REVIEW OF THE RTD FASTRACKS PLAN

Final Report

APRIL 21, 2004

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REVIEW OF
THE RTD FASTRACKS PLAN

Final Report

Denver Regional Council of Governments
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ABSTRACT

TITLE:	Review of the RTD FasTracks Plan
AUTHOR:	Denver Regional Council of Governments
SUBJECT:	Senate Bill 90-208 Review of the Regional Transportation District's FasTracks Plan
DATE:	April 21, 2004
SOURCE OF COPIES:	Public Information and Communications DRCOG 4500 Cherry Creek South Drive, Suite 800 Denver, Colorado 80246 (303) 455-1000
NUMBER OF PAGES:	84
ABSTRACT:	A review of the FasTracks Plan submitted to DRCOG for approval pursuant to Senate Bill 90-208.

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SUMMARY

The FasTracks Plan is an ambitious effort to construct rapid transit in nine corridors of the region along with other associated improvements by 2017. The Denver Regional Council of Governments (DRCOG), as the Metropolitan Planning Organization (MPO) is required by state statute to approve any action leading to the construction of a fixed guideway system. This action must include the approval of the method of financing and technology. Each corridor must be approved separately. To fully evaluate the Plan, the DRCOG Board of Directors adopted a set of criteria, which, in addition to finance and technology, includes consistency with the Metro Vision Plan, environmental, and other pertinent factors.

The FasTracks Plan

To initiate the evaluation, attention was given to defining the scope of the improvements to be undertaken. The improvements in each corridor are summarized in Table 1 of the report. These improvements, and the selection of a technology are subject to change based on the results of environmental and other studies to be undertaken in the future in eight of the corridors. Though Bus Rapid Transit is the ultimate desired technology in the US-36 Corridor, the construction of the bus/HOV lanes is not included in the FasTracks Plan. Access improvements to park-n-Ride stations, pedestrian bridges, funding for centerline stations and partial funding for bus lanes are included in the Plan as steps toward the implementation of BRT.

Consistency With the Metro Vision Plan

FasTracks solidly supports the region's Metro Vision Plan and is consistent with many of the conceptual corridors contained therein. Metro Vision calls for the development of higher density centers within the metropolitan area which will help to accommodate the one million additional residents of the region and thereby reduce the need to expand costly infrastructure beyond the region's established growth boundaries. Rapid transit can be a major stimulus to the development of higher density urban forms along the lines. FasTracks will serve many of these developments planned by local governments. With careful planning, stations that will be constructed at the perimeters of the urban growth boundary/area should not significantly impact the extent of regional development. As FasTracks will be constructed in or adjacent to highway right-of-way in a number of corridors, careful coordination between the Colorado Department of Transportation (CDOT), local governments, and the Regional Transportation District (RTD) will need to occur to efficiently provide for all modes of transportation. The recent Master Intergovernmental Agreement between CDOT and RTD, expected to be executed shortly, provides a process for this to occur.

Travel and Environmental Effects

FasTracks will provide travel time, accessibility, and environmental improvements. With FasTracks, by 2025, peak hour travel in the rapid transit corridors will be much faster by transit than by automobile. Employment accessibility will be improved for all residents of the region. Accessibility for low-income and minority persons will be significantly improved. Changes in air quality will result from the impact on transportation. FasTracks will decrease carbon monoxide and particulates, but nitrogen oxide emissions are likely to increase slightly.

Rapid Transit Technology

Both commuter rail and light rail transit (LRT) are technologies that can provide a faster trip than the private automobile. To gain the highest operating efficiency from these modes, station spacing needs to be carefully considered. Commuter rail is an appropriate technology in the US-36 and East Corridors. While commuter rail can be operated in the North Corridor, the shorter station spacing will reduce the operating efficiency of commuter rail in that corridor. Light rail transit is appropriate for the other corridors given the short station spacing. The short section of the light rail lines south of the Denver Central Business District, where 2.5-minute headways are proposed, will present an operational challenge. Should ridership of the light rail lines increase above the low end of the ridership estimates, additional light rail vehicles would be needed. Bus service and facility improvements will be made in the US-36 Corridor until such time as Bus Rapid Transit can be implemented.

Bus Service and Connections

To accompany the rapid transit construction, FasTracks proposes to increase bus service by 1 to 1.5 percent annually through 2025. Bus feeder service to rapid transit lines will be increased and suburb-to-suburb service will be improved through a reconfigured grid bus route system and a number of timed transfer points called FastConnects. The challenge will be to maintain the timed transfers given increasing traffic congestion on the region's streets and highways. Based on past experience with the Southwest LRT line, RTD will provide additional parking spaces at park-n-Ride lots. The number of spaces provided exceeds the parking demand identified through the modeling process.

Financial

A cost analysis by transit experts, CDOT, RTD and DRCOG staffs indicate that the $4.7 billion in capital costs is a reasonable estimate for this stage of the planning and implementation process. A major assumption in the costing is that CDOT and local government right-of-way will be made available without cost. Because the corridor improvements have yet to be designed, and, in all corridors except the West, environmental studies will be conducted which could result in changes in scope as well as cost, RTD has included contingency costs in its cost estimates. The cost of financing

the Plan is expected to be $3.3 billion through 2048. Additional operating costs are expected to be $1.5 billion for the rapid transit system through 2025.

To fund FasTracks, RTD has identified a number of funding sources. The principal funding source will be a 0.4 percent increase in the sales tax. Other sources include farebox revenues, the receipt of $815 million in discretionary funding from the Federal Transit Administration, the receipt of $60 million in federal funding awarded by DRCOG from funds that it regularly receives, and local government contributions of 2.5 percent of the total corridor costs. The principal financing vehicles will be bonding, use of certificates of participation, and a Transportation Infrastructure Finance and Innovation Act loan from the federal government.

At the request of DRCOG, AECom Consultants performed a review of the RTD financing plan. This firm has considerable experience in reviewing the financing plans of many transit properties across the country for the Federal Transit Administration. AECom found that the FasTracks financing plan is sound and can be accomplished with reasonable certainty assuming the cost estimates and voter approval of the tax increase and TABOR exemptions. By 2025, after construction of the FasTracks Plan, AECom estimates that RTD will have a balance of $853 million that could be used for earlier retirement of the debt.

Implementation

The construction of a multi-corridor transit system over a period of 12 years presents numerous implementation challenges. Rights-of-way and lease agreements need to be secured from the railroads. Rights-of-way need to be acquired from the state and local governments. The outcome of federal environmental studies in all but the West corridor[1] could affect the scope and cost of construction. Federal discretionary funding needs to be secured.

Substantial efforts have been made to address these uncertainties. Contingency costs have been included in corridor cost estimates. CDOT and RTD have developed a Master Intergovernmental Agreement that provides a process to make state highway rights-of-way available for FasTracks[2]. RTD has adopted a policy Regarding Board Commitments for FasTracks that calls for right-of-way agreements to be in place, as well as all corridor funding sources, before corridor construction is initiated. Should assumed federal discretionary funding not be provided to the level expected, a delay in the construction program would appear to be likely to provide sufficient time to generate the necessary additional sales tax revenue.

[1] Environmental studies have just been completed in the West Corridor.
[2] The agreement is expected to be executed shortly.

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I. INTRODUCTION

The Regional Transportation District's (RTD) FasTracks Plan proposes to construct various modes of fixed guideway mass transit in nine corridors of the Denver region between 2005 and 2017. Before RTD can implement this plan, state statute requires that the Denver Regional Council of Governments (DRCOG), as the Metropolitan Planning Organization (MPO), must approve the system and corridors within the transit system. Specifically:

> "The (RTD) Board shall take no action relating to the construction of a regional fixed guideway mass transit system until such system has been approved by the designated Metropolitan Planning Organization. Each component part or corridor of such system shall be separately approved by the Metropolitan Planning Organization. Such action shall include approval of the method of financing and the technology selected for such projects." [32-9-107.7 CRS]

RTD submitted its FasTracks Plan to DRCOG for approval pursuant to state statute. To evaluate the FasTracks Plan, the DRCOG Board of Directors adopted a process and set of criteria (see Appendix A). These criteria were used as the basis for the evaluation presented in this report. The evaluation is focused on the 2025 Regional Transportation Plan horizon year, since the anticipated FasTracks completion year (2017) is relatively close to the plan horizon year.

A consultant was retained to assist DRCOG in reviewing the financial aspects of the proposal. The consultant's review is documented in a separate report, *Financial Assessment of the Denver RTD FasTracks Program*, March 2004. In addition, experts from other transit systems were convened in Denver to review the costing methodology.

To ensure that the evaluation considered the concerns of the public, a public hearing was held on January 21, 2004 to receive comments regarding items that should be considered in the evaluation of the FasTracks proposal. A summary of the public hearing is attached in Appendix B. Concerns or issues raised in these comments were considered and addressed as part of the report discussion.

This report summarizes DRCOG's review of the RTD FasTracks Plan, as submitted on November 29, 2003, and revised in February 2004. Documentation submitted, as well as other documents used in this review, are listed in Appendix C.

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II. THE FASTRACKS PLAN

The FasTracks Plan calls for fixed-guideway transit improvements in nine corridors at a capital cost of $4.7 billion. Bonds will be issued to fund a portion of the cost. The cost of financing the capital cost is $3.3 billion through 2048. Rapid Transit service expansion operating costs are expected to be $1.5 billion. Construction is expected to begin in 2008 and be completed by 2017.

Improvements proposed to be constructed for each of the nine corridors are displayed in Figure 1 and presented in Table 1. It is important to note that, where federal funding is used or a federal action is required, an Environmental Impact Statement (EIS) will be required. A draft Environmental Impact Statement has recently been completed for the West Corridor. RTD has indicated that Environmental Impact Statements will be conducted for all the remaining corridors. The environmental process could result in changes to the scope of the improvements as well as the costs.

Bus Rapid Transit Corridor

Bus rapid transit (BRT) refers to an upgraded bus system that typically uses an exclusive right-of-way and includes on-line stations.

To move toward BRT, the FasTracks Plan provides for the construction of slip-ramps and access improvements to existing park-n-Rides from Boulder to Denver, as well as 1,433 new parking spaces at three park-n-Rides. This will improve the operation of buses that travel in mixed traffic along US-36. As a future second phase, RTD hopes to implement BRT operating in exclusive lanes in the US-36 median with center loading stations. Other high occupancy vehicles (HOV) may also use these lanes. However, funding for the complete construction of the BRT facility is not included in the FasTracks Plan. FasTracks will provide funding for five median BRT stations, and $66 million toward the construction of the BRT/HOV lanes. The $66 million is approximately one-fourth of the estimated cost of constructing BRT lanes in the corridor. FasTracks assumes that the Colorado Department of Transportation (CDOT) will provide the remainder of the funds, about $200 million. CDOT has not yet committed to providing this funding.

Commuter Rail Corridors

Commuter rail refers to passenger train service between a central city and outlying suburban or stand-alone communities.

For the three commuter rail corridors, FasTracks proposes to use existing railroad rights-of-way or to purchase land adjacent to existing rail operations. Existing rail tracks could also be leased for RTD operations. The specific technology has yet to be determined. Either conventional commuter rail (locomotive-hauled coaches) or diesel

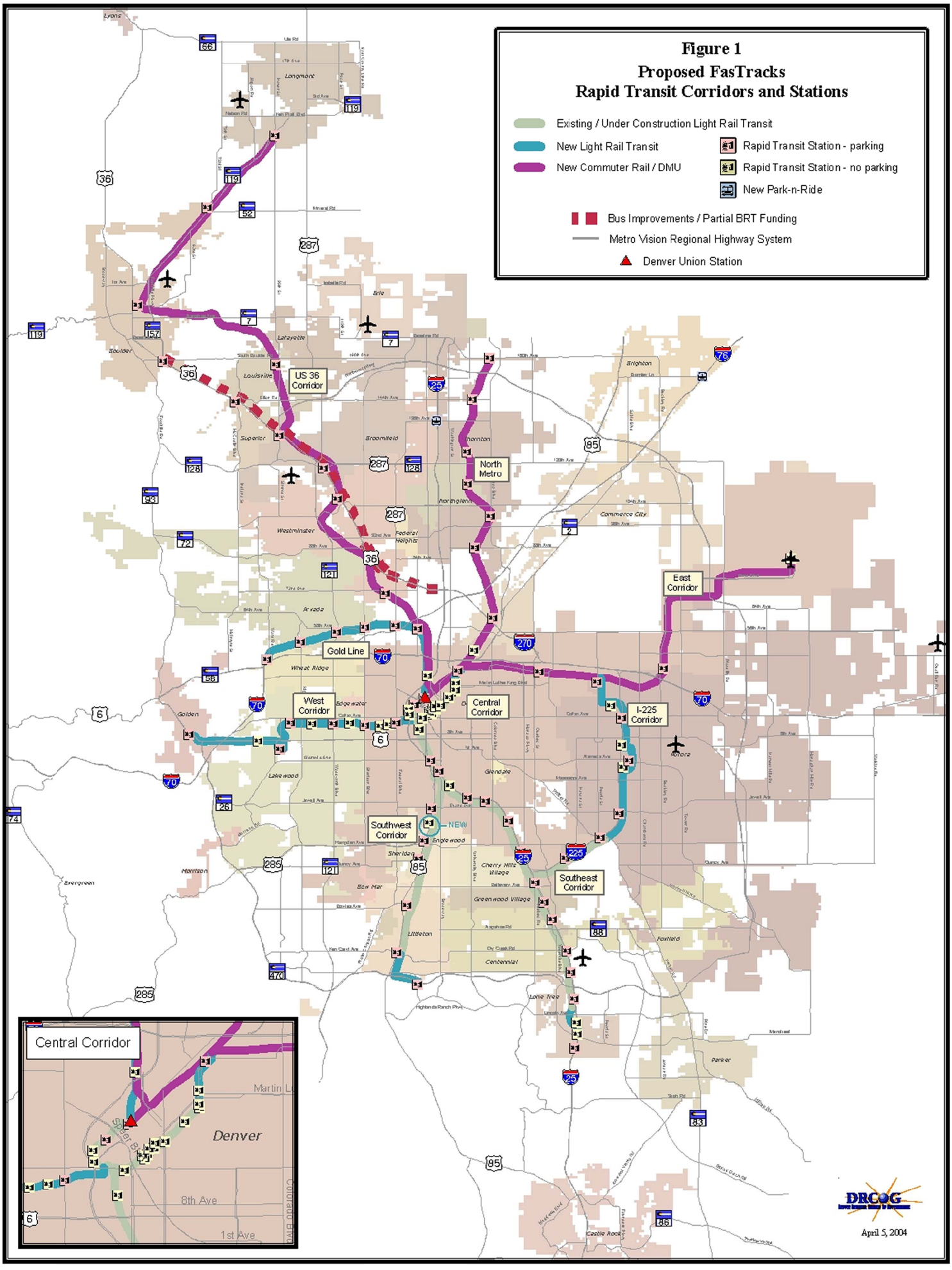
Figure 1
Proposed FasTracks
Rapid Transit Corridors and Stations
Existing / Under Construction Light Rail Transit
New Light Rail Transit
New Commuter Rail / DMU
Rapid Transit Station - parking
Rapid Transit Station - no parking
New Park-n-Ride
Bus Improvements / Partial BRT Funding
Metro Vision Regional Highway System
Denver Union Station
US 36 Corridor
North Metro
East Corridor
Gold Line
West Corridor
Central Corridor
I-225 Corridor
Southwest Corridor
NEW
Southeast Corridor
Central Corridor
Denver
8th Ave
1st Ave
Martin L
Colorado Blvd
DRCOG
April 5, 2004

Table 1

FasTracks Capital Cost Characteristics

					Rapid Transit					Non Rapid Transit				Millions of Dollars		
					Stations		Station Parking Spaces			PNRs (Spaces)		At-Grade	Length (Miles)	ROW	Capital Costs[2]	
Corridor	Mode	Track and Facilities (stations and PNRs in separate columns)	ROW	Operations	New	Lengthen	New	Spaces	Expand	New	Expand	Crossings[1]	Existing New	2002$	2002$	Inflated
US-36	Bus	Phase I: Construct slip ramps at 3 PRNs, pedestrian bridges over/under US-36 at 3 stations, close the existing Church Ranch/Mandalay PNR when the new PNR is constructed, and enhanced bus superstops on 28th Street.	Use CDOT (US-36); purchase private ROW for PNR expansion.	Ramps from/to US-36.							3 (1,433)			$0.4	$30.7	$36.9
	HOV/BRT	Phase II: When/if CDOT implements HOV lanes in US-36, RTD contribute $66 M for HOV lanes and $8 M for bicycle path.	Use CDOT (US-36) median ROW.	Median US-36.	5								18.0	$0.0	$147.9	$189.4
	Commuter Rail	Partially reconstruct existing BNSF track from DUS to Longmont (Hover Road), build second track from DUS to Boulder (Pearl); construct new grade separations at Utah Junction, 72nd, Lowell, Bradburn, 80th, 88th, S. Boulder Rd and 2 between Boulder and Longmont.	Lease BNSF railroad ROW and purchase private ROW for stations and PNR.	Shared BNSF tracks w/6 freight trains/day.	8 [4]		8	2,960				34	38.1	$4.1	$415.6	$565.1
North Metro	Commuter Rail	Build new double track from DUS to Sand Creek parallel to existing freight track; reconstruct existing track from Sand Creek to 160th (SH-7); build a second track from Sand Creek to 124th; and close existing Commerce City PNR when new PNR is constructed at rail station (net increase in 17 parking spaces); and construct new grade separations at stock show, Race, York, I-76, 74th, 88th, 104th, 120th and E-470. Also in the northeast quadrant: purchase ROW options in northeast (US-85/I-76) corridor.	Purchase BNSF and UP railroad ROW; purchase private ROW for stations and PNR expansion.	Shared BNSF railroad ROW from DUS to Sand Creek; shared UP railroad (Boulder Branch/Dent Line) tracks from Sand Creek to 160th Avenue.	8		7	3,000	17	2 (750)	1 (58)	16	18.0	$41.8	$317.9	$435.3
East Corridor	Commuter Rail	Build new double tracks; construct grade separations at Broadway, 38th, Denver Market lead RR, 2 freight flyovers for freight customer access track, Quebec, Peoria, Chambers, I-70/Airport Blvd/UPRR, 48th, 56th, Tower, E-470, Pena Blvd and DIA approach; DIA funding station at DIA (in count), close existing Stapleton PNR when new PNR is constructed with rail station (net decrease in 269 parking spaces at Stapleton)	Purchase UP railroad ROW; Use Denver Pena Blvd and DIA ROW; may purchase private ROW for section from Smith Rd to Pena Blvd and for stations & PNRs.	Shared ROW (railroads and Pena Blvd).	6 [3,4]		3	2,450			1 (-1,769)	21	23.6	$85.6	$554.2	$702.1
I-225 Corridor	LRT	Build new double tracks; build I-225 median flyout south of Iliff to the Iliff Station and a flyin north of Iliff, and final median flyout at Exposition; and build grade spearations at Iliff, Ellsworth, 2nd Avenue, 6th Avenue & I-225.	Use CDOT I-225 ROW; use Aurora (Abilene Street, Montview Blvd and Peoria Street) ROW; use RTD ROW (already acquired); purchase some private ROW.	Median I-225, city streets, Separate ROW.	7 [3]		3	1,250				13	10.5	$40.4	$321.1	$442.3
SE Extension & Upgrades	LRT	Extension: Build new double track and build grade separations at Lincoln, through Sky Ridge Medical, I-25, and Ridge Gate Parkway. Upgrades: Build pedestrian enhancements at Belleview and Arapahoe stations.	Use mostly developer donated ROW (pending) and purchase private ROW.	Separate ROW.	3	4	1	2,000	520			0	19.1 2.3	$0.2	$130.4	$183.0
SW Extension & Upgrades	LRT	Build new double track, grade separations at Mineral, County Line, BNSF/UP, C-470 and Bowen and acquire land for future station at C-470/Santa Fe Drive.	Use existing RTD ROW; use railroad ROW (already use agreement); use CDOT C-470 ROW, use Englewood ROW and purchase private ROW.	Separate ROW, shared ROW with C-470.	2	5	1	1,000	440			0	8.7 2.5	$6.5	$115.1	$164.1
West Corridor	LRT	Build new double track from DUS to Jefferson County Government Center; build grade separation at US-6 (east of Union), Federal, Sheridan, Wadsworth, Kipling, Indiana and I-70; build tunnel under US-6 (west of Union); lease 2,000 spaces from Invesco Field and close existing Federal Center PNR when new PNR is constructed at rail station for a net increase of 354 parking spaces.	Use RTD ROW (already acquired); use CDOT US-6 ROW; use Denver 12th Street ROW; use Lakewood 13th Street ROW; and purchase private ROW for stations.	Separate ROW, US-6 ROW and city streets.	11		5	5,700			1 (-646)	21	12.1	$35.8	$424.2	$508.2
Gold Line	LRT	Build new double tracks; build grade separations at consolidated mainline, South Platte River, I-25 (under), 38th, 48th (I-70 to 52nd), UP north yards tracks and office, Federal, 2 industrial flyovers, Wadsworth Bypass, Kipling and Ward.	Purchase BNSF railroad ROW & maybe purchase additional private land.	Shared ROW & maybe some separate ROW if BNSF double tracks existing line, but not shared tracks.	7		3	1,650	400			18	11.2	$27.4	$335.5	$463.5
Central Corridor Extension and Upgrades	LRT	Build new double track from 30th/Downing to 40th/40th; install new downtown circulator (not defined); build partial grade separation at 13th; install CBD signal software; and build second pair of tracks from Broadway station to Alameda Station and from 10th/Osage Station to Colfax (CPV/CBD split). Keeps single track on Welton from CBD to Downing.	Use Denver Downing ROW and purchase some private ROW.	Separate ROW/City street.	2 [3,4]	6						12	7.1 0.8	$10.0	$81.8	$118.4
Denver Union Station (DUS)	LRT, commuter rail & bus	Relocate LRT underground, at station along 16th Street, 18th Street and the Consolidated mainline; construct commuter rail at-grade and mall shuttle turn-around; build foundation for future construction and connection to existing historic station; provide connections to regional bus; and provide for internal pedestrian circulation.	RTD ROW (already acquired) and purchase Central Platte Valley Metro District ROW.	Separate ROW.	1 [5]									$4.7	$200.0	$268.5
Maintenance Facilities	LRT, commuter rail & bus	New facilities with buildings and vehicle storage areas - one for LRT, one for commuter rail, and one for bus.	Purchase private ROW.	Separate ROW.										$50.0	$209.2	$255.9
Other Items	Commuter Rail & other	Build grade separation of 23rd and the Consolidated mainline for both the Gold Line LRT and US-36 Rail; Transit ITS facilities (emergency telephones at stations, public announcement and security cameras at larger stations, and parking management systems and VMS at PNRs) and overall project management.	Purchase rail yards for Gold Line & US-36 Rail for better access to DUS.											$197.2	$311.3	$384.3
Totals					**60**	**15**	**31**	**20,010**	**1,377**	**2 (750)**	**6 (-924)**	**135**	**34.9 137.1**	**$504**	**$3,595**	**$4,717**

Notes:
1. The number of at-grade crossings are "new" for the rapid transit system and include construction/reconstruction costs to meet passenger safety requirements. Most of the US-36 Rail, North Metro, East and Gold Line corridor crossings currently exist for freight rail operations.
2. Capital costs includes the rights-of-way (ROW) costs.
3. The East Corridor shares stations with the I-225 Corridor and with the Central Corridor Extension where commuter rail and light rail meet.
4. The US-36 Rail, East Corridor and Central Corridor extension each have one station with the site to be determined.
5. DUS relocates LRT station to underground and uses AMTRACK station for commuter rail

Source: DRCOG summarized data from RTD FasTracks submittal, as revised 2-2-2004

multiple units (DMU) could be used. RTD has costed DMUs for the FasTracks Plan as they are costlier and, thus, provide a more conservative cost estimate. [See Chapter V, Rapid Transit Technology.]

Light Rail Corridors

Light rail transit refers to electric-powered lighter weight passenger rail cars operating singly or in trains.

Two entirely new corridors - the West and the Gold Line, and extensions of four corridors--I-225, I-25, Southwest, and Central--are proposed. All lines are double track.

Improvements will be made in the existing Central and Southwest corridors, and the Southeast Corridor (currently under construction). Existing stations in these corridors will be upgraded to accept four-car trains[3]. Pedestrian and bicycle enhancements will also be provided in the southeast corridor. A new station would be added at Bates Avenue in the southwest corridor if a transit-oriented development occurs.

Denver Union Station

Improvements at the Denver Union Station (DUS), consistent with the draft Denver Union Station Master Plan, are included to the extent the FasTracks funding provided ($200 million) will allow. At minimum, this will include the construction of the below-grade light rail transit station and railyard track improvement. Full implementation of DUS improvements for underground passenger rail and regional buses will most likely require additional funding.

Bus Service Improvements

By 2025, RTD will provide an additional 700,000 annual bus service hours, an increase of 24 percent. RTD will enhance its service as follows:

- Bus feeder service to rapid transit - the local bus network will be reconfigured to better serve the rapid transit stations.
- New suburb-to-suburb bus service - connections between major employment areas will be provided designed around FastConnects.
- FastConnects - a set of timed transfer locations will be provided (see page 51).

Other

- Three new maintenance facilities will be provided, one for LRT, one for commuter rail vehicles, and one for buses.
- Intelligent Transportation System applications will be included in each corridor.
- A grade separation of 23rd Street/Consolidated Mainline for both the Gold Line and US-36 rail will be constructed.

[3] Five stations along Welton through the Five Points neighborhood will remain as three-car stations.

- Funding for a central business district (CBD) circulator in the Denver Central Corridor is included in FasTracks, but the specifics of the service to be provided depends on the outcome of the Downtown Multimodal Access Plan (DMAP), and agreement by Denver with respect to the operational characteristics of the circulator.

Summary

- The exact nature of the improvements in many of the corridors have yet to be completely defined, as they are dependant on future actions such as:
  - selection of commuter rail technology - locomotive-hauled coaches or diesel multiple units
  - availability of funding for Bus Rapid Transit on US-36 in addition to FasTracks funding
  - results of Environmental Impact Statements
  - result of Denver DMAP's study
- Changes to the corridor improvements identified in FasTracks should be expected in the future as they are better defined.

III. CONSISTENCY WITH METRO VISION PLAN

Metro Vision

Metro Vision is the long-range, comprehensive growth strategy for the Denver region. It provides broad policy direction, as well as specific implementation strategies, to guide land development activity and transportation investment at the regional level, and to ensure environmental quality. Metro Vision 2020 was originally developed and adopted by DRCOG in 1997. The plan is currently being updated, extending its time horizon to 2030.

The relevant primary features of the Metro Vision plan are: (1) the establishment of an urban growth boundary, (2) the identification of strategic activity areas or "urban forms" within the boundary, and (3) the development of a balanced, multimodal transportation system. Other elements of the plan address freestanding communities, environmental quality and open space. To assure consistency with all DRCOG policies, FasTracks was evaluated with respect to Metro Vision.

Extent of Development

The Urban Growth Boundary/Area (UGB/A) is intended to manage development on the perimeter of the urban area to minimize the use of raw land and the corresponding need for additional expensive infrastructure. Rapid transit supports this principle by stimulating higher density development at station locations and elsewhere along the transit corridors, thereby reducing the need for development at the region's periphery.

All of the proposed transit stations are within the current UGB/A. However, the 160th station on the North Metro Corridor is located at the edge of the boundary (see Figure 2). The boundary at this location may need to be adjusted so that the station and an appropriate amount of surrounding area can be properly included. This type of adjustment is permitted under the Metro Vision flexibility provisions previously adopted by the DRCOG Board, which allow allocated growth to be moved from one area to another without affecting the overall allocation.

Even with this adjustment, other questions can be raised concerning the possibility that this and other stations located near the perimeter of the urban area could encourage development activity beyond the growth boundary. This situation exists in particular with the proposed stations at Niwot on the US-36 Corridor, 160th on the North Metro Corridor, and Ridgegate on the Southeast Corridor.

Because improved accessibility can lead to increased pressure for urban type development, DRCOG analyzed the extent of the geographic area within which residents could commute by any mode to central Denver within 45 minutes during peak periods in 2025 both with and without FasTracks. As expected, with FasTracks the extent of this geographic area increases from 377 to 532 square miles. Only a small

Figure 2
FasTracks Relationship to Urban Growth Boundary & Urban Forms

- FasTracks stations (approximate locations)
- FasTracks stations where RTD has identified major development/redevelopment opportunities (>10 acres)
- Metro Vision regional highway system
- FasTracks rapid transit corridors (new)
- Rapid transit corridors (existing/under construction)
- Proposed Urban Forms served by FasTracks stations
- Other proposed Urban Forms
- 2030 Urban Growth Boundary/Area (UGB/A)
- 1999 existing parks & open space

0 5 10
Miles

N

DRCOG
Denver Regional Council Of Governments

Source: DRCOG summary of RTD data

EF: April 1, 2004

portion of this geographic area (two square miles) is beyond the established 750 square mile UGB/A[4].

This area is not near any of the three stations of concern identified above. It is located in Boulder County, which has various open land protections already in place to manage growth in this area.

Urban Forms

Urban forms are compact, mixed-use activity areas, with sufficient densities to support cost-effective transit service. They are also intended to absorb a significant amount of the population and employment growth that is anticipated to occur within the region through 2030. Transit service, especially fixed-guideway rapid transit, encourages higher density development and has an important influence on the overall success of an urban form.

The proposed FasTracks rapid transit improvements will directly serve 18 of the proposed urban forms currently identified by DRCOG. Of these 18 forms, 16 are mixed-use Urban Centers, and two are employment-based Activity Centers. The FasTracks stations and their spatial relationship to the identified urban forms are shown on Figure 2.

<u>Other Development/Redevelopment</u>

The FasTracks Plan also cites examples of various local jurisdictions and private developers that are preparing major development plans (larger than 10 acres) in areas surrounding proposed station locations in anticipation of transit being provided in the future. There are 18 such major development opportunities identified in FasTracks, 12 of which are associated with the urban forms that have been identified by local governments for inclusion in the updated Metro Vision Plan. The associated transit stations are identified specifically on Figure 2.

It is reasonable to assume that the FasTracks Plan will stimulate development and redevelopment activity at numerous other station locations throughout the region. Specifically, 39 of the 55[5] total FasTracks stations are located within the existing urbanized area, where *redevelopment* can generally be expected to occur. The remaining stations are in currently undeveloped areas, but within the established Urban Growth Boundary/Area, where *new development* can be expected to occur. RTD and affected local governments should work together to identify the development opportunities and prepare the necessary plans and implementation measures.

[4] For this analysis, the non-urban "cutouts" shown on the map are considered to be part of the larger, generally contiguous UGB/A.

[5] Total station count (55) includes three stations with undetermined locations (not shown on Figure 2). Does not include five BRT stations.

Multimodal Transportation

The FasTracks corridors are consistent with the transportation principles and policies of the current Metro Vision 2020 Plan. The FasTracks Plan includes four corridor sections that were not identified in the Metro Vision 2020 Plan:

- Longmont to Boulder commuter rail service
- North Metro commuter rail north of 120th to 160th (SH-7)
- Southeast LRT extension to Lone Tree
- Southwest LRT extension to Lucent Boulevard

There are also three rapid transit corridors identified in the Metro Vision 2020 Plan that were not included in the FasTracks Plan. These corridors are conceptual and have not had any associated studies conducted since Metro Vision was adopted in 1997:

- Wadsworth Boulevard Corridor (Bowles Avenue to US-36)
- Hampden Avenue Corridor (Wadsworth to Southwest LRT)
- Alameda/Speer Corridor (Downtown Civic Center to Buckley Road)

All of the rapid transit components of the FasTracks Plan are included in the "draft for review" networks presently being considered for the updated Metro Vision 2030 Plan. This plan update is scheduled to be considered by the DRCOG Board of Directors in late 2004.

The current Fiscally Constrained Metro Vision 2025 Interim RTP (2025 Interim RTP) identifies only two additional rapid transit corridors (West and East) beyond the Southeast Corridor. This was based on funding estimates that were made in 2001. New estimates for the Fiscally Constrained 2030 Element of the Metro Vision 2030 Plan imply that base funding is insufficient to construct any new corridors. Therefore, two alternative 2030 rapid transit scenarios are being evaluated for the Fiscally Constrained 2030 Element: one alternative with the FasTracks Plan and a second alternative with no additional corridors beyond current construction. If a FasTracks funding initiative is presented to the public, and the initiative passes, the components could be included in the Fiscally Constrained Element.
Major highway improvement projects have been proposed that will directly affect the construction of the FasTracks corridors. These highway projects range from long-range conceptual ideas to designed improvements that have completed the environmental process and have been programmed in the Transportation Improvement Program (TIP). Significant cooperation and coordination between RTD and CDOT will need to occur as the following highway projects are implemented.

US-36 Corridor:

- Improvement of the McCaslin Boulevard interchange is included in the 2025 Interim RTP. An EIS is currently underway. Additional US-36 major investment study road improvements, including interchange improvements at Wadsworth Boulevard, are being considered for inclusion in the "draft for review" Metro Vision 2030 network.

I-225 Corridor:

- Widening of I-225 to six through-lanes was programmed in the Transportation Improvement Program (TIP) and received environmental clearances. The Finding of No Significant Impact document notes that "space for future widening and a future transit envelope will be preserved in the median." Funding reductions have forced this project to not be fully funded in the current TIP.
- Further widening of I-225 to eight through-lanes was identified in the I-225 major investment study, and is included in the "draft for review" Metro Vision 2030 network.
- Reconstruction and reconfiguration of the Colfax Avenue/I-225 Interchange is included in the Metro Vision 2020 Plan. Draft environmental documents have been prepared.

Southwest Extension:

- Widening of C-470 to six or eight lanes and the reconstruction and reconfiguration of the interchange of Santa Fe Drive and C-470 (Environmental Assessment ongoing) are included in the "draft for review" Metro Vision 2030 network.

West Corridor

- Replacement of the Federal Boulevard bridge over the rail line is partially programmed in the 2005-2010 TIP.
- Reconstruction of the Simms/Union at US-6 interchange is partially programmed in the 2005-2010 TIP.
- Reconstruction of the US-6/I-70 interchange is included in the "draft for review" Metro Vision 2030 network.

Gold Line

- Grade separation of the rail line and Grandview Avenue from Wadsworth Boulevard (partially programmed in the Transportation Improvement Program).

Southeast Corridor

- I-25 and Ridgegate Interchange (CDOT 1601 Interchange Studies approved; included in a revised Record of Decision).
- Widening of I-25 from C-470 to Castle Rock in Douglas County is a CDOT Strategic Priority (7th Pot) project identified in the 2025 Interim RTP (a revised Record of Decision has been issued).

East Corridor

- Widening of Peña Boulevard.

Smaller scale highway projects and operational projects associated with specific station locations will be defined during the Environmental Impact Statement (EIS) processes for each corridor. The EISs will also define specific non-motorized (bicycle and pedestrian) projects that will provide access to transit stations and mitigate safety concerns.

Summary

- The FasTracks Plan is consistent with the current Metro Vision 2020 Plan, including its transportation element. It could be incorporated into the Metro Vision 2030 Plan

- The FasTracks Plan is likely to provide substantial community benefits and will be helpful in achieving the goals of Metro Vision. Efforts should be made by the responsible local governments to encourage compact mixed-use transit-oriented development around all stations. This is especially important with respect to outlying stations so that development isn't stimulated beyond the growth boundary.
- Significant cooperation and coordination will be necessary as both transit and highway projects are implemented. (A Master Intergovernmental Agreement between CDOT and RTD to accomplish this is expected to be executed shortly.)

IV. TRAVEL AND ENVIRONMENTAL EFFECTS

Corridor Effects

The travel effects of FasTracks occur primarily within corridors and at peak travel times. Tables 2 and 3 display travel time and speed comparisons. Table 2 indicates significant time and speed advantages of FasTracks.

Table 2
FasTracks Mobility Measures by Corridor in 2025*

	Peak Hour Travel Time to Downtown Denver with FasTracks (in minutes)		Peak Hour Average Operating Speeds (miles per hour)	
	Drive Alone	**Train/Transit**	**Drive Alone**	**Train/Transit**
US-36 Rail Corridor from Longmont	133	61	14.9	41.7
North Metro from 160th Ave.	112	41	11.4	37.0
East Corridor from DIA	48	39	30.1	43.8
I-225 Corridor from Aurora C. Center	76	40	20.5	22.6
SE Extension from Ridgegate PW	96	43	12.1	27.1
SW Extension from Lucent/Plaza	97	31	9.5	30.8
West Corridor from Jeffco Gov. Ctr.	57	39	17.1	24.8
Gold Line from Ward Road	55	31	13.0	26.6
Central Corridor	n/a	n/a	n/a	n/a

* Drive-alone time and speeds are for in-vehicle segment of trip. Train/transit includes transfer time but not walk access or drive access time.

Source: RTD summary of regional travel model information.

Table 3 compares peak hour drive-alone vehicle speeds by corridor with and without FasTracks. FasTracks' impact on highway speeds varies from no impacts in four corridors, a one-mile-per-hour increase in four corridors, and a three-mile-per-hour increase in one corridor. Speeds on parallel arterials are likely to increase.

It should be noted that these speeds are based on "normal" conditions without impacts from highway crashes or other incidents such as breakdowns or bad weather. A key benefit of rail transit is the reliability of travel time. For example, current LRT service operates at 99 percent on-time reliability. In contrast, on -street local bus service operates at 90 percent on-time reliability. Roadway stalls and crashes and adverse weather conditions can routinely cause a significant increase in travel times for cars and buses.

Table 3
2025 Peak Drive-Alone Automobile Operating Speeds (miles per hour)

Corridor	Origin	Destination	Without FasTracks	With FasTracks
US-36 (Rail)	Longmont	Denver Union Station	15	15
North Metro	160th	Denver Union Station	11	11
East	DIA	Denver Union Station	29	30
I-225	Peoria & Smith	Nine Mile	33	36
Southeast	Ridgegate Parkway	16th & California	12	12
Southwest	C-470 & Lucent	16th & California	10	10
West	JeffCo Govt. Ctr.	Denver Union Station	16	17
Gold Line	Ward Road	Denver Union Station	12	13
Central	40th &40th	30th & Downing	14	15

Source: RTD summary of regional travel model.

Corridor Rapid Transit Ridership

RTD estimated corridor rapid transit ridership is shown in Table 4. The low end of the range reflects results from the regionally approved MinUTP model. This model was recalibrated to take into account the actual boardings achieved on the Southwest corridor, which opened in 2000. The upper end was established by RTD through surveys that attempted to measure latent demand in the Southwest corridor. Latent demand does exist as the parking lots are full early in the day and boardings would be higher if sufficient parking were available. The survey indicates that latent demand is about 17 percent of current ridership. The factor of 17 percent was then used by RTD to establish the upper end of the ridership range.

Table 4
Estimated 2025 Corridor Ridership

Corridor	Technology	Ridership 2025
US-36	Commuter Rail	8,600 - 10,100 (rail)
		16,900 (BRT)*
North Metro	Commuter Rail	10,200 - 11,900
East	Commuter Rail	30,400 - 35,600
I-225	Light Rail	15,200 - 17,800
Southeast(1)	Light Rail	51,100 - 59,800
Southwest(2)	Light Rail	20,200 - 23,600
West	Light Rail	31,200 - 36,500
Gold Line	Light Rail	16,300 - 19,100
Central & CPV(3)	Light Rail	26,300 - 30,800

*Only Phase 1 bus improvements included in FasTracks.
(1) Total corridor estimate. Ridgegate to Lincoln segment: 3,100 to 3,600 in year 2025.
(2)Total corridor estimate. C-470 & Lucent segment: 3,400-4,000
(3) Total corridor estimate. 40th & 40th to 30th & Downing segment: 2,100-2,500 riders/day
Source: RTD summary of regional travel model results for low end of range, plus 17 percent for latent demand for high end of range. East Corridor ridership based on 2001 transit trips to DIA, with growth factors from regional travel model.

The corridor transit mode shares during the peak hour are shown in the following table.

Table 5
Transit Percent Share of All Trips by Corridor
(bus and rail in peak direction/hour at most congested point)

	2001	2025 With FasTracks
US-36 Corridor	16%	19%
North Metro	12%	18%
East Corridor	10%	22%
I-225 Corridor	9%	18%
Southeast Corridor	12%	27%
Southwest Corridor	19%	21%
West Corridor	7%	26%
Gold Line	6%	25%

Source: RTD based on regional travel model.

Regional Travel Effects

With FasTracks, about 474,000 fewer vehicle miles would be driven per weekday in 2025 in the Denver region (95,066,000 versus 95,540,000). As noted in Table 3, because of the reduction in vehicle miles driven, highways adjacent to the rapid transit corridors will operate slightly faster during peak periods, generally improving overall operating speeds by one to three miles per hour.

Total bus and rail transit ridership[6] in 2025 with the FasTracks Plan is estimated to be 357,000[7] trips per day. This exceeds the without FasTracks Plan ridership of approximately 285,000 by 72,000 trips per day. The increase in trips is about evenly split between work and non-work trips. About 80 percent of the increase will be for non-CBD trips, reflecting the FasTracks Plan emphasis on providing increased rapid transit and bus service throughout the region.

It should be noted that the system ridership estimates with the FasTracks Plan include trips on buses using the US-36 BRT/HOV system. As previously mentioned, FasTracks does not fully fund the construction of BRT/HOV lanes on US-36. Instead, bus service would continue in the existing HOV lanes and in mixed flow with improved travel times through Phase 1 improvements. If full BRT/HOV were not implemented, system ridership would be somewhat less than the values presented.

[6] This section provides ridership data for the entire RTD fixed-route transit system, including both rail and bus trips, not just FasTracks. Ridership is defined as individual linked transit trips. For example, an end-to-end trip using a bus, a train, and the Mall Shuttle would count as one trip.
[7] 322,400 represents regional model figures. 357,100 includes latent demand. See "Rapid Transit Corridor Ridership."

As part of DRCOG's "reasonableness checking" of the FasTracks demand forecasts, DRCOG evaluated the level of transit demand in other cities across the country to compare the predicted boardings per person in the region under FasTracks to those in other cities. Boardings per person per year were calculated for several cities, for the transit service areas of the providers.

Under the FasTracks build scenario, travel modeling results estimate that transit will attract an average of 47 boardings per person per year for persons within the RTD service area. Examples of similar figures in other cities (for the year 2002) are shown in Table 6.

Table 6
2002 Boardings Per Person Per Year

City	Transit Service Area
Seattle	55
Minneapolis	37
Miami	44
Portland	80

Source: Federal Transit Administration's National Transit Database information.

These figures suggest that the overall system ridership forecasts prepared as part of the FasTracks submittal are not inconsistent with transit demand in other comparable cities.

Total system mode share--the percentage of total trips on transit--during the peak hour in 2025 is estimated to be about 4.1 percent and about 2.7 percent with and without FasTracks, respectively. The total daily system mode share is about 2.85 percent and about 2.27 percent with and without FasTracks, respectively. As discussed in the previous section, where RTD is proposing major transit improvements in FasTracks, corridor mode share is considerably higher, ranging from 18 to 27 percent.

Accessibility

FasTracks will improve employment accessibility region-wide. By 2025, there will be about 548,000 jobs located within walking distance (one-half mile) of a rapid transit station. This is about 26 percent of all jobs. In addition, about 12 percent of all households will be within walking distance of regional transportation, and about 86 percent of all households will be within a five-mile drive of a rapid transit park-n-Ride lot.

The FasTracks Plan will provide increased accessibility to the Denver central business district. The estimated number of residents living within a 45-minute transit trip from Denver Union Station is expected to increase from 535,000 to 1,015,000 with the implementation of FasTracks. This will be an important factor not only for daily commuters but also for people attending special events in the downtown Denver area.

Low-Income, Minority, and Disabled Person Accessibility

About 24,000 low-income persons and 192,000 minority persons currently live within one mile of stations that would be constructed or expanded as part of the FasTracks Plan, based on 2000 U. S. Census data. Table 7 shows the number of low-income or minority persons living within one mile of new or expanded stations within each corridor.

Table 7
Low-Income or Minority Persons in 2000 Living Within One Mile of FasTracks New or Expanded Transit Stations

	Low Income Persons	Minority Persons
US-36 Corridor	2,470	17,070
North Metro	1,870	21,450
East Corridor	920	15,720
I-225 Corridor	3,780	36,220
Southeast Corridor	40	440
Southwest Corridor	970	3,420
West Corridor	9,570	68,600
Gold Line	3,580	23,940
Central Corridor	1,920	19,350

Source: DRCOG compilation of US Census data reported in RTD FasTracks Plan.

Transit stations throughout the region will be located near major job sites that employ large numbers of lower income workers. Low-income and minority persons will have convenient access to many more jobs if FasTracks is completed. Table 8 provides examples of improved access for selected areas having high concentrations of low-income and minority persons.

Table 8
Number of Jobs Within a 45-Minute Transit Trip in 2025
(Includes walk and wait time and all transit modes)

Area	Without FasTracks	With FasTracks
Five Points	251,000	299,000
Alameda/Federal	187,000	312,000
Peoria/Colfax	85,000	189,000
Commerce City	45,000	89,000

Source: DRCOG summary of regional travel model information.

RTD is planning to accommodate disabled and special need rail passengers with the same type of single door "high block" boarding platforms that are used at the existing stations. Low-floor level rail vehicles and associated station configurations to permit "stepless" entry are not planned to be used. RTD reports that it has not had problems with the less costly high block platforms.

Service to Older Adults

The FasTracks Plan would give older adults improved access to typical destinations for older adults such as health facilities (e.g. Fitzsimons Campus, Sky Ridge Medical Center), cultural venues (e.g. Pepsi Center, Denver Center for the Performing Arts), major government facilities and libraries (e.g. Aurora, Denver, Jefferson County), and other key locations (e.g. Denver International Airport).

Transit-oriented developments around stations can provide excellent housing opportunities with easy accessibility to rail transit. Shopping, entertainment, and service uses will congregate around stations providing more travel opportunities via rail or via short walks around the transit oriented development. Many older adults also like the predictability and real or perceived comfort of rail vehicles versus buses.

Environmental

Air quality is the primary regional-level environmental concern. In 2002, the U. S. Environmental Protection Agency (EPA) declared the Denver region in attainment of all federal health standards (carbon monoxide, ozone, and small particulates called PM_{10}). During the summer of 2003, the area violated a new, stricter standard developed for ozone.

DRCOG requested the assistance of staff members from the Colorado Department of Public Health and Environment's Air Pollution Control Division (APCD), the Regional Air Quality Council (RAQC), and RTD in estimating the various air pollution impacts. Table 9 summarizes these estimates.

Table 9
Change in 2025 Air Pollution Emissions With FasTracks
(tons/day)

			Ozone	
	Carbon Monoxide	**Particulates (PM_{10})**	**Volatile Organic Compounds**	**Nitrogen Oxides**
General Traffic	-5.62	-0.40	-0.29	-0.15
Transit				
Diesel Bus	+0.03	+0.02	+0.01	+0.05
Light Rail	+0.02	0.00	0.00	+0.28
Diesel Commuter Rail	+0.16	+0.02	+0.04	+0.67
Transit Subtotal	+0.21	+0.04	+0.05	+1.00
Total	-5.41	-0.36	-0.24	0.85

Source: APCD, DRCOG, RAQC, RTD

The general traffic emissions reductions are the result of a decrease in vehicle miles traveled of about 474,000 miles per day. Transit vehicle emissions partially offset some of these emissions reductions. Commuter rail emissions were based on EPA Tier 2 rail emission rates. Light rail emissions involved estimating pollution generated at power

plants. Estimates of these emissions and their impact vary by type of fuel used and where the power is generated. The numbers in Table 9 are based on power generated at the Cherokee power plant.

The most significant of the reductions is in PM_{10}, where a decrease in emissions from general traffic of 0.40 tons per day, partially offset by transit emissions of 0.04 tons per day, results in an overall reduction of 0.36 tons per day. This reduction would help in meeting the emissions budget of 51 tons per day. Note that in the latest conformity finding, PM_{10} emissions were projected to be 50.2 tons per day in the year 2025. Additional increases in emission between 2025 and 2030 would be partially offset by FasTracks.

Both carbon monoxide and volatile organic compounds (VOC) would be reduced slightly by the FasTracks proposal.

The only overall emissions increase is for nitrogen oxides (NO_x), where the decrease in private vehicle emissions is negated by the transit vehicle emissions and total emissions increase by about 0.85 tons per day. This increase is a fraction of one percent of the NO_x generated in the region each day. The relationship between NO_x and ozone is complex. VOC and NO_x are the primary precursors of ozone. Depending upon the mixture of VOC and NO_x and atmospheric conditions, NO_x can increase ozone, and in other cases it decreases ozone. Considering the small increase and the geographic area where it is being generated, the increase should not negatively impact the region's ability to meet the new ozone standard.

Other non-air quality environmental factors include noise and vibration. These are not regional-level factors. Mitigation plans for these factors are developed during corridor-level environmental studies.

Summary

- By 2025, peak hour travel times will be considerably shorter by rapid transit than by automobile in the FasTracks corridors.
- Expected FasTracks boardings are consistent with other metropolitan areas.
- The rapid transit corridor patronage estimates are reasonable. They are based on the Southwest corridor operating experience.
- Transit accessibility to jobs, shopping, and services for low-income, minority, and/or elderly residents will greatly improve.
- Overall, air quality benefits would be small. The most significant would be a reduction in carbon monoxide and particulates. Increased nitrogen oxide emissions, primarily from diesel commuter rail vehicles, will occur. However, they are not expected to impact the region's ability to meet ozone standards.

V. RAPID TRANSIT TECHNOLOGY

Appropriateness of Corridor Technology

RTD is proposing three rapid transit technologies in the FasTracks Plan:

- Bus Rapid Transit,
- Commuter Rail, and
- Light Rail Transit of the type currently operating in the Denver region.

Bus Rapid Transit

While not fully provided for in FasTracks, bus rapid transit is ultimately desired for the US-36 corridor. This mode would build upon the current HOV lanes on I-25 and US-36 by continuing the provision of protected separate right-of-way along US-36 to Table Mesa Drive in Boulder. This extended HOV lane would allow the operation of buses at high speeds, providing a rapid transit experience. As such, it is an appropriate technology. The I-25 and the current barrier-separated US-36 sections of the current Bus/HOV lanes are expected to be converted to High-Occupancy Toll (HOT) lanes in the near future. To assure compatible operation with a Bus Rapid Transit system, CDOT is committed to the management of the HOT lanes so as not to delay bus operations.

Commuter Rail

Commuter rail is commonly associated with longer corridors, regional service, and with longer station spacing, on the average of three to five miles. Diesel Commuter Rail provides for higher operating speeds between widely spaced stations but its acceleration/deceleration is relatively slow. Commuter Rail service was selected through major investment studies in the US-36, North Metro, and East Corridors as the most appropriate technology for these longer corridors where high-speed operation is required.

Federal Railroad Administration (FRA)-compliant vehicles operating on existing freight railroad right-of-way are proposed. FRA-compliant vehicles could include either self-propelled Diesel Multiple Unit (DMU) and conventional locomotive-hauled coach (LHC) rail vehicles. The initial capital cost of DMU or LHC vehicles is comparable. As LHC is currently used in all regular commuter rail service in the United States, there is little technological risk associated with implementing LHC service. Self-propelled DMU service is comparatively new in the United States. There is only one DMU manufacturer whose vehicles are currently undergoing federal testing and certification. The South Florida Regional Transportation Authority has put FRA-compliant DMU vehicles into revenue service on a trial basis. As such, there is an additional risk as these vehicles have not been in long-term passenger service elsewhere.

Light Rail Transit (LRT)

Light rail transit is commonly associated with urban service in shorter corridors with shorter station spacing (one mile +/-). Light rail electric-powered vehicles have excellent acceleration and deceleration characteristics that minimize delay associated with frequent stops, but have a lower top speed than commuter rail.

FasTracks extends light rail transit in the Southwest, Southeast, and Central corridors, and light rail transit was selected as the preferred mode in the I-225 and Gold Line major investment studies, and the West Corridor environmental impact statement due to the service characteristics described above.

Technology Relationships

FasTracks proposes grouping the commuter rail technology to the north (US-36, North Metro, and East Corridors), with LRT technology to the south (I-225, Southeast and Southwest extensions, West, Gold Line, and Central corridors). LRT and commuter rail cannot share trackage as the vehicles are built to different safety standards. In addition, LRT can run on a lighter track than commuter rail. The geographic grouping of technologies therefore is useful in regard to location of maintenance facilities and sharing of vehicle use between corridors.

The use of two non-compatible rail technologies decreases the potential for interlining[8] of through-services between corridors. The FasTracks Plan includes the physical infrastructure to allow interlining among all the light rail transit lines, and between all the commuter rail lines, but the service plan only includes one instance of interlining where travelers between the West and Gold Lines do not have to transfer. No interlining is proposed for the commuter rail lines.

Stations and Station Spacing

Denver Union Station will be the central hub for most of the bus/HOV, commuter rail and light rail services. The intent is to expedite and facilitate passenger transfers between lines and modes of transportation. Passengers will be able to transfer among the three modes at the Denver Union Station. The ability to change modes and lines quickly mitigates the lack of significant interlining among the various modes and within the various modes.

Station spacing is an important consideration. As noted earlier, LRT is commonly associated with urban services having short station spacing (about one station per mile), and commuter rail is commonly associated with regional service having longer

[8] Interlining describes the ability for a mode operating in one corridor or line to continuously operate in another corridor or line.

station spacing (about 3 to 5 miles between stations). Station spacing in the FasTracks corridors is indicated in Table 10.

Table 10
FasTracks Rail Station Spacing

Technology	Station Spacing (stations/miles)
Commuter Rail	
US-36	5.4
North Metro	2.3
East	4.7
Light Rail	
I-225	1.5
Southeast	1.3
Southwest	1.6
West	1.1
Gold	1.6
Central/CPV	0.5

Source: DRCOG calculation from RTD FasTracks submittal 3/9/2004.

The North Metro corridor station spacing is short for efficient high-speed commuter rail operation. The only LRT corridor that has station spacing less than one mile is the Central Corridor, whose function is to improve system continuity and distribution to and from the CBD, not to provide independent service.

Comments were made at the public hearing suggesting additional stations along the East Corridor. The addition of these stops, depending on the number, could adversely affect the speed and operating efficiency of the commuter rail operation.

Operations

Figure 3 shows the FasTracks 2025 peak hour rail-operating plan including the frequency of service (trains per hour). RTD analyzed the ability of the system components to accommodate demand. Maximum line loads and proposed capacities (seated and standees) were compared to determine if the proposed service plan and recommended train consists would meet estimated demand.

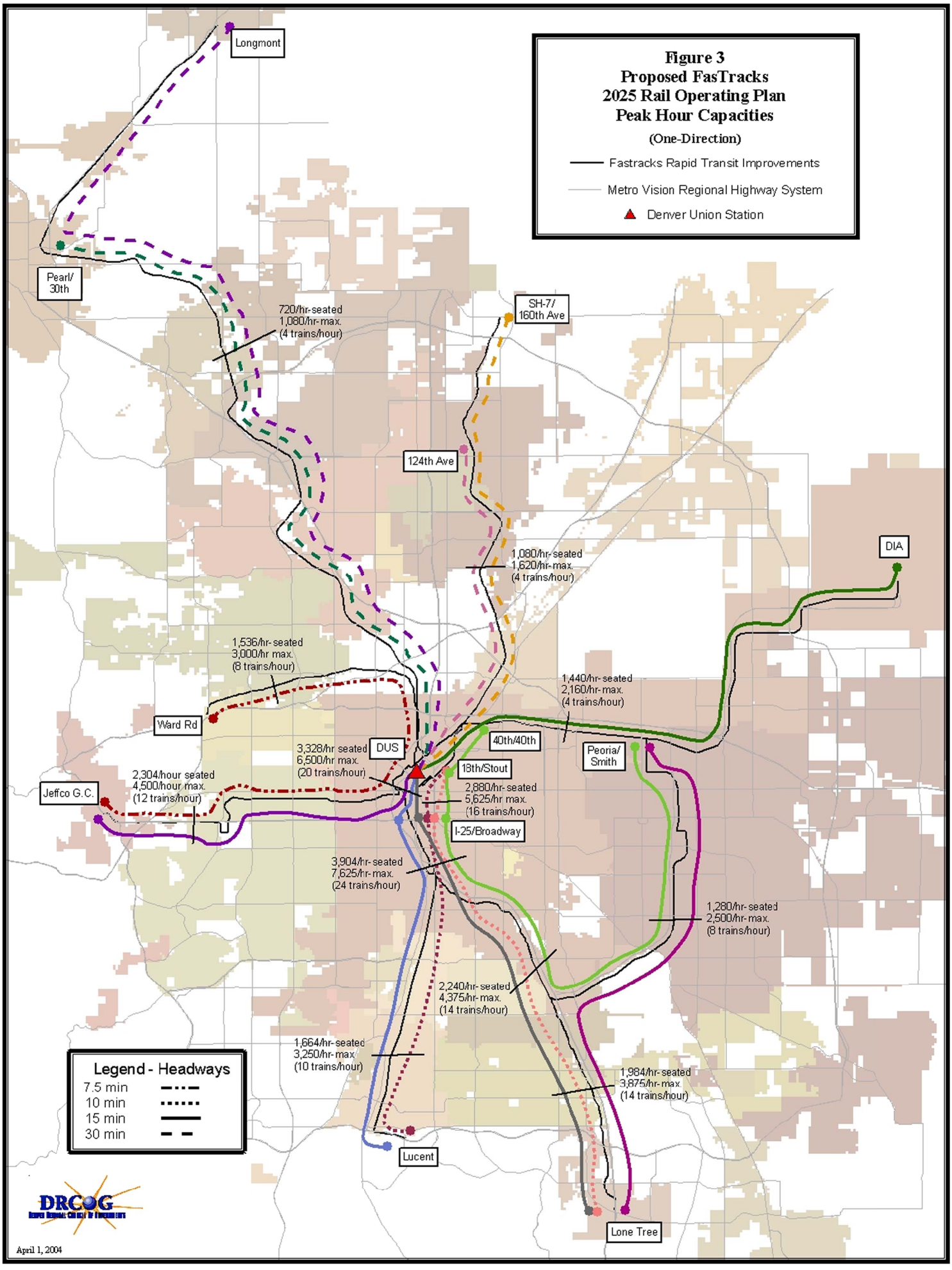
Figure 3
Proposed FasTracks
2025 Rail Operating Plan
Peak Hour Capacities
(One-Direction)
Fastracks Rapid Transit Improvements
Metro Vision Regional Highway System
Denver Union Station
Longmont
Pearl/
30th
720/hr-seated
1,080/hr-max.
(4 trains/hour)
SH-7/
160th Ave
124th Ave
1,080/hr-seated
1,620/hr-max.
(4 trains/hour)
DIA
1,536/hr-seated
3,000/hr max.
(8 trains/hour)
1,440/hr-seated
2,160/hr-max.
(4 trains/hour)
Ward Rd
3,328/hr seated
6,500/hr max.
(20 trains/hour)
DUS
40th/40th
Peoria/
Smith
18th/Stout
2,304/hour seated
4,500/hour max.
(12 trains/hour)
Jeffco G.C.
2,880/hr-seated
5,625/hr max.
(16 trains/hour)
I-25/Broadway
3,904/hr-seated
7,625/hr-max.
(24 trains/hour)
1,280/hr-seated
2,500/hr-max.
(8 trains/hour)
2,240/hr-seated
4,375/hr-max.
(14 trains/hour)
1,664/hr-seated
3,250/hr-max.
(10 trains/hour)
1,984/hr-seated
3,875/hr-max.
(14 trains/hour)
Lucent
Lone Tree
Legend - Headways
7.5 min
10 min
15 min
30 min
DRCOG
April 1, 2004

LRT vehicle capacities were based on 64 seats per car and 61 standees for a total 125 persons/car as the capacity. Commuter rail capacities were based on 90 seats per car and 45 standees for a total persons/car design load of 135. RTD standards allow for crush loads[9] of 150 persons/vehicle for short distances near or in the downtown. Station-to-station line loads from the regional model were graphed and compared to proposed hourly capacities. The analysis indicates that the system components meet model forecasted demand. Note that crush loads will be experienced on many lines as they approach or are operated in downtown Denver. Table 11 lists the approximate seated and standing capacity and maximum line loads.

Table 11
FasTracks Corridor Capacity and Year 2025 Maximum Line Loads

Corridor	Peak Hour Capacity	Peak Hour Maximum Line Loads
US-36 (71st/owell-DUS)	1,080	757
North Metro (Globeville/Swansea-DUS)	1,620	1,689*
East (40th/40th-DUS)	2,160	1,742
I-225 (Nine Mile-Dayton)	2,500	1,697
Southeast (Louisiana-I-25/Broadway)	4,375	3,549
Southwest (Evans-I-25/Broadway)	3,250	2,940
West (Federal-Auraria West)	4,500	4,248
Gold Line (38th-DUS)	3,000	2,228
Central (Alameda-10th/Osage)	7,625	6,705
Central Platte Valley (Auraria West-Invesco)	6,500	5,088

* Note that crush load capacity on this line is 1,800 passengers per hour. The East Corridor and extension of Central Corridor light rail to 40th/40th also provide redundant rail capacity to downtown Denver from this vicinity.

Source: DRCOG summary of RTD analysis by Manuel Padron and Associates.

The number of rail passenger cars needed, as well as the number proposed to be provided is shown in Table 12.

Table 12
Rail Passenger Cars

	Cars Needed to Meet Peak Demand in 2025	FasTracks Cars Proposed
LRT	189	227
DMU	51	62
Total	240	289

Source:

The calculated number of peak cars needed is based on the following assumptions:

- RTD will continue its current practice of allowing crush loads to occur on short route segments close to downtown Denver;

[9] Crush loads are the maximum number of persons with very little or no room between standees.

- The number of passengers served is as projected by the Regional Travel Model (lower end of the patronage range), and does not account for latent demand (higher end of patronage range); and
- DMU acceleration and deceleration characteristics are used, not LHC.

The number of vehicles proposed allows for 38 LRT vehicles and 11 DMU vehicles as spares. RTD is maintaining an adequate spare ratio of 20 percent or greater by technology and by line, assuming the lower end of the ridership estimates are achieved.

Central Corridor Choke Point

FasTracks will run a maximum of 24 light rail trains per-hour per-direction (48 trains per hour total) on the central line. The Plan specifies four-track sections between the I-25/ Broadway and Alameda stations and between the 10th/Osage station and the Central Platte Valley (CPV) junction. This leaves a two-track section between Alameda station and 10th/Osage for approximately 1.6 miles. Improvement of this 1.6-mile section is constrained by lack of readily available right-of-way. During peak hour service, there will be one train every 2.5 minutes in each direction. RTD reports that this short headway is achievable because the distance is short with no intervening stations and vehicles can be staged at the station platforms at each end. RTD points to its own experience immediately after opening of the Central Platte Valley (CPV) line, and the PATCO rail line service between Lindenwold, New Jersey and Philadelphia. In both these instances, only a few trains ran at headways at 2.5 minutes. The FasTracks Plan will run trains at 2.5-minute headways for two hours. While theoretically possible, actual operation is the only way to know if delays in this two-track section north of Alameda will be a long-term operating problem. If it proves infeasible to run trains at a 2.5-minute headway, additional track capacity will have to be added in this corridor or in a reliever alignment. Service might also be reduced to lengthen headways.

RTD assumed 24 trains per hour during the peak periods to meet the projected demand. These trains are a mixture of two- and three-car trains to downtown Denver, and up to four-car trains to DUS. RTD was unable to assume four-car trains in downtown Denver, because the four-car trains cannot be turned around at 19th Street/California/ Welton without the possibility of blocking two intersections simultaneously. This effectively restricts RTD to three-car trains in the downtown area during the normal weekday peak period. RTD will have to work with the City and County of Denver to resolve traffic signal timing so as to allow four-car trains.

At-grade Crossings

The commuter and light rail lines include 135 at-grade roadway crossings. While FasTracks proposes grade separations at select major crossings, many minor arterial, local streets and private at-grade crossings will remain. RTD anticipates a one-minute gate time per train for motor vehicles at these crossings. In addition to vehicle delays, the crossings increase the potential for crashes. Environmental studies may recommend elimination of some of these crossings.

Fleet Size

The transit fleet was sized by RTD to serve the lower end of the ridership estimate as reported in Chapter IV. If the higher end of the transit patronage estimate were reached, more vehicles would be needed and higher operating costs would occur. Some of these costs would be covered through additional farebox revenues, and by a reduction in the 20 percent spare ratio planned by RTD. In addition, RTD's analysis shows financial reserves growing in the years following completion of the system. Some of these reserves could be committed to accommodate the higher ridership numbers.

Maintenance Facilities

The FasTracks proposal includes funding for three additional maintenance facilities; one for LRT, one for commuter rail, and one for the bus system. RTD's reasoning is that economies of scale would be present in single large maintenance facilities. The proposed LRT facility will have a capacity of 100 vehicles. Total capacity, including the under-construction Elati facility (100 vehicles) and existing Mariposa facility (39 vehicles), should be sufficient to handle the maintenance needs of the 227 vehicle fleet that is proposed under FasTracks. However, if the fleet size grows in response to higher ridership, more maintenance track would be required at the three planned facilities. The commuter rail facility will have a capacity of approximately 100 vehicles compared to a proposed fleet of 62 vehicles.

Summary

- The three proposed FasTracks technologies are appropriate considering the specific travel characteristics, right-of-way opportunities and environmental constraints of each corridor. The technologies would provide reliable travel times that are competitive with private automobile use.

- The use of two different rail technologies (commuter rail and Light Rail Transit) reduces the possibilities of interlining of some of the corridors. This increases the need for efficient transfers at such locations as the Denver Union Station.

- Station spacing in the North corridor is short for commuter rail, especially for locomotive-hauled coach trains. If DMU is not available in the near term, Denver region trips might be better served by LRT.

- The addition of more stations or changes in the alignment to provide more urban type service in the East corridor may affect the decision to use commuter rail in this corridor. Reducing operating speeds significantly will undermine the purpose of the line, which is speedy service to DIA.

- The 1.6-mile Central Corridor choke point between the Alameda station and 10th/Osage is a concern. RTD has indicated that the short 2.5-minute train headways

can be maintained. If this is not the case, additional track capacity will have to be added either in this segment or in a reliever alignment or service will have to be decreased.

- RTD is providing an adequate number of vehicles to service the low end of the ridership estimate. If, in fact, the upper end is achieved, more vehicles and higher maintenance and electrical power costs will occur. Funding for this eventuality appears to be available in the latter years of the financial plan.

VI. BUS SERVICES AND CONNECTIONS

Bus System

The FasTracks Plan budgets for an increase in bus service of 1 percent annually through the year 2020, and 1.5 percent from then until 2025. This is a 24 percent increase in bus service from 2003 levels. In addition, the opening of the rail rapid transit lines will free up some buses currently in express and regional service. RTD plans to redeploy these resources to feed the rapid transit system and provide more suburban service. With all of the above-mentioned service, FasTracks increases annual revenue hours of bus service by 36 percent (new plus redeployed) and increases overall annual revenue hours of transit service (including rail) by 50 percent compared to existing service. This can be compared to the projected increase in population of 41 percent and in employment of 38 percent within the RTD between 2003 and 2025.

RTD plans to initiate a reconfigured suburb-to-suburb service called FastConnects. This grid reconfiguration is meant to increase suburban area coverage, service suburb-to-suburb trips and provide access to the rapid transit system. FastConnects refers to efficiency of connections, not necessarily the frequency of service. For example, much of this service is on a 30-minute headway. Two types of connections are proposed. The first type is so-called “grid transfers,” where the headways between vehicles are usually 10 minutes or less. The second type is timed transfer points of buses at a transit center, rail station or park-n-Ride. The service is designed to have buses traveling to multiple destinations timed to arrive at a major destination or transfer facility at the same time, thereby minimizing the time a passenger has to wait to transfer. Of concern is the feasibility of operating a large number of timed transfer points given the inherent schedule unreliability of local buses operating in mixed traffic. RTD has indicated that similar systems are in operation in Portland, Oregon and Norfolk, Virginia, that RTD already operates timed transfer points at Cold Spring, Avoca, Lakewood Center and at Federal/Evans, and that RTD’s local service operates 90 percent on time. A second concern is the comparatively modest increase in ridership on local and limited bus routes in the FasTracks proposal, as compared to modeled estimates of “no-build” ridership. Local bus boardings increase by 2.7 percent, despite an increase of 22.3 percent in vehicle miles. Limited bus boardings increase by 5.8 percent, despite an increase of 53.4 percent in vehicles miles. Much of this service is on circumferential roadways, and occurs in off-peak travel times. This type of service typically has lower passenger productivity and farebox recovery ratios. If this is the case, these routes may not be sustainable. If ridership is low, RTD will have to analyze route productivity and reallocate resources to more efficient service.

Intermodal Connections

Key intermodal connection elements of the FasTracks Plan include the following:

- Reconfiguration of express and local bus routes to feed into rapid transit stations (as was done for Southwest Corridor).
- Bicycle and pedestrian accommodations at stations and treatments to improve access to and from the stations. Details will be defined in individual corridor Environmental Impact Statements (EISs).
- Denver Union Station (DUS) will serve as a Downtown Multimodal Center. FasTracks will provide funding for constructing the basic requirements to facilitate the rapid transit lines and passenger transfers between lines and travel modes.
- Key interline transfer points (requiring extra passenger amenities and coordinated arrival/departure times when longer headways are in place) will be at the following stations:
  - Peoria/Smith Station – I-225 LRT and East commuter rail
  - I-25/Broadway Station – Southwest, Southeast, Central, and I-225 LRT lines
  - 40th/40th Station – Central LRT and East commuter rail
  - Auraria West Station – West and Central (to south) LRT lines

Platform-to-platform transfers will be provided at these stations to allow convenient passenger transfers between rail modes.

Parking

Over 21,000 parking spaces will be added to existing and new RTD park-n-Ride lots resulting in a total of 47,000 spaces for the RTD system. Over 43,000 would be located along rapid transit corridors in 68 lots. Table 1 presents those spaces to be provided by the FasTracks Plan. Total parking spaces provided along each corridor significantly exceed the amount of spaces required as estimated by the Regional Travel Model. RTD started with the estimates from the regional model, and modified them based on the experience of the Southwest Corridor. About 6,300 spaces would be provided at end-of-line stations. Corridors such as the North Metro, Southeast, Southwest, and West also have convenient second or third stations that could be used if the end-of-line station is filled upon arrival. Though not noted specifically in the FasTracks Plan, variable message signs on major highways that can display real-time information about the number of spaces available at key park-n-Ride lots should be considered. This would help to reduce vehicle miles traveled and congestion around stations in the morning peak hour. Consideration should also be given to establishing carpool-only parking spaces at prime park-n-Ride lots that fill up early in the morning.

Access to park-n-Ride lots and non-parking stations (e.g. drop-offs and pick-ups) from the arterial and local street system is an important issue that must be addressed in corridor environmental studies and site designs. Site-specific peak hour congestion could increase immediately adjacent to park-n-Ride lots. Environmental studies would define items such as turn lanes, traffic signal timing and coordination, and short segments of new travel lanes. RTD has included cost contingencies for these currently undefined improvements.

Summary

- FasTracks provides funding to maintain and expand the bus system.
- Site-specific bicycle, pedestrian, and roadway access improvements will need to be defined and addressed through the EIS processes.
- Local bus feeder service to rapid transit stations is an integral part of the plan.
- It appears that an adequate number of parking spaces will be provided.
- Of concern is the ability to operate a large number of timed-transfer points.

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VII. FINANCIAL

This chapter discusses the financial aspects of the FasTracks Plan. Presented first is an examination of the direct and indirect costs of FasTracks. These costs include infrastructure, operating and system, contingency costs, and related costs (highway, local roads, and other costs resulting from the Plan). Next, the review presents the revenue expected to meet these costs. This is followed by a summary of the financial plan.

Costs

The FasTracks Plan cost includes $4.7 billion for the capital expansion costs and $3.3 billion in interest on the bonds, loans and notes through 2048 (see Tables 13 and 14).[10] The new rapid transit corridor operating and maintenance cost is estimated at $1.5 billion through 2025 (see Table 15). Service expansion operating expenses will continue beyond 2025.

The cost per rider and cost per passenger mile for each of the corridors is shown in Table 16. The extension of existing corridors has higher cost per rider values as only the extension ridership is used in the calculation.

Table 13
RTD System Capital Costs
(amounts in $1,000,000s of inflated dollars)

Cost Category	2005-2016	2017-2025	Total
FasTracks Initial Capital Costs			
Commuter Rail and Bus/HOV	1,929		1,929
Light Rail	1,838	42	1,880
Denver Union Station	269		269
Maintenance Facilities	256		256
Other	352	32	384
Initial FasTracks Capital Cost Subtotal	**4,643**	**74**	**4,717**
Ongoing Capital Requirements			
Existing Light Rail	218	248	465
Bus and Other	1,080	1,311	2,392
FasTracks Service Enhancements	89	798	887
Ongoing Capital Subtotal	**1,386**	**2,357**	**3,743**
Total System Capital Costs	**6,030**	**2,431**	**8,460**

Source: RTD FasTracks submittal, as revised 2/2/2004

[10] Unless otherwise noted, all financial data is shown in inflated dollars to represent the value in the year of expenditure.

Table 14
FasTracks Finance Table
Revised Revenue Scenario
(amounts in 1,000s of inflated dollars)

Financial Instrument	Year Issued	Principal	Life (years)	Interest through 2025	Total Interest through maturity	Year last payment
Revenue Bond	2007	205,270	30			2036
	2009	693,225	30			2038
	2011	819,775	30			2040
	2013	800,225	30			2042
Revenue Bond Totals		**2,518,495**		**2,026,293**	**2,918,122**	
Certificates of Participation	2011	76,625	25			2035
	2013	106,025	25			2037
	2015	11,350	25			2039
	2017	19,450	20			2036
Certificates of Participation Total		**213,450**		**77,638**	**105,693**	
TIFIA (1) Loan	2013	97,639	35			2047
	2014	45,312	35			2048
TIFIA(1) Load Totals		**142,951**		**99,134**	**200,297**	
Commercial Paper Totals	**Annually 2005 through 2015**	**815,426**	**(2)**	**84,930**	**84,930**	**2016**
Totals		**3,690,072**	(3)	**2,287,994**	**3,309,042**	

Source: RTD FasTracks submittal, as revised 3/9/2004.
(1) TIFIA is Transportation Infrastructure Finance and Innovation Act
(2) Commercial paper term varies from 1 to 270 days, and may be rolled over after the initial maturity.
(3) The total amount of the principal is not available for the capital cost program. A portion of the principal borrowed must be (a) used to cover the cost of the issuance, and (b) set aside to fund the debt service reserves.

Table 15
RTD System Operating Costs
(amounts in $1,000,000s of inflated dollars)

Cost Category	2005-2016	2017-2025	Total
Existing light rail corridors (1)	486	626	1,113
New FasTracks Corridors			
Light Rail	117	645	762
Commuter Rail	106	446	552
Other	31	167	198
New FasTracks Corridors Subtotal	**253**	**1,258**	**1,511**
Bus Operations and Other(2)	3,826	4,618	8,444
RTD Total System Operating Cost	**4,565**	**6,503**	**11,068**

Source: RTD FasTracks submittal, as revised 3/9/2004.
(1) Costs for existing and committed LRT corridors includes service expansion
(2) Bus operations costs include costs for increases in base bus and feeder service.

Table 16
2025 Cost Per Rider and Cost Per Passenger Mile

Corridor	Cost Per Rider		Cost Per Passenger Mile	
	High Ridership	Low Ridership	High Ridership	Low Ridership
US-36 Rail	$16.00	$18.79	$0.88	$1.04
North Metro	$9.89	$11.54	$0.90	$1.04
East Corridor	$5.69	$6.67	$0.39	$0.46
I-225 Corridor	$7.33	$8.58	$1.62	$1.90
Southeast Extension	$13.53	$15.72	$8.26	$9.74
Southwest Extension	$9.27	$10.91	$2.65	$3.12
West Corridor	$4.83	$5.65	$1.13	$1.32
Gold Line	$6.84	$8.01	$1.20	$1.41
Central Corridor Extension	$9.31	$11.08	$19.39	$23.27

Notes: Annualized capital costs and 2025 operating costs in 2002 dollars
2025 Ridership
Source: RTD FasTracks submittal, revised 2/2/2004

Capital Costs

The $4.7 billion FasTracks capital expansion program was previously described in Table 1. It is important to note that all corridors except the West Corridor will be subjected to an Environmental Impact Statement that will likely result in project scope changes, and may result in cost changes.

As noted in Table 1, rights-of-way costs total $504.1 million in uninflated dollars. This total is subject to change depending upon negotiations with the railroads, the Colorado Department of Transportation (CDOT), local governments, and private landowners.

RTD contracted with EarthTech to perform an independent assessment of the FasTracks project costs and unit costs. RTD reports the EarthTech results were within 1.8 percent of the RTD cost estimates, with corridors ranging from 0.1 percent to 4.3 percent differences. This review confirmed RTD's unit cost estimates and costing approaches. Subsequent RTD estimates resulted in refined quantities and costs.

DRCOG conducted a peer review of the FasTracks capital cost estimates. Three transit experts having transit cost experience from other locations, CDOT staff and DRCOG staff reviewed and discussed the FasTracks program's unit costs, risk assessment and corridor construction components. Federal Transit Administration (FTA) and Federal Highway Administration (FHWA) representatives also attended. This peer group did not review the construction item quantities.

No fatal flaws were uncovered. It was the unanimous opinion of this group that the corridor components and unit costs are reasonable for this stage in the planning

process. CDOT indicated that for the items comparable to highway construction, the unit costs seemed reasonable. The panel was satisfied with the contingency amounts ranging from 15 to 30 percent (mostly 25 percent) for the corridor costs, and 39 percent for Denver Union Station.

Related Roadway Costs

Highway Improvements

Funding for the following projects is included in FasTracks: lengthen Federal Boulevard bridge over Lakewood Gulch $200,000, and flyover of Wadsworth Bypass at Grandview Avenue $428,000. RTD assumes that CDOT and others will provide the remainder of the funds necessary to complete these projects. If other funding is not available, RTD has assumed in its contingency costs funds to cover the full cost to complete these projects in a timely manner for the rapid transit program.

Local Streets and Roads

Based on the assumptions identified in the West Corridor environmental impact statement study, the FasTracks corridor costs include an average of 20 percent of the corridor construction costs to mitigate local circulation and access issues and environmental issues.

Contingency Costs

The FasTracks cost estimates contain a number of contingency costs. For most corridors, the general contingency is set at 25 percent of the estimated capital cost. A 15 percent contingency is used for the West Corridor since the Environmental Impact Statement and Record of Decision action is nearly complete. A 30 percent contingency is used for the East Corridor, and a 39 percent contingency for the Denver Union Station since more cost items are unknown. The park-n-Ride construction contingency is about 15 to 20 percent, and the vehicle acquisition contingency ranges from 4 to 20 percent. The total FasTracks contingency cost is about $573 million of the total $3,595 million uninflated capital program cost. Contingency represents about 16 percent of the capital cost.

A risk assessment was conducted to assess the reliability of the contingency rates applied to each corridor. Table 17 presents the general risk assessment components. RTD identified the risks with a quantified cost range (such as for unit costs) or lump sum value (such as adding a station or acquiring rights-of-way assumed free in base cost estimates). A “Monte Carlo” chance procedure was performed to assess the likelihood the risk will occur.

Table 17
RTD FasTracks Risk Assessment Components

Risk Items - General	Pre-PE*	Post-PE	Applied to
Scope enhancements	-2% to 4%	-1% to 2%	Construction
Geotechnical accuracy/HazMat	-25% to 200%	-15% to 50%	Earthwork
Differing conditions/force majeure	-2% to 3%	-1% to 2%	Construction
Shared cost by local governments	0% to 2.5%	0% to 2.5%	Construction
Quantity Adjustments	-2% to 4%	-2% to 2%	Construction
Risk Items - General			
Availability of labor and materials	-3% to 5%		Construction
Schedule delays	-1% to 3%		Construction
park-n-Rides	-5% to 20%		park-n-Ride Construction
Rights-of-way	-5% to 15%		Rights-of-way
Vehicles	0% to 9%		LRT Vehicles
Vehicles	0% to 20%		BRT Vehicles
Vehicles	0% to 4%		Buses

Source: DRCOG summarized data from RTD FasTracks Submittal, as revised 2/2/2004
* PE = Preliminary Engineering

The 90 percent risk level cost from the assessment was added to the base cost estimate and compared that to the base costs plus computed contingency percentage amounts. The results showed that the FasTracks costs (base plus contingency) are about $187 million in uninflated dollars above the base costs plus the 90 percent risk assessment level costs.

It was noted previously that the transit fleet was sized to serve the lower end of the ridership estimates. If the ridership is higher, more vehicles will be needed when the ridership levels exceed vehicle capacity. While the increased farebox revenues would cover part of the operating costs, the additional capital cost has not been considered in the contingency costs. This could be funded by the balance available after the rapid transit construction is completed.

It was also noted in the discussion of the central corridor choke point section that two additional tracks may be needed in the section between the Alameda Station and the 10th/Osage Station. The contingency costs and risk assessment did not include adding these tracks. However, $887 million has been set aside for capital service enhancements.

Finance Costs

The finance cost for borrowing $3.69 billion via bonds, notes and loans is about $3.31 billion; about $2.29 billion required from 2005 through 2025, and another $1.02 billion required from 2026 until all the bonds, notes and loans are paid in 2048. Table 14 summarizes the interest costs.

Operating and System Costs

The existing light rail transit corridor services and bus operations are estimated to cost about $9.6 billion for the period from 2005 through 2025. That includes $4.3 billion

during the FasTracks construction period from 2005 through 2016, and about $5.2 billion through the current plan horizon year. The new FasTracks Plan rapid transit operating costs are estimated to be about $1.5 billion through 2025 (see Table 15).

Post-2025 Costs

At the end of 2025, RTD estimates that the remaining payments on the bonds, notes, and loans at $3.03 billion through 2048. One hundred million dollars of this is paid by the debt service reserves. The unrestricted reserves of $853 million in 2025 and future year balances from the sales and use tax revenue could be used to make these payments. This debt could be paid early.

Revenue

New revenues generated by the FasTracks program through 2025 are estimated at $8.5 billion (see Table 18). The existing revenues are estimated at $12.8 billion through 2025. New sales tax revenues will account for $6.34 billion, or 74.5 percent of the new revenues, through 2025.

Additional sales and use tax, up to $2.93 billion, will be needed to make the remaining payments on the borrowed funds through 2048. This amount can be reduced through use of the unrestricted reserves, estimated at $853 million in 2025, and/or by advancing payments to reduce the interest costs.

Table 18
RTD System and New FasTracks Program Revenues
(amounts in $1,000s of Inflated Dollars)

Revenue Source	2005-2016	2017-2025	Total
Base System Revenues			
Sales and Use Tax (0.6%)	3,965	5,542	9,506
Farebox Revenues	771	959	1,730
Southeast Sources [1]	329	0	329
Advertising Revenue	31	33	64
Other Base Sources	585	600	1,185
Base System Subtotal	**5,680**	**7,134**	**12,814**
FasTracks Revenues			
Sales and Use Tax addition (0.4%)	2,643	3,694	6,338
Farebox Revenues	302	853	1,155
FTA New Starts Revenues	752	63	815
FTA Bus Capital Program	50	0	50
DRCOG Allocated Federal Funds	60	0	60
Local/Private Contributions	94	1	95
FasTracks Revenue Subtotal	**3,902**	**4,611**	**8,513**
Investment Income	**226**	**184**	**409**
Total Program Revenues	**9,808**	**11,929**	**21,736**

Source: RTD FasTracks submittal, as revised 3/9/2004
(1) Federal and local sources to complete construction of the Southeast T-REX project..

The remaining portion comes from farebox revenues (from opening to 2025) totaling $1.16 billion, FTA New Starts program for $815 million, contributions by participating groups, such as local governments and others for $95 million, additional federal sources awarded by DRCOG of about $60 million, and FTA bus acquisition discretionary programs for $50 million. The capital-only revenue sources are shown in Table 19.

Table 19
FasTracks Capital Program Revenues
(amounts in $1,000s of inflated dollars)

Revenue Source	**Amount**
Sales and Use Tax ("pay-as-you-go" funds)	$984,959
Revenue Bonds (1)	$2,365,850
Certificates of Participation (COP) Notes (1)	$203,098
TIFIA Loans (1,2)	$142,701
FTA Bus Capital Program	$50,000
FTA New Starts Program	$815,426
DRCOG Allocated Federal Funds	$60,000
Local/Private Contributions	$95,028
Total Capital Program Revenues	**$4,717,062**

Source: RTD FasTracks submittal, as revised 3/9/2004
(1) The revenue bonds, COPs loans and TIFIA loan are backed by the RTD sales and use tax for payback of the principal.
(2) Transportation Infrastructure Finance and Innovation Act (TIFIA)

Sales and Use Tax

The biggest source of revenue to support this plan is obtained through an increase of 0.4 percent in the sales tax - from 0.6 percent to 1.0 percent.

Farebox Revenues

The second most significant source of revenue for this project is the farebox receipts for operating the system from opening day to 2025 and beyond. The financial plan assumes an increase in fares of 8 percent every third year starting in 2006 to keep pace with inflation.

Federal Funds

FTA New Starts Program

Since 1990, RTD has been awarded $715 million in federal discretionary funding. To fund FasTracks, RTD will request $815 million of FTA New Starts Program funds over three transportation act reauthorization cycles for the East, West, and Gold Line

construction. A maximum of $80 million in funding is anticipated in a given year, consistent with Federal Transit Administration practice.

DRCOG and Other Federal Discretionary Funding

RTD expects to receive $60 million from federal funds allocated by DRCOG. The DRCOG Board of Directors has not yet committed to providing this funding. Historically, DRCOG has awarded over $60 million to RTD since 1993 to assist in completing rapid transit projects, such as the Southwest Corridor, T-REX, and Central Platte Valley lines, and the Denver Union Station acquisition.

The amounts assumed for bus capital expansion and replacement are reasonable based on historical amounts awarded to RTD. This amount is estimated to be $50 million through 2025.

The financial plan assumes that the federal transit and highway funding program will continue with sufficient funding levels to award grants as identified in the capital funding program. It also assumes that DRCOG will continue to receive the same levels of STP-Metro, STP-Enhancement, and Congestion Mitigation/Air Quality funding which would allow it to allocate a similar level of funds to RTD as in the past.

Local and Private Contributions

The amounts assumed from local governments for improvements in the FasTracks Plan are a key item. Starting with the Central Platte Valley (CPV) line, RTD has required local government-funded project contributions. Both the CPV (at 18.7 percent) and T-REX (at 3.4 percent) contributions were higher than the 2.5 percent included in the FasTracks program. The 2.5 percent contributions in each corridor can be provided in cash or by lowering the RTD costs to construct the corridors, through reducing the permitting and inspection fees, constructing local access improvements, etc. If local governments provided street rights-of-way in lieu of a cash contribution, project revenues would be decreased, since RTD has already assumed the local government street rights-of-way would be provided at no cost.

TABOR Exemption

As part of the ballot measure to increase the sales tax rate for FasTracks by 0.4 percent, RTD must also obtain voter approval to exempt all revenues from the limitations of the TABOR amendment. Specifically, the exemption will be for the revenue and spending restrictions contained in Section 20 of Article X of the Colorado Constitution until all debt is repaid, when the rate of tax will be decreased to that amount necessary for the continued operation of the system, but not less than six-tenths of one percent. Without this exemption, the revenue projections would be significantly reduced--probably resulting in adjustments to the FasTracks Plan.

Financial Plan

To analyze RTD's ability to finance FasTracks, financial plans were prepared using a number of different assumptions regarding rate of sales and use tax growth, bond interest rates, operating costs, and annual amount of federal discretionary funding. These scenarios and assumptions are shown in Table 20. The scenarios were selected to cover the possible revenue assumptions from high to low.
The initial FasTracks financial program was based on the original scenario. After review of these scenarios, RTD selected the middle scenario to be used for the FasTracks proposal. A more detailed description of this scenario is:

- Section 5309 New Start funds for FasTracks capped at $80 million annually.
- Section 5309 New Starts funding at a 51 percent local/49 percent federal funding split.
- Sales and use tax forecasts incorporating the following revised assumptions:
  - 2003 sales and use tax at actual 2003 tax receipts.
  - Short-term (2004-2009) sales and use tax forecasts reflecting the statewide growth rates projected by the Colorado Legislative Council in December 2003.
  - Long-term (2010-2025) sales and use tax forecasts suggested by AECom reflecting an annual sales tax growth rate of 6.2 percent, and an annual use tax growth rate of 6.69 percent.
  - Sales tax bond interest rate assumption at 6.354 percent.

All previous presentations of revenues in this report reflect the "middle" scenario. As noted in Table 14, a variety of instruments will be used to finance the program. In order to meet project cash flow needs, RTD will obtain bonds, certificates of participation, and loans. The financial costs related to these instruments will be approximately $3.3 billion over the financial life of this project. The final bonds, notes and loans are expected to be retired in the year 2048. While the interest rates for the financial instruments will vary throughout the project life, the proposal includes a conservative 6.354 percent bond interest, which is more than 20 percent above the current 30-year yield.

AECom Financial Plan Review

DRCOG contracted with AECom Consult, Inc. to assist in reviewing the FasTracks financial plan. AECom Consult, Inc. is used by the Federal Transit Administration (FTA) to review the financial plans of New Start Program applicants. AECom used the FTA New Starts Program evaluation guidelines in conducting the financial plan assessment.

AECom's review of the FasTracks Plan is presented in the report *Financial Assessment of the FasTracks Program*, March 2004. Referring to the middle scenario and assuming that costs won't vary from those considered, its major conclusions were:

- The FasTracks capital program can be implemented over a 12-year time horizon.
- Debt service is met on a level debt amortization schedule (30-year) with coverage ratios growing to 2.81 net coverage by 2025.

Table 20
Financial Scenarios for SB-208 Analysis

	Original Scenario	Middle Scenario	Middle Scenario w/Increased Operating Cost	Low Scenario
Revenue Changes				
Average Sales tax growth rate (2010-2025)	6.77%	6.20%	6.20%	5.75%
Average User tax growth rate (2010-2025)	6.77%	6.69%	6.69%	5.02%
Average Annual CPI growth	3.44%	3.40%	3.40%	3.44%
New Starts annual funds (maximum per year)	$100 million	$80 million	$80 million	$80 million
New Starts Federal/Local Funding Split	50% Federal/50% Local	49% Federal/51% Local	49% Federal/51% Local	49% Federal/51% Local
Cost Changes				
Capital costs	No change			
Bond interest rate	5.854%	6.354%	6.354%	5.854%
Operating costs	No Change	No change	5% increase	No change
Other Factors				
SB 154 Revenue Recovery rate	State mandated levels: 30%			
RTD Reserve Ratios	Operating reserves: 5% annual operating costs, Bond Debt Reserve: 50% of maximum annual debt service			

Source: DRCOG

- Provision is made for a debt service reserve fund that would generate interest earnings and revert to RTD upon debt retirement.
- Operations and maintenance costs are met and unrestricted financial reserves are available each year during the implementation period.
- Unrestricted cash balances grow to $853 million in 2025, which can be used for early retirement of debt.
- Federal New Starts funding is capped at $80 million maximum per year.

The revisions to the financial plan from RTD outlined in the March 9, 2004 letter to DRCOG (the middle scenario) addresses many of the recommendations for improvement relative to the RTD original submission.

- Issues regarding the sales and use tax revenue forecast have been resolved.
- Presentation of three alternative scenarios provides a comprehensive sensitivity analysis.
- FTA participation has been capped at $80 million per year.
- FTA total funding is reduced to $815 million, which lowers the FTA share to 49 percent for those projects in FasTracks seeking New Starts funding.
- Interest rate assumption for 30-year revenue bonds has been increased by 50 basis points and represents a 166 basis point spread above current rates on 30-year revenue bonds insured to an AAA rating.

In summary, the revisions to the FasTracks financial plan outlined in the March 9, 2004 letter from RTD to DRCOG and fully developed as an alternative financial plan (the middle scenario), achieves the following financial objectives with regard to implementation of the capital program continuing operations, and system recapitalization.

- The Plan demonstrates the financial capacity to implement the FasTracks Program, as scheduled. (RTD can afford the program in a 12-year build-out schedule.)
- The Plan demonstrates the financial capacity to operate and maintain the existing RTD system plus FasTracks. (Once implemented, RTD can sustain existing and expanded operations.)
- The Plan demonstrates the financial capacity to continue recapitalization of the RTD system. (There is remaining financial capacity to continue other investments, e.g., bus replacements.)

<u>Other Observations</u>

- The contingency cost “reserves” could be used for assuming additional rights-of-way costs for the I-225 and C-470 right-of-way.
- Local government rights-of-way may not be available free of charge to RTD, resulting in higher costs to the Plan. Further, some of the local governments may consider providing these rights-of-way as part or all of their required contributions in the corridor to offset RTD costs. As RTD did include the local governments/private

sector contributions in the financial plan, expected revenue could be reduced. RTD's contingency costs provide for such possibilities.

- As RTD has not completed negotiations with the railroads regarding the availability of their rights-of-way and tracks, the actual costs to RTD have yet to be determined.
- Energy costs may increase, beyond inflation rates, within the plan. If energy prices rise considerably, RTD could see both an increase in their operating costs (share of fuel to total). At the same time, however, these costs would also be felt in individual mode choice - possibly resulting in increased patronage, leading to increased fare revenues. The final impacts will be partially dependent on available capacity in the RTD system to absorb the additional demand.
- Inflation rates could rise faster than projected in the financial plan. Interest rates, both for borrowed and invested, would rise. Higher operating costs would also result due to labor contracts and other operating factors. However, this price change would likely result in higher sales and use tax growth. The final results could be offsetting.
- Federal participation is an important part of the financial plan, totaling $815 million out of the $4.7 billion capital cost. If the Federal New Starts program funds are not provided, the likely result is that RTD would have to either change the timing of or scale back the FasTracks Plan. RTD also has the option to seek additional TIFIA loans.
- Sales tax growth may be lower than forecast over the plan period. The sales tax growth was calculated based on normal growth conditions, anticipated in both the DRCOG region and the State of Colorado. The conservative forecast anticipates household growth, with limited income growth. For the forecast to fall below this conservative level, the region and state would have to grow at a rate equal to or below the national growth rate for employment and households. This condition would imply either weaker economic factors or limitations placed on growth, either through infrastructure limitations or growth limitations.

Summary

- The FasTracks Plan is based on reasonable cost assumptions, both for operating and capital costs, and provides enough contingency and flexibility in the cost structure to adequately meet most of the unanticipated costs related to the Plan scope.
- Assuming a positive vote on the 0.4 percent sales tax increase and TABOR exemptions, the FasTracks Plan, as revised in March 2004, is based on reasonable revenue assumptions. In addition, the alternative financial scenario analysis provided additional financial assurance of the plan. Even under conservative growth scenarios, the revenue components are adequate to meet the FasTracks funding demands.
- Under a financial "worst case" scenario, the FasTracks Plan would still be able to be undertaken - with adjustments to either timing or scale.

VIII. IMPLEMENTATION

The schedule for implementation of the FasTracks Plan is shown in Figure 4. All corridors are expected to be operating by 2017. The schedule reflects some corridors being farther along in the development process. A more ambitious schedule, assuming an improved economy and healthier sales tax growth, could accomplish construction of the entire plan by 2014.

Major issues that will affect construction and cost include availability of rights-of-way, availability of railroad tracks for shared track operations, availability of funding from partner agencies for items critical to FasTracks operations, and impacts on a FasTracks component by a delay in another FasTracks component. Other issues discussed in previous chapters and which could affect the construction and construction schedule include the outcome of Environmental Impact Statements and assumptions regarding federal funding.

Rights-of-Way Availability

RTD proposes to use railroad rights-of-way, CDOT state highway rights-of-way and some local governments rights-of-way for the construction of parts of the FasTracks rapid transit corridors and facilities, in addition to the land to be purchased from private owners. Table 1 lists the rights-of-way expected and the estimated costs for each corridor. Table 21 presents the rights-of-way needs by type and current owner.

Railroad Right-of-Way

RTD proposes to lease or purchase railroad rights-of-way to operate the US-36 Rail, North Metro, East, and Gold Line Corridors. RTD would negotiate with the railroads after a favorable FasTracks vote. RTD also proposes to share the track in the US-36 rail and North Metro Corridors with the railroads. RTD has included estimates for the rights-of-way in the FasTracks cost estimates.

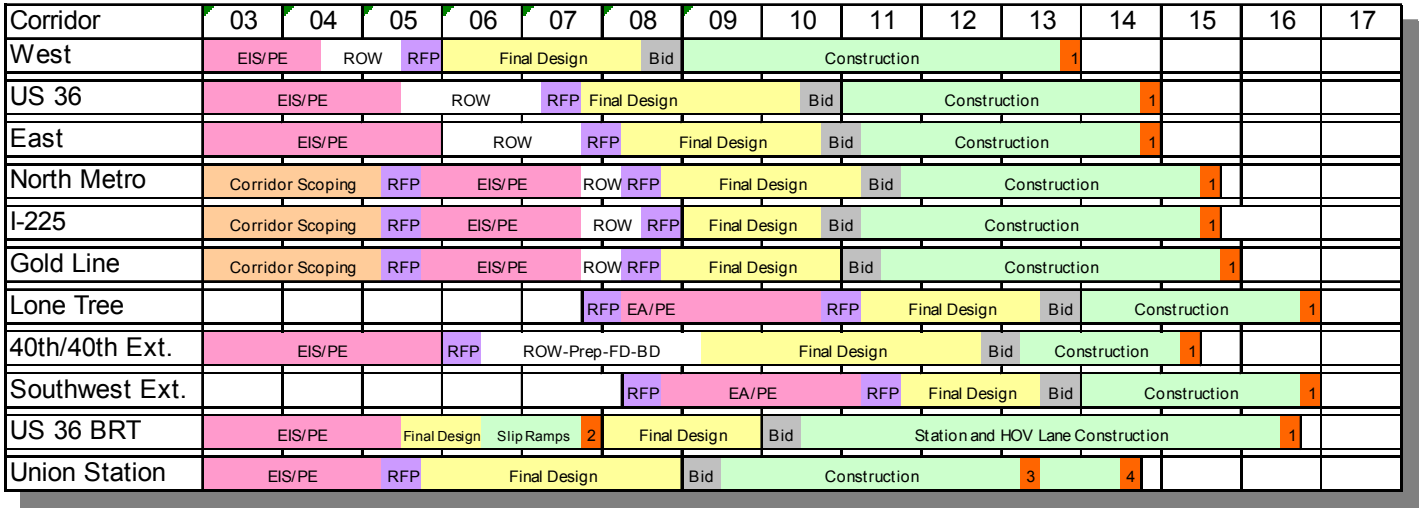
It is not certain that the railroads will make the land available or at what cost. DRCOG has had separate discussions with the two railroads – Burlington Northern Santa Fe (BNSF) and Union Pacific (UP). Both railroads have expressed an interest in providing the rights-of-way to RTD, but have not yet indicated specifics.

State Highway Right-of-Way

The FasTracks Plan assumes that highway rights-of-way needed for transit purposes will be made available free of charge by CDOT. RTD indicates that this right-of-way should be made available as no projects are identified in the Fiscally Constrained 2025 Interim Regional Transportation Plan and/or that funding is not available for them. The fiscally constrained Metro Vision 2025 Interim Regional Transportation Plan (RTP) does show the widening of I-225 from Parker Road to 6th Avenue to provide one additional lane in each direction. Given current CDOT Resource Allocation estimates, it is not certain

Figure 4
Revised Financially Constrained Implementation Schedule

Ballot Initiative Scenario



Northeast (Adams County) Corridor right-of-way preservation option negotiation starting in 2006 with final expenditure budgeted through 2010.

1. Testing and startup phase.
2. Start up phase for BRT Slip Ramps
3. Denver Union Station LRT testing and startup phase.
4. Denver Union Station Commuter Rail testing and startup phase.
Note: Financially constrained schedule based on conservative revenue forecasts consistent with RTD's FasTracks SB 208 Financial Plan *and state forecasts. A combination of factors could push opening days earlier, i.e. RTD and Federal revenue receipts higher than forecast, costs lower than forecast, receipts of SB 1 revenues and third party financial partnering. US 36 timeframe for construction of the HOV lanes is dependent on funding from CDOT.*
Relocation of the railroad operating facilities for each affected corridor is required prior to construction of RTD rail corridors. Right-of-way acquisition is done during Final Design.

Table 21
FasTracks Right-of-Way Needs

CDOT	Assumed state highway ROW at no charge to RTD for FasTracks		
	US-36	US-36 BRT	Phase A: left/right side ROW for slip ramps at 3 stations Phase B: median ROW from Federal Blvd. to Table Mesa Dr.
	I-225	I-225	Median ROW from Parker Road to Exposition Ave.
	C-470	Southwest	South side ROW from South Park Cr. to near Lucent Blvd.
	US-6	West	North side ROW from Union Blvd. to Jeffco Courthouse
Railroads	ROW purchased/leased from railroads		
	BNSF RR	US-36 Rail	Lease ROW/shared track use from DUS to Longmont & purchase for stations
	UP RR	East	Purchase ROW from DUS to about Smith Road/Airport Blvd.
	UP RR	North Metro	Purchase ROW from Sand Creek to 160th Ave. and lease back for freight operations
	BNSF RR	North Metro	Purchase ROW from DUS to Sand Creek
	BNSF RR	Gold Line	Purchase ROW from DUS to Ward Road pnR
Local Government	Assumed local government street ROW at no charge to RTD for FasTracks		
	Denver	East	Peña Blvd. from 40th to DIA and to DIA station
		West	12th Ave. from Newton Street to Perry Street
		Central	Downing from Downing station to 40th/40th
		Central	Lengthen some stations in CBD to handle 4-car trains
	Aurora	I-225	Abilene Street from Cedar Ave. to Parkview Drive
		I-225	Montview Boulevard from I-225 to Peoria Street
		I-225	Peoria Street (Montview Boulevard to Smith Road station)
	Englewood	Southwest	Land for station trade: Lucent station land acquired at no cost for new Bates station
	Lakewood	West	13th Ave. from Garrison Street to Harlan Street
Private Land	ROW purchased from owner		

Source: DRCOG summarized data from RTD FasTracks submittal, as revised 2/2/2004
Notes: Rights-of-way costs shown in Table 1

whether this project will be included in the 2030 fiscally constrained plan. The 2020 Metro Vision Plan indicates the need for the future widening of US-36 (to Wadsworth) and I-225. In addition, the Colorado Tolling Enterprise has undertaken a study to identify possible roads for tolling applications. Some of the FasTracks corridors are being considered.

To clarify the availability of the use of public rights-of-way in the FasTracks corridors, the Colorado Transportation Commission and the RTD Board of Directors recently developed a process to improve the coordination of planning and implementation in the region's major transportation corridors[11]. The intent of the agreement is to ensure that all proposed projects, programs, and facilities are accommodated to the maximum extent practicable and to minimize costs to both CDOT and RTD. Corridor-specific agreements will be entered into that will address the need to accommodate future planned transit and highway improvements. No present funding is committed by either the Transportation Commission or RTD. The joint use of CDOT right-of-way "will be considered" by CDOT consistent with a number of factors including the recognition of "transit as an important part of regional and statewide mobility with local government entities (including RTD) . . . ." If a proposed project involving the use of CDOT right-of-way limits or precludes a future planned transportation improvement both parties will coordinate to provide for the best public use of the right-of-way and preserve right-of-way for future projects. CDOT "may" allow RTD's joint use of CDOT right-of-way consistent with the terms of the agreement. With respect to FasTracks, the agreement indicates that CDOT will make right-of-way available for RTD's joint use in FasTracks consistent with a detailed process and federal regulations. The process involves identification of future planned improvements; conceptual design; final design and construction elements, design approval of construction elements to avoid precluding future planned improvements; and NEPA coordination. Any impacts of one party's construction on the other will be determined. Importantly, the agreement states that "In the event future needs are identified through the DRCOG regional planning process and included in the DRCOG long-range plan and transportation improvement program that will require additional ROW (right-of-way) for major transportation corridor improvements for highway or mass transit needs, the parties will negotiate the cost of additional ROW acquisitions." The agreement also references a number of "challenges of interest" in which design issues still need to be resolved. These include the Broomfield interchange (US-36 Corridor), the State Highway 121/Grandview grade separation (Gold Line), I-225 Colfax interchange (I-225 Corridor), I-70/Peña Boulevard Interchange, I-225/Iliff Interchange (I-225 Corridor), C-470/Santa Fe Interchange (Southwest Extension), I-70/US-6 Interchange (West Corridor), US-36/Foothills Parkway Interchange (US-36 Corridor), I-270, SH-285 (North Corridor), and I-25 between Mississippi and Alameda (I-225 Corridor).

Federal regulation (23 CFR 810 Subpart C) provides a process for making highway rights-of-way available for transit use. This process requires application by the transit agency to the State for the right-of-way, a request by the State highway agency to the FHWA, and approval by the Federal Highway Administrator. The use and occupancy of the right-of-way shall be without charge to the transit agency.

[11] This agreement is expected to be executed shortly.

In summary, it appears that CDOT rights-of-way needed for FasTracks construction can be made available without cost to RTD, provided agreement can be reached through the processes involved and federal approval is obtained. Some right-of-way contingency costs have been assumed as a safeguard by RTD.

Local Roads and Streets Right-of-Way

RTD states that both the City and County of Denver and the City of Aurora have agreed to allow the use of their rights-of-way for these corridors free of charge. However, DRCOG has been unable to confirm this.

Lakewood has indicated that its 13th Avenue rights-of-way would be a part of the Lakewood required corridor construction contribution.

Availability of Railroad Tracks for Shared Operations

Shared track operations for commuter rail and rail freight have been identified in two FasTracks corridors – US-36 Rail and North Metro. The US-36 rail corridor has six freight trains per day and the North Metro corridor has two freight trains per week. From the information provided by RTD, the US-36 Rail and the North Metro rail freight operations can be time-shifted so as not to interfere with FasTracks operations. RTD reports that BNSF railroad is also reviewing the potential impacts to freight operations if the US-36 rail tracks are realigned to have less horizontal curvature. A straighter alignment would allow higher operating speeds, but would increase capital costs.

RTD reports that in its discussions with the railroads, RTD has two options for acquiring the tracks: (a) lease use rights from the railroads, or (b) purchase the tracks and lease operations rights back to the railroad. The specific options will be negotiated with the BNSF and UP railroads.

Partner Agency Funding

Four FasTracks corridors are affected by the ability of another agency to construct facilities critical to rail operations. In each case, some funding has been assumed in the FasTracks proposal to construct these facilities.

The West Corridor is affected by the reconstruction of the Federal Boulevard Bridge over the Lakewood Gulch and West Corridor LRT line. The Federal bridge project is estimated to cost about $8 million but only $3 million is currently funded in the 2005-2010 TIP. The West Corridor cost estimate includes about $200,000 to cover the lengthening of the current bridge at Federal Boulevard needed for rail construction. The remaining funds have not yet been identified.

The Gold Line Corridor is affected by the Wadsworth Boulevard grade separation with the BNSF railroad. The Wadsworth Boulevard/BNSF grade separation is estimated to

cost $26 million (updated downward from $30 million in February 2004) and only $20 million is currently funded. The FasTracks proposal contingency costs used the previous $30 million cost estimate. The Gold Line Corridor cost estimate includes about $428,000 for a separate LRT flyover of the Wadsworth Bypass.

The East Corridor is affected by the DIA station. FasTracks assumes that DIA will fund the East Corridor end-of-line station at DIA.

The development of a Southwest Corridor Bates Station is being negotiated with the City of Englewood. The FasTracks proposal indicates that this station is contingent on a successful financial and operational arrangement between the city, RTD and adjacent property owners. This agreement would commit the city to share in the cost of the station with RTD and the developer of the adjacent transit-oriented development. The agreement also would require the city to be of assistance in acquiring land needed for the Lucent Boulevard Station.

RTD has adopted a policy regarding commitments on FasTracks.[12] It indicates that improvements within a corridor will not be started until there is a firm commitment of all required funding sources, including local funds.

Impact of Delays to Another Component

The reconstruction of Denver Union Station is the linchpin in the operation of the three Commuter Rail corridors and the Gold Line LRT. Delays in the DUS reconstruction could delay the opening of the new commuter rail facilities and the Gold Line.

The FasTracks Plan contains a large construction program compressed into 12 years. The work is defined in two groups – RTD with the construction responsibility for the LRT lines and the railroads using their crews for the commuter rail lines. RTD has the LRT construction schedule designed so that trackwork only occurs in one corridor at a time, or electrification only occurs in one corridor at a time. These two activities separate the demand for labor and materials making it more likely that the schedule will not drive up the construction costs that could slow down the whole program.

However, a delay in one or more corridors could affect the supply and demand for labor and materials. This could increase the cost or create supply problems for all corridors. RTD states that delays in one corridor will only delay the completion of that corridor, perhaps by more than one year until the supply or cost problems are overcome.

Other Issues

As noted in previous chapters, the outcome of Environmental Impact Statements to be conducted in all but the West Corridor could change the scope of the construction and affect cost as well as construction scheduled.

[12] "Regarding Board Commitments for FasTracks," #002, Series of 2004 dated February 17, 2004.

Assumptions regarding the availability and amount of federal discretionary funding for the East, West, and Gold Line Corridors could affect the scope and timing of construction.

Summary

- The availability of rights-of-way from the railroads, the state, and local governments, and at what cost, is an uncertainty that could affect schedule and cost. RTD has attempted to prepare for these uncertainties by including contingency costs in its estimates and through agreements with involved entities. The Master Intergovernmental Agreement between CDOT and RTD provides a process to make CDOT rights-of-way available to RTD free of charge. However, in the future, if CDOT requires additional rights-of-way in the FasTracks corridors for improvements recognized in the approved DRCOG long-range plan, RTD could be faced with purchasing them.

- The outcome of environmental studies could affect the scope of the improvements and have cost implications.

- The availability of federal funding could affect the construction scope and timing of construction.

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APPENDIX A
SENATE BILL 208 PROCESS AND CRITERIA

APPENDIX A
SENATE BILL 208 PROCESS AND CRITERIA
September 17, 2003

Fixed Guideway Transit System Review Process

Objective: Establish criteria and process for considering and acting upon fixed guideway mass transit system component parts or corridors. As the Metropolitan Planning Organization (MPO), the Denver Regional Council of Governments (DRCOG) shall examine such projects within a regional context and include approval of the method of financing and technology selected for such projects.

I. Process for establishing evaluation criteria and review process

- A. DRCOG staff draft evaluation criteria
- B. Review and advice from Transportation Advisory Committee (TAC)
- C. Regional Transportation Committee (RTC) recommendation
- D. DRCOG Board approval

II. Evaluation criteria (attached)

- A. Consistency with regional plans
- B. Technology selection
- C. Financing
- D. Other factors

III. Review process

- A. RTD submits system proposal
  1. Description of system components and rationale
  2. Response to evaluation criteria
- B. Technical assessment of system components
  1. DRCOG staff prepares draft Assessment Report
     - a. Technical assessment of system components in light of evaluation criteria
     - b. Makes preliminary findings and conclusions
- C. Public hearing(s)--DRCOG Board members joined by RTC members (one or more may be held, as appropriate)
- D. DRCOG staff prepares final Assessment Report

1. Technical assessment of system components and summary of public hearing
2. DRCOG staff identifies options for Board consideration

E. Final action

1. Forward Assessment Report to TAC and RTC
2. Forward Assessment Report and RTC recommendations to DRCOG Board
3. DRCOG Board of Directors takes action

Criteria and Measures for Evaluating Fixed Guideway Mass Transit Proposals

Senate Bill 90-208 states that "the (RTD) Board shall take no action relating to the construction of a regional fixed guideway mass transit system until such system has been approved by the designated Metropolitan Planning Organization. Each component part or corridor of such system shall be separately approved by the Metropolitan Planning Organization. Such action shall include approval of the method of financing and the technology selected for such projects."

The following presents the criteria and measures to be utilized by the Denver Regional Council of Governments, as the MPO, in assessing fixed guideway mass transit system proposals. All assessments will be made for the system completion date and for the Regional Transportation Plan (RTP) horizon year.

Evaluation Criteria and Measures

I. Consistency with the Adopted Metro Vision Rapid Transit Network and Regional Transportation Plan

A. Criterion: Are the proposed system components included in the adopted Metro Vision rapid transit network?

Measure: The Metro Vision preferred indicates corridors, not specific alignments. These corridors service travelsheds. Are proposed alignments consistent with those shown on the adopted Metro Vision rapid transit network?

B. Criterion: Are the proposed system components included in the Regional Transportation Plan?

Measure: The RTP indicates corridors, not alignments. Are proposed alignments consistent with those shown in the adopted Regional Transportation Plan?

II. Technology Selection

A. Criterion: Is the proposed technology for each system component capable of operating speeds that are competitive with those of automobiles in the same corridor?

Measure: Comparison of average peak period operating speed of proposed technology to general purpose automobile peak period average operating speed. Speeds will be calculated for the system completion date and the RTP horizon year.

B. Criterion: What is the projected ridership?

Measures: (1) System ridership for system completion date and RTP horizon year. (2) Ridership forecasts for each system component for the system completion date and for the RTP horizon year as part of a system.

C. Criterion: Does the system component meet high passenger demand?

Measures: (1) System component passenger capacity per hour. This measure will be calculated by using the design capacity of the vehicles and the number of vehicles planned per hour during the peak periods. (2) Ability of the system component to accommodate the demand.

D. Criterion: Are the technologies chosen for the different system components compatible with each other and with those of existing corridors?

Measures: (1) Compatibility with existing technology. (2) Compatibility with other proposed technologies. If there are multiple modes proposed in one corridor, explain why. (3) Passenger convenience and efficiency in transfers between system components.

E. Criterion: Can the number of rapid transit vehicles proposed for operation in each system component be accommodated on transit lines and at transfer facilities?

Measures: (1) Frequency of service. (2) Description of proposed operations at transfer facilities.

III. Financing

A. Criterion: Are the capital and operating cost estimates reasonable?

Measure: Are the unit costs comparable to recent transit construction experience?

B. Criterion: What is the cost efficiency for each system component?

Measure: Total cost per rider for the RTP horizon year.

C. Criterion: Is the proposal affordable? Are sufficient funds available to construct, operate, and maintain the proposed system?

Measure: Comparison of revenues with estimated costs to construct, operate, and maintain the system.

D. Criterion: Is funding available to maintain and expand the area-wide bus system in addition to the proposed fixed guideway system?

Measure: Amount of available funding for bus operations.

E. Criterion: If some external funding is assumed, what commitments have been made?

Measure: Amount of available and committed funding from the private sector and from other public agencies.

IV. Other Factors

A. Criterion: Overall community and transportation benefits.

Measures: Describe how the system components serve the transportation needs and community development goals or objectives.

B. Criterion: What are the air quality benefits?

Measures: (1) Change in vehicle miles traveled and/or vehicle hours of travel. (2) Pollutant emissions reduced.

C. Criterion: Are there any known problems which would impede the timely construction of the system components?

Measures: Known problems such as conflicts with the highway system and other existing infrastructure, right-of-way availability, or environmental factors.

D. Criterion: Will the proposed system help to improve regional mobility during the peak hours?

Measures: (1) Improvement in levels of service and highway speeds on regional roadways in the corridor. (2) Travel times for typical corridor trips and associated time reliability. (3) Travel mode share at key points in the corridor and the impact of the system on regional mode share during the peak hours.

E. Criterion: Have necessary associated highway improvements been identified?

Measures: Identification of minimum highway improvements necessary to allow the completion of rapid transit construction. Rapid transit construction should not preclude the building of past locally preferred alternatives.

F. Criterion: Is there sufficient parking to meet estimated demand at proposed stations?

Measure: Proposed number of parking spaces at stations.

G. Criterion: Are low-income and minority populations served by the system component?

Measure: Number and percent of persons in low-income and minority concentrated areas to be served by the proposed system.

H. Criterion: What development or redevelopment opportunities exist?

Measure: Identification of development or redevelopment opportunities.

Location of Criteria Discussion

The criteria were discussed in various sections of the report as they pertained to the topics discussed. Principal report locations where the criteria are discussed are:

Criteria	Chapter
IA	III
IB	III
IIA	IV
IIB	IV
IIC	V
IID	V
IIE	V
IIIA	VII
IIIB	VII
IIIC	VII
IIID	VII
IIIE	VIII
IVA	III
IVB	IV
IVC	VIII
IVD	IV
IVE	VIII
IVF	VI
IVG	IV
IVH	III

APPENDIX B
PUBLIC HEARING SUMMARY

APPENDIX B
PUBLIC HEARING SUMMARY

DRCOG Senate Bill 208 Evaluation of the Regional Transportation District's FasTracks Plan

Summary of Written Comments and Oral Testimony Received in Conjunction with the January 21, 2004 Public Hearing and Staff Responses

The following is a summary of the written and oral testimony received in conjunction with the public hearing held by the Denver Regional Council of Governments (DRCOG) Board of Directors on January 21, 2004. A complete set of written comments received is on file at the DRCOG office. The public hearing was held to receive comments regarding topics that DRCOG staff should consider when evaluating the FasTracks Plan as part of the review and approval process required by Colorado Senate Bill 90-208.

Thirty-nine people presented oral testimony during the public hearing, six of which also provided written testimony. An additional 21 letters or email comments were received. A list of the persons and organizations that provided comments is attached.

Seven general topics were raised through the comments received.

1. Are the revenue assumptions used by the Regional Transportation District (RTD) reasonable?
2. What are the benefits and disadvantages of the FasTracks systems approach versus prioritization of individual corridors?
3. What will be the impacts of delays in the schedule of one corridor on the others?
4. Is FasTracks complimentary to other local plans and transportation plans?
5. RTD Should consider changes to the FasTracks Plan definition or schedule
6. Support for the FasTracks Plan
7. Opposition to the FasTracks Plan

1. Revenue Assumptions

- One organization asked that DRCOG staff review the sales tax growth rate assumption and Federal discretionary revenue forecasts assumed by RTD.

2. Systems Approach versus Corridor Prioritization

- Two speakers/organizations asked that DRCOG staff evaluate the benefits and disadvantages of a system approach versus prioritization of the corridors.

3. Impacts of Delays to One Corridor on the Others

- One organization asked that DRCOG staff evaluate if each corridor would stand alone in the case of cost, schedule, or delays, or if changes to these would impact the other corridors.

4. Relation of FasTracks Plan to Local Agency and Other Transportation Plans

- Representatives from three organizations raised questions related to ensuring that the FasTracks Plan is complementary to local jurisdiction plans and agency transportation plans and proposed roadway improvements.

5. Changes to the FasTracks Plan Should be Considered

- Three speakers/writers were concerned about the schedule for the I-225 Corridor.
- Five speakers/writers requested consideration for more service and stations in the East Corridor.
- Two writers requested an increase in the planned service level between Denver and Boulder.
- One writer suggested consideration of a rapid transit line on C-470 from Santa Fe Drive to I-25.
- One speaker suggested the FasTracks Plan include adequate safety measures for pedestrian and train interactions.
- Two writers suggested transit improvements along Colfax Avenue in Denver.

6. Support of FasTracks Plan

- Forty-eight speakers/writers expressed support for the FasTracks Plan or for the concept of expanding the rail and bus service in the Denver region.
- Representatives of the Transit Alliance delivered a box of post cards supporting RTD's plan to expand rail and bus service and the Sierra Club delivered a box of post cards of support for FasTracks

7. Opposition to FasTracks Plan

- One speaker expressed clear opposition to the FasTracks Plan.

Speakers at DRCOG Public Hearing on RTD FasTracks Proposal and Senate Bill 208 Evaluation

(January 21, 2004)

Name	Organization	Summary of Comments
Graham Hill	21 Wheels	Supportive of FasTracks
Jon Esty	ColoRail	Supportive of FasTracks
John Maslanik	Sierra Club	Supportive of FasTracks, Delivered postcards of support (reported to be 12,000)
Dick Anderson	DIA Partnership	Supportive of FasTracks
Rick Pilgrim	Denver Metro Chamber	Asked DRCOG staff to address questions regarding federal funding and sales tax receipt assumptions, systems approach vs. prioritization of corridors, effects of funding/construction delays, and relationship to roadway improvements and tolling.
Debra Baskett	US-36 TMO	Supportive of FasTracks and US-36 MIS results
Karen Stuart	Mayor City and County of Broomfield	Supportive of FasTracks
Coralee Brown	resident of Lakewood	Supportive of FasTracks, access to transit by seniors
Marty Zemrik	Shea Homes	Supportive of FasTracks, consider more stations in east
Tex Elam	City of Centennial	Supportive of FasTracks
Ray Denonville		Concerned about saftey around trains
Jerry Cunningham		Supportive of expanded rail and bus service, delivered postcards (reported to be 8,000)
David Rothenburger		concerned about noise, station design, wait for EISs
Bill Johnston	Transit West	Supportive of FasTracks, West Corridor
Margi Ness	Colorado Mobility Coalition	Supportive of FasTracks
Dan Sturges	Moblility ---	Consider segway human transport vehicles
Preston Gibson	Jefferson Economic Council	Supportive of FasTracks
Gene Putman	City of Thornton	Supportive of FasTracks
Roger DeVries	Lone Tree Transp. Advisory Committee	Supportive of FasTracks
John Malito	City of Arvada City Council	Supportive of FasTracks
Beill Becker	Adams County Economic Development	Supportive of FasTracks
Jeanne Erickson	Colorado Asso. of Transit Agencies	Supportive of FasTracks
Sam Sager	Colorado Environmental Coalition	Supportive of FasTracks
Eugene Pearson	University of Colorado Student Union	Supportive of FasTracks
Albert Ammon III	Arvada Light Rail Committee	Supportive of FasTracks
Larry Schulz	Wheat Ridge City Council	Supportive of FasTracks
Paul	Northeast Corridor Coalition	Supportive of FasTracks, consider more stations in east
Chuck Erwin		Opposed to FasTracks, expand road capacity
Shelley Cook	Arvada resident	Supportive of FasTracks, individual corridors vs. system
Jean Labuda	AAUW and Sierra Club	Supportive of FasTracks, consider subway access to CBD
Wandee Schell	Denver resident	Supportive of FasTracks
Jason Longsdorf	City of Denver DPW	Supportive of FasTracks
Brendon Harrington	Downtown Denver Partnership	Supportive of FasTracks, Downtown circulator
Jennifer Finch	CDOT	Noted CDOT commitment to working with RTD
David Lewis	DIA Partnership	Supportive of FasTracks, concerned about corridor scheduling, service in East Corridor, local agency participation
Bob Matatall		Supportive of FasTracks
Ronald Wooding	Kenney Group	Supportive of FasTracks
Robert Brewster		Supportive of FasTracks
Macon Cowles	Consult Energy Coop	Supportive of FasTracks
Larry Ransford	Courtyard by Marriott	Supportive of FasTracks, consider more stations in east

Written Comments Received in Conjunction with DRCOG Public Hearing on RTD FasTracks Proposal and Senate Bill 208 Evaluation

(January 30, 2004)

Name	Organization	Summary of Comments
Dave Lewis, Julie Bender	DIA Partnership	Supportive of FasTracks elements in northeast metro area. Concerns about how results of East Corridor EIS will affect plan.
Rick Pilgrim, Julie Bender	DIA Partnership	Request expedited I-225 EIS process.
Curt Huber	American Lung Association	Supportive of FasTracks for air quality benefits.
Bill Ikler		Supportive of FasTracks. Priority to East Corridor.
David Cook		Supportive of FasTracks. Maintain Boulder-Longmont bus service along with rail.
Peter H. Neukirch		Supportive of FasTracks to keep businesses competitive.
Robert Brewster		Supportive of FasTracks. Suggests temporary commuter service on freight lines starting now until FasTracks buildout. Suggests corporate sponsorship.
Paul Ryan	Northeast Corridor Coalition, Inc.	Concern that no stops are planned between 40th/Pena and DIA on East Corridor. Suggest line should run along Tower Rd to better serve businesses and residents.
Bryce Matthews		Requsts a stop be added at Colorado Blvd on East Corridor to better serve residents and cultural/entertainment attractions.
Bernadette Milnick		Supportive of FasTracks. Suggests 24 service between Denver and Boulder and a stop at Crossroads Mall.
Thomas Delapa		Supportive of FasTracks. Concern over lack of benefits for Denver residents, suggests non-bus transit along East Colfax.
Randy Pye	Metro Mayors Caucus	Supportive of FasTracks.
Gardiner Hammond	Landmark Properties Group, Inc.	Requests alternate routing and station locations along East Corridor to better serve businesses and residents.
Rye Patterson		Supportive of FasTracks.
Michelle May Reichmuth		Supportive of FasTracks.
Chuck Howe		Supportive of FasTracks.
Anne Becher		Supportive of FasTracks.
Michael C. Deragisch		Suggests frequency of service should be 12 to 15 minutes with variable capacity. Distribution of service should be based on demand, not regional equity. Concern about noise between Baseline and Table Mesa.
Thad Jacobs		Supportive of FasTracks.
Django H. Andrews		Supportive of FasTracks.
Suzanne Janzen		Supportive of FasTracks.
Patrick Dawson		Suggests addition of beltway rapid transit, beginning with line from Sante Fe to I-25 along C-470.
Robert Hale		[sent before RTD's adjustment of construction schedule] Concurs with need for rapid transit, but disagrees with timeline making I-225 one of the last to be constructed.
Rick Pilgrim, Carla Romero Perez, Don Kortz, Joseph B. Blake	Denver Metro Chamber of Commerce	Asked DRCOG staff to address questions regarding federal funding and sales tax receipt assumptions, systems approach vs. prioritization of corridors, effects of funding/construction delays, and relationship to roadway improvements and tolling.
Derek Officer	North Denver Transportation Advocacy	Supportive of FasTracks. Wants more stops on East Corridor. RTD should address need for more transit, perhaps rapid transit, along E Colfax and between downtown and Cherry Creek area.
Marie Officer		Supportive of FasTracks. Wants more stops on East Corridor. Concerned about environmental justice issues on East Corridor - diesel pollution.
Resolutions		
	Colorado Mobility Coalition	Supportive of FasTracks.
	Rocky Mountain Chapter Sierra Club	Supportive of FasTracks.
	City of Centennial	Supportive of FasTracks.

APPENDIX C
RTD FASTRACKS DOCUMENTATION

APPENDIX C
RTD FasTracks Documentation

Senate Bill 208 FasTracks Plan (November 2003, Revised February 2004) [Volume 1]
- Executive Summary
- Program Description
- Evaluation
- Financial Plan

Senate Bill 208 Technical Appendices [Volume 2]
- Process and Criteria
- Rail and Bus Fleet Estimates and Operating Plans
- Capital Cost Estimates (in Volume 3)
- Rail and Bus Operating and Maintenance Costs
- Cost/Rider Calculations for Rapid Transit Corridors
- Financial Plan (in Volume 4)
- 20 Year Needs Assessment and System Plan
- Impacts to Highways and Local Streets
- Transit Oriented Development Opportunities
- Public Involvement
- Implementation and Schedule

Volume 3 - Appendices
- Cost Estimates Overview
- Cost Summary
- Risk Assessment
- Corridor Mileage
- Cost History
- Costing Unit Prices
- ROW Cost Estimates
- Park-n-Rides
- Miscellaneous Corridors/Maintenance Facilities
- Individual Corridor Descriptions, Cost Summaries
- Impacts to Highways and Local Streets
- Railroads

Volume 4 - Financial Plan

FasTracks Cost Estimates - EarthTech

LRT Traffic Simulation Study - URS Corporation

Southwest Light Rail Passenger Survey: Report of Results - National Research Center

Financial Assessment of the FasTracks Program - AECom

APPENDIX D
LIST OF ACRONYMS

List of Acronyms

APCD	Air Pollution Control Division
BNSF	Burlington Northern Santa Fe
BRT	Bus rapid transit
CBD	Central Business District
CDOT	Colorado Department of Transportation
COPs	Certificates of Participation
CPI	Consumer Price Index
CPV	Central Platte Valley
CRS	Colorado Revised Statutes
DIA	Denver International Airport
DMAP	Downtown Mulitmodal Access Plan
DMU	Diesel multiple unit
DRCOG	Denver Regional Council of Governments
DUS	Denver Union Station
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HOT	High-occupany toll
HOV	High-occupancy vehicle
LHC	Locomotive-hauled coach
LRT	Light rail transit
MPO	Metropolitan Planning Organization
NO_x	Nitrogen oxides
PE	Preliminary engineering
PM_{10}	Particulate matter (<10 micrometers in diameter)
pnR	park-n-Ride
RAQC	Regional Air Quality Council
RFP	Request for Proposals
ROW	Right-of-way
RTC	Regional Transportation Committee
RTD	Regional Transportation District
RTP	Regional Transportation Plan
SH	State Highway
STP	Surface Transportation Program
TABOR	Taxpayer Bill of Rights
TAC	Transportation Advisory Committee
TIFIA	Transportation Infrastructure Finance and Innovation Act
TIP	Transportation Improvement Program
T-REX	Transportation Expansion Project
UGB/A	Urban Growth Boundary/Area
UP	Union Pacific
VOC	Volatile organic compounds

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