



Technical Memorandum No. 7

Project No. C SWOO-242

Public Benefits of Potential Future Passenger Rail
May 18, 2005



May 18, 2005



Table of Contents	Page
Purpose of this Report	1
Background	1
Impacts on Front Range Passenger Rail Plans: No-Build Option.....	7
Impacts on Front Range Passenger Rail Plans: Build Option.....	9

Figures	Page
Figure 7.1 RTD Rapid Transit Plan	2
Figure 7.2 South I-25 and US 85 Corridor	5
Figure 7.3 Passenger Rail Corridors.....	7

Tables	Page
Table 7.1 Cost Comparison.....	8

All information and assessments contained herein are the sole responsibility of the Consultant. Although many other parties contributed substantially to the report, they shall not be held accountable for its accuracy.





Purpose of this Report

The purpose of this task is to estimate the degree to which the railroad project would support the implementation of passenger rail projects along and through the Front Range. Two types of passenger rail predominate for purposes of this study. Denver's Regional Transportation District (RTD) is building a Light Rail Transit (LRT) network within the Denver metro area. RTD is also evaluating commuter rail as a modal choice for some of its corridors. Other entities are considering commuter rail options outside the RTD service area. Commuter rail can take several forms including locomotive-pulled single or double level passenger cars and self-propelled cars operating singly or in trains. The energy source can be onboard fuel or external electric power.

The question for this section is whether the Build Option would have net benefits for passenger rail implementation with respect to the No-Build Option. What would the freight railroad situation be like in the year 2030 if the proposed railroad project were not built and how might passenger rail be developed in that case? What are the benefits and costs differences to potential passenger rail if the railroad project is built? Discussions in workshops with transit and railroad representatives determined that there are three specific potential passenger rail projects where a definite, quantifiable difference between the railroads Build versus No-Build Options can be estimated. Other passenger rail projects may be facilitated by the railroad project but that possibility is not quantifiable within the scope of this study given the preliminary nature of planning for those projects. The possible facilitation of these projects is classified as qualitative benefits.

As is the case for other sections of this study, much of the information needed to assess the net differences between Build and No-Build Options did not exist and had to be developed specifically by the consultant team in coordination with the affected entities. As an example, RTD is at the conceptual level of planning for some of its corridors and had not determined alignments and the infrastructure required for specific alignment alternatives. RTD was not at a stage to be able to answer questions about how specific changes in railroad facilities or operations would impact specific passenger rail options in their corridors. Since the mission of this study required such assessments the consultant team prevailed upon the railroads and RTD to jointly discuss ideas at the most preliminary level. It is very important to the cooperating institutions that the concepts herein presented are not given more weight than intended or appropriate. The consultant team takes responsibility for the passenger rail concepts presented below and represents them to be nothing more than ideas about how some passenger rail opportunities could be affected if the railroad project is built.

Background

Five prior studies in particular evaluated potential opportunities related to the possible implementation of rail passenger service in and through Colorado's Front Range communities. They are:

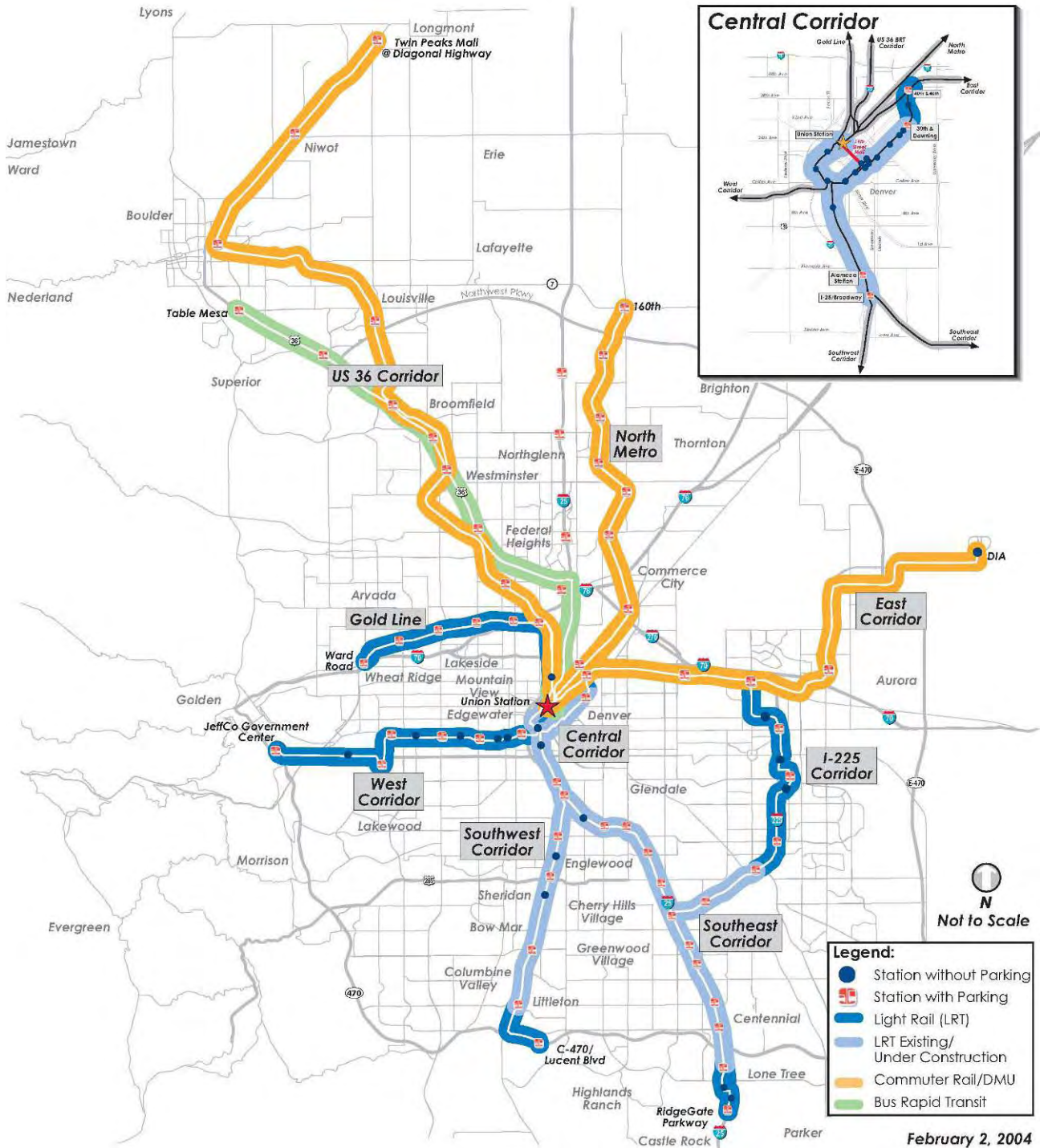
- The 1997 Colorado Passenger Rail Study,
- The 1999 North Front Range Transportation Alternatives Feasibility Study,
- The 1999 South I-25 Corridor Study,
- The 2002 Rail Oriented Development Study, and
- The 2002 Eastern Colorado Mobility Study.

These five reports provide context, data, and background for the present study, particularly since the rail infrastructure has changed little since their publication. Railroad company consolidation has changed during the interim however, leading to new opportunities for passenger rail implementation.

In addition to the above intercity studies, the Regional Transportation District has continued to develop its own Denver area passenger rail plans, as depicted on Figure 7.1.



Figure 7.1 RTD Rapid Transit Plan





Generally, RTD and any public transportation agency seeks available, continuous right of way when planning a passenger rail route. And generally the railroads, which obtained such rights of way during very early stages of development, become very attractive for right of way purchase or for cooperative use of existing infrastructure.

Freight railroad consolidation has progressed since the completion of several of the studies reviewed for this study. This has improved the prospects for some of the alternatives presented. When those studies were conducted coordinating with numerous competing railroad companies was a challenge. The current environment is considerably more conducive to discussion since there are now only two mainline freight railroads operating in the study area and they are cooperating on the proposed railroad project.

Colorado Passenger Rail Study - 1997

This statewide study was conducted for CDOT by Kimley-Horn and Associates in association with Cambridge Systematics, Coley/Forrest, Felsburg Holt, and ICF Kaiser. It created a long list of 160 candidate passenger rail projects for the state and pared them down to a ranked and recommended set of projects for further consideration. It did not overlap the Denver-Golden corridor or the three RTD MIS corridors (West, Southeast, and East).

Prior studies referenced were the Yampa-Valley Multi-Modal Corridor Transportation Plan, Analysis of Amtrak Service in TX, NM, and CO, Air Train Airport Corridor Rail Service, Glenwood-Aspen Rail Corridor Feasibility Project, and Vision Statement for Front Range RR, RTD Gold Line Study, West I-70 MIS, US 24 Corridor Study (Colorado Springs to Woodland Park), and Denver Union Terminal (DUT) Intermodal Study. Eighteen statewide passenger rail corridors were identified and mapped (pages 1-11 and 12) covering the Front Range from border to border and west and northwest as far as Grand Junction and Craig. Consistent with population distribution, the eastern plains and southwest Colorado had no corridors. Each of the corridors was divided into segments for data collection and analysis. These are summarized with basic characteristics on pages 1-18 and 19. More detailed segment descriptions follow.

The eighteen corridors are screened in Chapter 2 by ridership potential, capital cost, cost-effectiveness, environmental factors, and other major impacts. Candidates are ranked by annual riders per mile with Denver-Golden first and Pueblo-Trinidad last. Corridors are next ranked by capital cost-effectiveness, annualized cost divided by annual riders. Denver-Golden ranked first again at \$14 per rider and Pueblo-Trinidad was last at \$517. Rankings by the additional factors are presented. Then the rankings for each corridor were summed for a composite score. By composite score Denver-Ft. Collins ranked first and Pueblo-Trinidad ranked last. The corridor screening results are charted on page 2-44 and pages 2-45 through 50 present screening recommendations. High priority corridors are Denver-Fort Collins, Denver-Colorado Springs, Leadville-Vail-Glenwood Springs-Aspen, and Steamboat Springs-Vail-Aspen.

Technologies are screened in Chapter 3. Conventional, high speed, and experimental were considered. Recommended technologies for Colorado use are conventional locomotives with conventional single or bi-level cars, diesel multiple units (DMU's), and conventional electric locomotives. Used equipment could be used if higher O&M costs are acceptable. High speed, historic narrow or standard gauge, and experimental equipment were deemed inappropriate for use in these corridors.

Potential stations are screened in Chapter 4. Existing and new potential stations were described and ranked high, medium, and low on the basis of ridership market, station spacing, and existing and new facility potential. Chapter 5 assembles alternative system plans from the previously screened elements and evaluates these by the detailed evaluation criteria. The recommended Colorado passenger rail plan is presented in Chapter 6. The core system serves the Front Range from Fort Collins to Colorado Springs,



west via Kremmling to Grand Junction, north to Steamboat Springs, Leadville, and Aspen. Pages 6-1 thru 11 present the Recommended Colorado Passenger Rail Plan. Route miles total 642 for about \$1.2 billion. A phased implementation plan is then presented. The concluding section presents the Colorado Transportation Commission Recommendation that added the Colorado Springs/Pueblo segment to the core system.

North Front Range Transportation Alternatives Feasibility Study - 1999

This was Major Investment Study conducted jointly by CDOT, the North Front Range Transportation and Air Quality Planning council, the Upper Front Range Regional Planning Commission, and DRCOG. The goal of the study was to evaluate alternatives to improve mobility for residents and commuters as they travel around Northern Colorado, to and from the Denver metropolitan area, and between neighboring states. It will also look at how people and goods travel through this area on their way to and from locations throughout the nation. Alternatives under consideration include: taking no action, improvements to the existing highway network, transit options, including bus and rail technologies (particularly I-25 but perhaps also US 85 and US 287), and constructing a highway on a new location.

The long list of initial alternatives contained 18 highway and railroad alignments and 17 modes or technologies. The screened short list included four passenger rail alternatives. These were the I-25 corridor, a western route through Boulder, an interior route with connections to Greeley and Loveland, and an eastern route through Brighton and Greeley. Transit components of three packaged alternatives included Inter Regional Bus Service, Combination General Purpose HOV/Bus Lanes, and Passenger Rail Service (Ft. Collins to DUT). The Vision Plan was created from the three packages of alternatives. Its rail component focused on I-25 ROW, Diesel Multiple Unit (DMU) vehicles, single track with passing tracks (preserve I-25 ROW for double track), max speed 79 mph, average speed 45 mph, and projected 10,300 passengers per day in 2020. Phase IA would extend from DUT to US 34, 47 miles, at \$388 mil. Ph IB would extend to Ft. Collins and Greeley, 38 miles, at \$264 million.

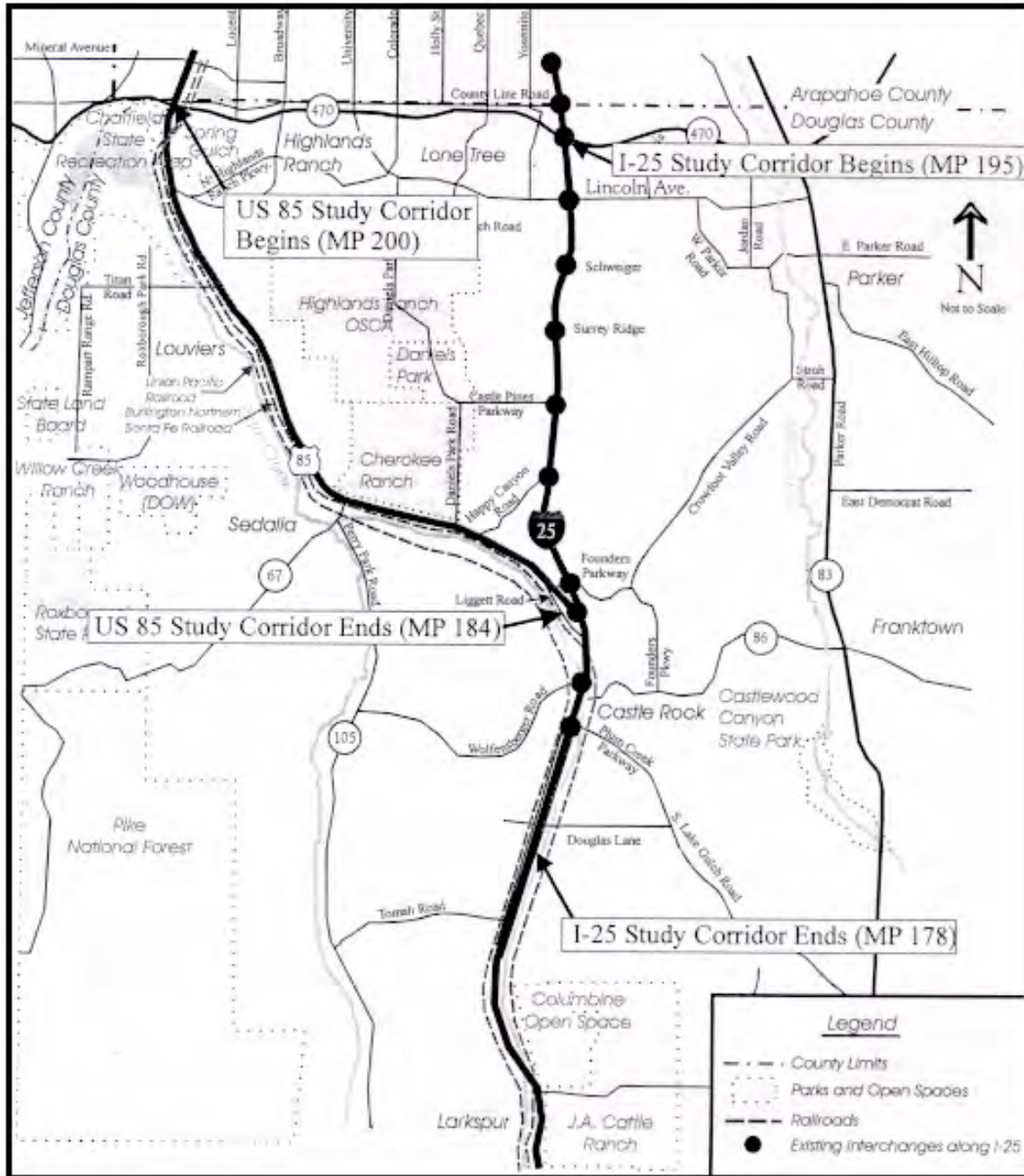
South I-25 Corridor and US 85 Corridor FEIS - 2001

This Final Environmental Impact Study was prepared by FHWA and CDOT, with PBS&J as consultant, dated May 2001. The project corridor is entirely within Douglas County and extends from C-470 to south of Castle Rock (see Figure 7.2). Three alternatives remain under consideration for the Selected Alternative. The principal problem for I-25 is congestion and for U.S. 85 congestion and safety. The primary recommended improvements are roadway widening of both facilities. The rail related environmental impact is to a couple of sections of D&RG Railroad historic alignment. Mitigation is proper documentation of the railroad prior to construction. There is a one-paragraph description of freight rail (UP/BNSF west of I-25 near Castle Rock). U.S. 85 widening would try to remain at least 10 feet from the railroad ROW. CDOT's Rail Corridor Preservation Policy Directive is cited. If the existing rail corridor is abandoned the land is preserved for future transit use.

A proposed US 85 Transit Rail Demonstration Project is described. This proposal is by an independent entity and not led by CDOT. It's objective is to implement passenger rail service between downtown Castle Rock and RTD's end of line LRT station at Santa Fe Drive and Mineral Avenue. The proposed service would be an alternative to peak period driving while I-25 and US 85 roadway construction projects are underway, with the expectation that many riders would continue with transit after construction is completed. The proposal includes four commuter rail demonstration options to determine potential ridership. Option A would operate one train set for 14 days with minimal improvements at an estimated cost of \$411,000. Option B would operate for six months to one year with one train set and includes some



Figure 7.2 South I-25 and US 85 Corridor





siding and station track improvements at a cost of \$1.3 to \$2.6 million. Option C would provide annual service with four train sets providing 7 round trips per day on newly constructed tracks. Construction costs would be \$15 to \$20 million for improvements, \$20 million for train sets, and \$3 million annually for operations. Option D would provide 9 daily round trips on a permanent basis with improvements costing \$117 million, trains at \$30 million, and annual operations at \$3.7 million. Twenty miles of new track is assumed. Special event trains were proposed to boost ridership.

An alternative to relocate the existing railroad through Castle Rock and construct passenger rail on the existing ROW was eliminated due to ease of construction issues, minimal benefits, and capital costs. The FEIS did not evaluate fixed guideway and bus transit as an alternative due to fiscal constraints. A transit demand forecast concluded that ridership numbers did not reduce the number of trips made by single-occupant vehicles to improve north to south mobility.

Future construction of fixed guideway transit adjacent to I-25 ROW is suggested as a transportation envelope on a couple of figures. Construction of fixed guideway is not anticipated in the next 20 years but CDOT has coordinated with local jurisdictions to not preclude future fixed guideway options.

This study provided useful background information on the South Front Range Corridor for the passenger rail component of the current study.

Rail Oriented Development: Strategies and Tools to Support Passenger Rail - 2001

The Research Branch of CDOT produced this study with support from Charlier Associates and Clarion Associates. It was created to define the land uses, land development patterns, and transportation system characteristics that are supportive of passenger rail transit. The findings are presented in a Handbook designed to provide practical answers to questions regarding how to plan for passenger rail. Rail Transit Support Strategies are presented in a table for four station types, CBD, downtown, commuter/suburb, and rural. Implementation Tools and Entity Roles are presented in a table for four entity types, state, regional, local and private sector. This report would be most useful in a next phase of the study when considering the next level of detail in defining passenger rail corridors.

Eastern Colorado Mobility Study - 2002

Felsburg, Holt, & Ullevig in association with DMJM+Harris, Jacobs Civil, Inc., Cambridge Systematics, Inc., and Infrastructure Management Group, Inc, prepared this study for CDOT and is dated April 2002. It was conducted to assist the Transportation Commission of Colorado in understanding freight mobility within the state and to make suggestions for infrastructure improvement to enhance the level of mobility. The study purpose was defined as "To evaluate the feasibility of improving existing and/or constructing future transportation corridors and intermodal facilities to enhance the mobility of freight services within and through eastern Colorado."

The Colorado Eastern Mobility Study analyzed and projected commodity flows within Eastern Colorado. Highway, railroad, and air transportation systems are also analyzed for ability and improvements needed to handle existing and projected commodity flows.

Various pieces of information were pulled from the Eastern Colorado Mobility Study for a guide to information needed for the CDOT Public Benefits and Costs study being conducted. Information about volumes of commodity flows, train traffic, truck volumes, intermodal descriptions, natural heritage conservation sites, public lands, and railroad safety issues was gathered from the Eastern Colorado Mobility Study and used as a reference point for the current Railroad Study.



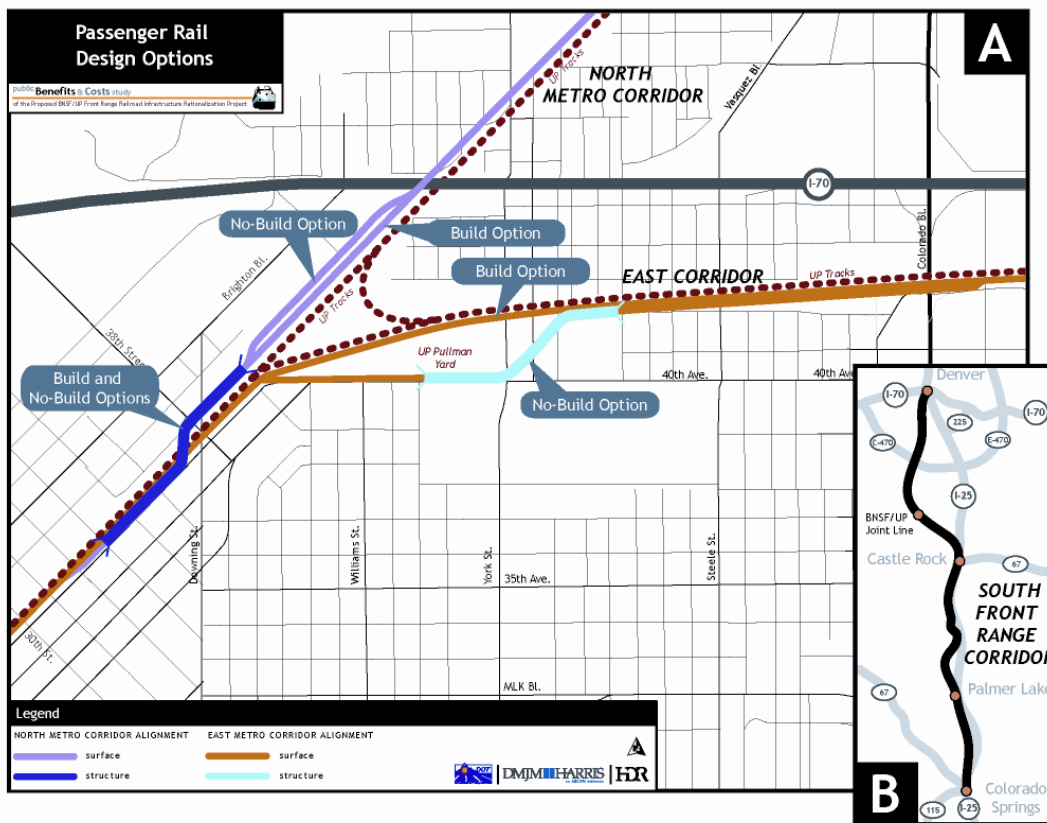
Impacts on Front Range Passenger Rail Plans: No-Build Option

Three corridors were found where the railroad project Build versus No-Build decisions made a clear and defined difference for passenger rail implementation. Two are RTD corridors, East and North Metro, and the third is commuter rail between Denver and Colorado Springs. For other RTD and commuter rail corridors the difference is speculative and not definitive at the current stage of corridor planning. Therefore these are not considered when estimating costs and benefits of the railroad project. Some of these other corridors could be shown to have quantifiable benefits from the railroad project later after additional planning and analysis is performed.

RTD East Corridor

Figure 7.3 shows the location where RTD requires approximately 3400 feet of elevated structure to cross York Street, if the railroad project is not built.

Figure 7.3 Passenger Rail Corridors



The cost of this structure, designed for E-80 loading for commuter rail trains, is estimated to cost \$25.5 million. Right of way for this structure is estimated at \$8.4 million. Tracks, power, and controls are not included since these would be required for an at-grade configuration as well. Total approximate cost for this No-Build Option is \$33.9 million. With a 30% contingency for possible unexpected costs due to a lack of detailed engineering information at this very preliminary stage the estimate increases to \$44 million above the railroad project Build Option.



RTD North Metro Corridor

Because of relatively high train traffic in the No-Build Option about 18 acres of ROW would be required west of the UP tracks in the area between Downing and I-70. The estimated cost of this ROW, including a 30% contingency, is \$5.5 million.

Other RTD Corridors

U.S. 36 Corridor and Gold Line

It would not be practical for RTD to build a new passenger rail alignment for these corridors with BNSF in place, Build or No-Build. The Rennick and TOFC yards could have to be removed. RTD’s right of way requirements from BNSF would be the same whether the railroad project was built or not. The Major Investment Study for this corridor shows the preferred RTD preferred alignment out of railroad ROW.

West Corridor

RTD could use the Burnam Yard property if it became available under the Build Option. However RTD has an alternative property at the same estimated cost as the Burnham property so, for purposes of this study, the Build versus No-Build decision is not a factor.

South Front Range Corridor

The Colorado Passenger Rail Study of statewide corridors ranked Denver to Colorado Springs fifth in statewide importance, a high priority corridor. The extension to Pueblo ranked 15th placing it in the low priority category. For purposes of this study the South Front Range Corridor is assumed to extend from Denver to Colorado Springs. Figure 7.3B shows this corridor with its two alternative basic alignments, U.S. 85 and I-25 to Castle Rock. The U.S. 85 alignment along the railroad ROW is the focus of this study.

For purposes of this study, the assumed difference between the Build and No-Build Options for this corridor is illustrated in Table 7.1.

Table 7.1 - Cost Comparison

	No-Build Option	Build Option
Track	\$3 million per mile	\$2 million per mile
ROW	Purchase \$21.5 M of ROW adjacent to reconstructed I-25 to Castle Rock. Buy approximately 39 miles of ROW to Colorado Springs at \$58.5 million.	No ROW cost (or included with Track cost)
Other	Cost of all other commuter rail infrastructure equal, Build or No-Build	Cost of all other commuter rail infrastructure equal, Build or No-Build

With heavy train traffic continuing under No-Build, a commuter rail operation could be built adjacent to or within the reconstructed and widened I-25 as far as Castle Rock. Cost of this ROW is estimated to be \$21.5 million, consisting of land for tracks and stations, one tunnel under I-25 and one bridge over I-25. From Castle Rock to Colorado Springs new ROW would be required. Based on a recent purchase of 175 miles of 20-foot ROW from the Union Pacific Railroad by the Utah Transit Authority for \$185 million, an estimate of \$58.5 million is assumed for the Castle Rock-to-Colorado Springs 30-foot ROW.

Under the Build Option the two railroads could sell one of their two tracks to the commuter rail owner, using the other for the continuing low volume of freight train traffic. Freight trains and commuter rail



would need to share the single track between Palmer Lake and Colorado Springs. Track cost savings would be about \$1 million per mile. New ROW would not be required.

Approximate cost for the No-Build Option is \$222 million for new tracks and \$80 million for ROW purchase for a total of \$302 million.

North Front Range Corridor

The Recommended Vision Plan for the North Front Range Corridor assumes an alignment within I-25 and thus would not be impacted by the Build or No-Build decision. A segment of the recommended alignment would use the Boulder Branch of the UPRR from its intersection with I-25 near Erie into Denver Union Terminal. Train counts do not change between the Build and No-Build alternatives on this segment. It is outside the scope of this study to evaluate or assume alternatives other than the one selected by the North Front Range Transportation Alternatives Feasibility Study.

Impacts on Front Range Passenger Rail Plans: Build Option

One consideration in examining changes for the Build Option is impacts to grade crossing and grade separation needs due to future implementation of passenger rail service. This subject was addressed in Task 5, Evaluation of Public Benefits. When reviewing all potential grade crossing candidates for grade separation a specific consideration was the difference that passenger rail would make. In no case was it found that the railroad Build or No-Build decision would provide grade separations that could count as a benefit to passenger rail implementation. There were cases, as noted in Task 5, where RTD would likely grade separate for its own reasons of travel time and schedule reliability.

RTD East Corridor

The railroad project would relocate the UP 40th Intermodal Yard and 36th Street Yard, reducing train traffic on the tracks serving them. RTD would be able to build its LRT or commuter rail tracks at-grade through this area, south of existing tracks to avoid crossing tracks. For purposes of estimating the difference between Build and No-Build the RTD cost is zero for the Build Option. Thus the savings for the Build Option is the \$44 million required for the No-Build Option.

RTD North Metro Corridor

The difference between the Build and No-Build Options for RTD is the right of way required. The savings of \$5.5 million is a benefit of the Build Option.

South Front Range Corridor

The Build Option reduces freight train traffic significantly such that the railroads could operate on just one of the double tracks. The other track is assumed to be purchased from the railroads for approximately \$2 million per mile. There would be no need to buy new land. This option would cost a commuter rail operation \$148 million (74 miles), excluding infrastructure improvements common under Build and No-Build.

The Build Option would save the difference between \$302 million and \$148 million, or \$154 million.

Total Passenger Rail Savings

The estimated savings for passenger rail projects for the Build Option is \$203.5 million, summed from the proposed RTD East and North Metro Corridors, and the proposed South Front Range Corridor.