexibility it provides fitting into the context of the local environment.

### 6.1.2 Evaluation of Northwest Area Bus System

As part of the study, the project team considered over 20 potential routings for Arterial BRT within the Northwest Area. Task 2 Report – Arterial BRT – List of Improvements and Range of Alternatives describes the study activities prior to the selection of a short list of potential route candidates for further analysis and outlined basic characteristics that may form the core of a BRT or express bus system tailored to the unique needs of the Northwest Area. This analysis was guided by three key components that were needed to confirm sufficient current ridership activity, corridor orientation to dominant travel origins and destinations and corridor development densities high enough for BRT success:

- Transit Service Performance Analysis - Arterial BRT was assumed to have at least 15 minute peak headways and 30 minute off-peak service for at least 14 hours per day consistent with national standards.
- Travel Patterns - Origin-destination patterns from the travel demand model were used to screen for the presence of major travel patterns between the study area and the overall RTD service area as well as internal to the Northwest study area. The screening sought to establish whether there was sufficient existing and forecast travel demand to support Arterial BRT investment. Boardings and alighting's were generated by the travel demand model.
- Land use - Another key determinant for BRT success is the analysis of land use density, supporting the potential mobility market for BRT. This factor, together with the orientation of the candidate corridor to the area's dominant travel origin and destination patterns helped to determine the potential market for BRT.

The process for determining the arterial BRT Candidates began with an overall study of all the Northwest Area routes. The specific steps included:

- Improving frequency of service on all routes;
- Analyzing routes using the NAMS Focus Model (DRCOG 2035 model modified to model the Arterial BRT corridors); and
- Comparing performance outcomes to current RTD metrics:
  - o If viable, improved service included on the candidate list; or
  - o If not, modeled service would revert to 2035 Regional Transportation Plan (RTP) levels.

Once all of the candidate corridors were identified, the corridors were analyzed to:

- Identify whether roadway congestion was delaying the bus;
- Identify whether bus lanes and/or signal priority measures improved service and were acceptable to the local jurisdictions and stakeholders; and
- If possible and acceptable, the candidate corridors were to be modeled again with the identified improvements.

## 6.2 Selection of Candidate Arterial BRT Corridors

While 20 corridors were originally identified, six corridors were determined to be potentially viable BRT candidates based on this initial high-level screening analysis that including an evaluation of ridership, the need to address future congestion as well as to address land-use and travel patterns. Additional analysis of associated capital improvements, potential operating plans, estimated capital and operations and maintenance (O&M) costs, and connections to US 36 BRT was necessary, as well as input from RTD and Northwest Area stakeholders.

### 6.2.1 Stakeholder Arterial BRT Workshop

A workshop with Technical Advisory Committee (TAC) members and other community officials was held in October of 2013 to define the six corridors in more detail and gain insight from the jurisdictional representatives needs for special amenities and to help the study team refine the final six Arterial BRT corridors.

The participants were given an overview of the Arterial BRT elements, operational features and how the candidate corridors were reviewed to determine the final list of potential options. Working together with the Northwest Stakeholders, the team re-enforced the criteria utilized to identify the six candidate Arterial BRT corridor alternatives for this study. They included:

- Routes that connect Northwest area cities
- Routes that connect employment centers to workers
- Routes where congestion significantly increases between 2010 and 2035
- Routes with increased service frequencies but where boardings are projected to decrease between 2010 and 2035
- Where opportunities exist for needed capital for improvements to mitigate delay at signalized intersections (Queue Jump Lanes/TSP)

Community participants were asked to provide the following input:

- Confirm and define each of the six candidate corridors
- Identify termini, stops, PnR locations and special conditions for each of the six corridors
- Describe the desirable running ways and TSP opportunities for each of the six corridors including mixed traffic lanes, dedicated lanes, lane or turn restriping and bus on shoulder opportunities

One of the additional benefits of the workshop was that the team was also looking for stakeholder input to capture specific improvement ideas to address congestion and connections for these corridors. The study team also presented data to be considered for the corridor discussions, including population and employment density maps, projected congestion areas, and key destination areas.

Each group of participants was given two corridors to analyze and evaluate. Each group of community representatives were asked to confirm or define the following elements for their assigned corridor. The elements included:

- Corridor Definition
- Running Way
- Transit Signal Priorities
- Termini (and possible extensions)
- Stations and PnR locations
- Special Conditions and Branding
- Community participants also identified current transit infrastructure needs such as the need for expansion of the transit vehicle areas at the Lafayette PnR

The overall intent for the stakeholder workshop was to provide input from each jurisdiction so that the study team could determine the definition of each Arterial BRT Project candidate; determine the capital costs for each corridor; and run the travel demand model to determine the ridership, operation and maintenance hours and costs, and service performance of each Arterial BRT route.



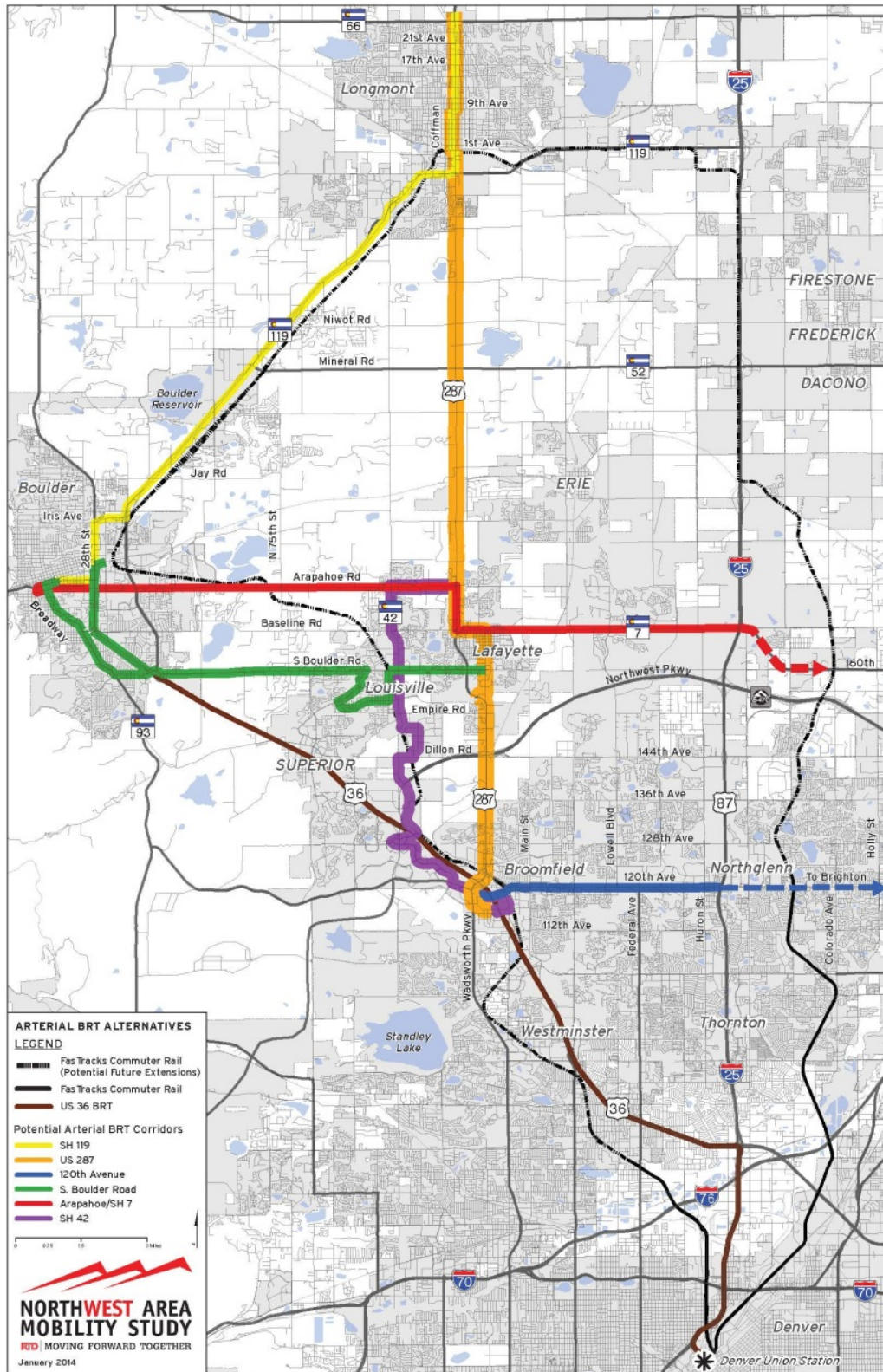
Stakeholder Workshop

As a result of the workshop six candidate Arterial BRT corridors were defined: (See **Figure 6.1**):

- SH 119 (Longmont Diagonal) between Boulder and Longmont;
- US 287 between Longmont and Broomfield/US 36 Corridor;
- 120th Avenue (East/West Connection: Broomfield to Thornton);
- South Boulder Road (includes Boulder System Improvements);
- Arapahoe/State Highway 7 (East/West Connection: Boulder, Louisville, and to Brighton); and,
- SH 42 (New Service).



Figure 6.1 Candidate Arterial BRT Corridors



## 6.3 Description of Candidate Arterial BRT Corridors

This section of the report provides an overview of the six candidate Arterial BRT corridors including:

- Route description including start/end points, length;
- Major route and running-way considerations;
- Travel time between start/end points/major origins and designations;
- Number and location of stations, PnRs, queue jumps/TSP improvements;
- Projected 2035 boardings;
- Estimated capital cost; and
- Key characteristics.

### 6.3.1 SH 119

The potential SH 119 BRT line would connect Boulder to Longmont generally using the Main Street and Ken Pratt Boulevard corridors in Longmont; the SH 119 between Longmont and Boulder and 28th Street to access the Boulder Junction on Pearl Parkway and Canyon Boulevard to access the Boulder Transit Center. The community recommendation is to have a separate guideway for BRT on SH 119 which may be center median running or by using the inner or outer shoulders of the highway. This improvement will also require constructing a separate trail for bikes. A summary of SH 119 BRT key characteristics is provided in Table 6.1 on the following page. Major route considerations for SH 119 include:

- **Northern Terminus:** The northern terminus would be at Main Street and SH 66. This location provides for a vehicle turn around and parking opportunities for patrons. This location could also provide for a layover depending on the needs of the BRT operating plan.
- **Main Street and Coffman Street:** Downtown Longmont is predominantly on Main Street, between 1st and 9th Avenues, which has been improved with streetscape and parallel parking for businesses fronting Main Street. The preferred alternative to Main Street is to provide a transit way on Coffman Street between 1st and 9th Avenues. If Coffman Street is used, then the Arterial BRT service should be able to use the surface parking lot at Roosevelt Park along Coffman Street at 8th Avenue.

**Table 6.1 SH 119 BRT Key Characteristics**

Key Statistics	Description
Starts/Ends:	Main Street/SH66 PnR in Longmont to Boulder Transit Center
Length:	<ul style="list-style-type: none"> <li>• 18.5 miles</li> <li>• 60% bus on shoulder <ul style="list-style-type: none"> <li>○ On SH 119 from Ken Pratt Boulevard to Independence Road</li> </ul> </li> </ul>
Travel Time (Start to End):	36 minutes from 21 <sup>st</sup> PnR to Boulder Transit Center
Number of Stations:	57
Projected 2035 Boardings:	5,000 (all services – Arterial BRT and local)
Estimated Capital Cost:	\$57,200,000 (based on outside bus on shoulder along SH 119 and <b>does not include funds for a new trail</b> )
Key Characteristics:	<ul style="list-style-type: none"> <li>• Dedicated transit way between Longmont and Boulder</li> <li>• Use of Coffman Road for transit in Downtown Longmont</li> <li>• Use of existing transit centers in Boulder and Longmont</li> </ul>

### Bus on Shoulder

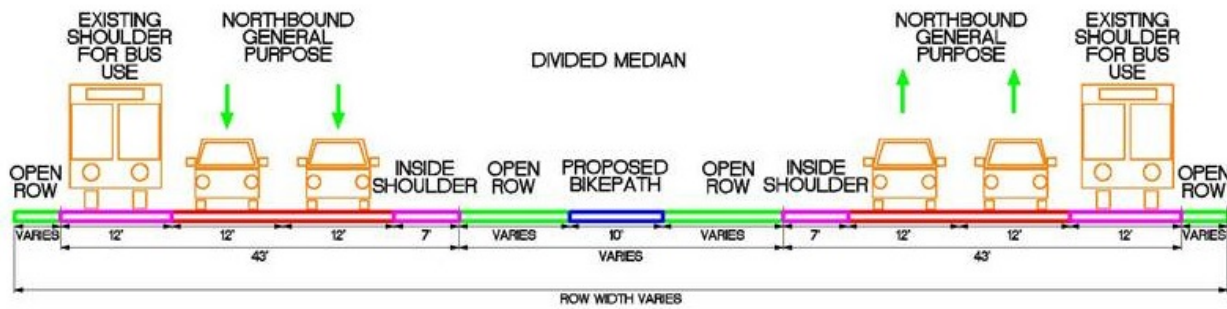
SH 119 provide an ideal opportunity for Bus-on-Shoulder. The existing bus routes between Longmont and Boulder travel along Main Street in Longmont where expansion and Bus-on-Shoulder is impossible. Discussions have included possibly rerouting the buses to Coffman Street between 1st Avenue and 9th Avenue to avoid the general traffic congestion along Main Street. Buses would remain curb-running in other areas along Main Street.

As the SH 119 route travels southward from Ken Pratt Boulevard in Longmont towards Boulder, the existing outside shoulder widths widen to adequate for bus travel from approximately Fordham Street to 47th Street in Boulder. While outside shoulder widths are adequate for Bus-on-Shoulder, it is anticipated that pavement base will need to be provided. One complication with Bus-on-Shoulder on SH 119 is that currently the shoulders are a popular route for both recreational cyclists and bicycle commuters, contributing heavy bicycle traffic.

One possible solution is to move the Bus-on-Shoulder route to the inside shoulders of SH 119 which would require expansion into the center median due to existing shoulders that are too narrow for bus travel. The natural landscaped median is wide, providing ample room to expand SH 119 inward and continue to allow bicycles to travel on the outside shoulders.

A second solution is to use existing outside lanes for Bus-on-Shoulder and provide a bike path either within the existing center median as shown in **Figure 6.2** below, or on either side of SH 119. This concept does not impact the current vehicle travel lanes, but does require relocation of the bike path. The final recommendation for the bike path is not part of the scope of this study and should be explored when planning BRT routes for SH 119.

Figure 6.2 SH 119 Typical Cross Section



### 6.3.2 US 287 BRT Candidate Corridor

The potential US 287 BRT line would connect Longmont to Lafayette and Broomfield using the US 287 Corridor all the way to the Transit Center/US 36 BRT station in Broomfield. A summary of key characteristics is provided in **Table 6.3 below**. Major route considerations include:

- Northern Terminus: The northern terminus would be at Main Street/SH 66 near the intersection of Main Street and SH 66. This location provides for a vehicle turn around and parking opportunities for patrons. Location could also provide for a layover depending on the needs of the BRT operating plan.
- US 36 BRT Connection: Depending on the arterial operating plan and available funds, the US 287 BRT service could be designed to be a one-seat ride to DUS, using the US 36 BRT Improvements.
- Southern Terminus: The southern terminus would be located at the US 36 & Broomfield PnR to connect to the US 36 BRT Service. This PnR and transfer facility would allow for connections to the proposed 120th Street and the SH 42 BRT services as well.

Table 6.2 US 287 BRT Key Characteristics

Key Statistics	Description
Starts/Ends:	Main Street/SH66PnR in Longmont to US 36 and Broomfield PnR
Length:	<ul style="list-style-type: none"> <li>• 21.8 miles</li> <li>• 58% bus on shoulder                             <ul style="list-style-type: none"> <li>○ On US 287 from Ken Pratt Boulevard to Arapahoe Road and from S. Public Road to Midway Boulevard</li> </ul> </li> </ul>
Travel Time (Start to End):	39 minutes from Main Street/SH66PnR to US 36 and Broomfield PnR
Number of Stations:	34
Projected 2035 Boardings:	9,000 (all services – Arterial BRT and local)
Estimated Capital Cost:	\$ 56,400,000
Key Characteristics:	<ul style="list-style-type: none"> <li>• Direct connection from Longmont to US 36 BRT service and corridor</li> <li>• Opportunities for bus on shoulder application</li> <li>• Limited stop service</li> <li>• Connects Lafayette to the north and south</li> <li>• Connects to two other potential Arterial BRT routes at the US 36 and Broomfield PnR</li> </ul>

## Bus-on-Shoulder

US 287 is locally designated as Main Street through Longmont, where the roadway and ROW footprint is limited necessitating curb-running transit in mixed traffic; however, buses may be rerouted to Coffman Street just west of Main Street from 1st Avenue to 9th Avenue where there is less traffic congestion. As development becomes more rural to the south of Ken Pratt Boulevard, the outside shoulders widen enough to provide opportunity for Bus-on-Shoulder all the way to South Boulder Road. It is anticipated that shoulders will need to be reconstructed for full depth pavement to operate as Bus-on-Shoulder.

### 6.3.3 120th Avenue

The potential 120th Avenue BRT line would connect Broomfield over to the I-25 Corridor, the Northwest Rail line and potentially could be extended on to Brighton at ADCOGC. A summary of key characteristics is provided in Table 6.3 below. Major route considerations include:

- **Western Terminus and US 36 BRT:** The western terminus would be located at the Arista Civic Center PnR in Broomfield to connect to the US 36 BRT Service. This PnR and transfer facility would allow for connections to the proposed US 287 and the SH 42 Arterial BRT services as well.
- **Interlocken Boulevard:** The service is planned to use Wadsworth Parkway/SH 121 up to US 287 and make the connection to head east onto 120th Avenue. An alternative route would be to use Interlocken Boulevard over to Wadsworth Boulevard and then onto Colman's Way to connect to 120th Avenue. This would allow the Arterial BRT service to serve this growing employment area.
- **North Metro Rail and Eastern Terminus:** This study evaluated Arterial BRT service on 120th Avenue all the way to Interstate 25 (I-25). Some important connections are possible east of I-25, including 124th Street at the new North Metro Rail service currently in design. Another connection would extend the service all the way to the ADCOGC along the 120th Parkway just west of Interstate 76 (I-76).

**Table 6.3 120th Avenue BRT Key Characteristics**

Key Statistics	Description
Starts/Ends:	Wadsworth area to ADCOGC
Length:	<ul style="list-style-type: none"> <li>• 16.3 miles</li> </ul>
Travel Time (Start to End):	41 minutes from Broomfield PnR to ADCOGC
Number of Stations:	18
Projected 2035 Boardings	5,000 (all services – Arterial BRT and local)
Estimated Capital Cost:	\$ 31,800,000
Key Characteristics:	<ul style="list-style-type: none"> <li>• Provides east-west connection from Broomfield to I-25 and the Northwest Rail line</li> <li>• Potential to connect to the North Metro rail line east of I-25 and ADCOGC</li> <li>• Connects to two other potential Arterial BRT routes at US 36 and Broomfield PnR</li> </ul>



**Bus-on-Shoulder**

Limited ROW availability and narrow shoulder widths prevent exclusive lane opportunities for BRT along 120th Avenue between US 36 and I-25.

### 6.3.4 South Boulder Road BRT and the Boulder System Improvements on Broadway and 28th Street

The potential South Boulder Road BRT line would connect Boulder to Lafayette and Louisville using South Boulder Road from the two transit centers in Boulder to the Lafayette PnR facility east of US 287. The proposed BRT route would loop through downtown Louisville using Main Street, Pine Street and Via Appia Way. A summary of key characteristics including stations, PnR locations and TSP opportunities is provided in Table 6.4 below. Major route considerations include:

- Western Termini: The western termini would be split between the Boulder Transit Center at 14th and Canyon and the Boulder Junction location that would connect to Northwest Rail when implemented as part of the FasTracks Plan.
- Eastern Terminus: The eastern terminus would be located at the Lafayette PnR. This PnR is located east of US 287 at South Boulder Road and South Public Road. The PnR lot is in need of additional area to accommodate all of the transit vehicles that use this location.

**Table 6.4 South Boulder Road BRT Key Characteristics**

Key Statistics	Description
Starts/Ends:	Boulder Transit Center/Boulder Junction to Lafayette PnR
Length:	<ul style="list-style-type: none"> <li>• 17.4 miles</li> <li>• 18% in dedicated lanes</li> <li>• On Broadway from Table Mesa to just north of Baseline</li> <li>• On 28<sup>th</sup> Street from Arapahoe to Mapleton</li> <li>• 30% bus on shoulder</li> <li>• South Boulder from Baseline Road to McCaslin Boulevard</li> <li>• US 36 from Table Mesa to Baseline Road</li> </ul>
Travel Time (Start to End):	21 minutes from Table Mesa to Lafayette PnR
Number of Stations:	65
Projected 2035 Boardings	3,300 (all services – Arterial BRT and local)
Estimated Capital Cost:	\$ 36,600,000 for South Boulder Road east of Table Mesa US 36 BRT station to the Lafayette PnR. The proportionate cost share for the Broadway and 28 <sup>th</sup> Street improvements is \$4,800,000. <i>See Boulder System Improvements for all the costs for Broadway and 28<sup>th</sup> Street.</i>
Key Characteristics:	<ul style="list-style-type: none"> <li>• Provides and east-west connection from Boulder to Lafayette</li> <li>• Maintains service to downtown Louisville</li> <li>• Connects to the US 36 BRT service at Table Mesa</li> <li>• Provides connection to the Boulder Transit Center and the Boulder Junction</li> <li>• Bus on shoulder potential between Table Mesa and Baseline on US 36</li> </ul>



## Bus-on-Shoulder

Currently, South Boulder Road is a four lane road connecting US 36 and US 287. Major construction projects are in the planning phase in the rural/Boulder County areas, north of Louisville, providing opportunity for RTD to partner with local jurisdictions and plan for design of exclusive or shoulder transit lanes. Limited ROW availability and narrow shoulder widths within prevent exclusive lane opportunities for BRT in Louisville or Lafayette; therefore buses will remain curb-running from Louisville to SH 287.

## Park and Ride Facilities

At the BRT Workshop, the City of Boulder representatives made a point to state that they would prefer not to have additional parking for transit.

### 6.3.4.1 Boulder System Improvements

#### Potential Boulder System Improvements Map

The potential Boulder Transit System Improvements map below highlights the two corridors in Boulder that would be part of the South Boulder Road Arterial BRT. The map also illustrates the connections that the Arapahoe/SH 7 BRT and the SH 119 BRT would have in Boulder and how those services connect to the South Boulder Road BRT improvements.

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Figure 6.3 Boulder System Improvements on Broadway and 28th



**Table 6.5 Boulder System Improvements Key Characteristics**

Key Statistics	Description
Starts/Ends:	Extension of US 36 BRT Service and facilitation of other Northwest Arterial BRT corridors up to the Boulder Transit Center and the future Boulder Junction
Length:	<ul style="list-style-type: none"> <li>• 7 miles</li> <li>• 44% in dedicated lanes <ul style="list-style-type: none"> <li>○ On Broadway from Table Mesa to just north of Baseline</li> <li>○ On 28th Street from Arapahoe to Mapleton</li> </ul> </li> <li>• 22% bus on shoulder <ul style="list-style-type: none"> <li>○ US 36 from Table Mesa to Baseline Road</li> </ul> </li> </ul>
Travel Time (Start to End):	N/A
Number of Stations:	37
Projected 2035 Boardings	TBD
Estimated Capital Cost:	\$4,900,000 for BRT share, the overall improvements are \$22,200,000
Key Characteristics:	<ul style="list-style-type: none"> <li>• Would provide consistent transit improvements for all rubber-tire services</li> <li>• Establishes a connection from the US 36 BRT service at Table Mesa to the Boulder Transit Center and the Boulder Junction</li> <li>• Provides some dedicated transit lanes in Boulder where six travel lanes currently exist on Broadway and 28th Street</li> </ul>

### Bus-on-Shoulder

The Broadway and 28th Street corridors in Boulder provide opportunity for a mixture of curb-running, dedicated transit lanes and Bus-on-Shoulder. Existing queue jumps at intersections along 28th Street provide ideal infrastructure for connecting with dedicated transit lanes. ROW is restricted within the corridor, but reconfiguring intersections and outside right lanes to right turn/transit only lanes is possible between Mapleton Avenue and Arapahoe Avenue. BRT will be curb-running with general traffic from Arapahoe Avenue to Baseline, but queue jumps and the 28th Street Frontage Road provide some time savings for BRT during congestion. Shoulder widths are adequate between Baseline Road and South Boulder Road for Bus-on-Shoulder during congestion.

The Broadway corridor is limited in ROW and shoulder width from Canyon Boulevard through the University of Colorado campus area, only allowing for curb-running transit with the assistance of queue jumps. The roadway widens to three lanes each direction from Baseline Road to Table Mesa Road and the City of Boulder is open to discussion of converting the outside lanes in this location to exclusive transit lanes. The capital costs of improving the transit connections between the Table Mesa PnR station (part of US 36 BRT) to the BTC using Table Mesa and Broadway, and to the future Boulder Junction using US 36 and 28th Street up to Pearl Parkway totals \$22.2 million. Approximately 22 percent of this total, or \$4.9 million, would be attributable to the Arterial BRT.

**Table 6.6 South Boulder Road Arterial BRT and Boulder System Improvements Capital Costs**

Summary of Improvements	Estimated Capital Cost
Boulder transit system improvements from the US 36 Table Mesa BRT Station to the Boulder Transit Center and the Boulder Junction.	\$4,900,000
South Boulder Road BRT improvements from the US 36 Table Mesa BRT Station to the Lafayette PnR.	\$31,700,000
Overall Arterial BRT Route South Boulder Road Costs	\$36,600,000

### 6.3.5 Arapahoe/SH 7 BRT Candidate Corridor

The potential Arapahoe/SH 7 BRT line would connect Boulder to Lafayette and over to I-25 using Arapahoe Road from the Boulder transit center to US 287 and then using SH 7 over to the interstate highway. This Arterial BRT line also provides a connection to the University of Colorado and is an east-west connection that is needed for the overall Northwest Area. A summary of key characteristics is provided in Table 6.7 below. Major route considerations include:

- Western Terminus: The western termini would be located at the Boulder Transit Center at 14th Street in Downtown Boulder.
- Eastern Terminus: The eastern terminus would be located just east of I-25 and adjacent to or within a new retail center. This would be a good location for a PnR facility.

**Table 6.7 Arapahoe/SH 7 BRT Key Characteristics**

Key Statistics	Description
Starts/Ends:	9 <sup>th</sup> Street in Boulder to I-25
Length:	<ul style="list-style-type: none"> <li>• 17.9 miles</li> <li>• 46% in dedicated lanes <ul style="list-style-type: none"> <li>○ On Arapahoe from 28th Street to US 287</li> </ul> </li> </ul>
Travel Time (Start to End):	34 minutes Boulder Transit Center to Lafayette PnR
Number of Stations:	46
Projected 2035 Boardings	4,600 (all services – Arterial BRT and local)
Estimated Capital Cost:	\$ 45,400,000
Key Characteristics:	<ul style="list-style-type: none"> <li>• Provides an east-west connection from Boulder to northern areas of Lafayette and Broomfield</li> <li>• Provides a connection to I-25</li> <li>• Helps implement recommendations from the SH 7 Planning and Environmental Linkage (PEL) study</li> </ul>



## Bus-on-Shoulder

Due to the planned expansion of the University of Colorado campus to the north, improvements to Arapahoe Road/SH 7 are expected between Broadway and 28th Avenue; however, it is likely the ROW width will only allow for curb-running transit. There is a possibility of converting the outside third lanes to an exclusive transit lane between 28th Street and 55th Street. From 55th Street to US 287, the ROW width allows for roadway expansion; however, this area is more rural and the cost of improvements may not be justified by the small time savings the additional lanes would provide. See US 287 Corridor running way description for improvements between Arapahoe Road and Baseline Road, where SH 7 coincides with US 287.

Planned improvements for SH 7 between Sheridan and I-25 and from I-25 to York Street include expansion to four lanes. BRT will still be curb-running in this area, but it is anticipated that traffic congestion will be relieved with the additional lanes, causing less delay for transit service.

### 6.3.6 SH 42 BRT Candidate Corridor

The potential SH 42 BRT line would connect Lafayette to the US 36 BRT service that is currently under construction. This route would use Arapahoe/SH 7, then head south on SH 42, connect to major destinations in the areas and terminate at the transit center in Broomfield. A summary of key characteristics is provided in **Table 6.8** on the following page. Major route considerations include:

- Northern Terminus PnR: The northern terminus would be at Arapahoe and US 287. There would need to be a major station and likely a PnR lot at this intersection to handle both SH 42 and US 287 BRT Lines.
- Arapahoe (287th to 95th Street): The route would then proceed west on Arapahoe to the 95th intersection and then south on 95th. A queue jump or TSP may be necessary at this intersection. There is planned development in this intersection and would warrant a major station.
- 95th Street (Arapahoe to South Boulder): The route would turn south from Arapahoe on 95th Street. A queue jump should be considered at Baseline Road and South Boulder Road and a station at Baseline Road. There are two new signals going in between Baseline and Boulder where queue jumps may be needed. The South Boulder intersection is in close proximity to the proposed rail station and a potential BRT station could be located at the proposed rail station for possible expansion when/if the rail line gets this far north. There would be a need for a PnR at the rail/BRT station.
- Empire Road to US 36: Between Empire and Dillon Road the line is proposed to divert off 95th to serve the new development with a station. The route then heads back to 95th on Dillon and then south across Northwest Parkway and into another emerging development prior to US 36.
- New Road Connection: A new road segment is needed between Courtesy Road and Arthur Avenue to connect existing development.
- US 36 BRT Connections: The route would then head toward the Flatiron PnR where a major station could be located and then under US 36 to the Mall (another station). Then it would proceed east with at least two stations within the Interlocken development, another station at Wadsworth Parkway (queue jump)
- Southern Terminus: The southern terminus would be located at the US 36 and Broomfield PnR.

**Table 6.8 SH 42 BRT Key Characteristics**

Key Statistics	Description
Starts/Ends:	US 287/Arapahoe Road to the US 36 and Broomfield PnR
Length:	<ul style="list-style-type: none"> <li>• 13 miles</li> <li>• 11% in dedicated lanes <ul style="list-style-type: none"> <li>○ On Arapahoe from N 96th/SH 42 to US 287</li> </ul> </li> </ul>
Travel Time (Start to End):	38 minutes from US 287/Arapahoe to Broomfield PnR
Number of Stations:	27
Projected 2035 Boardings	900 (all services – Arterial BRT and local)
Estimated Capital Cost:	\$ 27,400,000 (includes \$1 million for missing road segment)
Key Characteristics:	<ul style="list-style-type: none"> <li>• Provides and north-south connection from Louisville to the US 36 BRT service at the Broomfield pnR</li> </ul>

**Bus-on-Shoulder**

Limited ROW availability and narrow shoulder widths prevent exclusive lane opportunities for BRT along SH 42 or Dillon Road in Louisville.

## 6.4 Detailed Analysis of Candidate Arterial BRT Corridors -Capital and Operating and Maintenance Costs

The following section details the capital and operating and maintenance costs as well as the results of the evaluation of the service performance measures for each of the six Arterial BRT corridors. The results of all the evaluation performance measures that were defined as part of the overall study goals and objectives identified during the Collaboration Summit with Northwest Area stakeholders can be found in Appendix B of this Report. For more information on the Study Goals and Objectives and Study Evaluation Process and Results please see the Task 4 Report – Study Evaluation Process, Results and Prioritization Recommendations.

### 6.4.1 Capital Costs

Capital Costs for the six Arterial BRT corridors were estimated as corridor improvements of independent utility. This means the corridor costs do not consider potential overlapping costs, because phasing has not been identified. Within the overall program, 33 stations are duplicative which also includes duplicative TVMs and real time signs as well as other station amenities. Five queue jump lanes and other lane restriping are also duplicative. In addition, a seventh corridor, identified as Boulder Transit Improvements, includes the capital costs of improving the transit connections between the Table Mesa pnR station (that is part of the US 36 BRT corridor) to the Boulder Transit Center using Table Mesa and Broadway, and to the future Boulder Junction using US 36 and 28th Street up to Pearl Parkway. The capital costs for just these improvements total \$22.2 million, and are outside of the overall BRT Program cost estimate. These costs are not included in the Arterial BRT South Boulder Road cost estimate below, but were identified to understand the cost of improvements in Boulder that would potentially benefit all rubber-tire services using these two corridors. That is why they are not added to the overall BRT Program cost estimate. A maintenance and vehicle storage facility, estimated at \$50.9 million, has also been included in the overall program. The cost for the facility assumes \$30 million for capital costs and an additional \$20.9 million for land acquisition, engineering and environmental costs and contingency.



A summary of estimated capital costs are provided on **Table 6.9:**

**Table 6.9 Summary of Arterial BRT Full Program Capital Costs**

Arterial BRT Program	Capital Cost (\$2013)
SH 119 BRT	\$57,200,000
US 287 BRT	\$56,400,000
120 <sup>th</sup> Avenue BRT	\$31,800,000
South Boulder Road BRT	\$31,700,000
Arterial BRT Share of Boulder System Improvements	\$4,900,000
Arapahoe/SH 7 BRT	\$45,400,000
SH 42 BRT	\$ 27,400,000
<b>ARTERIAL BRT COSTS</b>	<b>\$ 254,800,000</b>
Maintenance/Storage Facility	\$ 50,900,000
Boulder System Improvements minus BRT Share	\$ 17,300,000
<b>TOTAL CAPITAL COSTS</b>	<b>\$ 323,000,000</b>
<i>DUPLICATE STOPS, TSP, AND OTHER CAPITAL</i>	<i>(\$14,600,000)</i>
<i>CONTINGENCY ADJUSTMENT</i>	<i>(\$ 4,400,000)</i>
<b>ADJUSTED FULL ARTERIAL BRT PROGRAM COST</b>	<b>\$304,000,000</b>
* Cost estimate in 2013 dollars. The Boulder Improvements are identified as an additional potential improvement with an estimated \$22.2 million capital cost. The Arterial BRT share would be \$4.9 million.	

## 6.4.2 Service Plan and Operations and Maintenance Costs

### Service and Operating Plans

The general service plan for the candidate corridors was assumed to have service with 15-minutes in the peak period and 30-minutes in the off-peak. Local service in these corridors is also assumed.

**Table 6.10 Peak and Off-Peak Service Frequencies**

Service	Peak/Off-Peak Service Frequencies
SH 119	15-minute/30-minute: Boulder Transit Center 15-minute/30-minute: Boulder Junction 15-minute/30-minute BOLT and J Route Local
US 287	15-minute/30-minute express 30-minute/30-minute local
120 <sup>th</sup> Avenue	15-minute/30-minute express 30/30 local
South Boulder Road	15-minute/30-minute: Boulder Transit Center (BTC) 15-minute/30-minute: Boulder Junction (BTV) 15-minute/30-minute: Dash Local
Arapahoe/SH 7	15-minute/30-minute express 15-minute/30-minute local
SH 42	15-minute/30-minute

Based on this service plan and RTD's in house cost model, an estimate was developed for annual O&M costs for the Arterial BRT corridors, as shown in **Table 6.11**:

**Table 6.11 Summary of Arterial BRT Corridor Annual Operating and Maintenance Costs**

Arterial BRT Program	Annual O&M Costs (\$2013)
SH 119 BRT	\$6,450,000
South Boulder Road BRT	\$7,950,000
Arapahoe Road / SH 7 BRT	\$3,790,000
120 <sup>th</sup> Avenue BRT	\$4,270,000
US 287 BRT	\$7,260,000
SH 42 BRT	\$1,630,000

## 6.5 Ridership and Travel Time

Using the results of the corridor-level workshop, exclusive lanes were incorporated into the 2035 transit network within the NAMS Focus Model (DRCOG 2035 model modified to model the Arterial BRT Corridors) as well as peak and off-peak bus frequencies. **Table 6.12** and **Table 6.13** show the results from the travel model in daily bus boardings and travel times, respectively, when inserting exclusive lanes within the study corridors.

Table 6.12 Effect on Daily Boardings Incorporating Exclusive Lanes for Arterial BRT

Arterial BRT Corridor	2035 NAMS Focus Model Daily Boardings	2035 NAMS Daily Boardings Mixed Traffic	2035 NAMS Daily Boardings Exclusive Lanes
<b>SH 119 BRT</b>			
BOLT/J Local	2,900	1,023	400
BOLT BRT (BTC)	n/a	n/a	1,600
BOLT BRT (BTV)	n/a	n/a	3,000
Corridor Total			<b>5,000</b>
<b>South Boulder Road BRT</b>			
DASH Local (BTC)	2,300	1,813	1,300
DASH BRT (BTC)	n/a	n/a	1,000
DASH BRT (BTV)	n/a	n/a	1,000
Corridor Total			<b>3,300</b>
<b>Arapahoe Road BRT</b>			
JUMP Local	2,200	2,380	2,600
JUMP BRT (BTC)	n/a	n/a	2,000
Corridor Total			<b>4,600</b>
<b>120th Avenue BRT</b>			
120 Local	1,300	4,144	3,100
120 BRT	n/a	n/a	1,900
Corridor Total			<b>5,000</b>
<b>US 287 BRT</b>			
L Local	1,200	3,304	400
L BRT	n/a	n/a	8,600 (N of US 36) 18,400 (SH66-DUS)
Corridor Total			<b>9,000</b>
<b>SH 42 BRT</b>			
SH 42 Local	n/a	n/a	900

Table 6.13 Effect on Travel Time incorporating Exclusive Lanes for Arterial BRT Corridors

Arterial BRT Corridor	2035 NAMS Focus Model Peak Travel Time (min) Mixed Traffic	2035 NAMS Peak Travel Time (min) Exclusive Lanes
<b>SH 119 (21<sup>st</sup> Avenue PnR to BTC)</b>		
Bolt/J Local	52	44
Bolt BRT (BTC)	n/a	36
Bolt BRT (BTV)	n/a	n/a
Auto	37	37
<b>South Boulder Road (Lafayette PnR to TM PnR)</b>		
Dash Local (BTC)	21	28
Dash BRT (BTC)	n/a	21
Dash BRT (BTV)	n/a	21
Auto	18	18
<b>Arapahoe Road (Lafayette PnR to BTC)</b>		
Jump Local	49	44
Jump BRT (BTC)	n/a	34
Auto	30	28
<b>120<sup>th</sup> Avenue (ADCOGC to Broomfield PnR)</b>		
120 Local	60	60
120 BRT	n/a	41
Auto	40	39
<b>US 287 (21<sup>st</sup> PnR to Broomfield PnR)</b>		
L Local	64	56
L BRT	n/a	39
Auto	43	44
<b>SH 42 (287/Arapahoe to Broomfield PnR)</b>		
SH 42 Local	n/a	38
Auto	38	37

## 6.6 Transit Service Performance Measures

The performance of existing transit service provides good insight into where the basic ridership intensity is already present to support a successful Arterial BRT system. At a fundamental level current routes that exhibit good service productivity should be first priorities as Arterial BRT candidates. However, it is important to establish guidelines based on appropriate metrics and thresholds in order to properly identify good candidates for Arterial BRT service. Performance is a term often used interchangeably with effectiveness and efficiency. RTD defines effectiveness-productivity across service classes including:

- Central Business District (CBD) Local Bus
- Urban Local Bus
- Suburban Local Bus
- Express Bus
- Regional Bus
- SkyRide Airport Service
- Mall Shuttle
- Light Rail Transit

Effectiveness measures are evaluated based on the ability of the project to maximize ridership within the budget and is presented as **subsidy per boarding**. Efficiency - productivity or output divided by input - is presented as **boardings per revenue hour**.

Routes that perform minimally get minimum service frequency, typically every 30 minutes during peak periods and 60 minutes off-peak. By evaluating performance, RTD also identifies routes where ridership significantly exceeds the minimum, and passenger loads justify more frequent service. RTD has established guidelines in its Service Standards that the least productive 10 percent of routes, based on either subsidy per boarding or boardings per hour, need to be evaluated for marketing, revision or elimination; the evaluation is also required if both measures for a route fall below 25 percent.

RTD does not currently have specific Arterial BRT service standards for which to evaluate candidate routes. For the purposes of this report, initial Arterial BRT performance metrics were defined by subsidy per boarding and boardings per revenue hour for “urban local” and “express” service classes. This approach for Arterial BRT service criteria was developed with RTD and stakeholders using current RTD Service Standards as guidance.

The performance charts in **Table 6.14** on the next page, summarize the acceptable performance domain containing all routes meeting the 10 percent minimums for each class of service. The calculation of the 10 percent and 25 percent standards were produced from the annual, un-weighted data, assuming the data have a normal distribution and using the appropriate formulas for standard deviation and confidence intervals; however, the standard deviation is applied to the weighted average. The Urban Local and Express standards that were used for Arterial BRT service standards in the study and are shown highlighted in green and yellow.

Table 6.14 2011 RTD Service Standards

Service Class	Subsidy Per Boarding			Boardings Per Hour		
	Average	10% Max	25% Max	Average	10% Min	25% Min
<b>CBD Local</b>	\$2.62	\$5.22	\$3.98	35.4	18.2	26.4
<b>Urban Local</b>	\$3.45	\$8.95	\$6.33	28.6	15.6	21.8
<b>Suburban Local</b>	\$7.12	\$12.32	\$9.84	16.4	7.0	11.5
<b>Express</b>	\$3.31	\$10.13	\$6.88	43.1	17.6	29.7
<b>Regional</b>	\$4.96	\$10.95	\$8.09	24.2	14.5	19.1
<b>SkyRide</b>	\$4.15	\$7.23	\$5.76	18.8	13.6	16.0
<b>Mall</b>	\$0.68			204.8		
<b>LRT</b>	\$2.78	\$3.98	\$3.41	125.9	90.1	107.2
<b>System (2011)</b>	\$3.31	--	--	31.7	--	--
<b>System 2010</b>	\$3.56	--	--	31.5	--	--

*Source: 2011 RTD Service Standards*

## 6.7 Performance Measures with Capital and Operating Costs

RTD has developed two in-house cost-effectiveness and operational performance statistics models for evaluating future year bus route improvements. The “OpStats Model” and the “Incremental O&M Costs Model” incorporate the output files from the NAMS Focus Model (DRCOG 2035 model modified to model the Arterial BRT Corridors) for vehicle revenue hours and develop estimates of O&M costs and number of peak buses required to implement the bus service. For the NAMS study, these operating costs and capital costs were then compared to 2011 RTD Service Standards to determine if the proposed improvements were cost-effective using boarding per revenue hour and subsidy per boarding criteria.

**Table 6.15** on the following page summarizes the cost-effectiveness and operational performance of the six candidate Arterial BRT Corridors. Elements in green represent those that would meet current RTD standards and elements in yellow represent those that fall below the average RTD service standard.



**Table 6.15 Summary of Cost-Effectiveness and Operational Performance of Arterial BRT Corridors**

Corridor	Annual/ Daily Ridership	Annual O&M Cost (\$2013)	Annual Capital Cost (\$2013)	Total Annual Cost	Annual Cost per Rider	Annual Boardings per Revenue Hour	Annual Subsidy per Boarding
SH 119 BRT	1,500,000/ 5,000	\$6,450,000	\$2,953,998	\$9,403,998	\$6.27	28.0	\$2.80
South Boulder Road BRT	990,000/ 3,300	\$7,950,000	\$1,960,975	\$9,910,975	\$10.01	12.2	\$6.53
Arapahoe Road / SH 7 BRT	1,380,000/ 4,600	\$3,790,000	\$2,187,137	\$5,977,137	\$4.33	30.7	\$1.25
120 <sup>th</sup> Avenue BRT	1,500,000/ 5,000	\$4,270,000	\$1,691,651	\$5,961,651	\$3.97	27.5	\$1.35
US 287 BRT	2,700,000/ 9,000	\$7,260,000	\$3,055,170	\$10,315,170	\$3.82	60.1	\$1.19
SH 42 BRT	270,000/ 900	\$1,630,000	\$1,378,833	\$3,008,833	\$11.14	16.4	\$4.54

\* Annual capital costs derived from FTA Standard Cost Categories spreadsheet Fare per boarding is assumed to be \$1.50, similar to Boulder Local routes 204, Dash, Jump, and Skip to derive annual fare revenue provided by RTD.

\* Annual cost per rider, annual boardings per revenue hour, and annual subsidy per boardings calculated by RTD (\$2013).

## 6.8 Summary of Key Findings

The Arterial BRT program is a viable, cost effective way to increase mobility within the Northwest Area. The projected ridership is based on two key components. The first component includes technology and capital improvements that allow transit to take priority in heavily traveled corridors which would demonstrate the interest, demand, and willingness of area residents to consider alternative modes of transportation. The second component to increasing ridership is more frequent service for the Arterial BRT mode and establishment of reliable, timely service to provide users confidence and certainty. The NAMS study provided an overall conceptual review of implementation of Arterial BRT in the Northwest Area. Further study and analysis is needed to define capital infrastructure, capital and operating costs and funding before any final plans are implemented.

The Policy Advisory Committee (PAC) recommended that all six Arterial BRT projects be implemented including system-wide service improvements in Boulder. The Final Consensus Statement at the conclusion of the NAMS process identified the SH 119 corridor as the number one priority, as well as the advancement of the US 287 for more detailed planning and environmental review. These recommendations were made given the routes predicted service performance and commuting needs of the Northwest area. A summary of priorities is identified in **Table 6.16**. In addition, it was recommended that RTD submit two TIGER Planning Grant requests for SH 119 and US 287, which were submitted on April 28, 2014.

**Table 6.16 Arterial BRT Corridor Implementation**

Implementation Priorities		
Corridors	Term	Time Frame
SH 119	Short Term	3 to 10 Years
US 287	Short Term	3 to 10 Years
Arapahoe/SH 7	Medium Term	7 to 10 Years
South Boulder Road	Long Term	7 to 20 Years
Broadway and 28 <sup>th</sup> Street System Improvements	Long Term	7 to 20 Years
120 <sup>th</sup> Avenue	Long Term	7 to 20 Years
SH 42	Long Term	7 to 20 Years

**Table 6.17** on the next page provides an overview of each BRT candidate and identifies: (1) termini, (2) length, (3) number of stations and (4) capital costs in 2013 dollars. It should be noted that a vehicle storage and maintenance facility would be needed if all six corridors were implemented. No costs or share of the cost for this facility has been assigned to any of the corridors.

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Table 6.17 Summary of Potential BRT Improvements by Route (Costs – \$ 2013)

Project Definition	1	2	3	4	5	6
	SH 119	US 287	120th Avenue	South Boulder Rd	Arapahoe/ SH 7	SH 42
<b>North / West Terminus</b>	Main Street and SH 66 PnR in Longmont	Main Street and SH 66 PnR in Longmont	Broomfield PnR at Transit Way and Uptown Avenue Parking Garage (off of Wadsworth Parkway)	Boulder Transit Center (using Broadway) and the Boulder Junction (using 28th Street)	Boulder Transit Center	US 287 and Arapahoe
<b>South / East Terminus</b>	Boulder Transit Center (using Canyon) and the Boulder Junction (using 28th Street)	Broomfield PnR at Transit Way and Uptown Avenue Parking Garage (off of Wadsworth Parkway)	Adams County Government Center (ADCOGC)	South Boulder Road at South Public Road	Baseline Road (SH 7) at I-25 (Terminus)	Broomfield PnR at Transit Way and Uptown Avenue Parking Garage (off of Wadsworth Parkway)
<b>Major Stations</b>	30	22	18	33	24	15
<b>Minor Stations</b>	27	16	0	32	22	12
<b>Station Totals</b>	57	38	18	65	46	27
<b>Route Miles</b>	18.5	21.8	16.3	17.4	17.9	13
<b>TOTAL PROJECT ESTIMATE</b>	\$57,200,000	\$56,400,000	\$31,800,000	\$31,700,000* Plus Boulder System Improvements Share of \$4,900,000 Total \$36,600,000	\$45,400,000	\$27,400,000

\* Does not include capital costs of \$50.9 million for a new Vehicle Maintenance Facility.

\* The Boulder System Improvements are estimated at \$22.2 million.

## 7.0 Opportunities for Funding

As part of the feasibility analysis of potential rail and arterial BRT projects, a range of likely potential funding sources for transit capital projects in the study area were investigated and evaluated. Funding sources were addressed with respect to the applicability of that source to projects under consideration in the study area; magnitude of potential funding from that source; and the probability or likelihood of receiving funding. Projects under consideration for funding were NW Rail and six final candidate arterial BRT corridors.

### 7.1 Applicability, Magnitude, and Probability of Funding Sources

This section summarizes the funding sources that were identified and investigated. They are organized by the funding origin (federal government, state government, regional and local government sources, and other sources, including user fees and private participation). The applicability, magnitude and probability of funding are discussed for each source. It is worth noting that any major transit capital project would likely to be funded from a multitude of sources. In some cases, such as FTA grants, a local match is a requirement of funding eligibility. In other cases, it is a practical matter of assembling the necessary funding to meet the project's costs.

#### 7.1.1 Federal Sources

Table 7.1 below summarizes potential State and Federal sources:

	Capital Expenses	Operating Costs
<b>Federal</b>		
Section 5307 – Urbanized Area Formula Grants	◆	
Section 5309 – New Starts / Small Starts	◆	
Section 5339 – Bus and Bus Facilities	◆	
TIGER	◆	
DRCOG TIP – STP Metro and CMAQ Funds	◆	◆
<b>State</b>		
Funding Advancement for Surface Transportation & Economic Recovery (FASTER)	◆	◆
MPACT64	◆	◆

##### 7.1.1.1 Section 5307 Urbanized Area Formula Funding Grants

Section 5307 is among the largest sources of transit funding provided by the Federal Transit Administration (FTA). Section 5307 allocates funds to all defined urbanized areas of 50,000 or more persons. RTD allocates the majority of its Section 5307 funding to capital maintenance projects such as maintenance of way and vehicle preventative maintenance. Because the grants are a recurring source programmed for recurring annual expenses, Section 5307 funding could be made available for the acquisition of BRT project-related rolling stock.

### 7.1.1.2 Section 5309 Fixed Guideway Capital Investment Grants

Section 5309 is the FTA's primary source of discretionary funding for major capital investments in transit system expansion. Under MAP-21, funds are distributed through the New Starts, Small Starts and Core Capacity Programs. New Starts funds are available to any new fixed guideway project, including BRT projects that operate in a separate right-of-way, provided the project costs \$250 million or more or includes a federal grant request of \$75 million or more. New Starts funds can be used to fund up to 80% of the total project cost, although in practice the federal share is typically lower. Based on cost constraints, only Northwest Rail projects were evaluated for New Starts funding potential. The analysis found that all of the potential rail projects would be likely to receive low evaluation scores and have a low probability of federal funding.

Small Starts funds are available to any fixed guideway or corridor-based BRT project with a total project cost of less than \$250 million and a federal capital grant request of less than \$75 million. Like New Starts, Small Starts funds can be used to fund up to 80% of a project's costs.

An evaluation found several arterial BRT corridors could be fairly competitive Small Starts projects and should be analyzed further during the next phase of project development.

The final FTA rating for both New Starts and Small Starts would be dependent on the results of future environmental, economic development and complete land use analyses, as well as more detailed ridership projections during the next stage of project development.

### 7.1.1.3 Other Federal Formula Grants

RTD currently receives funding from the FTA under a number of other grant programs, all of which are formula based. Among the more substantial of these programs are:

- Section 5337 State of Good Repair: This program is for mature system components and is not applicable to system expansion; however upon completion of expansion projects, RTD would be expected to receive additional Section 5337 funds to support the long term upkeep of an expanded system.
- Section 5339 Bus and Bus Facilities: Funds are only apportioned based in part on the existing extent of the system; however upon completion of any expansion project, a corresponding increase in Section 5339 funding would be expected, to aid in the long-term upkeep of the expanded system.

While Sections 5337 and 5339 would be useful sources for future upkeep of an expanded system, they were not intended for funding upfront capital investments.

### 7.1.1.4 Transportation Investment Generating Economic Recovery (TIGER)

The TIGER program, first established as part of the American Recovery and Reinvestment Act of 2009 (ARRA, also known as the Stimulus), requires annual appropriations from Congress and is therefore uncertain in the long term. TIGER grants have historically been highly competitive, with funding requests vastly outpacing appropriations. The program prioritizes the following project characteristics:

- Projects which "have a significant impact on desirable long-term outcomes for the Nation, a metropolitan area, or a region," especially those which generate long term job growth in economically distressed areas;
- Innovative methods of project delivery and/or financing, including public-private partnerships;
- Multi-modal and/or multi-jurisdictional

The region has a good track record of obtaining TIGER grants, but the overall competitiveness of the program means that the probability of funding is low. Funding magnitude would be too small for a substantial share of a rail project but could cover a substantial share of one or more arterial BRT projects. Both the NATA and the NAMS PAC recommended planning grants to be pursued with SH 119 as the number one priority and with 120th Avenue, SH 7 and US 287 as future candidates. Based on these recommendations, RTD submitted TIGER applications for advanced planning, environmental clearance, and engineering for BRT on both SH 119 and US 287. Awards will be announced in Fall 2014.

### **7.1.1.5 Federal Funds Allocated by DRCOG**

There are two additional sources of regional funding allocated by the federal government and disbursed through the Denver Regional Council of Governments (DRCOG), the regional metropolitan planning organization (MPO). To receive funding, a project must be included in the DRCOG 2040 Fiscally Constrained RTP (2040 RTP).

- Surface Transportation Program (STP) Metro: STP Metro funds can be applied to nearly any type of transit and roadway project that would be eligible for the other federal funding sources described previously.
- Congestion Mitigation and Air Quality (CMAQ): Funds can be used to construct and operate transportation projects that have an emissions reduction benefit such as transit improvements, bike/pedestrian improvements, transportation demand management, and congestion relief projects.

In order to be funded through STP Metro or CMAQ, it requires a local match of at least 20%. These funding sources should be explored as part of a larger funding package.

## **7.1.2 State Sources**

### **7.1.2.1 Funding Advancement for Surface Transportation & Economic Recovery**

The Funding Advancement for Surface Transportation & Economic Recovery (FASTER) program is administered by CDOT for the purpose of funding transit capital projects. Typically awards include bus replacement, park and ride lot improvements, and intermodal facility construction. The magnitude of typical FASTER grants would be sufficient only for minor or ancillary project elements such as park-and-ride facilities, fleet expansion, or future planning phases. The program also requires a 20% local match.

### **7.1.2.2 MPACT64**

MPACT64 is a proposed statewide transportation capital program that could be presented to voters in coming years. The name refers to Colorado's 64 counties, and the program would include dedicated funding levels to counties, municipalities, transit agencies, and CDOT. The precise funding proposal has not yet been finalized and CDOT has decided not to pursue a referendum in 2014 based on early proposals for the structure and magnitude of funding. Should the measure pass, it could generate nearly \$2 billion in funding for transit projects in the RTD service area over 15 years based on preliminary scenarios.



### 7.1.3 Local and Regional Sources

Table 7.2 below summarizes potential local sources.

**Table 7.2 Potential Funding/Financial Sources – Local**

	Capital Expenses	Operating Costs
<b>Local / Regional Taxes and Assessments</b>		
TIF	◆	◆
Special District	◆	◆
RTD Dedicated Funding Sources	◆	◆
<b>System Generated</b>		
Fare Revenue		◆
Real Estate	◆	◆
<b>Private</b>		
Public-Private Partnership	◆	◆
Philanthropy	◆	◆

#### 7.1.3.1 Sub-regional RTA

In the absence of funding from RTD or other statewide sources for projects in the study area, one proposal under consideration is the creation of a new regional transportation authority specific to the NAMS study area. Such an agency could issue bonds, directing the proceeds to RTD for the construction of a preferred program of transit projects. The RTA would then make regular interest payments on the bonds, backed by dedicated tax revenues. This type of arrangement would be contingent upon approval of voters to create the RTA as well as authorize it to collect taxes. Detailed analysis of revenue potential, agency overhead and revenue collection costs, and borrowing terms would need to be performed to determine the potential net revenues available for transit capital projects with a sub-regional RTA.

#### 7.1.3.2 Value Capture

Value capture refers to a method by which local or regional governments finance targeted infrastructure improvements by raising funds from the specific property owners that would benefit from those improvements. Typically this takes one of two forms:

- **Tax Increment Financing (TIF):** TIF is a mechanism by which a local government agency finances infrastructure improvements by borrowing against the anticipated increase in property tax revenues that will result. TIF may be a useful tool in assembling financing for a larger transit project if it can be used to finance a major station area redevelopment project. TIF was used at Denver Union Station to repay a loan from the federal government.
- **Special Assessment District:** A special assessment district is created by group of adjacent property owners who elect to subject themselves to a supplemental tax to pay for local improvements. Examples include downtown beautification as well as downtown transit projects such as streetcars or circulator routes.

The most likely application for transit projects would be station-area improvements or transit-oriented development projects.

## 7.1.4 Other Revenue Sources

### 7.1.4.1 Fare Revenue

Fare revenues are generally budgeted toward agency operating costs and not included in an agency's capital budget. Therefore, fare revenue will not be considered as a source of potential funding for study area projects.

### 7.1.4.2 Real Estate

Transit agency real estate holdings can be leveraged to raise revenues, such as:

- Station area lease arrangements
- Parking revenues
- Air rights development

Such arrangements may be viable for offsetting station development costs or ongoing facility O&M costs. They will likely be insufficient to substantially defray the upfront capital cost of any proposed transit corridor.

### 7.1.4.3 Public-Private Partnership (P3)

RTD has extensive experience with public-private partnerships, having initiated the Eagle P3 project, a design-build-finance-operate-maintain contract, in 2010. The primary benefit of P3s is the transference of risk from the agency to the private sector, resulting in greater predictability. This may lead to cost savings in the long run, but P3s themselves are not a funding source. However, P3s are favored by many state and federal funding agencies and may be a tool for demonstrating the viability of a project and securing capital grants.

### 7.1.4.4 Philanthropy

There are a number of cases where nonprofit or corporate contributions have been used to help defray the costs of a transit project. Examples include naming rights agreements or private donations. While naming rights may be an opportunity to defray station construction or O&M costs, it is unlikely in significant private funding in the NAMS study area.

## 7.2 RTD Funding Availability

RTD receives dedicated local funding through sales and use taxes. A total of 1.0% in sales and use taxes throughout the RTD service area accrue directly to the agency. This is divided into a 0.6% base system sales and use tax, available for district-wide capital and operating costs, and a 0.4% sales and use taxes dedicated to the FasTracks program, available for both capital projects and operations of newly constructed transit lines built and specified under this voter approved program. Arterial BRT projects would only be eligible for RTD Base System funding.

RTD recently completed an analysis of long term funding availability from both its base system and FasTracks funds. The analysis showed that FasTracks funds are fully committed through 2035, while the base system is expected to begin accumulating uncommitted funds in 2020. The results of the analysis are summarized in **Table 7.3**.

**Table 7.3 Estimated Available RTD Funds by Revenue Source (2013 \$ in Millions)**

Revenue Source	2015 – 2020	2020 – 2035	2035 – 2040
FasTracks	\$0	\$0	\$105 - \$125
Base System	\$0	\$900 - \$1,100	\$600 - \$750

### 7.3 Summary and Key Findings

Current financial forecasting by RTD indicates that local Base System funding for transit capital projects may not be available until at least 2020, with FasTracks funding fully committed until after 2035. Completion of any of the unfunded potential transit projects proposed for the study area will require an assessment of the availability of RTD revenue sources or more other creative funding strategies, such as a sub-regional RTA, federal funding, or increased assistance at the state level. Realistically, a combination of multiple funding sources will likely be necessary.

**Table 7.4 Funding Summary Matrix** below summarizes funding sources and applicability to NW area potential improvements.



Source	Northwest Rail			Arterial BRT (various Corridors)		
<b>Federal</b>						
New Starts	●	● \$75M +	○ Full project unlikely to qualify for funding	◐ Fixed guideway required	● \$75M +	◐ Depends on project ratings
Small Starts	● Project Cost >\$250M, Federal share < \$75M	◐ Up to \$75M	◐ Requires a phased approach to manage costs	● "Corridor-based BRT" <\$75M federal share	◐ Up to \$75M	◐ Depends on project ratings
TIGER Funding	◐ Station area and ROW upgrades	◐ Up to \$20M	◐ Highly competitive	● US 36 BRT upgrades received \$4.8M	◐ Up to \$20M	◐ Highly competitive
DRCOG TIP (STP Metro and CMAQ)	● Capital projects need to be included in 2040 RTP	◐	●	● Capital projects need to be included in 2040 RTP	◐ System-wide total ~\$52M	◐ DRCOG funding depends on other applications submitted
<b>State</b>						
MPACT64	● Transit set-aside	● \$100M - \$120M/yr	● New Initiative	● Transit set-aside	● \$100M - \$120M/yr	● New Initiative
FASTER	◐ Ancillary improvements	○ Insufficient for substantial project	◐ Dozens of statewide grantees	● Bus purchases and station improvements	◐ Up to \$3M	◐ Dozens of statewide grantees

Source	Northwest Rail			Arterial BRT (various Corridors)		
<b>Local/Regional</b>						
Innovative Funding / Value Capture	● Applicable to small area projects	○ Depends on project scale	○	●	◐ Depends on project scale	◑
Subregional RTA	●	◐	Would require voter referendum	●	●	Would require voter referendum
RTD Local Sales Tax Funds (FasTracks NWR/ Base System Arterial BRT)	●	●	●  NWR Remains in Plan	●	◐	◑

Federal funding is unlikely for Northwest Rail due to the modest demonstrated benefits of the program and the need for a substantial local match that is currently unfunded. Federal funding for arterial BRT may be feasible if a local match can be identified. Stronger arterial BRT corridors such as SH 119, US 287 and Arapahoe Road / SH7 should be pursued. A TIGER grant application was recently submitted to advance the planning for two of the arterial BRT projects: SH 119 and US 287. Should the TIGER program be funded in future years, 2015 or 2016 may be a more realistic timeframe for applying for construction funding.

Additional state funding, such as MPACT64, is currently only in the proposal stages. Any new sources of funding will likely include a large apportionment for Denver-area projects. However, new statewide taxes for transportation will be subject to voter referendum, and support for such a program is uncertain. Pursuing local project funding in the form of a sub-regional RTA would place the majority of the financial burden on the communities receiving the benefit of new transit facilities, but would also provide the most funding certainty. The potential for establishing a sub-regional RTA, including potential local support and feasible levels of taxation, should be explored further.

## 8.0 Study Evaluation Process and Results

The NAMS evaluation process concentrated on the range of commuter rail and Arterial BRT alternatives that would be considered to increase mobility in the Northwest Area. The alternatives to be evaluated focused on:

- Northwest Rail – phasing,
- North Metro Extension of Commuter Rail to Longmont – alignments, and
- Candidate Arterial BRT alternatives.

This study evaluation process did not include the FasTracks US 36 BRT Program or the North I-25 Reverse Commute Analysis. Both these analyses were performed separately and are summarized in Task 2 Reports - US 36 BRT Technical Report and North I-25 Reverse Commute Report. However, the recommendations from both these separate analyzes are included in the overall study consensus and prioritization recommendations.

## 8.1 Study Evaluation Process

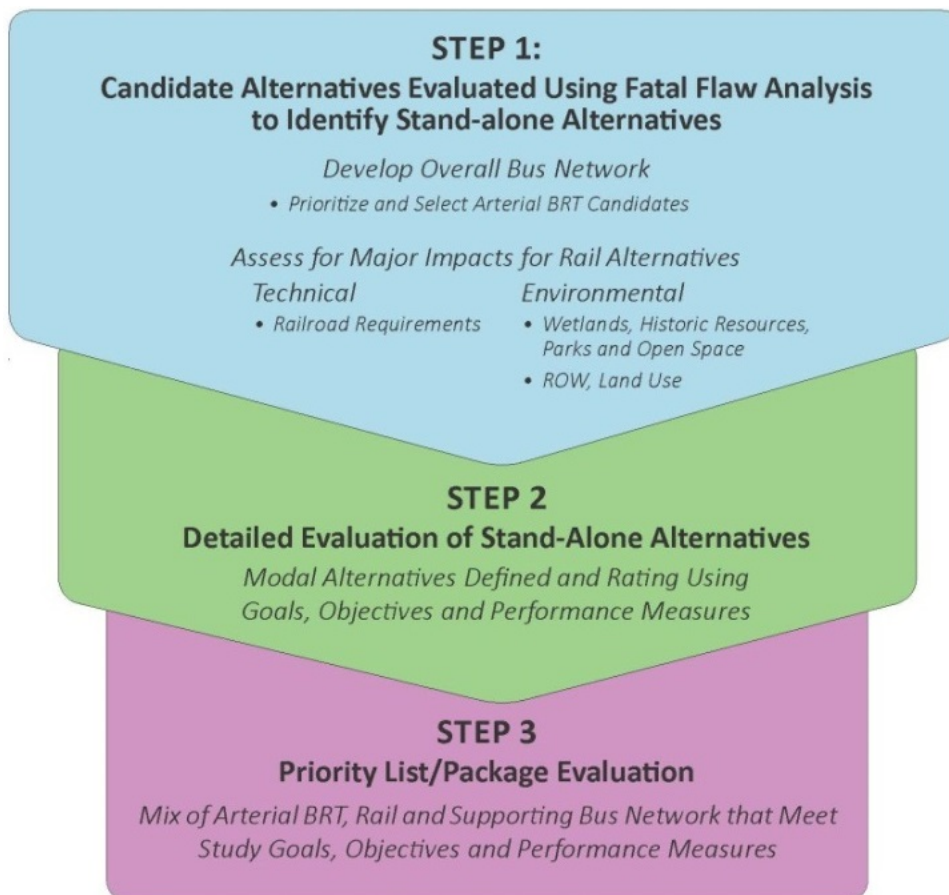
This Study Team worked collaboratively with RTD and the Technical and Policy Committees to define a systematic process and methodology for evaluating the study alternatives. This process included the identification of community goals and objectives as well as mode-specific quantitative and qualitative performance measures based on local and national best practices including the latest FTA New and Small Starts Evaluation Rating Process Policy Guidance.

## 8.2 Goals and Objectives and Study Process

The evaluation process was guided by the community goals and objectives identified during the Collaboration Summit. The following four goals were identified to guide the evaluation process:

- Goal 1: Provide a Transparent and Collaborative Process
- Goal 2: Provide a High Quality, Reliable Transit System
- Goal 3: Provide Cost Effective Transit Solutions
- Goal 4: Respect and Support Local and Regional Planning Efforts

Following the Summit, the study team developed proposed performance measures linked to the community goals and objectives. The study evaluation process was comprised of 3 key steps described below and illustrated in **Figure 8.1: Three Step Evaluation Process**



The fatal flaw screening in Step 1 provided a manageable set of alternatives for a more detailed evaluation in Step 2 of the evaluation process. Using the results of the Step 2, a summary rating was then prepared to determine how well the rail and arterial BRT improvements met the full set of goals and objectives and performance measures. For rail and arterial BRT and the financial review, the evaluation factors utilized a “consumer reports” type ranking (from best to worse) in meeting each goal and objective. For Step 3, the study team worked with the Northwest Area stakeholders, RTD and CDOT to develop the list of viable mobility alternatives as a result of detailed level evaluation provided as part of Step 2. This overall evaluation process was approved by RTD, CDOT and the Northwest Area Stakeholders at the July 30, 2013 Joint Technical and Policy Committee meeting.

### 8.3 Final Evaluation Results

The results of the study evaluation were presented to the NAMS Technical and Policy Advisory Committees in January 2014. The detailed *Study Evaluation Summaries for Northwest Rail, North Metro Extension, Arterial BRT and the Financial Review* are provided as part of **Appendix B** of this Final Report. The following tables provide an overall summary of the evaluation findings. The overall study process, goals and objectives and is summarized in **Table 8.1**. Major findings for Northwest Rail and the North Metro Extension are summarized in **Table 8.2**. Major findings for Arterial BRT are summarized in **Table 8.3**. The financial review findings were previously provided in Section 7.3 of this Report. This evaluation was presented to the PAC and was accepted on January 30, 2014. It provided the basis of a recommendation for the final prioritized list of improvements that was presented to the Policy Advisory Committee on April 18, 2014.

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Table 8.1 Goal 1: A Transparent and Collaborative Process

Goal 1: A Transparent and Collaborative Process		
Objective	Measure	Results
<b>1.1 Stakeholders will have adequate time to review information and ask questions before commenting or taking action</b>	Adherence to the 10-day review/comment period in the Collaboration Commitment; questions and comments are clearly articulated in writing	Yes <i>Comments regularly submitted through DashPort and Email w/in deadlines</i>
<b>1.2 RTD and the study team will have sufficient time to respond to questions, comments and new ideas</b>	Questions, comments, concerns and ideas raised in meetings are explored and responded to in a timely manner	Yes <i>Responses to comments posted to DashPort and/or discussed at next PACT/TAC meeting</i>
<b>1.3 Identify issues/concerns early and collaboratively address them throughout the process</b>	Adherence to the Collaboration Commitment	Yes
	Adhere to a transparent process; a "no surprises" approach	Yes <i>Data provided to TAC prior to PAC</i>
<b>1.4 Maintain an open and collaborative dialogue among all participants in all meetings.</b>	Adherence to the Collaboration Commitment	Yes
<b>1.5 Provide outcome-focused and priority-focused input</b>	Meeting discussion is facilitated to focus on key issues	Yes
	Input on detailed edits/revisions or similar micro-topics are submitted in writing as part of the comment period	Yes <i>Written comments regularly addressed these edits</i>
<b>1.6 All study participants actively inform, engage and solicit input from the public in a</b>	Adherence to the public involvement strategy outlined in the stakeholder involvement plan	Yes <i>Website updates, email blasts, organizational briefings, public mtgs</i>

Goal 1: A Transparent and Collaborative Process		
<b>coordinated fashion</b>		
<b>1.7 An effective public engagement strategy</b>	Adherence to the public involvement strategy outlined in the stakeholder involvement plan	Yes <i>Website updates, email blasts, organizational briefings, public mtgs</i>
	Project website is regularly maintained with study documents and reports	Yes
	Monthly summaries of public comments provided to study participants	No <i>Public comments solicited in January, so monthly summaries weren't available.</i>
	Coordinate media and public engagement with city/town/county public information officers	Yes <i>Multiple entities published project updates and meeting announcements</i>
<b>1.8 Ensure a "No-sacred cows" approach (process, options, assumptions)</b>	Adherence to the Collaboration Commitment	Yes
<b>1.9 Present information in a clear, consistent and understandable fashion</b>	Present financial information in current-day dollars	Yes

**Table 8.2 Comparison of Northwest Rail and North Metro Extension Rail Options**

	Northwest Rail				N. Metro Extension
	Westminster <sup>th</sup> to 116 Ave Broomfield	Broomfield to Louisville	Louisville to Boulder	71st to Longmont <i>Full Corridor</i>	
Ridership (2035)	2,100 - 3,400	1,700 - 1,800	2,000 - 2,100	9,300 - 10,800	840 – 900
Capital Cost (\$ 2013)	\$557M - \$681M	\$159M - \$194M	\$241M - \$295M	\$1,156M - \$1,413M	\$682M - \$834M
Annual Cost Per Boarding	\$36.19	\$15.34	\$26.10	\$23.42	\$138.82
Travel Time (from DUS)	27 min.	38 min.	52 min.	71 min.	59 min.

**Table 8.3 Comparison of Arterial BRT Corridors**

	Arterial BRT Corridors					
	S Boulder Rd + Share of Bway & 28th	120 <sup>th</sup> Ave	Arapahoe/ SH 7	SH 42	US 287	SH 119
Boardings (2035)	3,300	5,000	4,600	900	9,000	5,000
Capital Costs	\$36.6M	\$31.8M	\$45.4M	\$27.4M	\$56.4M	\$57.2 M
Annual Cost Per Boarding	\$10.01	\$3.97	\$4.33	\$11.14	\$3.82	\$6.27
Annual Subsidy per Boarding	\$6.53	\$1.35	\$1.25	\$4.54	\$1.19	\$2.80
Travel Time with Arterial BRT	21m	41m	34m	38m	39m	36m

*Costs in 2013 dollars. Does not include capital costs of \$50.9 million for a new Vehicle Maintenance Facility.*

*Annual cost per rider and annual subsidy per boardings calculated by RTD (\$2013).*

*The Boulder System Improvements are estimated at \$21.5 million. S. Boulder Rd share \$4.8m.*

## 9.0 Stakeholder Consensus on NAMS Priorities

### 9.1 Consensus Process to Determine the NAMS List of Priorities

At the conclusion of the July 30th, 2013 PAC, Northwest Area stakeholders accepted the study findings regarding the short and long terms solutions for the North I-25 Reverse Commute and the confirmation of the US 36 BRT Program and remaining capital commitments. Based on the findings for the US 36 BRT Program and remaining capital commitments the RTD Board of Directors took action at their September 17, 2013 Board meeting with Approval of Final Scope Elements for US 36 Bus Rapid Transit (See **Appendix F** of this Report). During the period of August through October 2013, incremental study findings on Northwest Rail, North Metro Extension and Arterial BRT (as summarized in this Report) were presented to both the Technical and Policy Advisory Committee. After the PAC meeting of October 7, 2013, the Northwest Area stakeholders provided the RTD Board of Directors with a conceptual consensus letter (See **Appendix C**, US 36 Mayors/Commissioners Coalition Letter, dated October 25, 2013). This letter requested a more detailed financial analysis of RTD's revenues prior to reaching a final consensus. It identified CDOT with responsibility to implement solutions for North I-25 Reverse Commute Challenges. The letter also acknowledged while all other FasTracks Corridors are likely to be completed prior to Northwest Rail, the stakeholders were still committed to this corridor. In addition, the stakeholders identified SH 119 Arterial BRT as the initial priority for Arterial BRT.

The final results of the study evaluation process for Northwest Rail, North Metro Extension, Arterial BRT and financial alternatives were presented to the NAMS stakeholder Technical and Policy Advisory Committee in January 2014. The evaluation findings were accepted at the January 30, 2014 PAC meeting. A brief discussion on setting priorities for recommendation to the RTD Board of Directors was held. The PAC requested additional information from RTD related to future revenue forecasts for both the RTD base system and for FasTracks prior to discussing in detail the list of priorities as an outcome of the NAMS study. This information was provided to the stakeholders by RTD in early April 2014 and is discussed in **Section 7.2** of this report. As reported to the stakeholders, as of April 2014, RTD is projecting limited availability of funding from the base system until after 2020 and for FasTracks limited availability until after 2035. RTD has indicated funding forecasts are subject to change and will be continued to be monitored.

On April 7, 2014 the Northwest Area stakeholders submitted to RTD a Local Stakeholder Consensus Document detailing their requested priorities resulting from the NAMS Study. This document can be found in **Appendix C**. On April 18, 2014 a NAMS PAC Meeting was held for the purpose of developing a consensus between the RTD, stakeholders and CDOT on mobility solutions to the serve the Northwest area. The five key areas discussed included previous recommendations made by the PAC to address the US 36 BRT Program and the North I-25 Reverse Commute Challenges as well as recommendations concerning Northwest Rail, the North Metro Extension and the Arterial BRT corridors serving the Northwest area. Based on the discussion at the April 18, 2014 PAC, the Northwest Area Stakeholders, RTD and CDOT reached consensus on the List of NAMS Priorities.

## 9.2 Policy Advisory Committee Consensus Recommendation on the List of NAMS Priorities to the RTD Board of Directors

Following the discussion at the April 18, 2014 PAC meeting, a Final Consensus Statement was developed and forwarded as a recommendation to the RTD Board of Directors.

### Final Consensus Statement

The following prioritized list of improvements reflects the general consensus of the Policy Advisory Committee (PAC) and RTD on April 18, 2014 regarding the NAMS Study and are provided as a Recommendation to the RTD Board of Directors (the Final Consensus Statement, dated May 1, 2014 is also provided as **Appendix G** of this Report :

- **An overarching theme serves as a basis from which consensus on the priorities is grounded:**
  - o The Northwest area remains committed to Northwest Rail as envisioned in FasTracks. Given the projected timing of Northwest Rail's implementation, Northwest stakeholders want to see mobility benefits sooner.
- **Projects on the prioritized list should not be considered absolutely sequential:**
  - o Nothing should preclude the pursuit or acceleration of any option of these priorities should viable opportunities or partners become available.
  - o More than one priority can be pursued simultaneously.
  - o RTD should be proactive, aggressive and creative in monitoring projects for any significant development that help a project move forward (e.g. public or P3 funding opportunities, BNSF plans).

- **North Metro Rail Extension (SH 7 to Longmont)**

- o Estimated cost combined with projected low ridership yields an annual cost per boarding almost six times higher than Northwest Rail.
- o It is recommended by the Study Team and accepted by the NAMS PAC not to proceed with any action on this corridor at this time. The corridor should be re-evaluated in the future if population densities or other conditions change.

- 1. Completion of the Remaining US 36 BRT Commitments (FasTracks Funding):**

- o Consistent with the NAMS Local Stakeholder Consensus Document (April 7th, 2014) and Approval of Final Scope Elements for US 36 Bus Rapid Transit, RTD Board of Directors Report (September 17th, 2013).

- 2. Arterial BRT/Enhanced Bus Service – (RTD Base System, State, Regional and Federal Funding)**

Short Term - next 3-10 years

- o Proceed into advanced planning/environmental/preliminary design via submittal of TIGER Planning Grant by 4-28-14:
  - SH 119 from Longmont to Boulder (1st priority)
  - Second Corridor - US 287 from Longmont to DUS
- o One or both corridors could be implemented following study based on further refinement of regional priorities, project scopes, funding availability and leveraging opportunities.
- o Arterial BRT/Enhanced Bus Service station investments should support anticipated bus ridership, and include station design features consistent with future rail service.

- 3. Interstate 25 Reverse Commute Solutions (Pecos to DUS) (Regional, State and Federal Funding – RTD Support)**

Short Term – next 3-10 years

- o Advance Bus-on-Shoulder concept with CDOT and RTD.
- o Investigate feasibility of downtown street/signal improvements.

Long Term – next 7-20 years

- o Initiate advanced planning for systematic improvements along Interstate 25.
- o Develop regional managed lane system plan.
- o Initiate feasibility planning based on agreed priorities.

- 4. Northwest Rail (FasTracks Funding):**

- o Given present funding challenges and accompanying near-term inability to secure a railroad agreement, completion of Northwest Rail is a longer term goal.
- o On an annual basis, RTD will explore and update Northwest Rail implementation strategies and report to stakeholders and the public.

- 5. Remaining Arterial BRT/Enhanced Bus Service Corridors (RTD Base System, State, Regional and Federal Funding):**

Long Term - next 7-20 years

- o Could be implemented based on further refinement of regional priorities, project scopes, funding availability and leveraging opportunities:
  - SH 7
  - South Boulder Road
  - 28th Street/Broadway

- 120th Avenue
- SH42/95th Street

o Arterial BRT/Enhanced Bus Service station investments should support anticipated bus ridership, and include station design features consistent with future rail service.

### 9.3 RTD Board of Directors Adoption of NAMS Consensus Recommendations

On June 24, 2014 the RTD Board of Directors approved Resolution No.6 to accept the Final Consensus Statement as developed by the Northwest Area Mobility Study stakeholders for priorities within the Northwest Study Area (**See Appendix H** to this Report). The resolution also noted that two high-priority Arterial BRT corridors, SH 119 and SH 287 were submitted for TIGER grants. This report was finalized after the RTD Board of Director's action to reflect the Boards concurrence with the project stakeholders' Final Consensus Statement.



# Appendices

# Appendix A

## BNSF Correspondence

### RTD Letter and BNSF Response



August 14, 2013

DJ Mitchell  
Assistant Vice President Passenger Operations  
2600 Lou Menk Drive  
P.O. Box 961034  
Fort Worth, Texas 76161-0034

RE: Northwest Area Mobility Study/Northwest Rail Coordination

Dear DJ:

This letter is to provide an update on recent Regional Transportation District (RTD) activities and to request clarification on issues related to the Northwest Rail Corridor. RTD and the communities in the Northwest area of RTD initiated the Northwest Area Mobility Study (NAMS) in April of 2013. The purpose of the Study is to develop consensus among RTD, the Colorado Department of Transportation (CDOT) and corridor stakeholders, including local jurisdictions, on cost effective mobility improvements to serve the Northwest Area. The analysis framework for developing a consensus will provide financial and project specificity for RTD's FasTracks Annual Program Evaluation (APE) and resultant Denver Regional Council of Governments (DRCOG) SB 208 Report and be structured to form the basis for Alternatives Analysis/Planning Environmental Linkages Studies to the extent possible. The study is to be officially completed in the spring of 2014.

#### **Background**

The Northwest Area Mobility Study is directed to review five key mobility elements. Two are related to bus rapid transit and one relates to reverse commute issues/improvements on I-25 in Denver. The remaining two Study elements involve the following proposed rail improvements in BNSF's Front Range freight rail corridor between Denver and Longmont and the former UPRR Boulder Industrial Lead between Sand Creek Junction and Longmont to accommodate passenger rail:

**Phased Construction of Northwest Rail:** The study will evaluate operational/service options and construction phasing options along the Northwest Rail line from the South Westminster/72nd Ave. (BNSF MP 6.2) end-of-line station currently under construction as part of the Eagle P3 project to Longmont.

**Feasibility of Extending North Metro Rail Line to Longmont:** As an alternative to providing commuter rail service to Longmont on Northwest Rail through Boulder the study will evaluate the feasibility of providing commuter rail service to Longmont by extending the North Metro Rail Line from the currently planned end of line at 162<sup>nd</sup> Avenue along various alignments into Longmont

Through our HNTB consultant team, we have previously provided you and Richard Weicher, Vice President and General Counsel, Regulatory, with a memorandum dated May 13, 2013 outlining various alternative scenarios and assumptions associated with the NW Rail portion of the Study. Richard Weicher provided an e-mail response to Pete Rickershauser and Eric J. Anderson, Senior Project Manager, Parsons Brinckerhoff, members of the consultant team, on June 18, asking as a precondition to participating more formally in NAMS that RTD provide timing when any further projects in the Denver-Longmont, CO corridor might commence, the pace at which they might

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progress, and at what level of desired service over the BNSF corridor. With that information, Mr. Weicher advised Messrs. Rickershauser and Anderson that BNSF would be in a better position to comment on various corridor service segmenting and operating scenarios.

One of the outcomes from The NAMS project will provide RTD and BNSF more clarity as to the specific information in response to Mr. Weicher's June 18, 2013 email, referred to above, about the planning for a NW Rail passenger service and the potential funding and timing of this service. The stakeholder have identified three specific segments that could be consecutively phased into service in the NW Corridor beyond the current end of line at 72<sup>nd</sup> Avenue and Lowell in Westminster to eventually allow for a fully operable RTD commuter line on BNSF to Longmont.

The stakeholders have requested that RTD ask BNSF if the planning assumptions that the study team is making regarding the rail improvements required to provide commuter service and protect present and future BNSF operations are reasonable and accurate. We would like BNSF to review and comment on the assumptions we are using to build our engineering and operating models preparatory to understanding costs of establishing and phasing RTD commuter service over BNSF, which will then permit us to more formally comment to you BNSF on project timing for the entire Denver-Longmont corridor.

The operational assumptions for the corridor are those that were identified as Operating Scenario #2 in the May 13, 2013 memorandum, which were the same as those that were used for the BNSF cost estimate prepared in August 2011 and described below:

Between Denver and Longmont approximately 55 one-way trips per weekday with schedules of not more than half hourly from approximately 6:00 am to 9:00 am and 3:30 pm to 6:30 pm with hourly service during the remainder of operating hours, and hours of operation between 4:00 am to midnight each weekday, with no service between midnight and 4:00 am. Between Denver and Longmont approximately 36 one-way trips each weekend day with service no more than hourly and hours of operation between 4:00 am and midnight and no service between midnight and 4:00 am.

Based on this service plan and past information exchanges with BNSF, we are including in our plans and cost estimates that if we segment the corridor and phase construction, RTD will include plans and a cost estimate that provides BNSF with an unobstructed chambering or staging track for its present and future freight traffic in the corridor located past (north of) any end of line RTD commuter passenger station able to accommodate trains of about 9000 linear feet.

The NAMS Technical and Policy Advisory Committees on July 30 agreed to narrow the effort to evaluate segmenting and phasing options on NW Rail for evaluation in more detail. One or all of the following options may be considered:

**Phase 1:** From the current end of line at 72<sup>nd</sup> Avenue and Lowell in Westminster (MP 6.2) to Broomfield (116<sup>th</sup> Street, between MP 13 and 14); BNSF freight chambering or staging track to be located between MP 14.8 and MP 17.2 (approximately).

**Phase 2:** From Broomfield/116<sup>th</sup> to Louisville (just beyond MP 20); BNSF freight chambering or staging track to be located between MP 22.5 and MP 24.7 (approximately) with single track between the RTD end of line and the chambering or staging track.

Regional Transportation District



These Northwest Rail commuter segments were chosen due to the ability to accommodate the BNSF freight chambering or staging track with minimal requirements for additional grade separations combined with reasonable curvature and grade requirements for the BNSF chambering/staging track located after the RTD end of line station.

An additional segment was requested for consideration by the members of the Technical and Policy committees at the July 30 meeting. There is a desire to consider the Boulder Transit Village (approximately MP 31.3) as a possible end of line station. This would be an additional alternative. This location was originally dismissed as a possible end of line station due to the inability to locate a chambering track as close as possible to the end of the line that would not require several very expensive grade separation structures along the State Highway 119 corridor between Boulder and Longmont (approximately MP 31 to 43).

#### **Request for Clarification**

In order for RTD to move forward with the study of the NW Rail corridor, we request that BNSF advise whether the options described above, including a segment to the Boulder Transit Village, are feasible. This will educate and aid the study participants and stakeholder to finalize line segments, estimate costs and provide a more formal funding and construction timeline for the entire project to BNSF.

1. Based on the referenced service plan, will BNSF require a separate and parallel freight chambering or staging track for the three scenarios, or would the existing BNSF single track main line be sufficient?
2. If required, we have assumed in our engineering work that the preferred ideal location for a BNSF freight chambering or staging track would be beyond and as close to the end of RTD's operational limits. Please verify our assumption.
3. If required, is there a conceptual scenario acceptable to BNSF where the BNSF freight chambering or staging track could be located on the Denver side of the "end-of-line" RTD Northwest Corridor commuter station? Please advise for our planning purposes what BNSF's requirements for this scenario would be for this option to be acceptable to BNSF.
4. For the Boulder segment, is there a scenario acceptable to BNSF that would not require chambering immediately at the end-of-line at Boulder Transit Village and that would minimize additional track improvements between Boulder and Longmont.

#### **Next Steps**

The RTD will be presenting to the Technical Advisory Committee at its August 20 meeting a revised financial plan for the entire FasTracks project. That presentation is expected to include a discussion of a proposed statewide effort to significantly increase transportation funding, for both highways and transit in the State. For the past year, a broad based group of cities, counties and organization from across the state have been developing the groundwork for a possible statewide ballot issue in the fall of 2014. RTD has indicated that it would use a portion of its share of these resources to initiate the implementation of the commuter rail related recommendations coming from the NAMS study.

Because of this proposed funding initiative, NAM's stakeholders are anxious to see BNSF become an active partner in this study in order to determine that commuter rail service proposed at the completion of NAMS can become a reality with a successful referendum.

**Regional Transportation District**



**DJ Mitchell II**  
*Assistant Vice President*  
*Passenger Operations*

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September 12, 2013

Ms. Nadine S. Lee, P.E.  
Northwest Rail Engineering Manager  
Regional Transportation District  
1560 Broadway, Suite 700  
Denver, CO 80202

Dear Ms. Lee:

I'm writing to you in your role as Chair of the Northwest Area Mobility Study Group and in reference to Mr. Henry Stoppolecamp's letter of August 14, 2013, regarding a future Northwest Area Mobility Study report. As you may know, Mr. Stoppolecamp's letter requested that we analyze and comment on various underlying study assumptions, and in particular the location of future freight train chambering tracks.

At the direction and request of RTD, over a multi-year period ending in 2012, and in great depth, BNSF reviewed, modeled and considered several RTD commuter rail service proposals between Denver and Longmont. In addition, we made specific proposals to RTD last year and, toward the end of the process, were told by RTD that it was not feasible for them to proceed with their proposed commuter rail project (beyond the significant transactions we had already finalized with RTD) because, as the situation was described to us, sufficient funding was not available to secure the property rights and construct the infrastructure necessary to support the level of service RTD was considering.

Going forward, as with all other corridor agreements under which we have successfully negotiated and completed transactions with communities to initiate commuter service, we look to the service provider and/or funding agency to define the desired level of rail service for a given corridor, and to advise all stakeholders when such service may be feasible and practical. This model has worked well for us, including during the RTD/BNSF Gold Line project negotiations; but it means that we must rely on the controlling public agency to describe to us project assumptions and design parameters, rather than have us speculate in the absence of defined service schedules and time horizons for implementation.





Our prior meetings with the Northwest Mayors' group following RTD's then proposed plans regarding future Denver/Longmont service implementation reflected this approach and as we demonstrated at that time, we were willing to address various alternatives, and did so, but not in an open-ended fashion.

So, where do we stand today? First, we know of no change in position from where RTD and BNSF left the matter of Northwest service over a year ago; and second, we continue to be unclear as to what service RTD might wish to implement in the foreseeable future, and for that matter what the definition of a "foreseeable future" is. This, in turn, makes it particularly difficult for us to make meaningful assumptions about future infrastructure needs. Mr. Stoppelcamp's letter describes a proposed weekday train schedule of 55 one-way trips, operating between Denver and Longmont based on half-hour schedules during part of the day, and at various other schedules covering the non-rush hour periods and the weekends. As we have discussed with RTD before and as we have documented over the years, service of this magnitude will trigger the need for extensive double tracking and other infrastructure improvements. We also know, as noted earlier in this letter, that RTD has determined that it was not financially feasible to proceed with its proposed commuter rail project as it was described to us last year.

However, until RTD, as the controlling agency, is in a position to communicate with certainty the location and level of service it wants to operate, combined with a timeline which describes when such service could be funded and progressed, we are not in a position to address what infrastructure would be needed for such service. This is because in the process of building an integrated passenger and freight operating plan to ensure that there is sufficient infrastructure in place to protect our existing and future freight capacity needs and successfully accommodate desired levels of commuter service operating at an on-time performance level acceptable to the RTD and the riding public, traffic projections need to be as accurate as possible, which means that service start up dates must be known. In addition, we do not believe individual elements of any plan, such as for example, a chambering track, can be viewed in isolation from an overall plan, the level of eventually desired service, and the timing of both construction and implementation.

We certainly respect the engineering firm RTD is working with to provide adequate guidance towards determining both service and infrastructure needs; but one must bear in mind that beyond a 2-5 year future time horizon, cost estimates become less reliable, infrastructure requirements become more speculative, and the exercise becomes less productive. In fact, speculation on specific track alignments, the location of chambering tracks, numbers of stations and their locations, or any other key elements related to project build-out beyond the relatively near-term could potentially be less than beneficial



to all concerned, as it might unduly raise the concerns of potential neighbors, developers, and people who are sensitive to meaningful levels of increased noise and congestion.

Much of what I've written mirrors some of the key points BNSF raised in Rick Weicher's letter to RTD last fall, and in particular the need for concrete projections of timing and the extent and level of desired commuter service at any given points of time in the future. As I hope you can appreciate, we need to understand the connections between commuter service levels, RTD's desired quality of commuter service, and commuter service start-up dates in order for us to assess our present and future freight mobility needs and to design improvements that are necessary for preserving both existing and future freight service capacity and the capacity needed to support future commuter service. Until the RTD is able to address all three elements, BNSF is not prepared to engage in an exercise that could be mischaracterized at some time in the future, when today we do not know when any work could actually commence.

Sincerely,

A handwritten signature in black ink, appearing to read "DJ Mitchell II".

DJ Mitchell II  
Passenger Operations

CC: Mr. Philip A. Washington, RTD  
Mr. Henry Stoppelcamp, RTD  
Ms. Marla Lien, RTD  
Mr. Richard Weicher, BNSF  
Ms. Cathy Norris, BNSF

# **Appendix B**

## **Study Evaluation and Financial Summaries**

**Goal 1: A Transparent and Collaborative Process**

**Goal 2: Provide a High Quality, Reliable Transit System**

**Goal 3: Provide Cost Effective Transit Solutions**

**Goal 4: Respect and Support Local and Regional Planning Efforts**

**Goal 1: A Transparent and Collaborative Process**

Objective	Measure	Results
<b>1.1 Stakeholders will have adequate time to review information and ask questions before commenting or taking action</b>	Adherence to the 10-day review/comment period in the Collaboration Commitment; questions and comments are clearly articulated in writing	Yes <i>Comments regularly submitted through DashPort and Email w/in deadlines</i>
<b>1.2 RTD and the study team will have sufficient time to respond to questions, comments and new ideas</b>	Questions, comments, concerns and ideas raised in meetings are explored and responded to in a timely manner	Yes <i>Responses to comments posted to DashPort and/or discussed at next PACT/TAC meeting</i>
<b>1.3 Identify issues/concerns early and collaboratively address them throughout the process</b>	Adherence to the Collaboration Commitment	Yes
	Adhere to a transparent process; a "no surprises" approach	Yes <i>Data provided to TAC prior to PAC</i>
<b>1.4 Maintain an open and collaborative dialogue among all participants in all meetings.</b>	Adherence to the Collaboration Commitment	Yes
<b>1.5 Provide outcome-focused and priority-focused input</b>	Meeting discussion is facilitated to focus on key issues	Yes
	Input on detailed edits/revisions or similar micro-topics are submitted in writing as part of the comment period	Yes <i>Written comments regularly addressed these edits</i>
<b>1.6 All study participants actively inform, engage and solicit input from the public in a coordinated fashion</b>	Adherence to the public involvement strategy outlined in the stakeholder involvement plan	Yes <i>Website updates, email blasts, organizational briefings, public mtgs</i>
<b>1.7 An effective public engagement strategy</b>	Adherence to the public involvement strategy outlined in the stakeholder involvement plan	Yes <i>Website updates, email blasts, organizational briefings, public mtgs</i>
	Project website is regularly maintained with study documents and reports	Yes

**Goal 1: A Transparent and Collaborative Process**

	Monthly summaries of public comments provided to study participants	No <i>Public comments solicited in January, so monthly summaries weren't available.</i>
	Coordinate media and public engagement with city/town/county public information officers	Yes <i>Multiple entities published project updates and meeting announcements</i>
<b>1.8 Ensure a "No-sacred cows" approach (process, options, assumptions)</b>	Adherence to the Collaboration Commitment	Yes
<b>1.9 Present information in a clear, consistent and understandable fashion</b>	Present financial information in current-day dollars	Yes

**Goal 2, Objectives 2.1, 2.2 and 2.3 Evaluation for Northwest Rail and North Metro Extension**

Measure	Measurement Type	Measurement Range	Northwest Rail				North Metro Rail Extension
			Westminster to 116th Ave Broomfield	Broom-field to Louisville	Louisville to Boulder	Westminster to Longmont Full Corridor	

**2.1 Provide better connections to the regional and local transit and transportation system**

Street connectivity (connections to interstates, highways and major roads)	Number of accessible interstates, highways (1st number) and major roads (2nd number) within 1/4-mile of stations	2/4 = Good, 1/3 = Average, 1/2 = Fair, less than 1/2 = Low	2/6 	1/4 	1/3 	2/13 	1/6 
Change in roadway vehicle miles travelled (VMT)	Projected 2035 percentage change in VMT over No Build. Breakpoints are consistent with the FTA New/Small Starts Evaluation and Rating Process.	Total VMT for Metro Area is 101,696,927, VMT saved ranges from 34,239 to 38,742  For NWR Segments 1 and 3 and 63,485 for the entire NWR corridor.	0.03% 	0.04% 	0.0% 	0.06% 	0.06% 

**2.2 Support the overall growth of transit ridership**

Projected 2035 boardings	Projected peak hour and all-day boardings by segment	More than 75,000 = Good, 74,999 to 34,000 = Average, 33,999 to 12,000 = Fair, Less than 12,000 = Low	2,100 - 3,400 	1,700 - 1,800 	2,000 - 2,100 	9,300 - 10,800 	840 - 900 
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**2.3 Meet the level-of-service and quality-of-service needs of local communities**

Number of transfers required between major trips origins and destinations	Number of transfers required for each alternative between major origin and destination pairs	1-2 = Good, More than 2 = Low	1-2 	1-2 	1-2 	1-2 	1-2 
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Good Average Fair Low



**Goal 2, Objective 2.4 Evaluation for Northwest Rail and North Metro Extension**

Measure	Measurement Type	Measurement Range	Northwest Rail				North Metro Rail Extension
			Westminster to 116th Ave Broomfield	Broomfield to Louisville	Louisville to Boulder	Westminster to Longmont Full Corridor	
<b>2.4 Provide a "backbone" transit network and level of service that can expand to support future transit expansion</b>							
Operational schedule comparison to FasTracks commuter rail	Comparison of schedules for each alternative with applicable RTD services and national best practices	Better than FasTracks average (15 minute peak, 30 minute off-peak) = Good, Comparable to FasTracks average = Average, Less than FasTracks average = Low	30 minute peak, 60 minute off-peak, ○	30 minute peak, 60 minute off peak, ○	30 minute peak, 60 minute off-peak, ○	30 minute peak, 60 minute off-peak, ○	30 minute peak, 60 minute off-peak, ○
		Better than national average (25 minute peak, 40 minute off-peak) = Good Comparable to national average = Average Less than national average = Low	30 minute peak, 60 minute off-peak, ◐	30 minute peak, 60 minute off-peak, ◐	30 minute peak, 60 minute off-peak, ◐	30 minute peak, 60 minute off-peak, ◐	30 minute peak, 60 minute off-peak, ◐

Good    Average    Fair    Low

●    ◐    ◑    ○

Goal 2, Objective 2.5 Evaluation for Northwest Rail and North Metro Extension

Measure	Measurement Type	Measurement Range	Northwest Rail				North Metro Rail Extension
			Westminster to 116th Ave Broomfield	Broomfield to Louisville	Louisville to Boulder	Westminster to Longmont Full Corridor	
2.5 Consistent and reliable travel times between major origins and destinations			116th Ave Broomfield	Louisville to DUS via US 36	Boulder Junction	Longmont to DUS via I-25	Longmont to DUS via I-25
Bus	AM Peak Period Time (in min)	Lower travel time compared to other modes = Good,	19	22	38	53	53
Auto (GP/MG Lanes)	AM Peak Period Time (in min)	Comparable travel time compared to other modes = Average	33	38	46/31	59/44	59/44
Rail	AM Peak Period Time (in min)	Higher travel time compared to other modes = Low	27	38	52	71	59

Good 
 Average 
 Fair 
 Low

**Goal 2, Objective 2.6 Evaluation for Northwest Rail and North Metro Extension\***











Measure	Measurement Type	Measurement Range	Northwest Rail				North Metro Rail Extension
			Westminster to 116th Ave Broom-field	Broomfield to Louisville	Louisville to Boulder	Westminster to Longmont Full Corridor	
<b>2.6 Support station siting that that encourages multi-modal access and easy transfers</b>							
Existing Population density	Total Existing population within ½ mile of stations/square mile (FTA measurement range).	Greater than 15,000 = Good, 9,600 - 15,000 = Average, 5,760 to 9,599 = Fair, Less than 5,759 = Low	2,663	1,600	2,761	2,063	684
Existing Total employment	Total existing population within 1/2-mile of stations / square mile.	Greater than 15,000 = Good, 9,600 - 15,000 = Average, 5,760 to 9,599 = Fair, Less than 5,759 = Low	5,186	2,441	5,102	3,722	4,535
Future Population density	Total 2035 projected population within 1/2-mile of stations / square mile (1st number is DRCOG, 2nd is jurisdictions).	Greater than 15,000 = Good, 9,600 - 15,000 = Average, 5,760 to 9,599 = Fair, Less than 5,759 = Low	5,186/ 7,604	4,095/ 8,191	5,102/ 5,217	2,063/ 7,175	1,699/ 3,108
Future Total employment	Total 2035 projected employment within 1/2-mile of stations or stops (1st number is DRCOG, 2nd is jurisdictions).	Greater than 220,000 = Good, 140,000 - 219,999 = Average, 70,000 to 139,000 = Fair, Less than 69,999 = Low	23,492/ 26,529	7,847/ 24,690	9,324	54,131/ 74,011	5,302
Bicycle/pedestrian environment (connection to trails, bike routes, sidewalks)	Coverage of trails, bike facilities and sidewalks within 1/4 mile of stations/stops	Direct trail and bicycle facility connections to stations = Good, some trail and bicycle facility connections with 1/4 mile of stations = Average, No trail or bicycle facilities = Low	●	●	●	●	○
Proximity to other bus/rail stops	Number of existing RTD stations/stops with 1/4 mile of stations	30 or greater stops = Good, 29-20 Stops = Average, 19 - 10 Stops = Fair, Less than 10 Stops = Low	70 ●	16 ◐	64 ●	228 ●	4 ○
Connectivity to service to DIA	SkyRide route within 1/4 mile of stations	Yes = Good, No = Low	●	●	●	●	○

\* It is to be noted that DRCOG is held to a regional control total. This sensitivity analysis was done to estimate the impact of jobs and housing based on local stakeholders' current plans and forecasts, only. DRCOG land use data is a snapshot in time that cannot realistically account for development that was recently approved or is in the planning stage.



**Goal 3, Objective 3.1 Evaluation for Northwest Rail and North Metro Extension**

Measure	Measurement Type	Measurement Range	Northwest Rail				North Metro Rail Extension
			Westminster to 116th Ave Broomfield	Broomfield to Louisville	Louisville to Boulder	Westminster to Longmont Full Corridor	
<b>3.1 Minimize right-of-way impacts and property acquisitions</b>							
Number of direct right-of-way impacts (station, PnRs and road improvements, track, etc.).	Total number of direct right-of-way impacts in acres	Total number of direct right-of-way impacts in acres	18 acres 	18 acres 	16 acres 	76 acres 	89 acres 
Impacts to Sensitive Land Use	Residential and civic/institutional uses which may be impacted by each alternative based in review of aerial photography, local land use plans and the DRCOG regional land use GIS dataset	Total acres of displaced sensitive land uses	0 acres 	0 acres 	2.4 acres 	3.9 acres 	0 acres 
Impacts to Parks and Open Space	Parks and open space are defined as lands that have been officially designated as such by a federal, state, or local agency	Total acres of impacted parks and open space	0.01 acres 	0.87 acres 	0.22 acres 	1.68 acres 	18 acres 
Impacts to Sensitive Wildlife	Threatened, endangered, and state sensitive species	Acres of impacted sensitive wildlife	4 acres 	3 acres 	54 acres 	90 acres 	N/A

Measure	Measurement Type	Measurement Range	Northwest Rail				North Metro Rail Extension
			Westminster to 116th Ave Broomfield	Broomfield to Louisville	Louisville to Boulder	Westminster to Longmont Full Corridor	
Impacts to Water Resources (Lakes, ponds, wetlands, Streams, etc.)	Intermittent streams, as well as lakes and ponds as designated on U.S. Geological Survey (USGS) maps and National Wetlands Inventory (NWI) maps	Total acres of impacted streams, wetlands, etc.	1.2 acres 	1.2 acres 	6.3 acres 	9.11 acres 	1 acre of wetlands 
Environmental Justice Impacts	DRCOG TAZs with substantial minority populations and/or low-income populations. Substantial minority populations within the affected areas were compared to the statewide average.	Number of impacted TAZs with a substantial minority and/or low-income population	Crosses 7 TAZ with higher level of minority residents 	Crosses no TAZ with higher level of minority residents 	Crosses no TAZ with higher level of minority residents 	Crosses 12 TAZ with higher level of minority residents 	Crosses 5 TAZ with higher level of minority residents 

Good 
 Average 
 Fair 
 Low 

**Goal 3, Objective 3.2 Evaluation for Northwest Rail and North Metro Extension**

Measure	Measurement Type	Measurement Range	Northwest Rail				North Metro Rail Extension
			Westminster to 116 <sup>th</sup> Ave Broomfield	Broomfield to Louisville	Louisville to Boulder	Westminster to Longmont Full Corridor	
<b>3.2 Recommend solutions based on current funding availabilities, with prioritized list of solutions should new funding become available</b>							
Fund availability schedule (what NWR money is available when, prior to 2044)	Fund availability schedule	Meets Project Schedule Needs (Yes/No)	TBD by RTD	TBD by RTD	TBD by RTD	TBD by RTD	TBD by RTD
<b>Applicability of Additional Funding Sources</b>							
FTA New/Small Starts	FTA New/Small Starts Criteria Guidance	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
TIGER Funding	Best Practices from Successful TIGER Applications	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
TIFIA Loans	FHWA Guidance on Innovative Program Delivery	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
RRIF Loans	FHWA Guidance on Innovative Program Delivery	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
P3 Opportunities and Innovative Funding	State of Colorado P3 Guidelines	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
New source of state or local funds	Potential new state enabling legislation	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
Study Recommendations should cost less than the current cost estimate	NWR (Northwest EE) and NME (North I-25 EIS)	Yes/No	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section

Good    Average    Fair    Low

●    ◐    ◑    ○



**Goal 3, Objective 3.3 Evaluation for Northwest Rail and North Metro Extension**

Measure	Measurement Type	Measurement Range	Northwest Rail				North Metro Rail Extension
			Westminster to 116 <sup>th</sup> Ave Broomfield (See Note below)	Broomfield to Louisville	Louisville to Boulder	Westminster to Longmont Full Corridor	
<b>3.3 Recommend solutions whose costs justify the benefits</b>							
Capital costs	Base year capital costs required to complete the corridor improvements	Total capital costs per alternative	*\$557 - \$681	*\$159 - \$194	*\$241 - \$295	*\$1,156 - \$1,413	*\$682 - \$834
Annualized Capital and O&M costs	Annualized capital costs and O&M costs based on service plan for each alternative	Total Annualized Capital and O&M costs per alternative	\$23.3	\$8.0	\$16.0	\$66.9	\$35.8
Annualized Cost per Annualized Boarding	Total annualized capital and O&M cost / total annualized boardings (FTA measurement range)	Less than \$4.00 = Good, Between \$4.00 and \$5.99, Average, Between \$6.00 and \$9.99 = Fair, More than \$15.00 = Low	\$36.19 	\$15.34 	\$26.10 	\$23.42 	\$138.82 
Subsidy per Boarding (compared to existing RTD Service)	Existing subsidy for existing service and projected subsidy per boarding for each alternative based on projected revenue and total capital and O&M costs	Projected revenue - total Capital and O&M costs	Subsidy per boarding information is not available until RTD implements commuter rail	Subsidy per boarding information is not available until RTD implements commuter rail	Subsidy per boarding information is not available until RTD implements commuter rail	Subsidy per boarding information is not available until RTD implements commuter rail	Subsidy per boarding information is not available until RTD implements commuter rail
Boardings per Revenue Vehicle Hour	Total projected boardings and vehicle hours per alternative	Total Boardings / Revenue Vehicle Hours. 2011 RTD Average Daily Boardings per Revenue Hour = 125.9	90.56 	233.06 	117.12 	108.92 	22.45 

Good Average Fair Low

**Goal 4, Objective 4.1, 4.2 and 4.3 Evaluation for Northwest Rail and North Metro Extension**

Measure	Measurement Range	Northwest Rail				North Metro Rail Extension
		Westminster to 116th Ave Broomfield	Broomfield to Louisville	Louisville to Boulder	Westminster to Longmont <i>Full Corridor</i>	
<b>4.1 Respect the Iterative Nature of Planning</b>						
Local jurisdictions provide RTD and study team with guidance on interpreting their plans.	Yes = Good, No = Low	●	●	●	●	●
FTA New Starts Definition of Economic Development Potential in Corridor around Stations.	Potential FTA Economic Development Rating	◐	●	●	◐	○
<b>4.2 Work with agencies and local communities to identify and consider appropriate local and regional plans</b>						
DRCOG Regional Transportation Plan and State Transportation Plan – Regional Elements	Yes/No	Yes	Yes	Yes	Yes	No
FasTracks Integration	Yes/No	Yes	Yes	Yes	Yes	No
Transit Technology Options and Integration	Yes/No	Yes	Yes	Yes	Yes	Yes
<b>4.3 Provide clarity and certainty about any commitments coming out of this projects</b>						
Study commitments – and any financial requirements tied to them – are clearly documented in the final report	Yes/No	TBD	TBD	TBD	TBD	TBD

Good      Average      Fair      Low  
 ●      ◐      ◑      ○

**Goal 2, Objectives 2.1, 2.2 and 2.3 Evaluation for Arterial BRT Corridors**

Measure	Measurement Type	Measurement Range	Potential Arterial BRT Corridors					
			S Boulder Road	120th Avenue	Arapahoe / SH7	SH 42	US 287	SH 119
<b>2.1 Provide better connections to the regional and local transit and transportation system</b>								
Street Connectivity (Connections to interstates, highways, and major roads)	Number of accessible Interstates, US Highways (1st number) and State Highway and Major Roads (2nd number) within 1/4-mile of stations	2/4 = Good, 1/3 = Average, 1/2 = Fair, less than 1/2 = Low	3/12 ●	2/6 ●	3/13 ●	2/6 ●	2/11 ●	2/9 ●
Change in Regional roadway vehicle miles travelled (VMT)	Projected 2035 percentage change in VMT over No Build	Total VMT for Metro Area is 101,696,927	negligible	negligible	negligible	negligible	negligible	negligible
<b>2.2 Support the overall growth of transit ridership</b>								
2010-2013 Observed Boardings	Number of Boardings		2,939	767	2,477	n/a	1,328	1,894
NAMS Focus Model (DRCOG 2035 model modified to model Arterial BRT Corridors)	Number of Boardings		2,300	1,300	2,200	n/a	1,200	2,900
NAMS 2035 increased freq/no lanes	Number of Boardings		1,813	4,144	2,380	n/a	3,304	1,023
NAMS 2035 travel time improvements	Number of Boardings		3,300	5,000	4,600	900	9,000	5,000
<b>2.3 Meet the level-of-service and quality-of-service needs of local communities</b>								
Number of transfers required between major trips origins and destinations	Number of transfers required for each alternative between major origin and destination pairs	1-2 = Good, More than 2 = Low	1-2 ●	1-2 ●	1-2 ●	1-2 ●	1-2 ●	1-2 ●

Good    Average    Fair    Low  
 ●    ◐    ◑    ○

**Goal 2, Objective 2.4 Evaluation for Arterial BRT Corridors**

Measure	Measurement Type	Measurement Range	Potential Arterial BRT Corridors					
			S Boulder Road	120th Avenue	Arapahoe/SH7	SH 42	US 287	SH 119
<b>2.4 Provide a "backbone" transit network and level of service that can expand to support future transit expansion</b>								
Operational schedule comparison to existing RTD Bus service	Comparison of schedules for each alternative with applicable RTD services and national best practices	Better than RTD average (15 minute peak, 30 minute off-peak) = Good, Comparable to RTD average = Average, Less than RTD average = Low	15/30 BTC 15/30 BT 15/30 Local Dash ●	15/30 express 30/30 local ●	15/30 express 30/30 local ◐	15/30 ●	15/30 express 30/30 local ●	15/30 BT 15/30 BTC 15/30 Bolt + J ●

**Goal 2, Objective 2.5 Evaluation for Arterial BRT Corridors**

Measure	Measurement Type	Measurement Range	Potential Arterial BRT Corridors					
			S Boulder Road	120th Avenue	Arapahoe/SH7	SH 42	US 287	SH 119
<b>2.5 Consistent and Reliable Travel Times</b>								
Comparison of travel time of modes between major origin and destination pairs								
Existing Local Background Bus Service	AM Peak Period Travel Time (in min)	Lower travel time compared to other modes = Good,	28-min Lafayette -Table Mesa	60-min ADOGC to Broomfield	44-min Lafayette - BTC	n/a	56-min 21st - Broomfield	44-min 21st -BTC
Arterial BRT	AM Peak Period Travel Time (in min)	Comparable travel time compared to other modes = Average	21-min Lafayette -Table Mesa ●	41-min ADOGC to Broomfield ●	34-min Lafayette - BTC ●	38-min 287/ Arapahoe to Broomfield ●	39-min 21st - Broomfield ●	36-min 21st -BTC ●
Auto (GP Lanes)	AM Peak Period Travel Time (in min)	Higher travel time compared to other modes = Low	18-min Lafayette -Table Mesa	39-min ADOGC to Broomfield	28-min Lafayette - BTC	37-min 287/ Arapahoe to Broomfield	44-min 21st - Broomfield	37-min 21st -BTC



**Goal 2, Objective 2.6 Evaluation for Arterial BRT Corridors**

Measure	Measurement Type	Measurement Range	Potential Arterial BRT Corridors					
			S Boulder Road	120th Avenue	Arapahoe/SH7	SH 42	US 287	SH 119
<b>2.6 Support station siting that that encourages multi-modal access and easy transfers</b>								
Existing Population density	Total existing population density within 1/2-mile of stations / square mile. Breakpoints consistent with FTA Ratings.	Greater than 15,000 = Good, 9,600 - 15,000 = Average, 5,760 to 9,599 = Fair, Less than 5,759 = Low	4,931	2,736	2,598	972	2,399	3,552
Existing Total employment	Total existing employment within 1/2-mile of stations or stops. Breakpoints consistent with FTA Ratings.	Greater than 220,000 = Good, 140,000 – 219,999 = Average, 70,000 to 139,000 = Fair, Less than 69,999 = Low	54,592	10,527	39,608	21,927	19,832	58,034
Future Population density	Total 2035 Projected Population Density within 1/2-mile of stations / square mile (1st number is DRCOG, 2nd is jurisdictions). Breakpoints consistent with FTA Ratings.	Greater than 15,000 = Good, 9,600 - 15,000 = Average, 5,760 to 9,599 = Fair, Less than 5,759 = Low	5,844/ 5,545	3,664	3,713/ 3,635	1,804/ 2,033	2,676	4,311/ 4,332
Future Total employment	Total 2035 projected employment within 1/2-mile of stations or stops (1 <sup>st</sup> number is DRCOG, 2nd is jurisdictions). Breakpoints consistent with FTA Ratings.	Greater than 220,000 = Good, 140,000 - 219,999 = Average, 70,000 to 139,000 = Fair, Less than 69,999 = Low	54,986/ 56,343	14,588	51,609/ 52,776	37,534/ 39,233	20,410	56,942 / 61,307

Measure	Measurement Type	Measurement Range	Potential Arterial BRT Corridors					
			S Boulder Road	120th Avenue	Arapahoe/SH7	SH 42	US 287	SH 119
Bicycle/ pedestrian environment (connection to trails, bike routes, sidewalks)	Coverage of trails, bike facilities and sidewalks within 1/4 mile of stations/stops	Direct trail and bicycle facility connections to stations = Good, some trail and bicycle facility connections with 1/4 mile of stations = Average, No trail or bicycle facilities = Low	●	●	●	●	●	●
Proximity to other bus/rail stops	Number of existing RTD stations/stops with 1/4 mile of stations	30 or greater stops = Good, 29-20 Stops = Average, 19 - 10 Stops = Fair, Less than 10 Stops = Low	335 ●	67 ●	214 ●	78 ●	156 ●	328 ●
Connectivity to service to DIA	SkyRide route within 1/4 mile of stations	Yes = Good, No = Low	Yes ●	Yes ●	Yes ●	Yes ●	Yes ●	Yes ●

Good      Average      Fair      Low  
 ●      ◐      ◑      ○



### Goal 3, Objective 3.1 and 3.2 Evaluation for Arterial BRT Corridors

Measure	Measurement Type	Measurement Range	Potential Arterial BRT Corridors					
			S Boulder Road	120th Avenue	Arapahoe/SH7	SH 42	US 287	SH 119
<b>3.1 Minimize right-of-way impacts and property acquisitions (Future work is need to review assessor's data, inventory properties, and coordinate with the State Preservation Officer in order to determine eligibility for listing on the National Register of Historic Places)</b>								
Historical/Cultural	Quantitative	Total number of potential historic impacts	97 	13 	121 	24 	40 	43 
Water Resources	Quantitative	Potential water resource historic impacts	0 	0 	1 	1 	1 	0 
Sensitive Land Use (Trails, Parks/Open Space, Structures in close proximity)	Quantitative	Potential sensitive land use impacts	15 	7 	5 	3 	9 	15 
<b>3.2 Recommend solutions based on current funding availabilities, with prioritized list of solutions should new funding become available</b>								
<b>Applicability of Additional Funding Sources</b>								
FTA New/Small Starts	FTA New/Small Starts Criteria Guidance	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
TIGER Funding	Best Practices from Successful TIGER Applications	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
TIFIA Loans	FHWA Guidance on Innovative Program Delivery	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
RRIF Loans	FHWA Guidance on Innovative Program Delivery	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
P3 Opportunities and Innovative Funding	State of Colorado P3 Guidelines	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section
New source of state or local funds	Potential new state enabling legislation	by eligibility	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section	See Financial Section



**Goal 3, Objective 3.3 Evaluation for Arterial BRT Corridors**

Measure	Measurement Type	Measurement Range	Potential Arterial BRT Corridors					
			S Boulder Road	120th Avenue	Arapahoe/SH7	SH 42	US 287	SH 119
<b>3.3 Recommend solutions whose costs justify the benefits</b>								
Capital costs	Base year capital costs required to complete the corridor improvements	Total capital costs per alternative	\$36.43 M	\$32.13 M	\$45.39 M	\$27.36 M	\$56.41 M	\$56.92 M
Annualized Capital and O&M costs	Annualized capital costs and O&M costs based on service plan for each alternative	Total Annualized Capital and O&M costs per alternative	\$9.9 M	5.96 M	5.97 M	3 M	10.3 M	\$9.4 M
Annualized Cost per Rider	Total annualized capital and O&M cost / total annualized boardings	Less than \$4.00 = Good, Between \$4.00 and \$5.99, Average, Between \$6.00 and \$9.99 = Fair, More than \$10.00 = Low	\$10.01	\$3.97	\$4.33	\$11.14	\$3.82	\$6.27
Subsidy per Boarding (compared to existing RTD Service)	Existing subsidy per Boarding for existing service and projected subsidy per boarding for each alternative based on projected revenue and total capital and O&M costs	Average RTD subsidy per boarding for: Urban local service = \$3.45, Suburban local = \$7.12 Express service = \$3.31	\$6.53	\$1.35	\$1.25	\$4.54	\$1.19	\$2.80
Boardings per Revenue Vehicle Hour	Total projected boardings and vehicle hours per alternative	Average RTD boardings per revenue hour for: Urban local service = 28.6 Suburban local = 16.4 Express service = 43.1	12.2	27.5	30.7	16.4	60.1	28



**Goal 4, Objective 4.1, 4.2 and 4.3 Evaluation for Arterial BRT Corridors**

Measure	Measurement Range	Potential Arterial BRT Corridors					
		S Boulder Road	120th Avenue	Arapahoe /SH7	SH 42	US 287	SH 119
<b>4.1 Respect the Iterative Nature of Planning</b>							
Local jurisdictions provide RTD and study team with guidance on interpreting their plans.	Yes = Good, No = Low	●	●	●	●	●	●
FTA New Starts Definition of Economic Development Potential in Corridor around Stations.	Potential FTA Economic Development Rating	*	*	*	*	*	*
<b>4.2 Work with agencies and local communities to identify and consider appropriate local and regional plans</b>							
DRCOG Regional Transportation Plan and State Transportation Plan – Regional Elements	Yes/No	Yes	Yes	Yes	Yes	Yes	Yes
FasTracks Integration	Yes/No	Yes	Yes	Yes	Yes	Yes	Yes
Transit Technology Options and Integration	Yes/No	Yes	Yes	Yes	Yes	Yes	Yes
<b>4.3 Provide clarity and certainty about any commitments coming out of this projects</b>							
Study commitments – and any financial requirements tied to them – are clearly documented in the final report	Yes/No	Yes	Yes	Yes	Yes	Yes	Yes

Good    Average    Fair    Low  
 ●    ◐    ◑    ○

## Financial Section

### Potential Funding/Financing Sources – State and Federal

	Capital Expenses	Operating Costs
<b>Federal</b>		
Section 5307 – Urbanized Area Formula Grants	◆	
Section 5309 – New Starts / Small Starts	◆	
Section 5339 – Bus and Bus Facilities	◆	
TIGER	◆	
DRCOG TIP – STP Metro and CMAQ Funds	◆	◆
<b>State</b>		
Funding Advancement for Surface Transportation & Economic Recovery (FASTER)	◆	◆
MPACT64	◆	◆

### Potential Funding/Financial Sources – Local

	Capital Expenses	Operating Costs
<b>Local / Regional Taxes and Assessments</b>		
TIF	◆	◆
Special District	◆	◆
RTD Dedicated Funding Sources	◆	◆
<b>System Generated</b>		
Fare Revenue		◆
Real Estate	◆	◆
<b>Private</b>		
Public-Private Partnership	◆	◆
Philanthropy	◆	◆

## Local/ Regional Funding Sources

Type of Funding	Definition	Applicability	Magnitude	Probability
<b>Tax Increment Financing (TIF)</b>	Borrow against future growth in tax assessments to finance infrastructure improvements	Downtown/ redevelopment areas Blighted areas Station area development	Depends upon size and scope of development	Agencies with TIF authority already established in Denver and Boulder – Could be used in certain cases
<b>Special Assessment Districts</b>	Special tax assessed on those that directly benefit from the improvement(s) funded by the tax	Station area development Circulator/streetcar projects	Typically limited to a small contiguous area	Created by vote of those within proposed district, must also be approved by municipality/county
<b>Private Funding</b>	e.g.: P3, Philanthropy, Corporate naming rights	Station area development Development of a new line	Typically under \$10M Up to \$100M (Detroit) Denver's CPV Light Rail received \$2.55M in private funding.	TBD – Would need solicitation of interest from private sources

## Subregional RTA Analysis

## Applicability:

- Collect revenue in the NAMS region
- Bond against that revenue and lend the money to RTD
- Assume the debt with a negotiated RTD payback

## Availability:

- Enabling legislation passed in 2005
- Would require voter referendum within proposed area

## Magnitude – Conceptual Analysis

- Potential bonding capacity assuming 20-year repayment, 3% real interest rate (above inflation). The following projections would need to factor in payment schedules, bond issuance costs, debt service coverage costs and other items.
  - at \$10M/year: \$150M
  - at \$25M/year: \$370M
  - at \$75M/year: \$1.12Bn

### Financial Summary Matrix

Source	Northwest Rail			Arterial BRT (various Corridors)		
	Applica- bility	Magni- tude	Probability of Funding	Applicability	Magni- tude	Probability of Funding
<b>Federal</b>						
New Starts		 \$75M +	 Full project unlikely to qualify for funding	 Fixed guideway required	 \$75M +	 Depends on project ratings
Small Starts	 Project Cost >\$250M, Federal share < \$75M	 Up to \$75M	 Requires a phased approach to manage costs	 "Corridor-based BRT" <\$75M federal share	 Up to \$75M	 Depends on project ratings
TIGER Funding	 Station area and ROW upgrades	 Up to \$20M	 Highly competitive	 US 36 BRT upgrades received \$4.8M	 Up to \$20M	 Highly competitive
DRCOG TIP (STP-Metro and CMAQ)	 Capital projects need to be included in 2040 RTP			 Capital projects need to be included in 2040 RTP		 DRCOG funding depends on other applications submitted
<b>State</b>						
MPACT64	 Transit set-aside	 \$100M - \$120M/yr	 New Initiative	 Transit set-aside	 \$100M - \$120M/yr	 New Initiative
FASTER	 Ancillary improvements?	 Insufficient for substantial project	 Dozens of statewide grantees	 Bus purchases and station improvements	 Up to \$3M	 Dozens of statewide grantees



Source	Northwest Rail			Arterial BRT (various Corridors)		
	Applicability	Magnitude	Probability of Funding	Applicability	Magnitude	Probability of Funding
<b>Local/Regional</b>						
Innovative Funding / Value Capture	● Applicable to small area projects	○ Depends on project scale	○	●	◐ Depends on project scale	◐
Subregional RTA	●	◐	Would require voter referendum	●	●	Would require voter referendum
RTD Local Sales Tax Funds (FasTracks NWR/ Base System Arterial BRT)	●	●	● NWR Remains in Plan	●	◐	◐

# Appendix C

## US 36 Mayors/Commissioners Coalition (MCC) Letters

## *US 36 Mayors/Commissioners Coalition (MCC)*

*Boulder County*  
*City of Boulder*  
*City & County of  
Broomfield*  
*City of Louisville*  
*Town of Superior*  
*City of Westminster*

October 25, 2013

Board of Directors  
Regional Transportation District  
1600 Market Street  
Denver, CO 80202

Dear RTD Board of Directors:

The U.S. 36 Mayors and Commissioners Coalition (MCC), along with the City of Longmont, have spent significant efforts working together to develop a path forward on transit investments in the Northwest Corridor. Following much discussion, debate and deliberation, we are pleased to announce a conceptual consensus.

This consensus is predicated on information received to date through the Northwest Area Mobility Study (NAMS). It also assumes a successful vote on a transportation ballot initiative in 2014 (MPACT 64), which would provide substantial transit revenue to RTD over the 15-year life of the tax. The MCC and the City of Longmont expect that a significant portion of these revenues would be committed to the Northwest Corridor. While exact amounts are continuing to be developed, the MCC and the City of Longmont formally request that RTD provide a financial analysis that shows when Northwest Rail could be completed with a significant amount of additional revenues through MPACT 64.

Finally, and most importantly, the MCC and City of Longmont recognize the commitment made to voters regarding Northwest Rail in the 2004 FasTracks election and the ongoing public expectation that rail will be built in the corridor. The public expects visible mobility improvements in the short term if they are to be expected to support additional funding. At the same time, the MCC and City of Longmont understand financial challenges to completing the line, along with requirements and complications that ensue from sharing this line with Burlington Northern Santa Fe (BNSF) freight traffic. Due in to these challenges, the coalition recognizes that all other FasTracks corridors are likely to be completed prior to Northwest Rail.

With these considerations in mind, the MCC and City of Longmont's consensus framework includes the following:

- Early Action Rail/BRT Projects: Funds from the first years of MPACT 64 would be programmed to provide near-term Bus Rapid Transit (BRT) mobility improvements, along with preparatory investments in the rail corridor that would provide a tangible benefit throughout the corridor.
  - Highway portion of MPACT 64 would include BRT roadway infrastructure investments on State Highway 119, State Highway 7, State Highway 287, 28<sup>th</sup> Street/Broadway, (connecting U.S. 36 to Boulder Junction/14<sup>th</sup> & Walnut), and a connection from Louisville/Lafayette to U.S. 36 via SH 42/95<sup>th</sup> Street per the final recommendations of NAMS.
  - Transit portion of MPACT 64 would provide funding to construct FasTracks and identified non-FasTracks rail stations (88<sup>th</sup> Avenue, 116<sup>th</sup> Avenue, East Boulder, Twin Peaks) and related infrastructure improvements (i.e. structured parking, street/pathway connections).

In the interim before rail service, these station investments would be served by BRT, as identified above with transit service and vehicles. \$17 million has already been identified from EAGLE P3 savings for the Downtown Longmont station.

- In anticipation of commuter rail service, MPACT 64 would also provide funding in the early years for the establishment of railroad crossing quiet zones along the length of the Northwest Corridor. This would provide an immediate benefit to communities all along the corridor.

Northwest Commuter Rail: The MCC and the City of Longmont recognize the likelihood of RTD's prioritization of the completion of other rail corridors and extensions before further substantial investments are made for Northwest Commuter Rail. With this in mind, the MCC and the City of Longmont acknowledge that funding in the early years of MPACT 64 might not be allocated to build the rail service, but we expect funding to be dedicated to construction of a significant portion of Northwest Commuter Rail in the later years of the MPACT 64 tax. These MPACT 64 funds would be combined with FasTracks revenue and bonding capacity in these latter years to complete the entire Northwest Commuter Rail line to Longmont. As stated above, the MCC and the City of Longmont need RTD to provide a financial analysis that shows when Northwest Rail could be completed under this type of scenario. Accordingly, the MCC and City of Longmont request that RTD reserve its TABOR bonding capacity to execute the financing of Northwest Commuter Rail under this approach. When the implementation plan and timeline and firm funding for construction of NW Rail are established, negotiations on the purchase of operating rights from BNSF should be initiated.

- Plan Adjustments: The MCC and City of Longmont understand future uncertainties regarding negotiations with BNSF and other factors. If a supermajority among Boulder County, the City of Boulder, the City and County of Broomfield, the City of Longmont, the City of Louisville, the Town of Superior and the City of Westminster determine that completion of the Northwest Commuter Rail is either impossible or simply undesirable, RTD would either re-direct the funding for alternative transit/mobility investments in the Northwest Corridor in a manner that is acceptable to all of these communities or return the accrued funding to the voters in the region. A super-majority would require an affirmative vote of five of the seven jurisdictions' governing bodies to proceed with any potential change. An intergovernmental agreement should be developed between RTD and the MCC and City of Longmont prior to passage of MPACT 64 to detail the process for deciding upon a plan for alternative transit/mobility investments.
- I-25 Bi-Directional Managed Lanes: The MCC and City of Longmont's interests in achieving bi-directional managed lane service between U.S. 36 and downtown Denver remains a top priority. While the MCC and the City of Longmont remain committed to working on this issue, any improvements to facilitate bi-directional service benefit the broader region and should thus be funded through the Colorado Department of Transportation independent of funding for the Northwest Corridor.

This consensus is centered on a scenario where additional revenue is available under MPACT 64. In the event there is an absence of funds in the near term, the MCC and the City of Longmont will work to seek other funding to complete the early action rail/BRT items listed above and will advocate for statewide/region-wide highway funding to solve the bi-directional issue on the I-25. The MCC and the City of Longmont are also committed to working on BRT service for Highway 119 between Longmont and Boulder as the initial BRT priority.

The MCC and the City of Longmont thank RTD and our other regional partners for working with us through NAMS and other venues on this challenging consensus process. Collectively, the MCC and the City of Longmont feel that this consensus approach is realistic and equitable, while respecting the will of the voters in 2004.

Sincerely,



Robert Muckle,  
Mayor, City of Louisville (on behalf of the MCC and the City of Longmont)

Cc: Phil Washington, Bill Van Meter, Chris Quinn

*US 36 Mayors/Commissioners Coalition  
(MCC)*

*Boulder County* April 9, 2014

*City of Boulder* RTD Board of Directors  
Mr. Phil Washington, General Manager, RTD

*City & County of Broomfield* NAMS Policy Advisory Committee Members

*City of Louisville* Greetings,

*Town of Superior* The US36 Mayors and Commissioners Coalition, expanded to include Longmont, and the 36 Commuting Solutions Board of Directors are pleased to provide you with a copy of the "NAMS Local Stakeholder Consensus Document."

*City of Westminster*

The local stakeholders thank RTD and our other regional partners for working with us through the Northwest Area Mobility Study (NAMS) on this challenging consensus process. Collectively, we believe that the priorities reached through this consensus approach are realistic and equitable, while respecting the will of the voters in 2004.

Local stakeholders actively participating in the NAMS have spent significant effort working together to develop a path forward on transit investments in the Northwest Corridor. Following much discussion, debate and deliberation we have come to a consensus predicated on the information received to date through the NAMS process. The consensus is based on the technical analysis and data developed through this process, as well as the consideration of the uncertainty associated with Burlington Northern Santa Fe (BNSF) and other challenges.

Recognizing that conditions change with time, the local stakeholders support periodically exploring creative and alternative implementation strategies for all elements identified in NAMS as circumstances effecting feasibility, costs, ridership, and funding sources, evolve.

We believe that the public expects and deserves visible cost effective mobility improvements in the short term that will form the foundation of our long term transportation system while honoring the vision of rail connecting the corridor communities to each other and the Denver region expressed in the 2004 FasTracks plan approved by the voters.

To that end, we recognize that FasTracks funding should be targeted towards those Northwest corridor improvements identified in the FasTracks system approved by the voters in 2004. FasTracks funding should therefore be used to build and operate the US 36 BRT

system as well as those improvements that are consistent with implementation of Northwest Rail from Westminster to Longmont and other, non-FasTracks funding sources should be targeted toward those improvements that are not consistent with the FasTracks plan.

We also firmly believe that RTD should focus any further FasTracks investments in the Northwest Corridor prior to using FasTracks funds for improvements or equipment replacement in any other corridor.

Sincerely,



Robert Muckle  
Mayor of Louisville



## NAMS LOCAL STAKEHOLDER CONSENSUS DOCUMENT

US36 Mayors and Commissioner Coalition  
36 Commuting Solutions

April 7, 2014

The local stakeholders thank RTD and our other regional partners for working with us through Northwest Area Mobility Study (NAMS) on this challenging consensus process. Collectively, we believe that the priorities reached through this consensus approach are realistic and equitable, while respecting the will of the voters in 2004.

Local stakeholders actively participating in the NAMS have spent significant effort working together to develop a path forward on transit investments in the Northwest Corridor. Following much discussion, debate and deliberation we have come to a consensus predicated on the information received to date through the NAMS that regional transit operating and infrastructure improvements in the Northwest region should include the following elements.

- **Completion of the US 36 Bus Rapid Transit (BRT) System:** Completion of the US 36 BRT system as committed in the 2004 FasTracks, US 36 Environmental Impact Statement and Record of Decision, TIGER and TIFIA funding applications and additional elements approved by the RTD Board on September 17, 2013, including relocation of the Church Ranch boarding platforms, improvements to the Westminster Center pedestrian bridge and structured parking in Broomfield. Local stakeholders also support implementation of the US 36 First and Final Mile study recommendations that provide a tangible benefit to residents, employees and commuters in the corridor. In order to leverage these capital improvements and show a true net FasTracks benefit to the corridor, service enhancements and a robust operating plan that includes increased bus frequencies must be implemented.
- **Arterial BRT/Enhanced Bus Service Projects:** Arterial BRT/Enhanced Bus Service system capital and operating improvements should be implemented as soon as feasible. No FasTracks funds should be utilized for these arterial BRT investments.
  - State Highway 119 from Longmont to Boulder is the highest priority arterial BRT corridor.
  - The remaining corridors should be implemented based on further refinement of regional priorities, project scopes funding availability and leveraging opportunities.
  - State Highway 7 connecting North I-25/North Metro Park-n-Ride/Northglenn, Broomfield, Erie, Lafayette and Boulder
  - State Highway 287 connecting Longmont, Lafayette and Broomfield to the US 36 Corridor
  - South Boulder Road connecting Lafayette and Louisville to Boulder
  - 28<sup>th</sup> Street/Broadway (connecting US 36 BRT and South Boulder Road BRT to Boulder Junction/14<sup>th</sup> & Walnut)
  - Improved transit connection from Louisville/Lafayette/Superior/Broomfield to US 36 via SH 42/95<sup>th</sup> Street.
  - 120<sup>th</sup> Avenue between Broomfield Park-n-Ride and Adams County Government Center



- **I-25 Bi-Directional Managed Lanes:** Construction of two additional managed lanes between US 36 and downtown Denver to facilitate bi-directional service that will benefit the broader region (both North I-25 and US36 connections to Denver). Identified interim measures should be implemented as quickly as possible, including bus on shoulder service and downtown Denver circulation improvements, with long term measures to follow.
- **Railroad crossing quiet zones** should be implemented along the length of the Northwest Corridor, with a priority on crossings that benefit the greatest number of residents in the most cost effective manner.
- **Early Action Rail/Transit Stations:** Station investments and US 36 First and Final Mile infrastructure and programs that serve both BRT and future rail should be implemented. \$17 million has already been identified from BAGLE P3 savings for the Downtown Longmont station that will serve both BRT and future rail. Similar investments should be made at other stations that will serve both future rail and BRT/Enhanced Bus Service such as Boulder Transit Village, Gunbarrel, East Arapahoe, Downtown Louisville, Broomfield at Flatirons Crossing and 116th, and Westminster at 104<sup>th</sup>/Church Ranch and at 88<sup>th</sup> Avenue.
- **Northwest Rail:** The local stakeholders recognize the commitment made to voters in the 2004 FasTracks election and the ongoing public expectation that rail will be built in the corridor from FasTracks revenue. Local stakeholders support full completion of the Northwest Commuter Rail Project to Longmont. Considering costs, lack of revenues, ridership projections, uncertainty with Burlington Northern Santa Fe (BNSF) and other challenges, completion of Northwest Rail is a longer term goal. Local stakeholders support periodically exploring creative and alternative rail implementation strategies (including phasing) as circumstances effecting feasibility, such as change in BNSF position, costs, ridership, and funding sources, evolve.

**Re-evaluation of Priorities:** We believe that the public expects and deserves visible cost effective mobility improvements in the short term that form the foundation of our long term transportation system while honoring the vision of rail connecting the corridor communities to each other and the Denver region expressed in the 2004 FasTracks plan approved by the voters.

To that end:

- We support regular monitoring of the factors influencing the costs, revenue and feasibility of the implementation options identified above, including phasing, and, should they significantly change, the reconsideration of investments priorities.
- We recognize that FasTracks funding should be targeted towards those Northwest corridor improvements identified in the FasTracks system approved by the voters in 2004. FasTracks funding should therefore be used to build and operate the US 36 BRT system as well as those improvements that are consistent with implementation of Northwest Rail from Westminster to Longmont and other, nonFasTracks funding sources should be targeted toward those improvements that are not consistent with the FasTracks plan.
- We also firmly believe that the RTD should focus any further FasTracks investments in the Northwest Corridor prior to using FasTracks funds for improvements, or equipment replacement, in any other corridor.

# Appendix D

## NATA Letter



April 18, 2014

Phil Washington  
 General Manager, Regional Transportation District  
 1600 Blake Street  
 Denver, CO 80220

Re: NATA Position on North Area Mobility Study (NAMS)

Dear Mr. Washington,

NATA appreciates the opportunity to participate in the NAMS study and believes the process provided a good forum to discuss possible phasing of the Northwest Rail while identifying key future arterial Bus Rapid Transit (BRT) corridors needed in the northwest Denver metro area.

Before commenting on the NAMS study, NATA would like to emphasize the importance of keeping the Northwest Rail corridor, in its entirety, in the FasTracks Plan. We realize a phased approach may be the most reasonable way to move forward with the corridor given the challenges of joint use of the rail line. However, we encourage you to continue your efforts to have an open dialogue with BNSF and the stakeholders to ensure no possible opportunity is missed to build out this corridor. We are supportive of the completion of the U.S. 36 BRT as envisioned by the U.S. 36 Coalition and construction of the final phase of North Metro from 124<sup>th</sup> to 162<sup>nd</sup>.

With regards to the NAMS study, we are encouraged by the development of several arterial BRT corridors, particularly the 120<sup>th</sup> and S.H. 7 arterial BRTs as these are a critical element to providing the much needed east-west regional bus connectivity in the north area to the North Metro line. We also support S.H. 119 as the top priority arterial BRT as this provides critical connectivity for Longmont. We look forward to having an

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Adams County    Adams County Economic Development    Brighton    Broomfield    Commerce City    Dacono  
 Erie    Firestone    Frederick    Longmont    Northglenn    Thornton  
 Smart Commute Metro North TMO    Westminster    Federal Heights    Metro North Chamber of Commerce

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on-going dialogue between your staff and NATA members to further develop strategies on the 120<sup>th</sup>, S.H. 7 and U.S. 287 future arterial BRT services.

As the RTD Board looks to approve the NAMS study in the near future, we hope to continue our positive, ongoing partnership with RTD on the NAMS and FasTracks elements outlined in this letter.

Should you have any questions, please do not hesitate to contact me.

Sincerely,



Erik Hansen, Chair of NATA  
Adams County Commissioner

cc: RTD Board of Directors  
NATA Members  
Chris Quinn, RTD NAMS Project Manager

# Appendix E

## RTD Response to Local Consensus Letter



April 23, 2014

The Honorable Robert Muckle  
Chair, US 36 Mayors/Commissioners Coalition  
749 Main Street  
Louisville CO 80027

Dear Mayor Muckle:

On behalf of the RTD Board of Directors, I would like to respond to your letter and "NAMS Local Stakeholder Consensus Document" dated April 9, 2014, representing the US 36 Mayors and Commissioners Coalition. We appreciate the significant effort required to prepare the document.

We will work with the consultant, CDOT, and stakeholders to incorporate the document's recommendations into the proposed prioritization of projects, as intended by the Northwest Area Mobility Study (NAMS). In fact, we are happy to work with you on the majority of the recommendations in the letter. However, there are a couple of items discussed in the submittal to which RTD would like to respond outside the NAMS process. These items are as follows:

1. **Railroad Crossing Quiet Zones:** RTD supports the establishment of quiet zones in the Northwest Corridor with the establishment of FasTracks passenger rail service. Until RTD implements such service, RTD believes the existing impact to be the responsibility of local jurisdictions and the BNSF to resolve. Additionally, given the uncertainty related to the timing for implementation of the Northwest Rail, and the lack of a final design for the corridor, RTD believes it would be premature to establish quiet zones prior to the completion of a higher level of design since the rail geometry at the crossings has not yet been finalized.
2. **Focus any further FasTracks Investments in the Northwest Corridor:** The RTD Board has consistently prioritized the advancement and completion of all of FasTracks as one of the top goals for staff. To that end, RTD has pursued innovative funding opportunities for FasTracks throughout the District, successfully leveraging grant dollars and innovative approaches such as public-private partnerships to make significant progress over the past few years. RTD will continue to explore opportunities to advance each of the remaining projects, including the Northwest Corridor, in an effort to leverage such opportunities in the future. RTD also has a responsibility to maintain both base system and FasTracks investments in a state of good repair, now and in the future, to assure the continued provision of reliable transit service and to assure safety to the public and our employees. Future RTD Board decisions regarding FasTracks investments will need to take into account the financial opportunities that arise (letting the market speak) as well as the needs for maintaining a strong safety and state of good repair emphasis.

Also, as you know, the levels of service for the US 36 BRT on opening day will be planned based on the available additional service dollars as described in the June 2012 memorandum to

1600 Blake Street, Denver, Colorado 80202 • 303.299.6000 • rtd-denver.com **Regional Transportation District**





the MCC. RTD is currently working with our service planning consultant to develop a BRT operating plan for opening day that is in line with our financial constraints. We will notify you when the proposed opening day plan is ready for review and comment

We would again like to acknowledge the considerable effort on the part of the US 36 MCC to reach this consensus and appreciate your participation in the NAMS process.

Sincerely,

A handwritten signature in black ink, appearing to read "Phillip A. Washington".

Phillip A. Washington  
General Manager and CEO

cc: RTD Board of Directors  
Bill Van Meter, RTD Assistant General Manager, Planning  
Brian Welch, Senior Manager, Planning Technical Services  
Chris Quinn, Planning Project Manager  
Nadine Lee, Engineering Project Manager  
Liz Rao, HNTB



# Appendix F

## RTD Board Action –Approval of US 36 Final Program

12.C

**BOARD OF DIRECTORS REPORT**

To: Phillip A. Washington, General Manager

From: William Van Meter, Assistant General Manager,  
Planning

Date: August 28, 2013

Subject: Approval of Final Scope Elements for US 36  
Bus Rapid Transit

Date: September 11, 2013
GM
Board Meeting Date: September 17, 2013

**RECOMMENDED ACTION**

It is recommended by the FasTracks Monitoring Committee that the RTD Board of Directors approve the final scope elements (as illustrated in the table below) to establish BRT in the US 36 Corridor, as it is RTD Staff's desire and intent to implement a "World Class" Bus Rapid Transit (BRT) in the US 36 Corridor. RTD Staff believe that the implementation of these final scope elements will effectively complete a model BRT in the US 36 Corridor. Approval of this action will allow RTD to commit to the completion of the US 36 BRT project through implementation of defined scope items, as RTD does on every other project in the FasTracks program.

Remaining Project Scope Items			
Item	Description	Completion	
		Opening Day	Post Opening Day
Station Amenities	Upgraded and standardized furniture, including benches, trash receptacles, bike racks/lockers, etc.	X	
Station Security Upgrades	Security devices such as cameras, emergency telephones and conduit at each BRT station.	X	
Transit Signal Priority (TSP)	Implementation of TSP at key US 36 interchanges as documented in RTD's Transit Signal Priority study which will provide a potential travel time savings of over two minutes.	X	
Passenger Communications improvements	Improve data accessibility for passengers on US 36 (WiFi, predictive arrival time information, etc.)	X	
BRT Vehicle Fleet	Procure fleet sufficient to meet 2016 opening day service plan.	X*	
Church Ranch Platforms	Relocation of the Church Ranch Station boarding platforms closer to RTD-designated parking.		X
Westminster Pedestrian Bridge	Improvements for vertical circulation (additional stairs and elevators) on each side of the bridge.		X
Broomfield park-n-Ride	Construct a park-n-Ride with structured parking on the north side of US 36 at the Broomfield Station for better access		X

Packet Pg. 111

	to the station for residents north and east of US 36 in Broomfield.		
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*\*Note: RTD's ability to provide the full fleet required for opening day service will be dependent on the cost of the vehicle that can best satisfy the corridor's service requirements.*

### **BACKGROUND**

The 2004 voter-approved FasTracks Plan provided \$204.1 million for BRT in the US 36 Corridor. The original budget assumed \$66 million for the RTD contribution for the HOV/Bus lanes (this was prior to the decision to pursue Managed Lanes) along with various upgrades to the corridor's stations. The remainder of the scope was left undefined. This budget has been adjusted with each Annual Program Evaluation (APE) to reflect rises in the composite construction labor and materials costs. However, unlike all of the other FasTracks corridors, RTD did not define a specific scope for the corridor for the following reasons:

- The joint CDOT/RTD Environmental Impact Statement (EIS) was not completed when the FasTracks plan was under development;
- It was unknown at the time of the FasTracks plan development how BRT would integrate with CDOT expansion of the highway; and
- It was assumed that construction would likely be led by CDOT since many of the anticipated BRT elements would share the CDOT facility.

For these reasons, the FasTracks plan opted to create a budget which was deemed reasonable for completing BRT in the Corridor. To date, RTD has completed the following improvements in the corridor:

- Construction of the McCaslin station platforms;
- Construction of the McCaslin pedestrian bridge over US 36;
- Relocation of the Church Ranch park-n-Ride;
- Construction of the Church Ranch station platforms and slip ramps;
- Relocation of the Broomfield park-n-Ride;
- Construction of the Broomfield station platforms and slip ramps;
- Construction of the Broomfield pedestrian bridge;
- Construction of the Table Mesa pedestrian bridge; and
- Construction of the Table Mesa eastbound station platform and slip ramp.

Additionally, RTD has also committed funding to CDOT and the High Performance Transportation Enterprise (HPTE) for ongoing US 36 Managed Lanes construction. The US 36 Managed Lanes project will construct the shared guideway (managed lanes) for travel time savings and reliability, install new station canopies, a fiber-optic communications network, and programmable information displays for customer information. The managed lanes project also includes construction of the US 36 bikeway from the US 36 EIS. With the completion of all these projects, approximately \$75 million (2015 dollars) remains in the FasTracks US 36 BRT budget commitment.

### **DISCUSSION**

Many of the corridor's stakeholders have expressed concern that, unlike every other FasTracks corridor, the US 36 Corridor has not included a defined scope and, they have advocated that RTD instead work with the stakeholders to define a BRT scope for the corridor and establish the corresponding cost for the necessary capital items required to complete that scope in future budgeting efforts. Through the Northwest Area Mobility Study (NAMS) process, the study's project

team has worked with the stakeholders to determine the remaining capital elements that should be included in the scope. At the July 30, 2013 NAMS Joint Policy/Technical Advisory Committee (PAC/TAC) meeting, the PAC/TAC members agreed that, with the completion of the Phase I BRT improvements and the completion of the Managed Lanes project, the following remaining scope items should be implemented as part of US 36 BRT:

Remaining Project Scope Items			
Item	Description	Completion	
		Opening Day	Post Opening Day
Station Amenities	Upgraded and standardized furniture, including benches, trash receptacles, bike racks/lockers, etc.	X	
Station Security Upgrades	Security devices such as cameras, emergency telephones and conduit at each BRT station.	X	
Transit Signal Priority (TSP)	Implementation of TSP at key US 36 interchanges as documented in RTD's Transit Signal Priority study which will provide a potential travel time savings of over two minutes.	X	
Passenger Communications improvements	Improve data accessibility for passengers on US 36 (WiFi, predictive arrival time information, etc.)	X	
BRT Vehicle Fleet	Procure fleet sufficient to meet 2016 opening day service plan.	X*	
Church Ranch Platforms	Relocation of the Church Ranch Station boarding platforms closer to RTD-designated parking.		X
Westminster Pedestrian Bridge	Improvements for vertical circulation (additional stairs and elevators) on each side of the bridge.		X
Broomfield park-n-Ride	Construct a park-n-Ride with structured parking on the north side of US 36 at the Broomfield Station for better access to the station for residents north and east of US 36 in Broomfield.		X

*\*Note: RTD's ability to provide the full fleet required for opening day service will be dependent on the cost of the vehicle that can best satisfy the corridor's service requirements.*

Staff has determined that the first five elements on the list – station amenities, security upgrades, Transit Signal Priority, Passenger Communications improvements, and vehicles (depending on vehicle cost) – can be funded and in place by opening day. The US 36 stakeholders have requested RTD's support to upgrade bike parking at the stations in the form of Bus then Bike Shelters. Per the final report from the First and Final Mile Study conducted by the stakeholder group, "36 Commuting Solutions will take the lead with the stakeholders on a grant writing and fundraising campaign for the Bus then Bike facilities." It is RTD's intent to cooperate with the stakeholders as they pursue such funding for both capital and operations and maintenance of these upgraded facilities.



As shown in the table below, depending on the final cost of the remaining capital items, and depending on the chosen BRT vehicle, the remaining cost for establishing BRT could vary between \$58 million and \$79 million. Funding for these items could potentially come from the FasTracks Internal Savings Account (FISA) and potentially from outside grants. In any case, staff is in agreement with the stakeholders that, in order to establish BRT in the corridor, RTD should focus on completing the required scope listed above rather than defining the project through the FasTracks remaining commitment.

Cost to Complete Remaining Items		
Item	Cost in \$millions	
	Low	High
Capital Items Requested for BRT Completion	\$25	\$28.5
Buses	\$33	\$50.45
<b>Total</b>	<b>\$58</b>	<b>\$79</b>

#### FINANCIAL IMPACT

Depending on the final cost of the remaining capital items and the chosen BRT vehicle, RTD could be required to allocate up to \$4 million more than originally anticipated for the corridor. As noted above, potential funding sources for these items could come from the FISA or other potential outside grant sources.

#### ALTERNATIVES

1. Accept the Recommended Action. It is recommended by the FasTracks Monitoring Committee that the RTD Board of Directors approve the final scope elements (as illustrated in the table below) to establish BRT in the US 36 Corridor, as it is RTD Staff's desire and intent to implement a "World Class" Bus Rapid Transit (BRT) in the US 36 Corridor. RTD Staff believe that the implementation of these final scope elements will effectively complete a model BRT in the US 36 Corridor. Approval of this action will allow RTD to commit to the completion of the US 36 BRT project through implementation of defined scope items, as RTD does on every other project in the FasTracks program.

Remaining Project Scope Items			
Item	Description	Completion	
		Opening Day	Post Opening Day
Station Amenities	Upgraded and standardized furniture, including benches, trash receptacles, bike racks/lockers, etc.	X	
Station Security Upgrades	Security devices such as cameras, emergency telephones and conduit at each BRT station.	X	
Transit Signal Priority (TSP)	Implementation of TSP at key US 36 interchanges as documented in RTD's Transit Signal Priority study which will provide a potential travel	X	

12.C

	time savings of over two minutes.		
<b>Passenger Communications improvements</b>	Improve data accessibility for passengers on US 36 (WiFi, predictive arrival time information, etc.)	X	
<b>BRT Vehicle Fleet</b>	Procure fleet sufficient to meet 2016 opening day service plan.	X*	
<b>Church Ranch Platforms</b>	Relocation of the Church Ranch Station boarding platforms closer to RTD-designated parking.		X
<b>Westminster Pedestrian Bridge</b>	Improvements for vertical circulation (additional stairs and elevators) on each side of the bridge.		X
<b>Broomfield park-n-Ride</b>	Construct a park-n-Ride with structured parking on the north side of US 36 at the Broomfield Station for better access to the station for residents north and east of US 36 in Broomfield.		X

\*Note: RTD's ability to provide the full fleet required for opening day service will be dependent on the cost of the vehicle that can best satisfy the corridor's service requirements.

- Do not accept the Recommended Action. Do not accept the NAMS Policy/Technical Advisory Committee recommendation for these scope items deemed necessary to establish BRT in the US 36 Corridor. This action is not recommended since it could undermine the efforts and credibility of the NAMS study.

**RESULT:** PASSED [13 TO 1]  
**MOVER:** Chuck Sisk, Director, District O  
**SECONDER:** Tom Tobiassen, Director, District F  
**AYES:** Anderson, Bagley, Daly, Deadwyler, Folska, Hoy, James, Lubow, Rivera-Malpiede, Sisk, Solano, Tobiassen, Walker  
**NAYS:** Natalie Menten  
**ABSENT:** Gary Lasater

Prepared by:  
 Chris Quinn, Project Manager, Planning

Approved by:

*William C. Van Meter* *Phillip A. Washington*  
 William C. Van Meter, Assistant General Manager, Planning 2013 Phillip A. Washington, General Manager 9/11/2013

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# Appendix G

## NAMS Final Consensus Statement



## Northwest Area Mobility Study Policy Advisory Committee May 1, 2014

### Final Consensus Statement

### Draft Consensus Statement General Principles

- The following NAMS prioritized list of improvements reflects the general consensus of the Policy Advisory Committee (PAC) on April 18, 2014.
- An overarching theme serves as a basis from which consensus on the priorities is grounded:
  - The Northwest area remains committed to Northwest Rail, as envisioned in FasTracks. Given the projected timing of Northwest Rail's implementation, Northwest stakeholders want to see mobility benefits sooner.
- Projects on this prioritized list should not be considered absolutely sequential:
  - Nothing should preclude the pursuit or acceleration of any of these priorities should viable opportunities or partners become available.
  - More than one priority can be pursued simultaneously.
  - RTD should be proactive, aggressive and creative in monitoring these projects for any significant developments that help a project move forward (e.g. public or P3 funding opportunities, BNSF plans).

## North Metro Extension (SH 7 to Longmont) Recommendation to the RTD Board of Directors

- North Metro Rail Extension (SH 7 to Longmont)
  - Estimated cost combined with projected low ridership yields a annual cost per boarding almost 6x higher than Northwest Rail.
  - It is recommended by the Study Team and accepted by the NAMS PAC not to proceed with any action on this corridor at this time. Corridor should be re-evaluated in the future if population densities or other conditions change.

### List of NAMS Priorities

#### Recommendation to the RTD Board of Directors

1. Completion of the Remaining US 36 BRT Commitments (**FasTracks**):
  - Consistent with the NAMS *Local Stakeholder Consensus Document* (April 7, 2014) and *Approval of Final Scope Elements for US 36 Bus Rapid Transit*, RTD Board of Directors Report (September 17, 2013)

## List of NAMS Priorities

### Recommendation to the RTD Board of Directors

#### 2. Arterial BRT/Enhanced Bus Service – (RTD Base System, State, Regional and Federal Funding)

##### **Short Term - next 3-10 years**

- Proceed into advanced planning/environmental/preliminary design via submittal of TIGER Planning Grant by 4-28-14:
  - SH 119 from Longmont to Boulder (1<sup>st</sup> priority)
  - Second Corridor - US 287 from Longmont to DUS
- One or both corridors could be implemented following study based on further refinement of regional priorities, project scopes, funding availability and leveraging opportunities.
- Arterial BRT/Enhanced Bus Service station investments should support anticipated bus ridership, and include station design features consistent with future rail service.

## List of NAMS Priorities

### Recommendation to the RTD Board of Directors

#### 3. Interstate 25 Reverse Commute Solutions (Pecos to DUS) (Regional, State and Federal Funding – RTD Support)

##### **Short Term**

- Advance Bus-on-Shoulder Concept with CDOT and RTD
- Investigate Feasibility of Downtown Street/Signal Improvements

##### **Long Term**

- Initiate Advanced Planning for Systematic Improvements along Interstate 25
- Develop Regional Managed Lane System Plan
- Initiate Feasibility Planning Based on Agreed Priorities

## List of NAMS Priorities

### Recommendation to the RTD Board of Directors

#### 5. Remaining Arterial BRT/Enhanced Bus Service Corridors (RTD Base System, State, Regional and Federal Funding):

##### **Long Term - next 7-20 years**

- Could be implemented based on further refinement of regional priorities, project scopes, funding availability and leveraging opportunities:

SH 7	South Boulder Road
28 <sup>th</sup> St/Broadway	120 <sup>th</sup> Ave
SH42/95 <sup>th</sup> St	

- Arterial BRT/Enhanced Bus Service station investments should support anticipated bus ridership, and include station design features consistent with future rail service.

## List of NAMS Priorities

### Recommendation to the RTD Board of Directors

#### 4. Northwest Rail (FasTracks):

- Given present funding challenges and accompanying near-term inability to secure a railroad agreement, completion of Northwest Rail is a longer term goal.
- On an annual basis, RTD will explore and update Northwest Rail implementation strategies and report to stakeholders and the public.

# Appendix H

## RTD Board of Directors Approval of NAMS Recommendation



**BOARD OF DIRECTORS REPORT**

To: Phillip A. Washington, General Manager	Date: May 28, 2014
From: William C. Van Meter, Assistant General Manager, Planning	GM
Date: May 22, 2014	Board Meeting Date: June 24, 2014
Subject: Approval of NAMS Recommendation	

## Resolution

**RECOMMENDED ACTION**

It is recommended by the Planning and Development Committee that the RTD Board of Directors approve the attached Resolution, which accepts the Final Consensus Statement as developed by the Northwest Area Mobility Study stakeholders for priorities within the Northwest Study Area. Implementation of these priorities will be subject to future Board consideration and approval.

**BACKGROUND**

In April 2013, RTD initiated the Northwest Area Mobility Study (NAMS). The purpose of the study was to develop consensus among RTD, the Colorado Department of Transportation (CDOT) and the Northwest-area stakeholders, including local jurisdictions and businesses, on cost effective and efficient mobility improvements to serve the Northwest area. RTD engaged HNTB Corp. to serve as the lead consultant in March 2013.

The study had five key tasks as described below:

1. Determine how the remaining FasTracks US 36 BRT commitment will be allocated to the corridor and determine what, if any, BRT elements are needed to achieve full BRT in the corridor;
2. Evaluate the feasibility and determine the cost associated with constructing the Northwest Rail in segments;
3. Evaluate the possibility for extending the North Metro Corridor from SH 7 to Longmont;
4. Evaluate potential for early implementation mobility improvements in the area, such as arterial BRT; and
5. Conduct a high-level analysis of the reverse commute issues on the I-25 Downtown Express lanes.

The study was governed by:

1. A Technical Advisory Committee (TAC), made up of staff members from the northwest area local jurisdictions, CDOT, DRCOG, the University of Colorado Boulder, 36 Commuting Solutions and the North Area Transportation Alliance (NATA); and
2. A Policy Advisory Committee, made up of the elected officials from the local jurisdictions, as well as a representative from CDOT, the 36 Commuting Solutions Board of Directors, NATA and the RTD Board members representing Districts within the study area (Directors Anderson, Hoy, Lubow and Sisk).

RTD staff, the consultant and the stakeholders contributed significant input throughout the study. At the final PAC meeting held on April 18, 2014, the stakeholders came to a consensus on how to

move forward with transit improvements in the northwest area. A Consensus Statement was developed to document the principles and priorities that the stakeholders desired.

#### **DISCUSSION**

The Consensus Statement includes a section that discusses general principles and a section which discusses prioritization of potential projects.

#### **General Principles**

The Consensus Statement general principles are as follows:

- An overarching theme serves as a basis from which consensus on the priorities is grounded: *The Northwest area remains committed to Northwest Rail, as envisioned in FasTracks.* Given the projected timing of Northwest Rail's implementation, the Northwest stakeholders want to see mobility benefits sooner.
- Projects on this prioritized list should not be considered absolutely sequential. Nothing should preclude the pursuit or acceleration of any of these priorities should viable opportunities or partners become available. More than one priority can be pursued simultaneously. RTD should be proactive, aggressive and creative in monitoring these projects for any significant developments that help a project move forward, such as public or P3 funding opportunities.

#### **Priorities**

The Consensus Statement's priorities are as follows:

1. **Completion of the Remaining US 36 BRT Commitments** – These are the commitments that were included in the Final Scope Elements for US 36 Bus Rapid Transit, as approved by the RTD Board of Directors September 17, 2013.
2. **Arterial BRT/Enhanced Bus Service** – Proceed into advanced planning, environmental clearance and preliminary engineering via submittal of TIGER Planning Grant (submitted April 28, 2014) for SH 119 from Longmont to Boulder as the first priority; and US 287 (as selected by staff, based on cost effectiveness and ridership) as the next priority. One or both corridors could be implemented following the next phase of study based on further refinement of regional priorities, project scopes, funding availability and leveraging opportunities.
3. **North I-25/Downtown Express Reverse Commute Solutions** – In the short-term, RTD should work with CDOT to advance a bus-on-shoulder concept. For the long-term, advanced planning for systematic improvements should be initiated for this segment of I-25.
4. **Northwest Rail** – The stakeholders recognize the present funding challenges and accompanying near-term inability to secure an agreement with the BNSF. However, as noted above, completion of Northwest Rail, while a longer term goal, remains a priority. On an annual basis, RTD will explore and update Northwest Rail implementation strategies and report to stakeholders and the public.
5. **Remaining Arterial BRT/Enhanced Bus Service Corridors** – This priority would be a long-term goal depending on funding availability and further refinement of regional goals, project scopes, funding availability and leveraging opportunities. These corridors include:
  - a. SH 7 from Boulder to I-25
  - b. 120th Avenue from Broomfield to I-25
  - c. S. Boulder Rd from Boulder to I-25
  - d. SH 42/95<sup>th</sup> Street in the Louisville area
  - e. 28th Street/Broadway Arterial BRT/Enhanced Bus Service improvements.

13.D

**North Metro Extension from SH 7 to Longmont**

Given the high estimated cost, combined with projected low ridership, the stakeholders opted not to proceed with any action that would advance the North Metro Rail Extension (from SH 7 to Longmont) at this time. They recommended that the corridor should be re-evaluated in the future if population densities or other conditions change.

**FINANCIAL IMPACT**

There is no financial impact directly related to this action; however, should the Board at a later date, and after further study, opt to move forward with specific recommendations from the Consensus, there will be a financial impact to the District.

**ALTERNATIVES**

1. Accept the Recommended Action. It is recommended by the Planning and Development Committee that the RTD Board of Directors approve the attached resolution, which accepts the Final Consensus Statement as developed by the Northwest Area Mobility Study stakeholders for priorities within the Northwest Study Area. Implementation of these priorities will be subject to future Board consideration and approval.
2. Do not accept the Recommended Action. Do not approve the attached resolution, which accepts the Final Consensus Statement as developed by the Northwest Area Mobility Study stakeholders. This action is not recommended given the considerable commitment on the part of RTD and the stakeholders to reach this consensus, which provides RTD a path forward for implementing mobility improvements in the Northwest area.

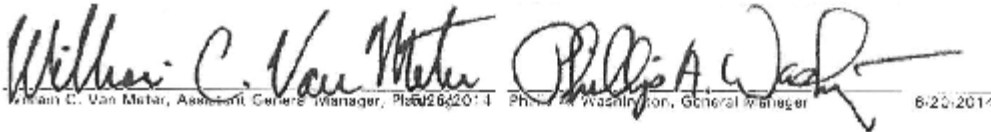
**ATTACHMENTS:**

- Consensus Statement (EPTX)

**Prepared by:**

Chris Quinn, Project Manager, Planning

**Approved by:**

  
 William C. Van Meter, Assistant General Manager, Planning | Phillip A. Washburn, General Manager, Planning | 6-23-2014

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## RESOLUTION No. 006

## SERIES OF 2014

ACCEPTING THE CONSENSUS STATEMENT OF THE NORTHWEST  
AREA MOBILITY STUDY STAKEHOLDERS

Whereas, RTD initiated the Northwest Area Mobility Study (NAMS), in April 2013. The purpose of the study was to develop consensus among RTD, the Colorado Department of Transportation (CDOT) and the Northwest-area stakeholders, including local jurisdictions and businesses, on cost effective and efficient mobility improvements to serve the Northwest area;

Whereas, the Northwest area stakeholders and RTD executed a Memorandum of Understanding (MOU) dated January 14, 2013. The MOU included a stakeholder involvement plan for achieving consensus;

Whereas, RTD and the stakeholders analyzed a wide variety of alternatives to address the study purpose; and

Whereas, the Northwest area stakeholders formulated the attached Final Consensus Statement, which was endorsed on April 18, 2014, to document the principles and priorities which the stakeholders desired for mobility improvements in the Northwest area; and

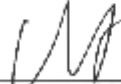
Whereas, RTD has submitted a Transportation Investment Generating Economic Recovery (TIGER) grant to pursue advanced planning on two of the high-priority Bus Rapid Transit corridors identified in the Final Consensus Statement.

NOW THEREFORE BE IT RESOLVED that:

The RTD Board of Directors accepts the attached Final Consensus Statement as developed by the Northwest Area Mobility Study stakeholders and presented to the Board Planning & Development Committee on May 13, 2014; and

RTD will be proactive, aggressive and creative so as to advance the recommendations and priorities as described in the Final Consensus Statement, with implementation of these priorities subject to future RTD Board consideration and approval.

Passed and adopted by the Board of Directors of the Regional Transportation District on the 24th day of June, 2014.

  
\_\_\_\_\_  
Charles Sisk  
Chair

  
\_\_\_\_\_  
Jeff Wagner  
Secretary