



FRPR

**FRONT RANGE
PASSENGER
RAIL**



ALTERNATIVES EVALUATION REPORT

FINAL - December 2020



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ACRONYMS AND ABBREVIATIONS

BRT	Bus Rapid Transit
CDOT	Colorado Department of Transportation
DEN Airport	Denver International Airport
DRCOG	Denver Regional Council of Governments
DTC	Denver Tech Center
DUS	Denver Union Station
EIS	Environmental Impact Statement
EO	Executive Order
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FRPRA	Front Range Passenger Rail Authority
Rail Commission	Front Range Passenger Rail Commission
FRPR	Front Range Passenger Rail
HPTE	High Performance Transportation Enterprise
ICS	Interregional Connectivity Study
I-25	Interstate 25
LRT	Light Rail Transit
MPO	Metropolitan Planning Organization
MPH	Miles per Hour
MMT	Mountain Metro Transit
NAMS	Northwest Area Mobility Study
NEPA	National Environmental Policy Act
NFRMPO	North Front Range Metropolitan Planning Organization
PACOG	Pueblo Area Council of Governments
PEL	Planning and Environmental Linkages
PPACG	Pikes Peak Area Council of Governments
RTD	Regional Transportation District
RMRA	Rocky Mountain Rail Authority
SE Corridor	Southeast Corridor
SH	State Highway
T-REX	Transportation Expansion
VMT	Vehicle Miles Traveled

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1.0 INTRODUCTION AND BACKGROUND

The Front Range Passenger Rail (FRPR) Project would provide a new travel option for Colorado Front Range residents and workers. As a new mobility option, FRPR would create an alternative to inter-regional travel on Interstate 25 (I-25) and provide a passenger rail backbone to facilitate expanded and connected multimodal travel in and among local communities. Providing safe, reliable travel options is essential for Colorado's growing economy and population and is highly supported by Colorado residents and businesses.

Colorado has been considering a comprehensive passenger rail system serving the Front Range for more than a decade. In 2017, the Southwest Chief and Front Range Passenger Rail Commission (Rail Commission) was re-established by the Colorado legislature and tasked with facilitating development and operation of a passenger rail service along the Front Range (SB17-153). The Rail Commission is comprised of 11 voting members, representing local and regional governments and rail interests, including both Class I railroads and the Regional Transportation District (RTD). The Colorado Department of Transportation (CDOT), Amtrak, and Cheyenne, Wyoming, are non-voting members of the Rail Commission.

In 2018, the Colorado General Assembly provided funding for the Rail Commission (SB18-001) to hire staff and retain a consultant team to begin the FRPR Project. With the funds provided by the General Assembly, the team was began the first phase of work to advance preliminary planning to consider potential service operations and prepare to advance this major infrastructure project through the National Environmental Policy Act (NEPA) process. NEPA approval would be required for federal funding. In 2020, CDOT formally partnered with the Rail Commission and dedicated staff and resources to help develop this initial phase of the FRPR Project. Through 2020, the consultant team, CDOT, and Rail Commission staff coordinated with federal agencies, local jurisdictions, policy makers, and interested Colorado residents and organizations to:

- Clarify needs and opportunities of a FRPR system
- Develop, evaluate, and refine alignment and operational alternatives
- Develop implementation strategies for FRPR to contribute to Colorado's transportation infrastructure and provide travel, environmental, and economic benefits for the state and region

1.1 PREVIOUS PLANNING

Improving transit and travel options are consistent themes in statewide and regional planning initiatives by the metropolitan planning organizations (MPO) along the Front Range. The Front Range MPOs include the Pueblo Area Council of Governments (PACOG), Pikes Peak Area Council of Governments (PPACG), Denver Regional Council of Governments (DRCOG), and the North Front Range MPO (NFRMPO). As members of the Rail Commission, CDOT and the Front Range MPOs have played key roles in this planning process, including the creation of the FRPR goals to develop and operate passenger rail.

FRPR is unique in Colorado transportation project development. FRPR is responding to legislative direction and broad statewide planning goals to develop passenger rail and provide a new option for regional travel across the Front Range. New options for regional travel can complement and relieve pressure on the state's existing transportation network, which consists primarily of roads with limited in-state air and passenger rail service. In the context of the underlying need to develop a new transportation option, the FRPR Project requires regional level planning to determine the possibilities of the new system and define the specific purpose and need for the project.

All of the Front Range MPOs have included rail objectives in their regional transportation visions and plans. Some have advanced these visions with additional planning for passenger rail in their communities. For example, PACOG provided partial funding for Pueblo County to complete a station alternatives analysis in preparation for passenger rail. Additionally, CDOT has strengthened its commitment to passenger rail over the past decade after developing its first State Freight and Passenger Rail Plan in 2012. Through the 2045 statewide planning effort, CDOT conducted extensive public outreach focused on a 10-year transportation infrastructure plan. The 2045 plan recognizes the opportunity to expand passenger rail in Colorado and focuses on three key themes:

- Providing new travel options
- Mitigating the impacts that growth and congestion are having on the quality of life for Coloradans
- Addressing road condition and safety, particularly in rural areas

Numerous previous studies have assessed transit and travel options along the Front Range. These studies are relevant to the development of FRPR and provide a basis of understanding for the constraints and opportunities presented within the project limits. Several of the previous studies include assessment of specific rail alignments, stations, and operations. This information directly informed the creation of the FRPR’s alternatives and options. Critical studies utilized by the FRPR team included the 2010 Rocky Mountain Rail Authority (RMRA) High Speed Intercity Passenger Rail Feasibility Study, the 2014 CDOT Interregional Connectivity Study (ICS Study) and 2017 Interregional Connectivity – Interoperability Study, the 2011 North I-25 Environmental Impact Statement (EIS) and 2015 North I-25 EIS Commuter Rail Update, and the 2014 Northwest Area Mobility (NAMS) Study. All relevant studies are summarized in Appendix A.

1.2 STUDY PROCESS

The FRPR study followed a four-step project development process to answer key questions about the scope and effectiveness of FRPR options (Figure 1).

Figure 1: FRPR Pre-NEPA and Service Development Planning Process



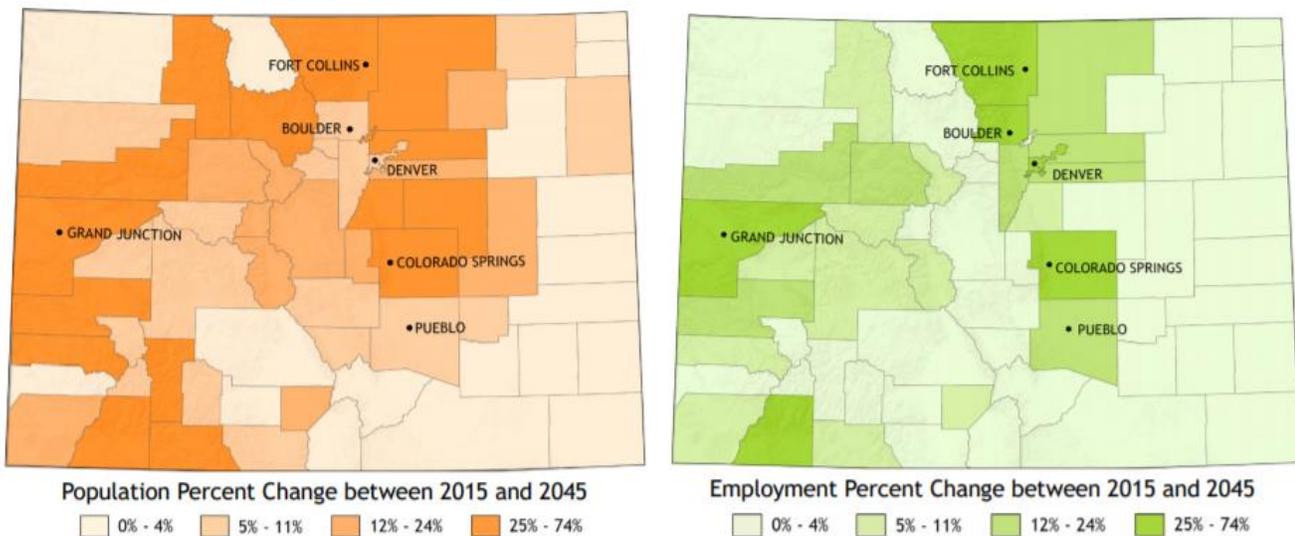
Outcomes of each of these interrelated and iterative steps are described in this report. Section 2.0 describes the vision and purposes for the system (Step 1). Section 3.0 describes the initial (Step 2) and refined (Step 3) alternatives evaluated, and the alternatives recommended to be carried forward into NEPA. Section 4.0 describes governance. Section 5.0 summarizes agency and public input. Finally, Section 4.0 outlines next

steps to strengthen the remaining alternatives before formally entering the NEPA process with a Notice of Intent to prepare an EIS (Step 4).

1.3 GEOGRAPHICAL CONTEXT

Colorado’s Front Range is situated along the eastern foothills of the southern Rocky Mountains and encompasses an urban corridor of communities from Pueblo, Colorado, to Cheyenne, Wyoming, generally along I-25, Colorado’s most traveled and congested highway. The Front Range is home to 85 percent of Colorado’s population, more than 90 percent of the state’s jobs, and its largest cities, including Fort Collins, Denver, Colorado Springs, and Pueblo. The Denver metropolitan region in the middle is by far the most populous, containing nearly 3 million of the Front Range’s 5 million residents. The same pattern of concentrating people and jobs along the Front Range is also expected to continue (Figure 2).

Figure 2. Population and Employment Growth in Colorado



Source: Colorado Department of Local Affairs, 2020

1.4 FRPR STUDY LIMITS

The geographic limits of the FRPR Project extend approximately 180 miles from Pueblo (south) to Fort Collins (north), and encompass the major population, employment, and activity centers in between (Figure 3). The study area includes the four MPO areas and 11 counties (Pueblo, El Paso, Douglas, Arapahoe, Jefferson, Denver, Adams, Broomfield, Boulder, Weld, and Larimer) outlined in blue on Figure 3.

Regional transit within the study area is provided by CDOT’s Bustang intercity bus service, which also includes Outrider bus service to communities outside the Front Range (Figure 5: Bustang Intercity Bus Service and Routes in Colorado). Bustang service began in 2015 and has been consistently building ridership. Its current system includes 19 over-the-road coaches and serves more than 250,000 riders annually, with ridership growing each year. CDOT is considering expansion of the Bustang service to add or improve additional service areas along I-25 with multimodal “mobility hubs” and increase bus frequency (headways).

Figure 3: FRPR Study Area

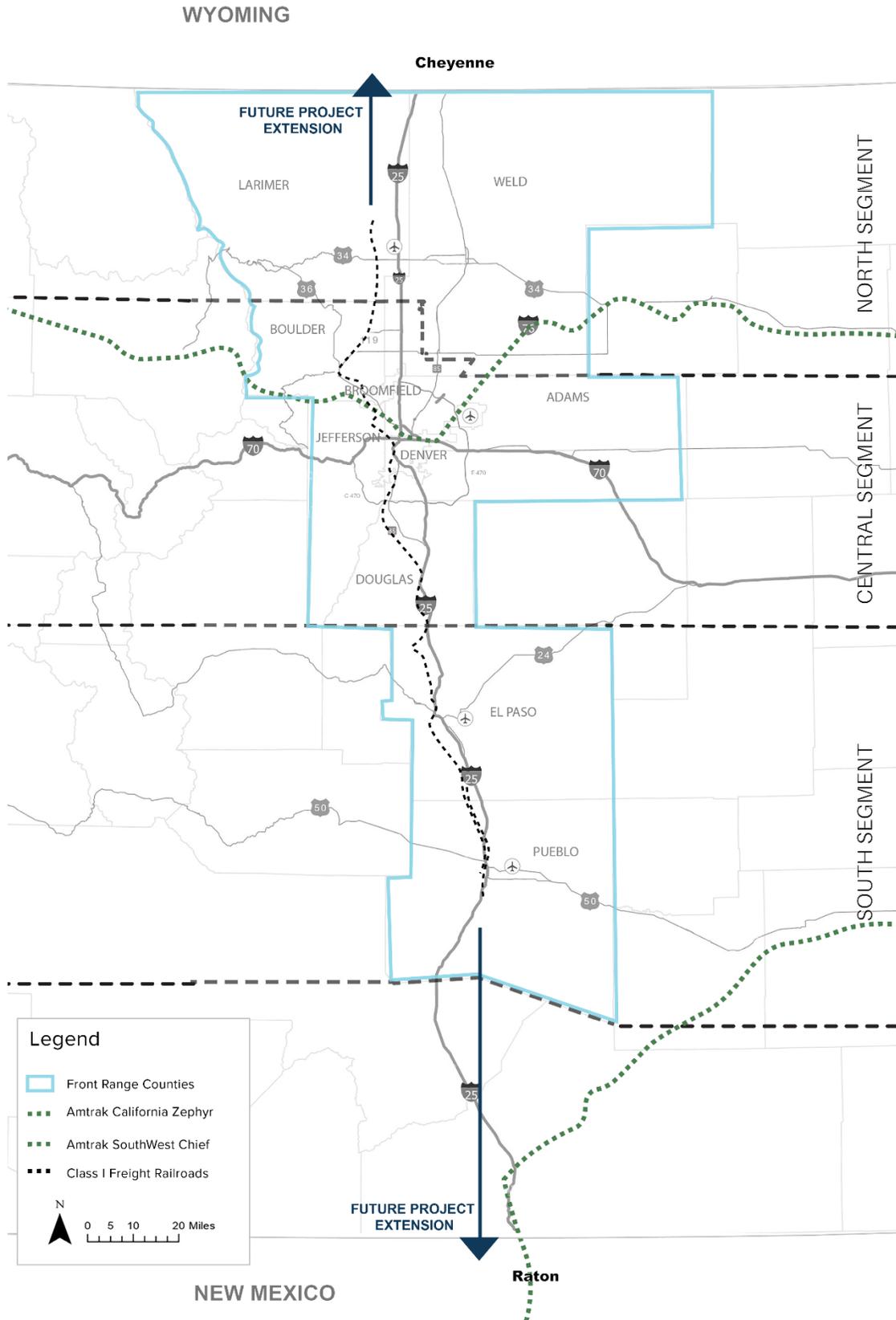
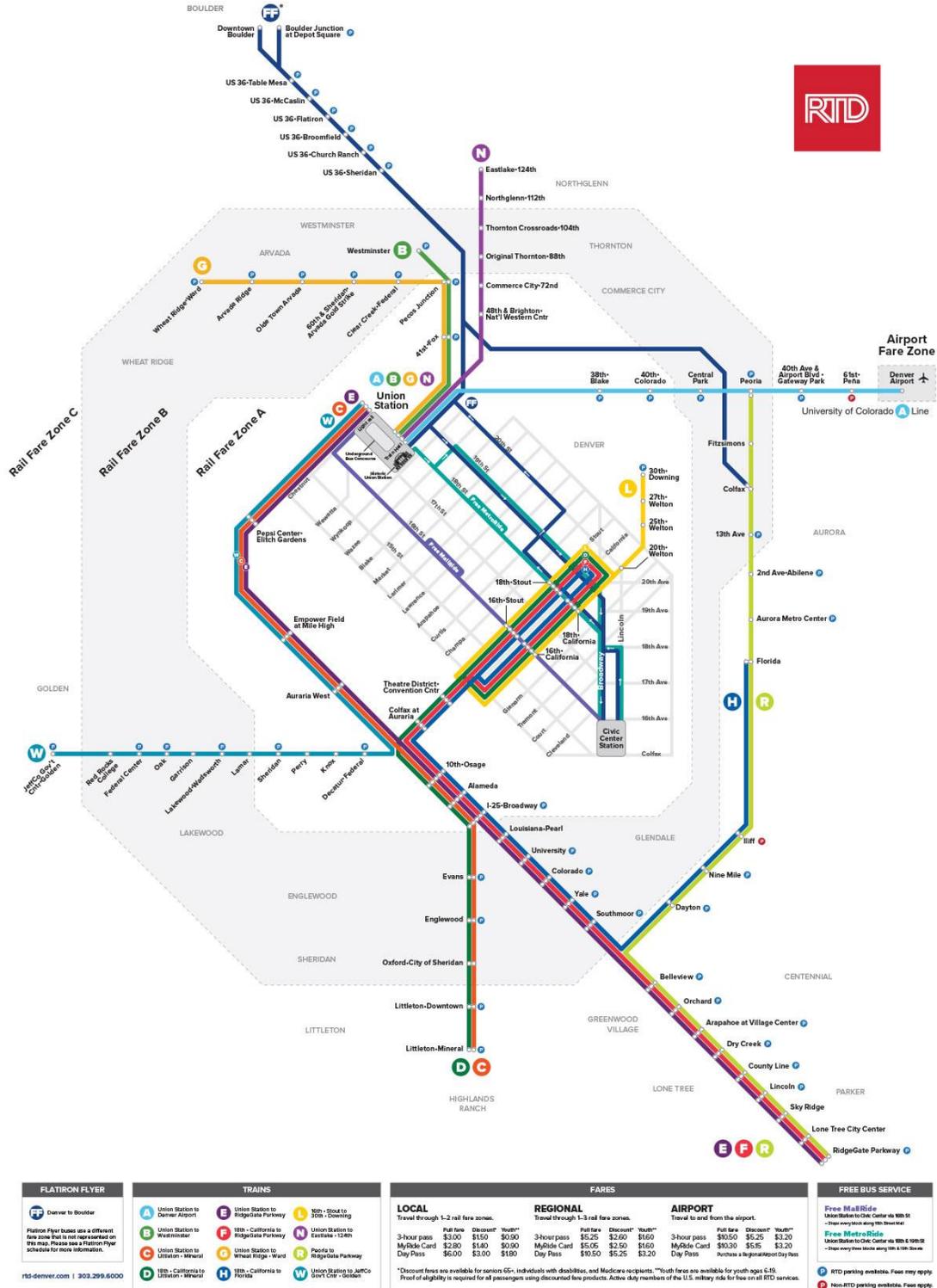
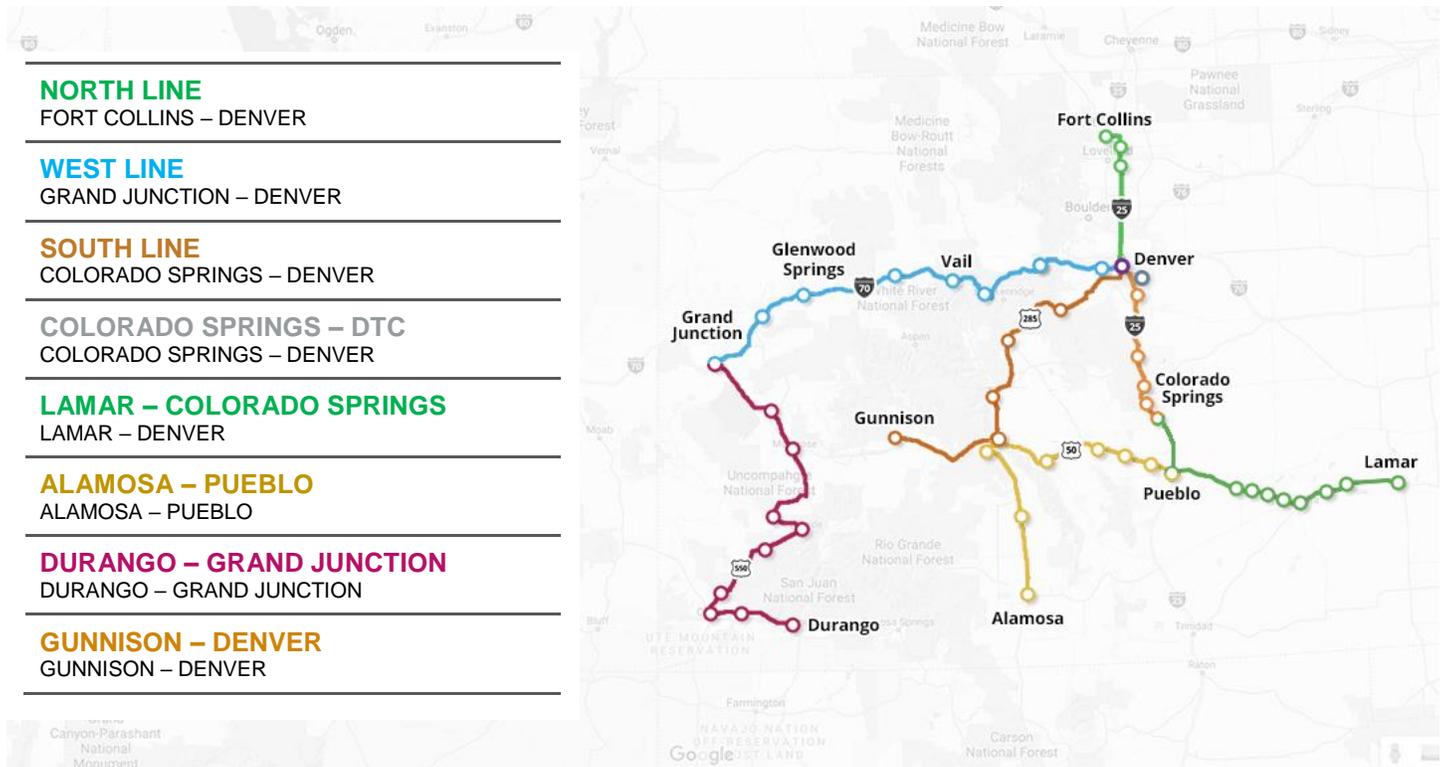


Figure 4: RTD FasTracks Rail Network (DRCOG Region)



Source: RTD

Figure 5: Bustang Intercity Bus Service and Routes in Colorado



Source: CDOT

Within the study limits, the corridor is divided into three segments. The boundaries of the South, Central, and North segments are delineated by dashed yellow lines in Figure 3. These segments reflect the differing characteristics, contexts, and transportation patterns of the Front Range.

- The South Segment includes the PACOG and PPACG regions, the regional centers of Pueblo and Colorado Springs, smaller communities of Fountain and Monument, major military installations, and undeveloped land areas
- The Central Segment includes the DRCOG boundary and the densely populated Denver metropolitan area, which is served by the extensive RTD transit network, including the light rail and commuter rail systems (Figure 4)
- The North Segment comprises the NFRMPO boundary with larger cities of Fort Collins, Loveland, and Greeley, many smaller established communities, and fast-growing towns and suburbs in Larimer and Weld Counties

The north-south limits are consistent with the Rail Commission’s legislative charge and reflect the initial FRPR vision. The study limits set the boundaries for this effort and represent a critical first phase of passenger rail in Colorado. Additionally, the study limits are aligned to support any desired future extensions south to Trinidad and New Mexico, north to Cheyenne and other areas of Wyoming, and west along the I-70 Mountain Corridor. This potential expansion is reflected in engineering and design criteria for the current project termini.

2.0 PURPOSE AND NEED

The initial development and analysis of the FRPR alternatives was based on the vision for the system developed in consultation with the Rail Commission, CDOT, and corridor stakeholders over several months:

Developing passenger rail that serves Front Range communities from Fort Collins to Pueblo is a critical component of Colorado's future. FRPR will provide a safe, efficient, and reliable transportation option for travel between major population centers and destinations along the Front Range and create a backbone for connecting and expanding rail and transit options in the state and region.

The vision stems from overarching needs and opportunities for passenger rail to become a key option for travel between major Front Range population and employment centers, now and into the future. FRPR can:

- Provide relief for our congested interstates
- Create a transportation backbone to leverage available and planned regional transit options and local investments
- Attract environmentally sustainable economic development and growth
- Generate support from Coloradans to develop passenger rail

This vision communicated the basic parameters for the FRPR system and the evaluation criteria for this alternatives evaluation. The vision answered the questions of what, why, and where for FRPR needed to guide the pre-NEPA alternatives development and explore further how and when the system could operate and who might operate it.

- **What?** – Implementation of passenger rail
- **Why?** – A new foundational transportation option that expands multimodal travel choices
- **Where?** – Serving the Front Range population centers and destinations

The study vision provided the basis for developing and refining potential project alternatives. As the project has evolved, the team developed a strong understanding of where routes could be reasonably located, how a system might realistically operate, and the contributions FRPR could and should make to Colorado's transportation network. These parameters inform and focus the NEPA purpose and need, which is currently being developed.

3.0 ALTERNATIVES EVALUATION PROCESS

3.1 PRE-NEPA ALTERNATIVES EVALUATION PROCESS

The pre-NEPA phase was used to develop, evaluate, refine, and recommend potential alternatives to be carried forward into NEPA and solicit stakeholders' input on project alternatives prior to formal NEPA scoping. Additional data collection and scoping conducted during this phase provide context for comparing and recommending alternatives, identifying next steps, and framing important issues moving forward into NEPA.

The FRPR study used a process for two levels of evaluation to focus and narrow alternatives to a reasonable range:

- Level 1 Approach and Criteria – resulted in a fatal flaw analysis process using the high-level evaluation criteria to identify feasible alignment options to meet the FRPR vision
- Level 2 Approach and Criteria – included a detailed evaluation and screening process of the alignment alternatives and comparisons of operational performance, including differences in ridership, costs, and impacts

Both evaluations compared alternatives based on four broad categories:

- Operational characteristics
- Community and environmental impacts
- Financial and economic factors
- Feasibility and ability to implement

Performance measures were broad and qualitative in Level 1 and more refined and quantitative in Level 2. Through these evaluations, the project team engaged federal transportation agencies, along with local and state agencies with jurisdiction across the corridors, corridor stakeholders, members of the public, and elected officials, to define an implementation strategy and next steps to advance FRPR.

3.2 LEVEL 1 EVALUATION

The Level 1 evaluation considered a broad range of possibilities for FRPR corridors and operations, consistent with the range of options considered in previous studies. The Level 1 alternatives consisted of broad geographic corridors centered on rail and highway corridors. A “corridor” referred to a wide swath of area that included either multiple existing freight railroads or roadway corridors that could be considered for the FRPR Project. At Level 1, corridors were intended to be broad to encompass a wide range of potential options.

3.2.1 LEVEL 1 EVALUATION CRITERIA

The Level 1 analysis evaluated rail and highway corridors along the Front Range to answer the following questions:

Feasibility – Is it feasible to construct a FRPR system in the corridor?

Ability to meet the vision for FRPR – Is it possible to fulfill the stated FRPR vision in the corridor?

The Level 1 analysis is often called a “fatal flaw” analysis because alternatives that cannot meet these minimum requirements are removed from further consideration. The Level 1 evaluation identified feasible corridors that were able to meet the FRPR Project vision and were advanced to Level 2 analysis. The Level 1 evaluation identified high-level opportunities and constraints, such as community and environmental benefits and impacts, and constructability, by considering qualitative evaluation with broad questions in each of the four evaluation categories noted in Table 1.

Table 1: Level 1 Evaluation Criteria



L1 – Operational Characteristics:

- Can passenger rail in this corridor serve major population centers in the Front Range, based on 2040 population projections?
- Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?



L1 – Community and Environmental Impacts:

- Can passenger rail be implemented in this corridor without causing severe community disruption due to right-of-way acquisition, noise, and vibration?
- Can passenger rail be implemented in this corridor without causing severe effects on natural resources due to fill placed in wetlands, streams, and floodplains, and conversion of habitat for protected species?



L1 – Financial and Economic Factors:

- Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?



L1 – Feasibility and Implementation:

- Is passenger rail constructible in this corridor?
- Is passenger rail in this corridor compatible with existing freight rail or highway operations?
- Does public input indicate some level of support for passenger rail in this corridor?

The evaluation criteria were presented as questions, and the evaluation answered the questions as “yes”, indicating that the corridor meets the criteria, or “no”, indicating the corridor is considered fatally flawed. A rating of “no” was given to a corridor that was either infeasible or cannot fulfill the FRPR vision, and any corridor with one or more “no” ratings was not recommended to be considered in Level 2. Findings from previous studies assisted in the evaluation of high-level opportunities and constraints of the Level 1 alternatives (corridors). The outcomes of the Level 1 evaluation assisted in the development of specific geographic alignment alternatives for analysis in Level 2.

3.2.2 LEVEL 1 CORRIDORS

The Level 1 corridors were developed from a suite of existing highway and freight rail corridors, many of which had been considered by previous studies (listed in Appendix A). Previous studies concluded that existing transportation corridors represented the most attractive corridors for developing a new passenger rail system. New alignments (referred to as greenfield corridors) had greater community and environmental impacts, have been met with public resistance, and should be avoided if possible. Stakeholder input during the FRPR study reinforced support for developing FRPR mostly within existing transportation corridors. Existing transportation corridors provide an established travel pattern and minimized community and environmental impacts. Additional opportunities for sharing right-of-way or track with freight rail corridors was highly supported, particularly for communities along freight rail corridors that desire passenger service. Previous studies concluded that sufficient options for passenger rail alignments exist in transportation corridors; therefore, Level 1 did not evaluate any complete greenfield alternatives.

Engineering design for the Level 1 alternatives was limited to evaluation of constraints and potential rail operations and speeds based on the existing freight rail or highway geometry and surrounding land uses. The Level 1 corridors were studied to understand if it would be **feasible** to operate a passenger rail system adjacent to existing freight rail and highway corridors. The feasibility analysis considered the horizontal and vertical geometry, physical location, right-of-way availability, and if the route provided a reasonable opportunity to **serve Front Range communities and meet the FRPR vision**. During the Level 1 evaluation, a ridership model was developed and tested to generate a baseline understanding of Front Range regional travel and potential passenger rail demand. At Level 1, alignments were not optimized to improve speeds or minimize impacts, although potentially significant constraints were identified for refinement in Level 2.

In addition to passenger rail alternatives within the major rail and highway corridors along the Front Range, a Best Bus alternative was developed as a “baseline” alternative. The alternative consisted of the currently funded and planned transportation improvements, including significant expansion of the Bustang system without investing in a new passenger rail system. This Best Bus alternative is similar to a No Action but sets a higher bar and would require identification of additional funding to expand and realize the full vision of Bustang.

Level 1 analysis considered the markets served by the various corridors and their suitability as origin and destination pairs for intercity rail. Six of Colorado’s seven metropolitan statistical areas are located on the Front Range. These areas include one or more of the major rail or highway corridors considered in Level 1 (in order of population size):

- Denver-Aurora-Lakewood
- Colorado Springs
- Fort Collins
- Boulder
- Greeley
- Pueblo

These population centers are considered major markets that could potentially be served by and support passenger rail service. Previous studies found that the Denver metropolitan area, Colorado Springs, and Fort Collins are the three major markets that are essential to maintaining the ridership base and the financial viability of the system. Additionally, Pueblo was included in the legislative mandate and is therefore relevant to the political viability of the project. Boulder and Greeley are served by some, but not all, of the Level 1 corridors, which is noted as a difference but not a fatal flaw.

The five passenger rail corridors and the Best Bus alternative considered in the Level 1 evaluation are described below in Figure 6 through Figure 11. All represent distinct end-to-end corridors but share some common portions.

Figure 6: Level 1 BNSF Rail Corridor

From Pueblo to downtown Denver the corridor follows the joint BNSF/Union Pacific lines' rights-of-way. The BNSF and Union Pacific lines run parallel to one another (or share track) in what is termed the consolidated mainline from Pueblo to Prospect Junction, just north of Denver Union Station. From downtown Denver, the BNSF corridor continues north along the BNSF Front Range Subdivision to Westminster. At Westminster, the rail corridor follows the BNSF along the future commuter rail extension of RTD's B Line to Boulder and Longmont. This RTD extension is in BNSF right-of-way. From Westminster, the corridor turns west/northwest, traveling through Louisville, Broomfield, and Boulder. From Boulder, the corridor continues parallel to SH119 northeast to Longmont. From Longmont north to Fort Collins, the BNSF corridor is located west of I-25 and parallel to US 287.

The BNSF corridor passes through major population centers, including Pueblo, Colorado Springs, Denver, and Fort Collins. North of Denver, the BNSF corridor traverses west of I-25 to also serve Boulder, Longmont, Berthoud, and Loveland.

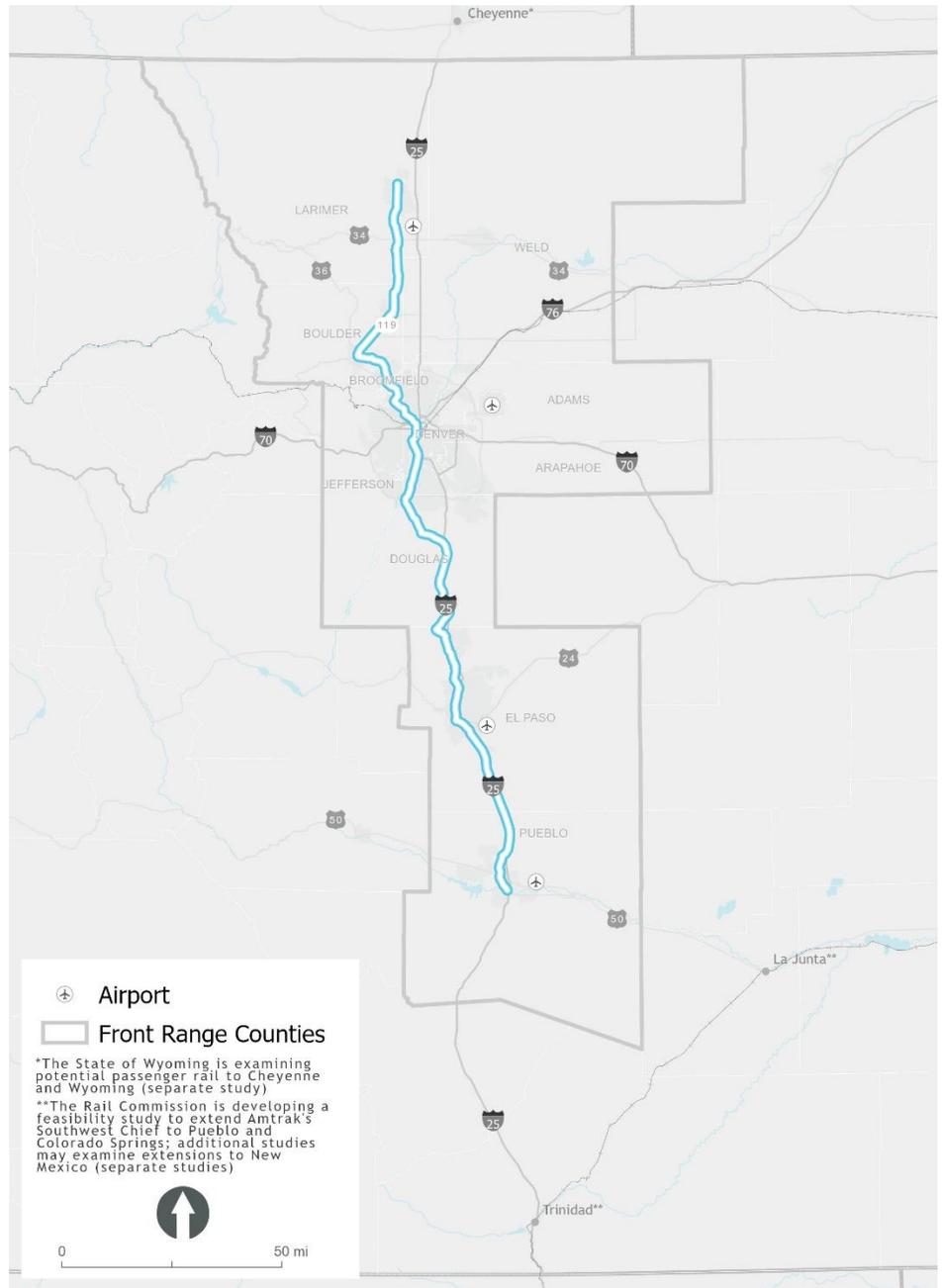


Figure 7: Level 1 Consolidated Mainline with Union Pacific/Great Western Rail Corridor

This corridor begins in Pueblo traveling north along the joint Union Pacific/BNSF lines' rights-of-way (the same corridor as the BNSF Rail Corridor). North of central Denver, this corridor follows the Union Pacific corridor north to Greeley. From Greeley, the corridor travels northwest along the existing Great Western rail line right-of-way to Fort Collins.

This corridor serves major population centers of Pueblo, Colorado Springs, Denver, and Fort Collins. North of Denver, the corridor traverses east of I-25 to serve Greeley, but does not directly serve communities west of I-25 along the planned North I-25 EIS Commuter Rail alignment.

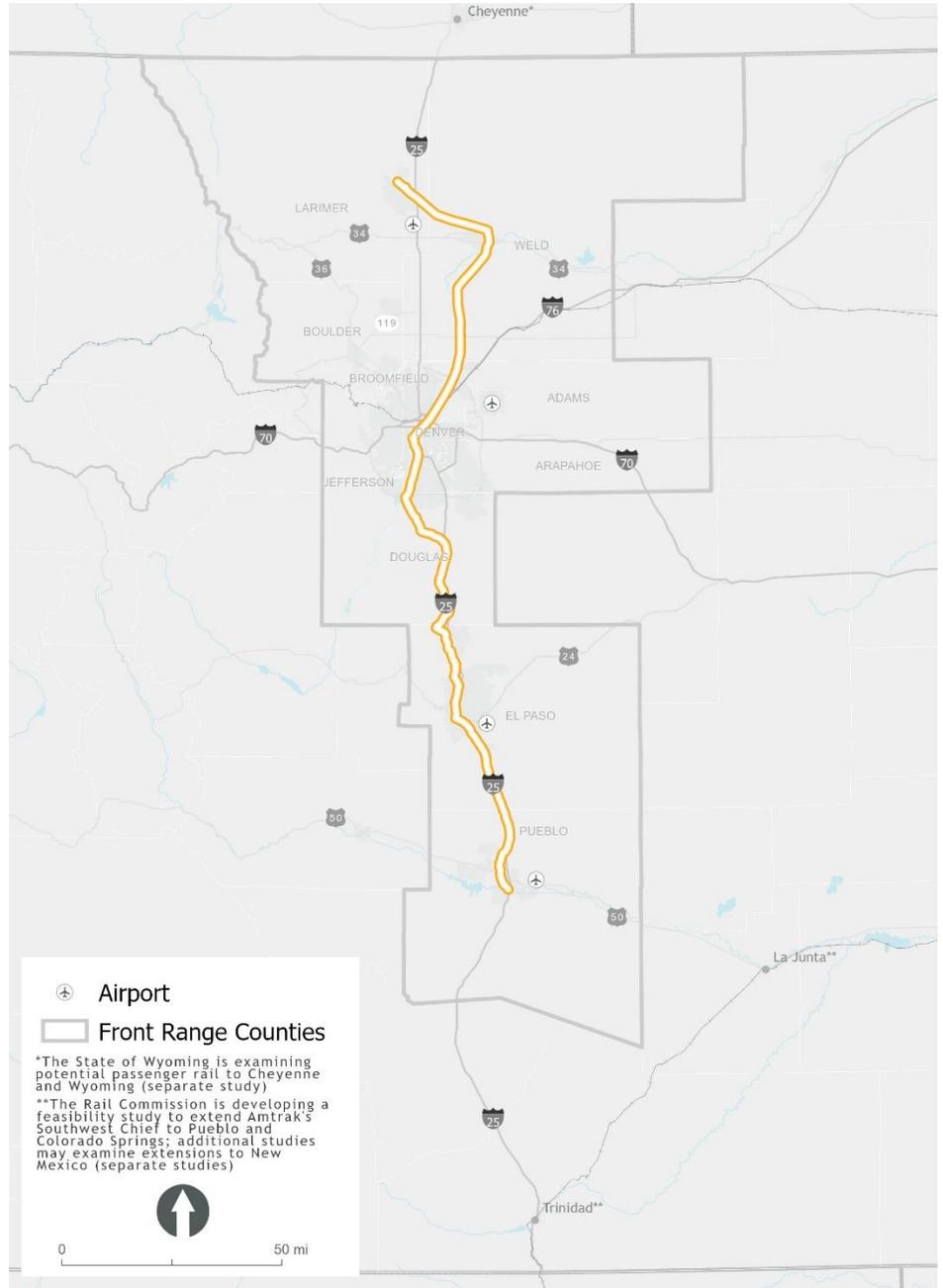


Figure 8: Level 1 BNSF + North I-25 EIS Commuter Rail Corridor

From Pueblo to downtown Denver, the corridor follows the joint BNSF/Union Pacific lines' rights-of-way (same as the other rail corridors). North of downtown Denver, the corridor follows the RTD N Line commuter rail corridor (near I-25) to the planned end of line station at SH 7/162nd Ave. The corridor proceeds north roughly parallel to I-25 to the intersection with SH 119 in the Longmont area. From this station, the corridor follows SH 119 west until it meets BNSF right-of-way near US 287 in Longmont. From Longmont, the corridor travels north to Fort Collins along the BNSF right-of-way parallel to US 287.

This corridor serves major population centers of Pueblo, Colorado Springs, Denver, and Fort Collins. It also serves the communities along the RTD N Line and North I-25 EIS Commuter Rail corridor between Longmont and Fort Collins but does not directly serve Boulder or Greeley.

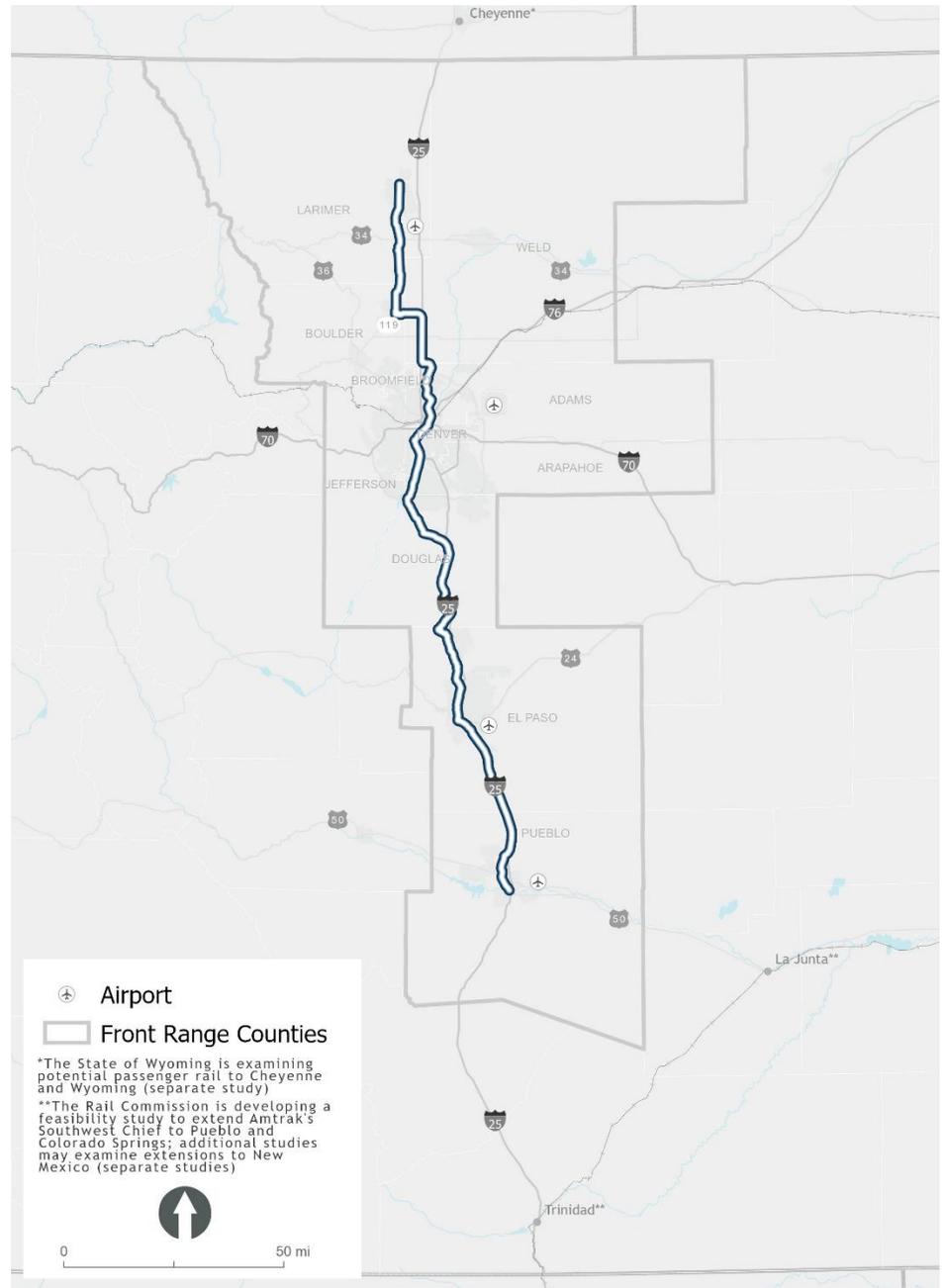


Figure 9: Level 1 I-25 + RTD Southeast Corridor Through Denver

This corridor follows I-25 from Pueblo north to Lone Tree. From Lone Tree, the corridor follows RTD’s Southeast Light Rail Transit (LRT) Corridor to downtown Denver (Figure 4). Through this area along RTD Southeast Corridor, options were considered for passenger rail adjacent to the RTD corridor and interoperating jointly with RTD service. Both of these options were considered by the Interregional Connectivity – Interoperability Study (CDOT, 2017a) and reevaluated in this Level 1 evaluation.

From downtown Denver, this corridor follows the RTD N Line commuter rail to the planned SH 7/162nd Ave end of line station and then follows I-25 north to Fort Collins and then the Great Western spur from I-25 to downtown Fort Collins.

This corridor serves major population centers of Pueblo, Colorado Springs, Denver, and Fort Collins. It also serves the south and north Denver suburban communities along the RTD Southeast Corridor and N Lines, including the Denver Tech Center (DTC). North of Denver, it does not directly serve existing communities east or west of I-25 but does serve future growth toward the I-25 corridor from both directions.

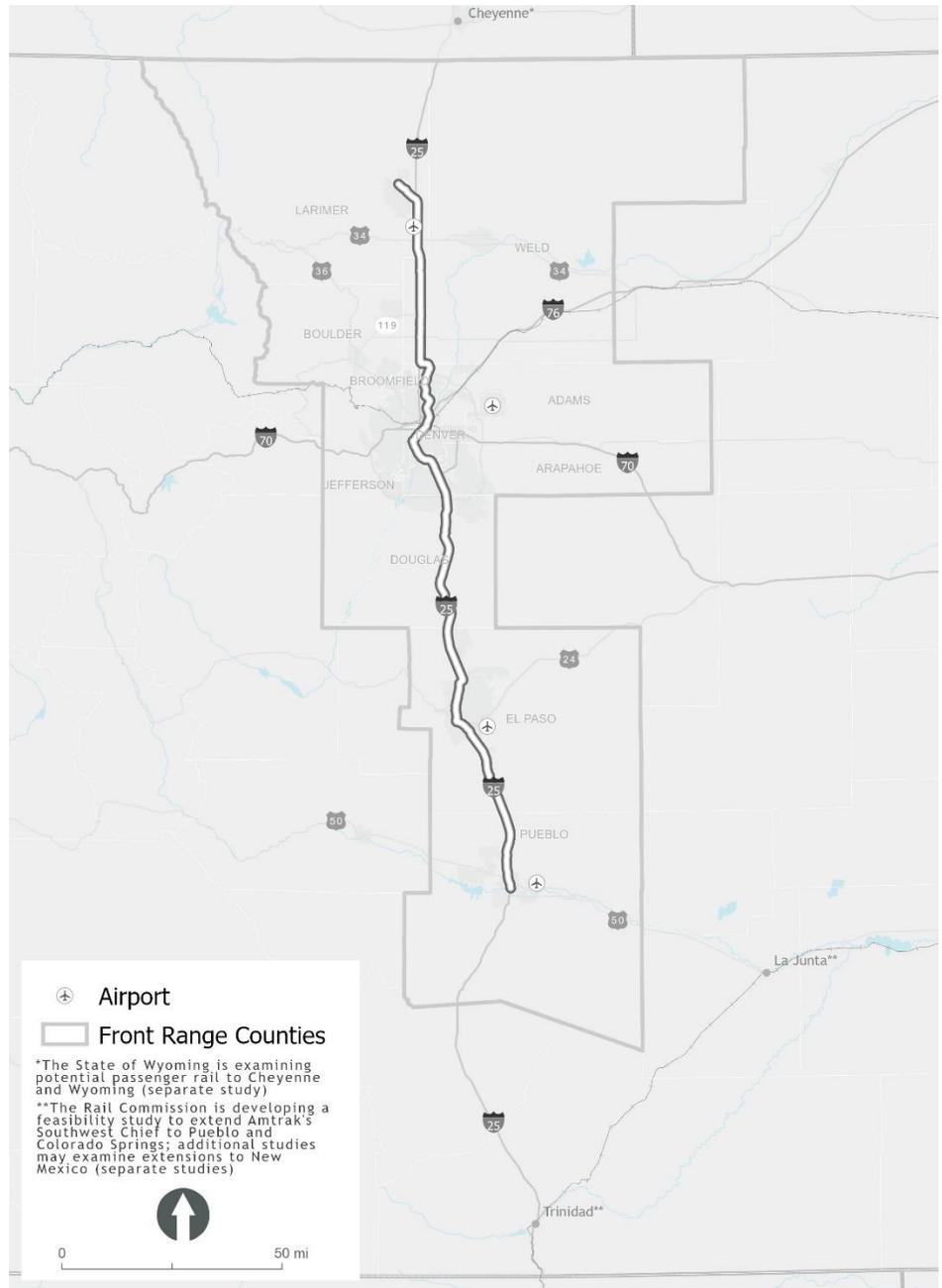


Figure 10: Level 1 I-25 + E-470 Highway Corridor

The corridor begins in Pueblo following I-25 right-of-way north past Castle Rock to the Lone Tree area at the intersection of I-25 and E-470 (Lincoln Avenue). From this area, the corridor turns east and follows E-470 right-of-way east of Denver. The corridor continues along E-470 before rejoining I-25 (near SH 7) and follows I-25 north until it reaches Fort Collins, then, into downtown Fort Collins on the Great Western spur.

This corridor serves Pueblo, Colorado Springs, and Fort Collins. It does not penetrate downtown Denver but integrates with RTD FasTracks system and directly serves the Denver International Airport (DEN Airport). North of Denver, it does not directly serve communities east or west of I-25 but does position to serve projected growth toward the I-25 corridor from both directions.

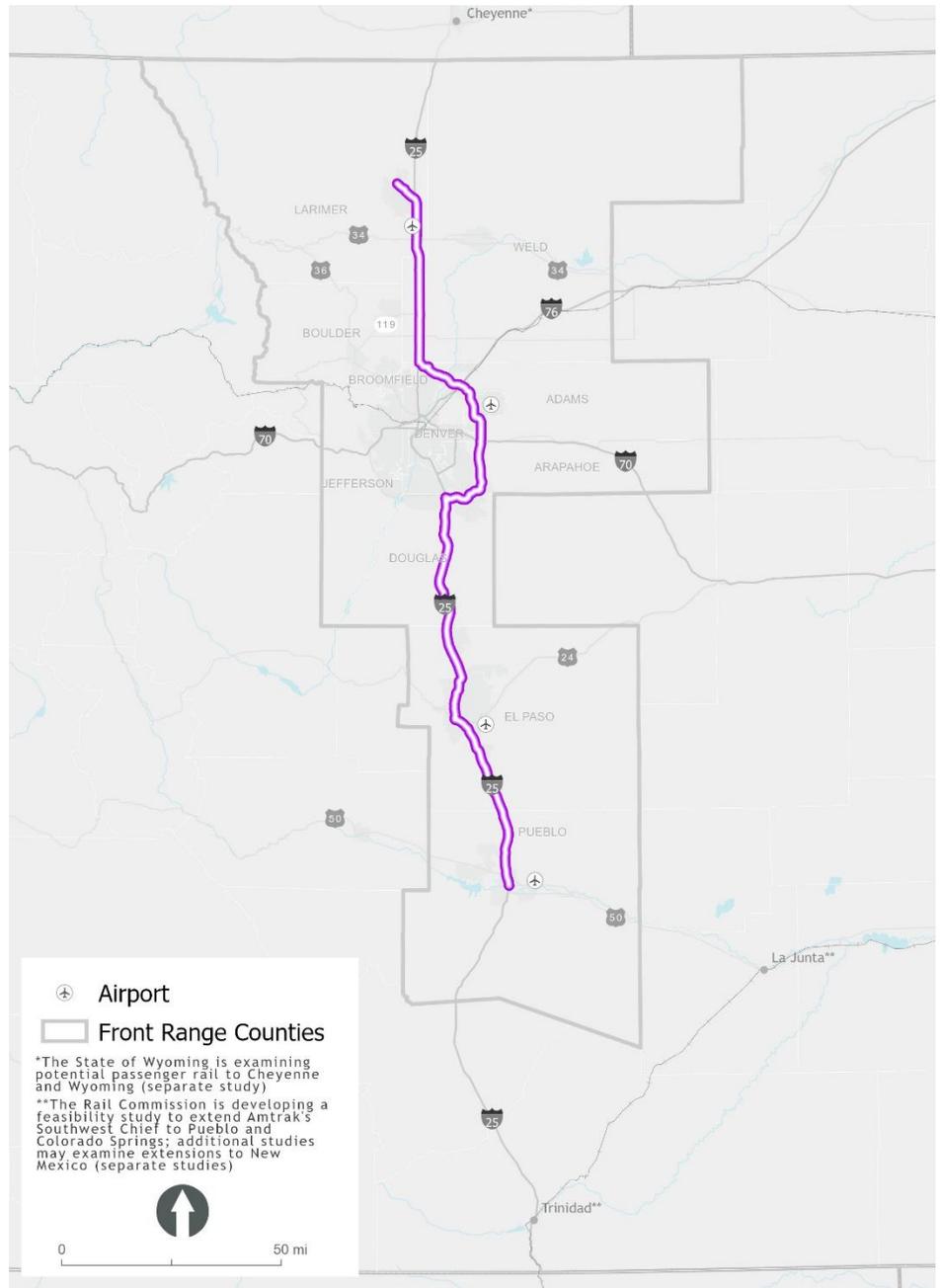


Figure 11: Best Bus

The Best Bus alternative includes a combination of improvements beyond a traditional No Action alternative. This alternative was developed during the Level 1 evaluation to compare passenger rail to an equivalent regional bus option with a fully realized expansion of the Bustang system. Therefore, the Best Bus alternative is comprised of reasonably foreseeable, planned transportation infrastructure and operational improvements; as well as a significant expansion of the Bustang system enhanced with multimodal stations/mobility hubs. Similar to the Level 1 rail corridor alternatives, the Best Bus alternative is not financially constrained.



Within the FRPR Project limits, Bustang currently provides direct and transfer intercity bus services for communities along the I-25 corridor between Pueblo and Fort Collins. Bustang’s North Line currently connects Fort Collins and Denver, with existing stations in Fort Collins, Loveland, and downtown Denver, and a planned station in Thornton (Figure 5: Bustang Intercity Bus Service and Routes in Colorado). The South Line connects Denver and Colorado Springs, with existing stations in downtown Denver, central Denver, Monument, and Colorado Springs, and a planned station in Lone Tree. The Lamar – Colorado Springs Outrider route provides service between Pueblo and Colorado Springs and provides intersecting service between Lamar and Pueblo, and the Alamosa – Pueblo Outrider route also intersects the FRPR Project limits. CDOT plans to add four new bus lines to its Bustang Outrider service in 2021, including Trinidad to Pueblo.

The Best Bus alternative assumes that, in the absence of FRPR, Bustang service in the Front Range would be substantially enhanced with new stations and increased service frequency to provide a robust intercity bus system. The Best Bus alternative would add stations in north Pueblo, north Colorado Springs (Briargate), Larkspur, Castle Rock, north Denver metro (SH 7/I-25), Longmont, and Berthoud.

Service frequency would be increased to hourly in the off-peak throughout the system, to match ultimate service levels assumed for FRPR. New feeder bus routes, created from existing Bustang routes, were assumed to have headways that match the Front Range Bustang headways, in order to provide timed connections with Bustang along the Front Range.

The Best Bus alternative does not provide passenger rail service and, therefore, does not meet the purpose and need for the project. However, this alternative was developed as a baseline to compare rail options with intercity bus.

3.2.3 LEVEL 1 EVALUATION RESULTS

Each of the Level 1 corridors was evaluated according to the evaluation criteria noted in Section 3.2.1. The Level 1 evaluation provided a broad review of opportunities and constraints, consistent with the fatal flaw analysis. Analysis of potential fatal flaws related to operational characteristics, environmental and community impacts, and public support are described in this section. No fatal flaws were identified for any of the corridors based on financial and economic characteristics. Additionally, no fatal flaws materialized for the feasibility and implementation categories related to constructability and potential operational conflicts. It must be noted that engineering and cost data were not available to provide more than a high level consideration of these criteria. The detailed assessment of these criteria was deferred to Level 2 when the corridors were refined. Financial and economic characteristics are listed as not applicable (N/A) in the Level 1 evaluation because infrastructure and operating costs were unknown at the corridor level. Previous studies have found that passenger rail along the Front Range could be cost competitive.¹ No additional data were developed in the Level 1 screening to suggest this would not be the case again. Section 5.0 of this report provides additional detail regarding the public input referenced in the Level 1 evaluation.

Of the five corridors considered, three were recommended to advance for further refinement in Level 2. Two corridors were determined to be fatally flawed due to feasibility or inability to meet the FRPR vision (Table 2). The three corridors recommended for Level 2 evaluation present a reasonable range of options for passenger rail. Each advancing corridor offers distinct advantages and tradeoffs, presenting a suite of options along each of the corridor segments. These segment options could be mixed, matched, and optimized to improve performance and/or reduce impacts. Appendix B contains the Level 1 Alternatives Evaluation Matrix.

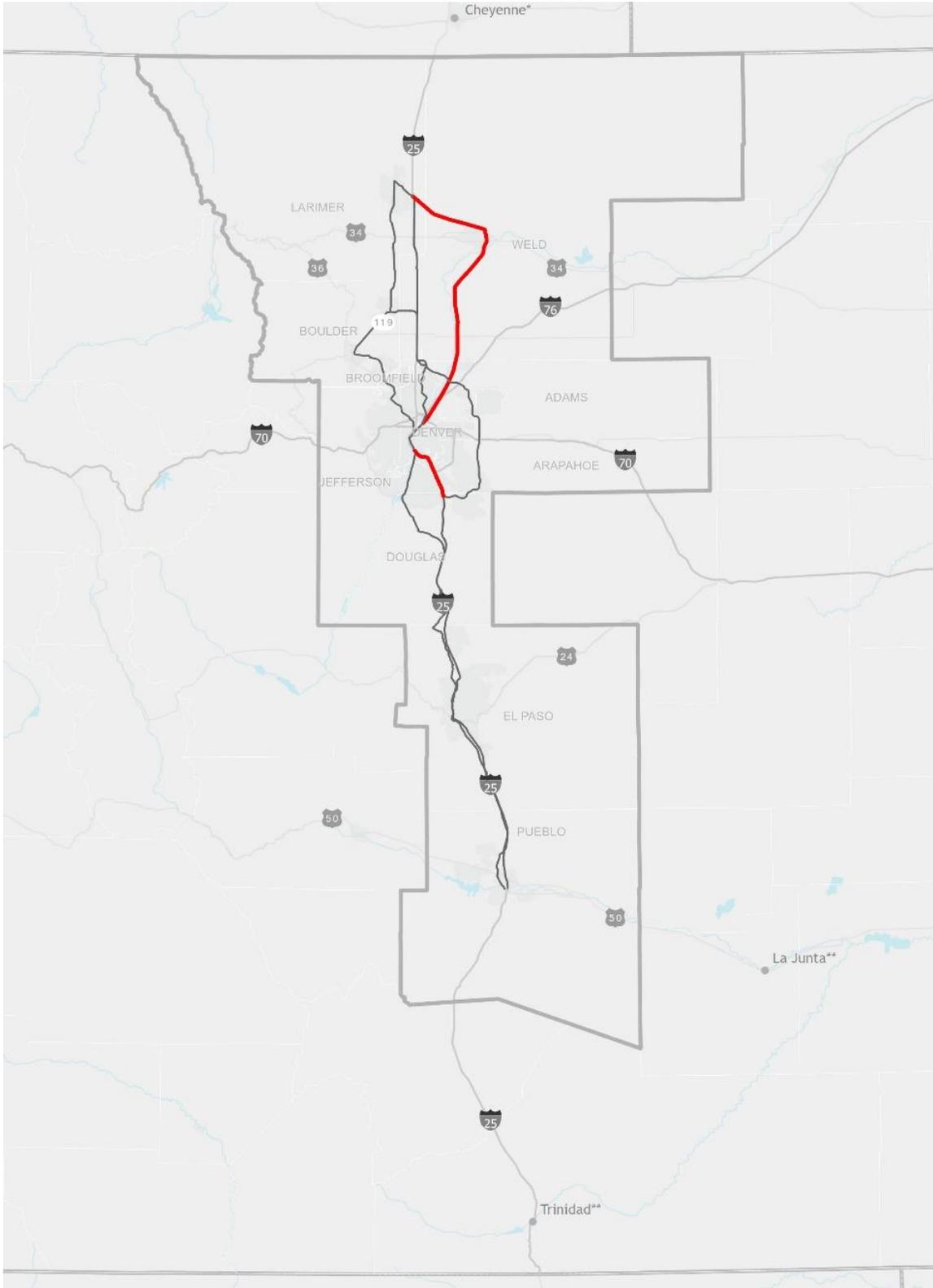
Table 2: Level 1 Evaluation Results

Corridor	Advanced or Not Advanced
Best Bus	Advanced (as baseline for comparison)
BNSF Rail Corridor	Advanced
Consolidated Mainline + Union Pacific /Great Western Rail Corridor	Not Advanced
BNSF + North I-25 EIS Commuter Rail Corridor	Advanced
I-25 + RTD Southeast Corridor	Not Advanced
I-25 + E-470 Highway Corridor	Advanced

Figure 12 illustrates the Level 1 corridors. The eliminated portions of corridors are shown in red. Portions that were coincident with other corridors are retained as elements of the alternatives that were advanced. The corridors that advanced from Level 1 to Level 2 are shown in Figure 13.

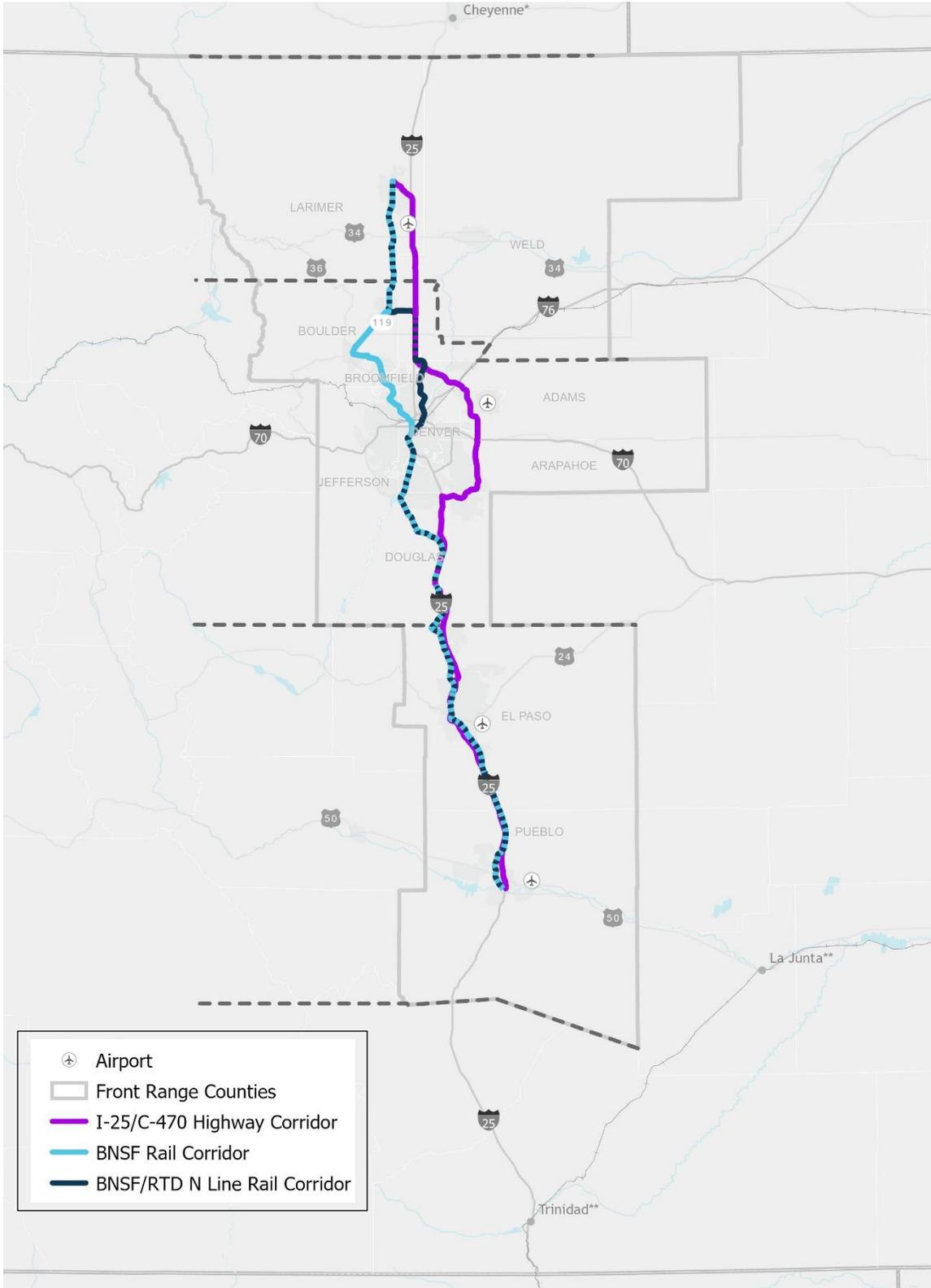
¹ Both the RMRA and ICS studies found high-speed rail along the Front Range would meet FRA criteria for economic feasibility (with a positive cost-benefit ratio).

Figure 12. Level 1 Corridors Eliminated



Note: Red lines indicate those that were eliminated based on Level 1 evaluation.

Figure 13. Level 1 Corridors Advanced to Level 2 Evaluation



LEVEL 1: BNSF RAIL CORRIDOR

The BNSF Rail Corridor was found to be feasible and supportive of the FRPR vision, as summarized in Table 3. It was recommended to advance to Level 2 refinements.

Table 3: Summary of BNSF Rail Corridor Level 1 Evaluation

Category	Criteria	Rating	Evaluation
 <p>Operational Characteristics</p>	Can passenger rail in this corridor serve major population and employment centers in the Front Range, based on 2045 projections?	Yes	<ul style="list-style-type: none"> Corridor serves Pueblo, Colorado Springs, Denver, Boulder, Fort Collins, and other locations. Corridor accessible to Monument, Air Force Academy, Fort Carson, Castle Rock, smaller communities between Denver and Fort Collins, and other locations.
 <p>Operational Characteristics</p>	Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?	Yes	<ul style="list-style-type: none"> Stations throughout the system would be sited to provide connections with other modes. End-of-line station at Pueblo would be integrated with future regional service south to Trinidad and New Mexico. End-of-line station at Fort Collins could be integrated with future regional service north to Cheyenne and other areas of Wyoming.
 <p>Community and Environmental</p>	Can passenger rail be implemented in this corridor without causing severe community disruption?	Yes	<ul style="list-style-type: none"> Corridor traverses five of Colorado's seven metropolitan statistical areas. Corridor follows existing freight rail corridor to minimize community impacts. Specific community impacts are unknown until alignments are selected within the corridor.
 <p>Community and Environmental</p>	Can passenger rail be implemented in this corridor without causing severe effects on natural resources?	Yes	<ul style="list-style-type: none"> Corridor includes several existing streams, parks, open spaces, wildlife habitat, and other environmental features. Corridor follows existing freight rail corridors to minimize environmental impacts. Specific environmental impacts are unknown until specific alignments are identified within the corridor.
 <p>Financial and Economic</p>	Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?	N/A	<ul style="list-style-type: none"> Alternative follows an existing transportation corridor with potential to share right-of-way in locations. Passenger rail expected to be similar in cost to other passenger rail alignments; at Level 1 this criterion is not a likely differentiator.
 <p>Feasibility and Implementation</p>	Is passenger rail constructible in this corridor?	Yes	<ul style="list-style-type: none"> Passenger rail is constructible within the freight right-of-way with additional adjacent right-of-way acquisition where needed.

Category	Criteria	Rating	Evaluation
 Feasibility and Implementation	Is passenger rail in this corridor compatible with existing freight rail or highway operations?	Yes	<ul style="list-style-type: none"> Passenger rail operation is compatible with existing BNSF freight rail operation.
 Feasibility and Implementation	Does public input indicate some level of support for passenger rail in this corridor?	Yes	<ul style="list-style-type: none"> Public input indicates high level of public support for passenger rail service and general support for options that leverage existing freight rail corridors. Past studies and input received through current scoping efforts have indicated public support for this corridor.

Additional analysis related to these evaluation ratings and conclusions is presented in the following sections.

BNSF RAIL CORRIDOR: OPERATIONAL CHARACTERISTICS

Can passenger rail in this corridor serve major population and employment centers in the Front Range, based on 2045 population projections?

Yes. In the South Segment, passenger rail would serve major population centers of Pueblo and Colorado Springs and would be easily accessible to Monument, the Air Force Academy, and Fort Carson military installations.

In the Central Segment, passenger rail would serve the major population centers of Denver and Boulder and would be accessible to Castle Rock. This corridor would not be easily accessible to the DTC or DEN Airport but could serve these areas through transfers with RTD (although access to the DTC would be circuitous from the south, requiring a transfer from central Denver). There are three major markets in the Denver metro area, best served with stations at Denver Union Station (DUS), DTC, and DEN Airport. None of the Level 1 corridors are capable of serving all three. In the North Segment, passenger rail would serve the major population center of Fort Collins and would be easily accessible to many communities (such as Boulder, Longmont, Berthoud, and Loveland) between Denver and Fort Collins.

Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?

Yes. Specific transit route connections are unknown because station locations are undetermined. Future transit operations would likely serve passenger rail station locations, even if they do not do so today. Transit agencies with more robust systems would have more flexibility. Development of FRPR would require working with each community to build on the opportunities and mobility hubs to increase transit access to FRPR.

In the South Segment, passenger rail could provide connections to Mountain Metropolitan Transit (MMT), which provides public transit in Colorado Springs and the Pikes Peak region. Key military installations in the area, including Fort Carson and the Air Force Academy, have expressed interest in connectivity to potential future FRPR. Connectivity to these installations would depend on reliable first and last mile connections within each installation. The end-of-line station in Pueblo would connect with or be sited with the proposed Southwest Chief Amtrak station and could be integrated with future regional service south to Trinidad and New Mexico. In the Central Segment, a station at DUS would likely produce the greatest connection to other modes based on current operations. Connecting into DUS would be difficult because it is a stub end station and is constrained

by development. Burnham Yard, if the property is acquired by CDOT, could be a feasible station location and hub for transit. South of central Denver, the shared Union Pacific/BNSF corridor provides good connections to existing and planned transit, and stations would be sited to provide connections to other modes. At the north end of the Central Segment, this corridor would provide a connection to other modes in Boulder and Longmont, including the future RTD B Line extension to Longmont (commuter rail).

In the North Segment, this corridor would have the opportunity to facilitate connections to existing and planned transit systems serving movement within and between communities along the US 287 corridor. Service would be integrated with bus service along US 287 and the planned North I-25 EIS recommended commuter rail in the BNSF rail corridor. The end-of-line station in Fort Collins would be integrated with MAX Bus Rapid Transit (BRT) service and could be integrated with future regional service north to Cheyenne. (Once FRPR is operational, changes to existing and planned local services would be expected to change to complement feeder service and/or have layered service that could encompass commuter rail and passenger rail.)

BNSF RAIL CORRIDOR: COMMUNITY AND ENVIRONMENTAL IMPACTS

Can passenger rail be implemented in this corridor without causing severe community disruption?

Yes. This corridor traverses many developed communities, including five of Colorado's seven metropolitan statistical areas: Denver-Aurora-Lakewood, Colorado Springs, Fort Collins, Boulder, and Pueblo, as well as smaller communities between these population centers. Implementation and operation of passenger rail within the corridor would require some right-of-way acquisition through communities for passenger rail operation (including grade separations at some at-grade crossings). Implementation of passenger rail would increase impacts associated with additional rail movements and speeds, change existing local transportation systems, require right-of-way acquisition, and cause proximity impacts. Community disruption would not be so severe as to eliminate this corridor from further study. Affected communities would receive some benefits from access to passenger service. Specific benefits include a reduction in noise and other proximity impacts when compared to the existing freight rail operations. The implementation of quiet zones is anticipated, which would reduce train horn noise from freight trains as well as the passenger trains. Severe community disruption is minimized because the corridor follows an existing transportation corridor (the BNSF rail corridor), which has the capacity to accommodate passenger rail traffic in some highly constrained areas.

Can passenger rail be implemented in this corridor without causing severe effects on natural resources?

Yes. This corridor follows an existing freight rail corridor and would not require long sections of greenfield track through undeveloped areas, limiting severe impacts. Although not considered a fatal flaw, the corridor would traverse some undeveloped areas. Sections of the corridor run parallel to, and would likely have some additional impact to streams, parks, open spaces, and wildlife habitat that are currently impacted by freight rail operations, necessitating mitigation. Impacts and mitigation are evaluated further in Level 2.

BNSF RAIL CORRIDOR: FINANCIAL AND ECONOMIC FACTORS

Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?

Yes. The corridor follows an existing transportation corridor with potential to share right-of-way in locations. This corridor is expected to be similar in cost to other passenger rail alignments. Engineering details to formulate cost estimates are not available at Level 1. Cost effectiveness is evaluated further in Level 2.

BNSF RAIL CORRIDOR: FEASIBILITY AND IMPLEMENTATION

Is passenger rail constructible in this corridor?

Yes. Passenger rail is likely constructible within the freight right-of-way with some additional adjacent right-of-way acquisition. There are areas of narrow, constrained right-of-way. The freight right-of-way generally ranges from 100 feet in urban areas to 200 feet in rural areas along the corridor, although locations of narrower and wider right-of-way are present throughout the corridor. Existing freight rail is occasionally double tracked within the right-of-way, reducing the right-of-way that could be available for passenger rail. Many of the locations where freight right-of-way is constrained are in the more densely developed communities where land use and roadway conflicts would be greater. Additionally, while the freight corridor is designed with gentle vertical grades compatible with the needs of higher-speed passenger rail, horizontal curves in some locations are too tight for effective passenger rail operation and speeds without veering away from the right-of-way. Some new grade separations would likely be need to accommodate passenger rail speeds.

Specific areas of constraint need to be considered in each of the segments during Level 2 refinements. In the South Segment, important constraints include access into and through Colorado Springs and tight horizontal curves along the rail line at the Palmer Divide north of Monument. In the Central Segment, the connection to DUS (with or without the CDOT acquisition of Burnham Yard) is technically challenging but is feasible. Access may be possible from the west end in the vicinity of the current light rail station, through a dead-end stub, substantial fly-over structure, or access from the light rail station locations (CDOT, 2017a). Between Denver and Boulder, numerous horizontal curves on the BNSF right-of-way create challenges for effective passenger rail operation. In the North Segment, between Longmont and Fort Collins, existing freight right-of-way is narrow and constrained through sections of the communities of Longmont, Berthoud, and Loveland where residential development and downtown areas abut the freight right-of-way. For the most part, the horizontal and vertical geometry is conducive to passenger rail operations, although there are a couple of localized areas where horizontal curves could be broadened for improved operations.

Is passenger rail in this corridor compatible with existing freight rail or highway operations?

Yes. Passenger rail operation is compatible with existing BNSF freight rail operation, provided FRPR adheres to BNSF design standards and requirements. Key standards include physical separation requirements and established commuter principles that commuter operation not degrade BNSF's freight service, negatively affect BNSF's freight customers or BNSF's ability to provide customers with service (BNSF, 2007). The Federal Railroad Administration (FRA) has established standards for track, equipment, crossings, and operating practices for shared use agreements (Mat Dolata, 2005). Because FRPR is planning to use FRA-compliant equipment, it is likely that shared right-of-way or track can be negotiated with the freight rail lines.

In the South Segment, most of the freight corridor between Pueblo and Fountain is double tracked. Freight volumes may be low enough in some areas (approximately 20 trains/day) for passenger rail interoperation. From the El Paso/Douglas County line to south Denver, the freight corridor is double tracked. The section from Fountain to the El Paso/Douglas County line has been single track since the late 1970s and will require additional right-of-way to accommodate passenger and freight rail operations. In the Central Segment, BNSF and Union Pacific have stated their freight lines have capacity to accommodate some passenger rail operation. There would be the potential for interoperation on RTD's future B Line extension to Longmont (commuter rail) if it were built concurrently with FRPR. Some locations along the North Segment would require additional right-of-way to add passenger rail tracks. Shared track use may be possible depending on freight rail operational needs. Existing freight traffic on this portion of the BNSF is 10 to 12 trains per day.

Does public input indicate some level of support for passenger rail in this corridor?

Yes. Statewide transportation planning and outreach, surveys, and scoping for the FRPR Project indicate a high level of public support for passenger rail service and general support for options that leverage existing freight rail corridors. Past studies and input received through current scoping efforts have indicated public support for this corridor.

In the Central Segment, stakeholders have indicated support for FRPR. Some support is predicated on the integration of the future RTD B Line extension into the alignment. Past project efforts have demonstrated support for commuter rail operations for the North I-25 corridor and the B Line alignment. Both of these projects would focus on serving local communities. The RTD B Line alignment is a 41-mile commuter rail line that will connect downtown Denver (DUS) to downtown Longmont, passing through North Denver, Adams County, Westminster, Broomfield, Louisville, and Boulder. The first 6.2-mile segment from DUS to south Westminster (71st Avenue/Lowell Boulevard) is now operating. The remainder of the line to Longmont is planned to be built as funding becomes available; however, this is not anticipated to occur before 2040.

In the Denver metro area, stakeholders have expressed interest in accessing the DTC by FRPR. This corridor would require a bus or light rail transfer to access the DTC market. In the North Segment, input received through past studies and FRPR scoping have indicated public support particularly for the portion of this corridor that follows the North I-25 EIS (CDOT, 2011) commuter rail corridor in the North Segment. The North I-25 EIS preferred alternative included a recommendation for commuter rail along the US 287/BNSF line. The study documented that residents repeatedly reported that transit service was needed between Longmont, Loveland, Denver, Boulder, and southwest Weld Counties. Congestion on I-25 was seen as limiting access to businesses and participation in cultural events in metro Denver. Agency input suggested two alignment variations to this corridor to be considered in Level 2 refinements. The first alignment variation would follow the US 287 highway corridor between Broomfield and Longmont, shortening the alignment and traveling east of, rather than through, Boulder. The second suggested alignment variation would follow the Great Western rail line from the BNSF corridor to I-25, either from Longmont or Loveland, to minimize the impacts of traveling through residential communities. From Longmont, the Great Western rail line travels northeast and intersects the I-25 corridor in the vicinity of Mead. From Loveland, the Great Western rail line travels east and intersects the I-25 corridor south of the US 34 interchange. These variations and tradeoffs between direct access of routes and community impacts are evaluated in the Level 2 analysis.

LEVEL 1: CONSOLIDATED MAINLINE WITH UNION PACIFIC/GREAT WESTERN RAIL CORRIDOR

Level 1 analysis concluded that the Consolidated Mainline with Union Pacific/Great Western Rail Corridor was not supportive of the FRPR vision. The corridor does not serve major population and employment centers now or into 2045, as summarized in Table 4. Therefore, it was not recommended to advance to Level 2.

Table 4: Summary of Consolidated Mainline with Union Pacific/Great Western Rail Corridor Level 1 Evaluation

Category	Criteria	Rating	Evaluation
 Operational Characteristics	Can passenger rail in this corridor serve major population and employment centers in the Front Range, based on 2045 population projections?	No	<ul style="list-style-type: none"> Corridor bypasses many populated communities in the northern Denver area. Corridor is too far northeast to efficiently serve the existing Northern Colorado communities west of I-25 and the anticipated employment and population growth to the west along I-25.

Category	Criteria	Rating	Evaluation
 Operational Characteristics	Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?	No	<ul style="list-style-type: none"> In the North Segment, the corridor presents fewer opportunities to connect with existing and planned transit than corridors on the west side of I-25.
 Community and Environmental	Can passenger rail be implemented in this corridor without causing severe community disruption?	Yes	<ul style="list-style-type: none"> Corridor follows existing freight rail corridors to minimize community impacts; community impacts are less in North Segment. Specific community impacts are unknown until an alignment is developed within the corridor.
 Community and Environmental	Can passenger rail be implemented in this corridor without causing severe effects on natural resources?	Yes	<ul style="list-style-type: none"> Sections of the alignment are physically located parallel to important natural resources. Resources could be impacted and require mitigation, including streams, parks, open spaces, and wildlife habitat. Corridor follows existing freight rail corridors to minimize environmental impacts. Specific natural resource impacts are unknown until an alignment is developed within the corridor.
 Financial and Economic	Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?	N/A	<ul style="list-style-type: none"> Corridor follows an existing transportation corridor with potential to share right-of-way in locations. Passenger rail expected to be similar in cost to other passenger rail alignments; at Level 1 this criterion is not a likely differentiator.
 Feasibility and Implementation	Is passenger rail constructible in this corridor?	Yes	<ul style="list-style-type: none"> Passenger rail is constructible within the freight right-of-way with additional adjacent right-of-way acquisition where needed.
 Feasibility and Implementation	Is passenger rail in this corridor compatible with existing freight rail or highway operations?	Yes	<ul style="list-style-type: none"> Passenger rail is compatible with existing Union Pacific and Great Western freight operation.
 Feasibility and Implementation	Does public input indicate some level of support for passenger rail in this corridor?	No	<ul style="list-style-type: none"> In the North Segment, public support and interest favor FRPR alignments along I-25 and west on the BNSF freight corridor considerably over the Union Pacific/Great Western Rail Corridor.

Additional analysis related to these evaluation ratings and conclusions is presented in the following sections.

CONSOLIDATED MAINLINE WITH UNION PACIFIC/GREAT WESTERN RAIL CORRIDOR: OPERATING CHARACTERISTICS

Can passenger rail in this corridor serve major population and employment centers in the Front Range, based on 2045 projections?

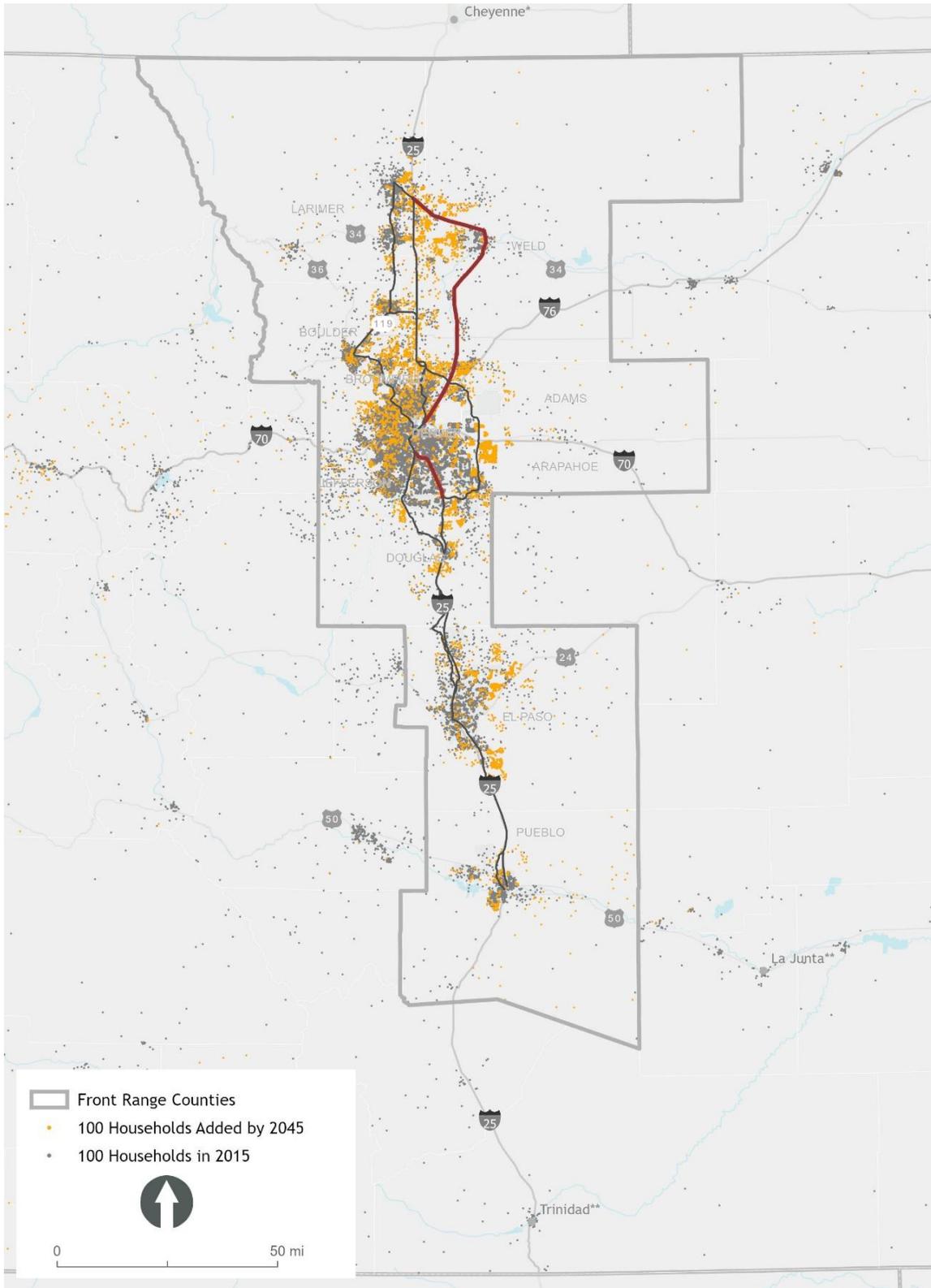
No. The portion of this corridor north of DUS (central Denver) is not suitable for FRPR because it does not serve key 2045 population or employment centers. Figure 14 and Figure 15 show the population and employment densities along the Front Range and illustrate how this corridor alignment misses key population centers in the FRPR Central and North Segments.

In the Central Segment, the Union Pacific alignment running northeast out of the Denver metropolitan area is unsuitable as a backbone for FRPR because it bypasses the populated communities near I-25 and along the US 287/BNSF corridor north of Denver. For most of its route in the North and Central Segments between Denver and Greeley, the corridor is sparsely populated and does not align with major population or employment centers. The majority of the existing and projected population and employment in the North Segment can be found on the US 287/BNSF corridor and surrounding I-25, rather than along the US 85 and Union Pacific corridor. While there is a large population and employment center in Greeley, the population and employment is less dense along the Union Pacific corridor between Greeley and Denver than along the US 287/BNSF corridor between Fort Collins and Denver, as seen in Figure 14 and Figure 15. The North I-25 EIS (CDOT, 2011) considered commuter rail along the Union Pacific corridor and concluded that it was not reasonable because of the out-of-direction travel required to serve population centers to the west.

In the North Segment, the North Front Range MPO (NFRMPO) 2045 Regional Transit Element (North Front Range MPO, 2018) considered the Great Western portion (Class III short line railroad) of this corridor for regional rail (Greeley-Fort Collins, Greeley-Loveland, and Greeley-Windsor) for its potential to integrate with other local transit services and travel modes in the Northern Colorado region. While it could provide an important regional connection between Greeley and Fort Collins, including Windsor, it is located too far northeast to efficiently serve the existing Northern Colorado communities west of I-25 and the anticipated employment and population growth to the west along I-25; it is not suitable as a backbone for serving northern Colorado communities or as part of an interregional Front Range passenger rail system. The North I-25 EIS considered commuter rail along the Union Pacific corridor and concluded that it was not reasonable because of the out-of-direction travel required to serve population centers to the west (CDOT, 2011). In the Central Segment, this corridor would not be easily accessible to the DTC or DEN Airport but could serve these areas through transfers with RTD. There are three major markets in the Denver metropolitan area, best served with stations at DUS, DTC, and DEN Airport. None of the Level 1 corridors are capable of serving all three.

The South Segment is viable and retained and represented as a component of the other freight rail corridor alternatives. The shared Union Pacific/BNSF corridor is feasible for passenger rail. In the South Segment, passenger rail would serve major population centers of Pueblo and Colorado Springs and would be easily accessible to Monument, the Air Force Academy and Fort Carson military installations.

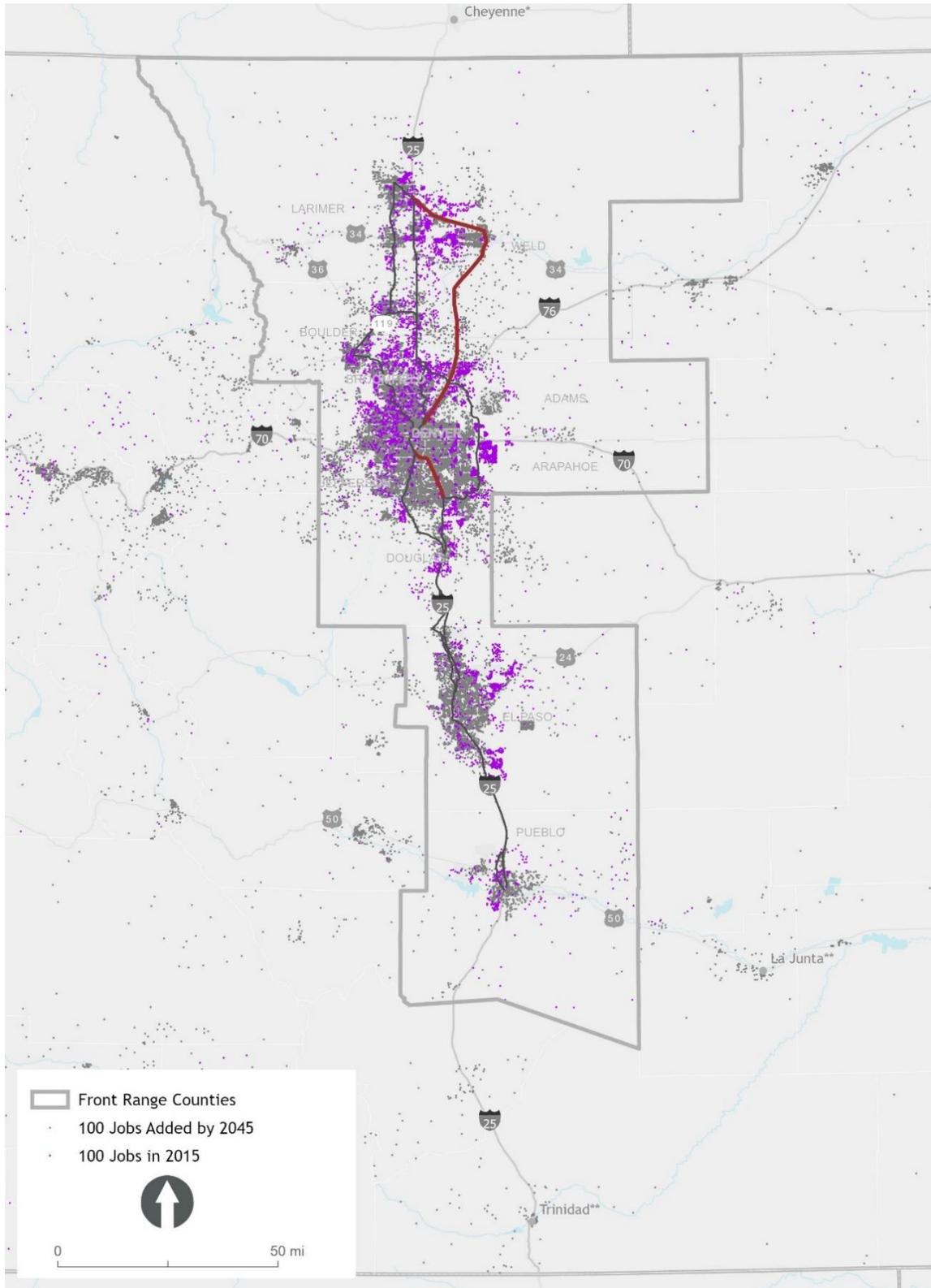
Figure 14: Existing and Projected Population Density along the Front Range



Source: CDOT Statewide Travel Demand Model

Note: Each dot = 100 households. Grey dots = existing and yellow dots = projected new households (2045). Fatally flawed segments are indicated in red.

Figure 15: Existing and Projected Employment Density on Front Range



Source: CDOT Statewide Travel Demand Model

Note: Each dot = 100 jobs. Grey dots = existing and purple dots = projected growth by 2045. Fatally flawed segments are indicated in red.

Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?

No. This corridor presents fewer opportunities to connect with established transit agencies and planned transit operations than other corridors in the Central and North Segments.

In the north end of the Central Segment, this corridor would not provide connections to existing or planned transit in the population and employment centers, such as Longmont, nor would it provide a connection to the RTD B Line. While the Union Pacific alignment north of Denver could connect to the southernmost RTD N Line stations at DUS, National Western Center, and Commerce City, the corridor would veer from the populated areas to the east would not improve or leverage ridership on either FRPR or RTD's system.

In the North Segment, this corridor would not connect with existing and planned transit systems along the US 287/BNSF and I-25 corridors, such as bus service along US 287. The corridor would provide the opportunity for a connection to future commuter bus service along US 85. However, this planned system serves fewer communities and connects to fewer other transit systems than those along the US 287/BNSF and I-25 corridors. The Great Western alignment focuses on east-west connections in northern Colorado and provides opportunities to connect to other services but does not provide the backbone for higher-priority and higher-ridership north-south routes, both rail and highway. While the east-west connections have considerable regional benefit, they are of limited value as a north-south backbone for FRPR. However, the Great Western alignment could integrate well with the end-of-line station in Fort Collins. The Fort Collins station would be integrated with MAX BRT service and could be integrated with future regional service north to Cheyenne.

CONSOLIDATED MAINLINE WITH UNION PACIFIC/GREAT WESTERN RAIL CORRIDOR: COMMUNITY AND ENVIRONMENTAL IMPACTS

Can passenger rail be implemented in this corridor without causing severe community disruption?

Yes. This corridor traverses many developed communities, including five of Colorado's seven metropolitan statistical areas: Denver-Aurora-Lakewood, Colorado Springs, Fort Collins, Greeley, and Pueblo, as well as smaller communities between these population centers. Implementation and operation of passenger rail within the corridor would require right-of-way acquisition through communities (including some grade separations). Additional impacts are anticipated associated with increased rail movements and speeds. Because this corridor bypasses populated areas north of the Denver metropolitan area, its effects on communities would be less than the BNSF Rail Corridor.

Can passenger rail be implemented in this corridor without causing severe effects on natural resources?

Yes. This corridor follows an existing freight rail corridor and would not require long sections of greenfield passenger rail track through undeveloped areas, limiting severe impacts. However, the corridor would traverse some undeveloped areas. Sections of the alignment are physically located parallel to important natural resources and would likely have some additional impact to streams, parks, open spaces, and wildlife habitat that are currently impacted by freight rail operations.

CONSOLIDATED MAINLINE WITH UNION PACIFIC/GREAT WESTERN RAIL CORRIDOR: FINANCIAL AND ECONOMIC FACTORS

Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?

NA. Cost is not anticipated to differentiate this corridor or make it more feasible, given other fatal flaws.

CONSOLIDATED MAINLINE WITH UNION PACIFIC/GREAT WESTERN RAIL CORRIDOR: FEASIBILITY AND IMPLEMENTATION

Is passenger rail constructible in this corridor?

Yes. Passenger rail is constructible within freight right-of-way with additional adjacent right-of-way acquisition where needed (similar to the BNSF Rail Corridor). While the geometry of the corridor in the North Segment is favorable to passenger rail operations, its location away from population and employment centers is not a feasible route to meet FRPR vision.

Is passenger rail in this corridor compatible with existing freight rail or highway operations?

Yes. Passenger rail operation would be compatible with existing freight operations with the same caveats as the BNSF Rail Corridor. While not a fatal flaw, the Union Pacific portion of the corridor has less capacity to accommodate passenger rail in the North and north Central Segments. The Union Pacific corridor's freight traffic is approximately 17 trains per day compared to the lower 10 to 12 trains per day on the BNSF corridor. The Union Pacific corridor generally runs parallel to US 85 through much of the North and north Central Segments of the rail corridor, and CDOT's US 85 Planning and Environmental Linkages (PEL) Study (CDOT, 2017b) identified numerous conflicts with US 85 operations from the railroad proximity. Passenger rail in this corridor may further those conflicts or present an opportunity to mitigate those conflicts.

The Class III Great Western Railway provides regional freight services to customers in Colorado and provides long-haul transfers to intersect with the Class I Union Pacific and BNSF railroads. It is unknown at this time if the Great Western Railway would be open to interoperability with passenger rail.

Does public input indicate some level of support for passenger rail in this corridor?

No. The FRPR scoping efforts to date have neither identified public support for, nor strong opposition to, this corridor.

In the North Segment, public support and interest favor FRPR corridors along I-25 or to the west on the BNSF freight corridor considerably over the Union Pacific/Great Western Rail Corridor. Input from the segment coalitions for the North Segment held November 19, 2019, and January 21, 2020, emphasized the need for a FRPR corridor that aligns with population centers. Stakeholders expressed concerns at these meetings that a commuter rail system may result in a movement of labor to other cities, thereby affecting economic development. The City of Greeley is apprehensive about becoming a bedroom community, where people live in the city, but commute to other municipalities to work.

The Union Pacific/Great Western Rail Corridor was evaluated and set aside by the North I-25 EIS (CDOT, 2011), the Rocky Mountain Rail Authority (RMRA) Study (Rocky Mountain Rail Authority, 2010), and the ICS Study (CDOT, 2014) because of its inability to serve major population and employment centers and resulting lack of community support. The stakeholder input from the RMRA Study scoping meeting highlighted the need to consider local land use and development plans in relation to station location options (Rocky Mountain Rail Authority, 2010).

The North I-25 EIS (CDOT, 2011) identified and evaluated multimodal transportation improvements along approximately 60 miles of the I-25 corridor from the Fort Collins-Wellington area to Denver. The EIS addressed regional and interregional movement of people, goods, and services along I-25. The preferred alternative included the following:

- Commuter Rail – Commuter rail service with nine stations connecting Fort Collins to Longmont using the BNSF right-of-way, generally paralleling SH 119 then County Road 7 and tying into the RTD N Line in Thornton, providing service to downtown Denver.
- Commuter Bus – Commuter bus service with eight stations along US 85 connecting Greeley to downtown Denver.

The US 85 PEL underlined railroad proximity as a problem in the need statement (CDOT, 2017b). The study stated that close proximity of Union Pacific and US 85 could negatively affect the operations of US 85, restricting access and travel, causing substantial queues and raising safety concerns. Because of these concerns, the public may not support passenger rail on this corridor. While the need statement did mention the likelihood that corridor demand for public transit may increase, this study did not recommend commuter or passenger rail for the corridor.

The NFRMPO 2045 Regional Transit Element (North Front Range MPO, 2018) considered the Great Western right-of-way for regional rail (Greeley-Fort Collins, Greeley-Loveland, and Greeley-Windsor) for its potential to integrate with other local transit services and travel modes in the northern Colorado region. Considering the costs, ridership estimates, and public demand for services, regional rail using the Great Western rail line was considered a low priority compared to other bus transit investments in the region. If this regional rail were to be implemented as a result of the plan, it could provide a connection to FRPR.

In the South and Central Segments, there is a high level of public support for passenger rail service and general support for options that leverage existing freight rail corridors.

LEVEL 1: BNSF + NORTH I-25 EIS COMMUTER RAIL CORRIDOR

The BNSF + North I-25 EIS Commuter Rail Corridor was found to be feasible and supportive of the FRPR vision, as summarized in Table 5. It was recommended to advance to Level 2.

Table 5: Summary of BNSF + North I-25 EIS Commuter Rail Corridor Level 1 Evaluation

Category	Criteria	Rating	Evaluation
 Operational Characteristics	Can passenger rail in this corridor serve major population and employment centers in the Front Range, based on 2045 projections?	Yes	<ul style="list-style-type: none"> • Corridor serves Pueblo, Colorado Springs, Denver, Fort Collins, and other locations. • Corridor accessible to Monument, Air Force Academy, Fort Carson, Castle Rock, smaller communities between Denver and Fort Collins, and other locations.
 Operational Characteristics	Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?	Yes	<ul style="list-style-type: none"> • Stations throughout the system would be sited to provide connections with other modes. • End-of-line station at Pueblo could be integrated with future regional service south to Trinidad and New Mexico. • End-of-line station at Fort Collins could be integrated with future regional service north to Cheyenne and other areas of Wyoming.

Category	Criteria	Rating	Evaluation
 Community and Environmental	Can passenger rail be implemented in this corridor without causing severe community disruption?	Yes	<ul style="list-style-type: none"> Corridor follows existing freight rail and RTD rail corridors to minimize community impacts. Specific community impacts are unknown until alignments are selected within the corridor.
 Community and Environmental	Can passenger rail be implemented in this corridor without causing severe effects on natural resources?	Yes	<ul style="list-style-type: none"> Sections of the alignment are physically located parallel to important natural resources and would likely impact streams, parks, open spaces, and wildlife habitat necessitating mitigation. Corridor follows existing freight rail and RTD rail corridors to minimize environmental impacts. Specific natural resource impacts are unknown until alignments are selected within the corridor.
 Financial and Economic	Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?	N/A	<ul style="list-style-type: none"> Alternative follows an existing transportation corridor with potential to share right-of-way in locations. Passenger rail expected to be similar in cost to other passenger rail alignments; at Level 1 this criterion is not a likely differentiator.
 Feasibility and Implementation	Is passenger rail constructible in this corridor?	Yes	<ul style="list-style-type: none"> Passenger rail is constructible within the freight and RTD rights-of-way with additional adjacent right-of-way acquisition where needed.
 Feasibility and Implementation	Is passenger rail in this corridor compatible with existing freight rail or highway operations?	Yes	<ul style="list-style-type: none"> Passenger rail operation is compatible with existing BNSF freight rail operation and RTD's N Line operations.
 Feasibility and Implementation	Does public input indicate some level of support for passenger rail in this corridor?	Yes	<ul style="list-style-type: none"> Public input indicates a high level of public support for passenger rail service and general support for options that leverage existing freight rail corridors. Past studies and input received through current scoping efforts have indicated public support for this corridor, particularly portion that follows the North I-25 EIS (CDOT, 2011) commuter rail corridor.

Additional analysis related to these evaluation ratings and conclusions is presented in the following sections.

BNSF + NORTH I-25 EIS COMMUTER RAIL CORRIDOR: OPERATIONAL CHARACTERISTICS

Can passenger rail in this corridor serve major population and employment centers in the Front Range, based on 2045 projections?

Yes. The BNSF + North I-25 EIS Commuter Rail Corridor would serve the same populations as the BNSF Rail Corridor in the South and North Segments. The corridor would differ in the Central Segment, north of central Denver, where it would serve communities along the RTD N Line. This corridor would not serve the planned RTD B Line extension, including Boulder.

Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?

Yes. As with the BNSF Rail Corridor, the North I-25 EIS Commuter Rail Corridor would integrate with RTD's system with some common stations. During Level 2, station areas will continue to be refined to optimize transit connections and land use compatibility.

BNSF + NORTH I-25 EIS COMMUTER RAIL CORRIDOR: COMMUNITY AND ENVIRONMENTAL IMPACTS

Can passenger rail be implemented in this corridor without causing severe community disruption?

Yes. As with the BNSF Rail Corridor, the BSNF + North I-25 EIS Commuter Rail Corridor traverses many developed communities, including four of Colorado's seven metropolitan statistical areas: Denver-Aurora-Lakewood, Colorado Springs, Fort Collins, and Pueblo, as well as smaller communities between these population centers. Implementation and operation of passenger rail within the corridor would likely require some right-of-way acquisition through communities (including some new grade separations). The increased rail movements and speeds would likely result in additional impact but the implementation of quiet zones is anticipated, which would reduce train horn noise from freight trains as well as the passenger trains.

Can passenger rail be implemented in this corridor without causing severe effects on natural resources?

Yes. Within the Denver area, this corridor primarily follows existing highway and transit corridors and would not require long sections of greenfield track through undeveloped areas, which limit severe impacts. Outside the Denver area, the corridor would traverse some undeveloped areas. Sections of the alignment are physically located parallel to important resources. Passenger rail would likely result in additional impacts necessitating mitigation to streams, parks, open spaces, and wildlife habitat in areas that are currently impacted by freight rail operations.

BNSF + NORTH I-25 EIS COMMUTER RAIL CORRIDOR: FINANCIAL AND ECONOMIC FACTORS

Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?

Yes. The alternative follows an existing transportation corridor with potential to share right-of-way in locations. It is expected to be similar in cost to other passenger rail alignments. Engineering details to formulate cost estimates were not available at Level 1. Cost effectiveness is evaluated further in Level 2.

BNSF + NORTH I-25 EIS COMMUTER RAIL CORRIDOR: FEASIBILITY AND IMPLEMENTATION

Is passenger rail constructible in this corridor?

Yes. Similar to the BNSF Rail Corridor, passenger rail is constructible within freight and RTD right-of-way with additional adjacent right-of-way acquisition. This corridor has similar constraints to the BNSF Rail Corridor with one exception. The RTD N Line segment includes a long, single track viaduct. This segment does not have capacity for shared operations, and a similar costly structure would be needed for FRPR adjacent to RTD’s operations.

Is passenger rail in this corridor compatible with existing freight rail or highway operations?

Yes. Passenger rail operation would be compatible with existing freight operations with the same caveats as the BNSF Rail Corridor. Full build out of RTD’s N Line would require FRPR to construct new track to be compatible with RTD operations.

Does public input indicate some level of support for passenger rail in this corridor?

Yes. As with the BNSF Rail Corridor, statewide transportation planning and outreach, surveys, and scoping for this project indicate high level of public support for passenger rail service and general support for options that leverage existing freight rail corridors. This corridor incorporates the preferred alignment from the North I-25 EIS (CDOT, 2011) and associated Commuter Rail update. The EIS documented area residents’ desire for transit service between Longmont, Loveland, Denver, and other communities north of Denver.

LEVEL 1: I-25 + RTD SOUTHEAST CORRIDOR THROUGH DENVER CORRIDOR

Level 1 analysis concluded that the I-25 + RTD Southeast Corridor through Denver Corridor was not feasible for FRPR because of the significant community disruption and disruption to RTD service that would occur along RTD’s Southeast Corridor. Therefore, it was not recommended to advance to Level 2, as summarized in Table 6.

Table 6: Summary of I-25 + RTD Southeast Corridor Level 1 Evaluation

Category	Criteria	Rating	Evaluation
 Operational Characteristics	Can passenger rail in this corridor serve major population and employment centers in the Front Range, based on 2045 projections?	Yes	<ul style="list-style-type: none"> Corridor serves Pueblo, Colorado Springs, Denver, Fort Collins, and other locations. Corridor accessible to Monument, Air Force Academy, Fort Carson, Castle Rock, and other locations. Corridor indirectly serves smaller communities between Denver and Fort Collins (compared to the US287/BNSF line).
 Operational Characteristics	Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?	Yes	<ul style="list-style-type: none"> Stations throughout the system would be sited to provide connections with other modes and integrate with planned mobility hubs along I-25. End-of-line station at Pueblo could be integrated with future regional service south to Trinidad and New Mexico.

Category	Criteria	Rating	Evaluation
			<ul style="list-style-type: none"> End-of-line station at Fort Collins could be integrated with future regional service north to Cheyenne and other areas of Wyoming.
 Community and Environmental	Can passenger rail be implemented in this corridor without causing severe community disruption?	No	<ul style="list-style-type: none"> Corridor would substantially disrupt the most densely developed and constrained right-of-way in the Colorado and would have severe community impacts. Corridor follows the I-25 and RTD Southeast LRT Corridor where dense development is present adjacent to the corridor.
 Community and Environmental	Can passenger rail be implemented in this corridor without causing severe effects on natural resources?	Yes	<ul style="list-style-type: none"> Sections of the alignment outside of central Denver parallel and would likely impact streams, parks, open spaces, and wildlife habitat necessitating mitigation. Corridor follows I-25 and RTD LRT corridors to minimize environmental impacts. Specific environmental impacts are unknown until alignments are selected within the corridor.
 Financial and Economic	Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?	N/A	<ul style="list-style-type: none"> Alternative follows an existing transportation corridor with potential to share right-of-way in locations. Passenger rail expected to be similar in cost to other passenger rail alignments; at Level 1 this criterion is not a likely differentiator.
 Feasibility and Implementation	Is passenger rail constructible in this corridor?	No	<ul style="list-style-type: none"> It is not feasible to construct new passenger rail service through the RTD Southeast Corridor portion of the I-25 corridor through Denver due to operational challenges and disruption to RTD service on the light rail corridor.
 Feasibility and Implementation	Is passenger rail in this corridor compatible with existing freight rail or highway operations?	No	<ul style="list-style-type: none"> Operating passenger rail service with RTD on the Southeast Corridor is incompatible with RTD service and not feasible.
 Feasibility and Implementation	Does public input indicate some level of support for passenger rail in this corridor?	Yes	<ul style="list-style-type: none"> Past studies and input received through this current scoping efforts have indicated public support for this corridor and its access to DUS and DTC. Stakeholders have concerns regarding passenger rail approval process and long travel times through Denver that affect system efficiency and ridership.

Additional analysis related to these evaluation ratings and conclusions is presented in the following sections.

I-25 + RTD SOUTHEAST CORRIDOR THROUGH DENVER CORRIDOR: OPERATIONAL CHARACTERISTICS

Can passenger rail in this corridor serve major population and employment centers in the Front Range, based on 2045 projections?

Yes. This corridor would serve the same communities as the I-25 + E-470 Highway Corridor in the South and North Segments. In the Central Segment, this corridor passes through the most densely populated neighborhoods in Denver and serves both downtown Denver and the DTC.

Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?

Yes. This corridor would have the highest degree of integration with RTD in the Central Segment, following RTD's busiest rail line and most central destinations. Outside of central Denver, the I-25 corridor provides good opportunities to integrate with planned mobility hubs along the interstate.

I-25 + RTD SOUTHEAST CORRIDOR THROUGH DENVER CORRIDOR: COMMUNITY AND ENVIRONMENTAL IMPACTS

Can passenger rail be implemented in this corridor without causing severe community disruption?

No. Within the Central Segment, it is not feasible to construct new passenger rail service through the RTD Southeast Corridor portion of I-25 through Denver without severe community disruption and impacts. Developing passenger rail through central Denver adjacent to I-25 or the RTD Southeast LRT Corridor between Lone Tree and DUS would substantially disrupt the most densely developed and constrained right-of-way in the state and would have severe community impacts. Unlike development along freight railways, commercial and residential development are built out near the interstate and RTD corridor to take advantage of the access they provide. The corridor is the commercial spine of the south Denver metropolitan area. Examples of the constraints posed by the area's complex transportation infrastructure, extremely dense population, residential and commercial development, and employment in central Denver abutting this corridor can be seen in Figure 14 through Figure 18.

Figure 16: Example Portion of I-25 Demonstrating Land Use Adjacent to I-25: Evans to Broadway



Figure 17: Example Portion of I-25 Demonstrating Land Use Adjacent to I-25: Logan Street Area

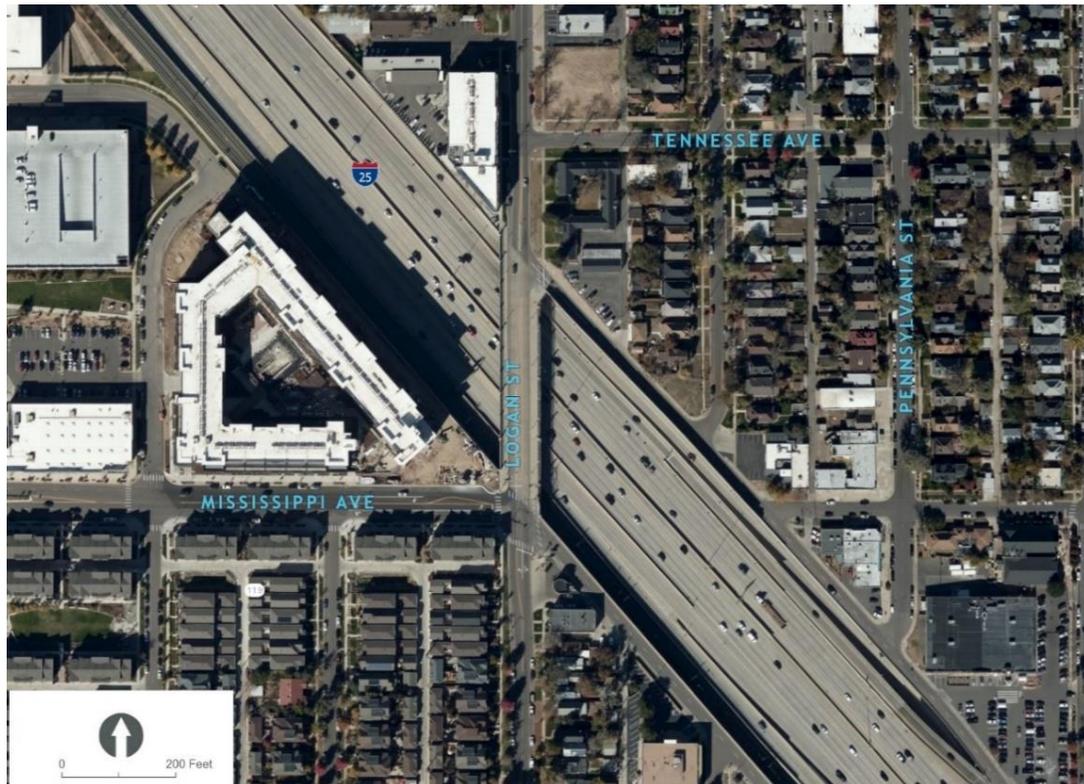
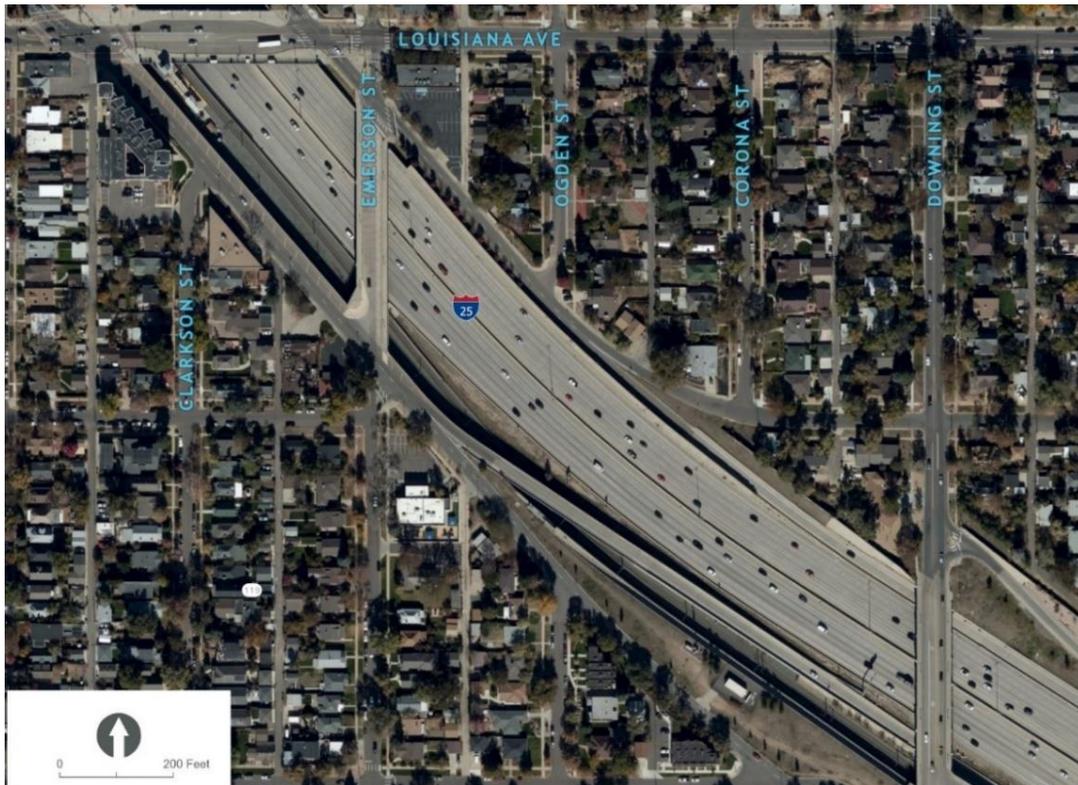


Figure 18: Example Portion of I-25 Demonstrating Land Use Adjacent to I-25: Ogden Street Area



CDOT studied the potential for interoperating passenger rail on the existing RTD Southeast Corridor LRT infrastructure in the Interregional Connectivity – Interoperability Study (CDOT, 2017a). Although it could be feasible to retrofit RTD’s Southeast Corridor to accommodate passenger rail, this would also result in severe disruption to adjacent communities and to the existing RTD service. Extensive reconstruction of the light rail guideway would be required to flatten excessive grades, flatten curves, raise clearances, and other modifications because of the differences between light rail and commuter rail vehicle sizes and operational needs. Construction impacts would cause severe disruption by limiting and closing light rail service and requiring bus bridges for two to four years, which would likely have a disproportionate impact on minority and/or low-income populations and transit-dependent populations (CDOT, 2017a).

Can passenger rail be implemented in this corridor without causing severe effects on natural resources?

Yes. Within the Denver area, this corridor primarily follows existing highway and transit corridors and would not require long sections of greenfield track through undeveloped areas, which limit severe impacts. Outside the Denver area, the corridor would traverse some undeveloped areas. Sections of the alignment are physically located parallel to important resources. Passenger rail would likely impact streams, parks, open spaces, and wildlife habitat necessitating mitigation.

I-25 + RTD SOUTHEAST CORRIDOR THROUGH DENVER CORRIDOR: FINANCIAL AND ECONOMIC FACTORS

Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?

Yes. The alternative follows an existing transportation corridor with potential to share right-of-way in locations. Although not a fatal flaw alone, the cost of reconstructing the RTD Southeast Corridor portion of the corridor is expected to be significantly higher than with other rail corridors because of the high costs of right-of-way, dense development, and impact to RTD operations.

I-25 + RTD SOUTHEAST CORRIDOR THROUGH DENVER CORRIDOR: FEASIBILITY AND IMPLEMENTATION

Is passenger rail constructible in this corridor?

No. It is not feasible to construct new passenger rail service along the I-25 corridor through south and central Denver because of operational challenges and disruption to RTD service on the light rail corridor.

In the Central Segment, I-25 through Denver from the DTC to downtown is highly constrained. There is no excess right-of-way, and the highway is over capacity with no opportunity to convert any of the right-of-way to rail operations.

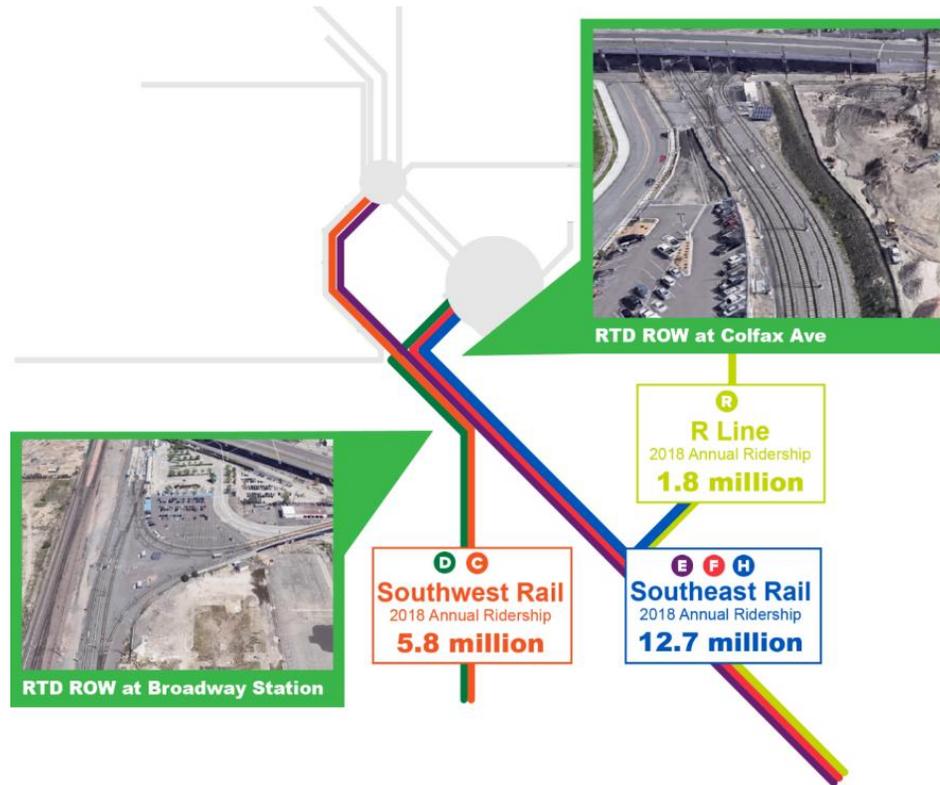
The RTD Southeast LRT Corridor also traverses this area and presents a better opportunity to convert and share operations with regional passenger rail. However, substantial work would be needed to retrofit the LRT guideway to allow shared passenger rail operations and to address numerous geometric challenges. Various challenges include steep grades, inadequate clearances, and tight curves that are incompatible with heavier passenger rail operations (such as RTD's commuter rail operations). Retrofitting could entail raising bridge clearances, electrification, signals, and station configuration. Capacity constraints on the existing system would require adjacent track to be constructed in some locations, in areas of extreme right-of-way constraints. The most substantial impact is the need to flatten vertical grades at 12 locations along the LRT corridor where grades are greater than 3 percent. Passenger rail vehicles are also wider and longer so each station would require modifications to platforms (CDOT, 2017a).

Five LRT lines operate between Broadway and Colfax, and there is no room for expansion or shared service through this area; thus, an additional 3.3 miles of track would be needed to accommodate passenger rail service (this capacity could potentially be accommodated by the Burnham Yard acquisition). RTD Southeast LRT Corridor is RTD's highest ridership rail line with 12.7 million passengers per year according to 2018 ridership data (RTD, 2019) displayed in Figure 19. Between Broadway and Colfax, the Southwest LRT Corridor shares the track infrastructure, and the RTD system is at capacity. Retrofitting the right-of-way would interrupt RTD service for six years, with busing needed for at least two years. Figure 16, Figure 17, and Figure 18 illustrate the constrained right-of-way.

Is passenger rail in this corridor compatible with existing freight rail or highway operations?

No. Operating passenger rail service with RTD on the Southeast Corridor is incompatible with RTD service and not feasible, although other portions of the corridor are feasible and retained for further consideration as also described in the I-25 + E-470 Corridor below. The primary issue with interoperating passenger rail on the Southeast LRT Corridor is that LRT technology has the ability to handle much steeper vertical grades than heavy rail and was designed as such. To retrofit the corridor for interoperating passenger rail would require nearly full reconstruction of the line. Additionally, because of the lack of space to build a third passing track at stations, passenger rail trains would be limited to the speed of the LRT service, which stops at each station in the corridor. This presents a significant operational constraint for passenger rail service because of slow travel times (CDOT, 2017a). Express service bypassing some or most of the stations would not save sufficient time due to the heavy LRT traffic. There is insufficient right-of-way to build passing sidings at or between stations, preventing trains from achieving sustained higher speeds.

Figure 19. RTD Southeast and Southwest LRT Corridors 2018 Annual Ridership



Source: Figure adapted from RTD 2019 Fact Sheets (RTD, Facts and Figures Guide, 2019), images from Google Maps

In the Central Segment, while retrofitting the RTD Southeast LRT Corridor to accommodate passenger rail operations is possible, RTD service would be severely disrupted for an estimated two to four years (CDOT, 2017a). In other portions of the corridor, passenger rail could operate parallel to the I-25 highway corridor and be compatible with existing highway operation.

Does public input indicate some level of support for passenger rail in this corridor?

Yes. Statewide transportation planning and outreach, surveys, and scoping for the FRPR Project indicate high level of public support for passenger rail service overall and for operating this service along the I-25 corridor.

The Central Segment of this corridor is favored by stakeholders in the current scoping efforts and past studies that view it as providing the most direct access to destinations throughout Denver, including DTC and DUS. Stakeholders in past studies and current project development have also expressed concerns regarding the impacts of and difficulty in gaining approvals to develop passenger rail in this corridor, as well as long travel times through Denver that affect system efficiency and ridership.

One of the major themes from the stakeholder feedback gathered for the ICS Study (CDOT, 2014) was that stopping high speed rail on the perimeter of the Denver metropolitan area and relying on RTD service to make final connections may negatively impact ridership. Additionally, concerns were expressed that an alignment through the center of Denver could have significant environmental, construction, and social impacts that may impede the approval process.

LEVEL 1: I-25 + E-470 HIGHWAY CORRIDOR

The I-25 + E-470 Highway Corridor was found to be feasible and supportive of the FRPR vision, as summarized in Table 7. It was recommended to advance to Level 2.

Table 7: Summary of I-25 + E-470 Highway Corridor Level 1 Evaluation

Category	Criteria	Rating	Evaluation
 Operational Characteristics	Can passenger rail in this corridor serve major population and employment centers in the Front Range, based on 2045 projections?	Yes	<ul style="list-style-type: none"> Corridor serves Pueblo, Colorado Springs, Denver (via DEN Airport and transfers with RTD FasTracks), Fort Collins, and other locations. Corridor accessible to Monument, Air Force Academy, Fort Carson, Castle Rock, and other locations. Corridor indirectly serves smaller communities between Denver and Fort Collins (compared to the US287/BNSF line).
 Operational Characteristics	Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?	Yes	<ul style="list-style-type: none"> Stations throughout the system would be sited to provide connections with other modes and integrate with planned mobility hubs along I-25. End-of-line station at Pueblo could be integrated with future regional service south to Trinidad and New Mexico. End-of-line station at Fort Collins could be integrated with future regional service north to Cheyenne and other areas of Wyoming.
 Community and Environmental	Can passenger rail be implemented in this corridor without causing severe community disruption?	Yes	<ul style="list-style-type: none"> Corridor follows I-25 and E-470 highway corridors to minimize community impacts. Specific community impacts are unknown until alignments are selected within the corridor, however, I-25 and E-470 corridors follow undeveloped lands or have dedicated rights-of-way, minimizing impacts.
 Community and Environmental	Can passenger rail be implemented in this corridor without causing severe effects on natural resources?	Yes	<ul style="list-style-type: none"> Sections of the alignment are physically located parallel to important natural resources and would likely impact streams, parks, open spaces, and wildlife habitat necessitating mitigation. Corridor follows I-25 and E-470 highway corridors to minimize environmental impacts. Specific natural resource impacts are unknown until alignments are selected within the corridor.
 Financial and Economic	Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?	N/A	<ul style="list-style-type: none"> The alternative follows an existing transportation corridor with potential to share right-of-way in locations. Passenger rail expected to be similar in cost to other passenger rail alignments; at Level 1 this criterion is not a likely differentiator.

Category	Criteria	Rating	Evaluation
 Feasibility and Implementation	Is passenger rail constructible in this corridor?	Yes	<ul style="list-style-type: none"> • Passenger rail is constructible along the I-25 corridor, although most of the corridor lacks enough right-of-way to fully accommodate passenger rail, and new right-of-way would be needed adjacent to the corridor. • Passenger rail is constructible along the E-470 corridor, which has right-of-way available (for purchase) for future transit and rail.
 Feasibility and Implementation	Is passenger rail in this corridor compatible with existing freight rail or highway operations?	Yes	<ul style="list-style-type: none"> • Passenger rail would operate parallel to the I-25 and E-470 highways and would be compatible with existing highway operations.
 Feasibility and Implementation	Does public input indicate some level of support for passenger rail in this corridor?	Yes	<ul style="list-style-type: none"> • Past studies and input received through current scoping efforts have indicated public support for passenger rail service and this corridor. • Direct access to DEN Airport is seen by many as a benefit of this corridor; however, access to destinations in central Denver and DUS is a concern.

Additional analysis related to these evaluation ratings and conclusions is presented in the following sections.

I-25 + E-470 HIGHWAY CORRIDOR: OPERATIONAL CHARACTERISTICS

Can passenger rail in this corridor serve major population and employment centers in the Front Range, based on 2045 projections?

Yes. In the South Segment, rail would serve major population centers of Pueblo and Colorado Springs and would be easily accessible to Monument, Air Force Academy and Fort Carson military installations.

In the Central Segment, passenger rail would serve the major population center of Denver and would be easily accessible to Castle Rock and DEN Airport. This corridor would serve DEN Airport directly and would serve employment centers in the DTC and south (i.e., Meridian) better (through RidgeGate station) but would not be accessible to central Denver except through transfer to RTD. It would serve central Denver and south and north Denver suburban areas through integration with RTD FasTracks. There are three major markets in the Denver metropolitan area, best served with stations at DUS, DTC, and DEN Airport.

None of the Level 1 corridors are capable of serving all three (DUS, DTC and DEN Airport).

In the North Segment, passenger rail would serve the major population center of Fort Collins. The corridor would serve communities between Denver and Fort Collins but less directly than the freight corridor along US 287 between Berthoud and Fort Collins in the North Segment. The I-25 corridor has the potential to serve 2045 population and employment centers well because this is the highest projected area of growth, with Greeley and Windsor developing toward the west, and Loveland and Fort Collins developing toward the east. Additionally, the I-25 corridor would also serve the fastest-growing smaller communities in Northern Colorado (Severance, Timnath, Johnstown, Windsor, and Milliken).

Can passenger rail in this corridor provide connections with other modes (existing or planned transit)?

Yes. Existing and planned I-25 mobility hubs and travel patterns associated with Bustang service along I-25 would be well served by this corridor outside of Denver.

In the Central Segment, this corridor would provide less connection to existing and planned transit in Denver than the I-25/RTD Corridor because it would not provide a connection at DUS or Burnham Yard. It would, however, provide connections to RTD's N Line, A Line, and Southeast LRT Corridor.

I-25 + E-470 HIGHWAY CORRIDOR: COMMUNITY AND ENVIRONMENTAL IMPACTS

Can passenger rail be implemented in this corridor without causing severe community disruption?

Yes. This corridor would require right-of-way acquisition and associated community disruption for passenger rail operation along sections of the I-25 portion of the alignment, especially in Colorado Springs and Castle Rock. However, in the Central and North Segments, the easterly alignment of the E-470 and I-25 corridors follow undeveloped lands or have dedicated rail rights-of-way that provide a buffer between passenger rail and established communities, minimizing community disruption in comparison to other possible corridors.

Can passenger rail be implemented in this corridor without causing severe effects on natural resources?

Yes. This corridor primarily follows existing highway corridors and would not require long sections of greenfield track through undeveloped areas, limiting severe impacts. However, the corridor would traverse some undeveloped areas. Sections of the alignment are physically located parallel to important natural resources. Passenger rail would likely impact streams, parks, open spaces, and wildlife habitat. In the Central and North Segments, the easterly alignment of the E-470 and I-25 corridors avoid impacts to streams and wildlife habitat.

I-25 + E-470 HIGHWAY CORRIDOR: FINANCIAL AND ECONOMIC FACTORS

Does passenger rail in this corridor have the potential to be cost effective when considering likely capital and operating costs against likely benefits and revenues?

Yes. The alternative follows an existing transportation corridor with potential to share right-of-way in locations. Highway right-of-way would likely be less costly than purchase or lease of Class I Railroads right-of-way. Engineering details to formulate cost estimates are not available at Level 1. Cost effectiveness is evaluated further in Level 2.

I-25 + E-470 HIGHWAY CORRIDOR: FEASIBILITY AND IMPLEMENTATION

Is passenger rail constructible in this corridor?

Yes. Passenger rail is constructible along portions of the I-25 corridor, although most of the corridor lacks enough right-of-way to fully accommodate passenger rail, and new right-of-way would be needed adjacent to the corridor.

The I-25 corridor is straighter horizontally than the freight corridors with large-radii horizontal curves and is generally conducive to high-speed passenger rail operation. However, the corridor contains several locations where vertical grades of greater than 3 percent are present in both short and relatively long (several mile)

segments. Vertical grades are generally more of a concern than horizontal curves for rail operations, and these areas would need to be flattened by building on retained fill, elevated structures, or tunnels.

I-25 is fully grade separated from intersecting roadways. Passenger rail would be required to go around, over, or under the I-25 interchanges, which are generally spaced a mile or farther apart. The passenger rail would not generally interact with at-grade roadways.

In the South Segment, the I-25 corridor is highly constrained through the downtown Colorado Springs area, and north through downtown where noise walls line both sides of the highway and established neighborhoods.

Through the Air Force Academy property, CDOT does not own right-of-way, and I-25 is on an easement. Passenger rail in the I-25 corridor would require an easement or need to be realigned east and acquire private right-of-way. Vertical grades are challenging on Monument Hill, north of the Air Force Academy.

In the Central Segment, I-25 right-of-way is constrained through Castle Rock. Vertical grades are challenging between Castle Pines and Lone Tree.

Passenger rail is constructible along the E-470 corridor; however, the E-470 Highway Authority stated that the 300-foot right-of-way is intended for highway operations and it might be a challenge to share with FRPR. To implement a railroad on E-470, support would be required from the E-470 Highway Authority board of directors. Transit is not currently part of the E-470 Highway Authority master plan (E-470 Public Highway Authority, 2020).

In the North Segment, the straighter I-25 alignment has horizontal geometry that is conducive to effective passenger rail operation, and much of the I-25 corridor through the North Segment has some available right-of-way appropriate for passenger rail. Through the Loveland area, right-of-way is more constrained. This area includes a short section of vertical grade at almost 3 percent and multiple areas of grades exceeding two percent. As in the South Segment, these areas would need to be flattened by building on retained fill, elevated structures, or tunnels.

Is passenger rail in this corridor compatible with existing freight rail or highway operations?

Passenger rail would operate parallel to the I-25 and E-470 highways and would be compatible with existing highway operations.

Does public input indicate some level of support for passenger rail in this corridor?

Yes. Statewide transportation planning and outreach, surveys, and scoping for the FRPR Project indicate a high level of public support for passenger rail service overall and for operating this service along the I-25 corridor.

In the Central Segment, the E-470 corridor is favored by stakeholders that see advantages of the corridor around Denver reducing community impacts, avoiding potential opposition to alignments along densely populated highway and rail alignments through Denver, and increasing speeds and travel times that improve regional ridership. Although direct access to DEN Airport and DTC is seen by many as a benefit of this corridor, the lack of access to destinations in central Denver and DUS is a concern. This corridor was the preferred alternative for high-speed rail (up to 220 mph) from the ICS Study (CDOT, 2014). The ICS alignment around Denver allowed for faster speeds and reduced community impacts and concerns with opposition along densely populated rail alignments through Denver. The ICS Study noted that stakeholders expressed that an alignment providing access to DEN Airport was the best equitable distribution of service to garner the broadest support and ridership for high-speed rail.

Stakeholder input suggested a variation to this corridor that would follow the Union Pacific Milliken branch line into Fort Collins from I-25. The Milliken line intersects I-25 in the vicinity of Centerra and US 34, then curves northward and runs parallel to, and in between, US 287 and I-25. This variation of the I-25 + E-470 Highway Corridor is analyzed in Level 2.

LEVEL 1: BEST BUS

The Best Bus alternative does not meet the FRPR vision but was developed and retained to understand the comparative costs and benefits of rail alternatives. Because it is beyond the purview of the Rail Commission's purpose, and does not meet the purpose and need, it rated as "no" for all Level 1 evaluation categories. Several issues with the Best Bus alternative were documented in the Level 1 evaluation:

- The Best Bus alternative would rely primarily on I-25, which is at or beyond capacity and subject to slow and unreliable travel times. While portions of the Bustang route could use CDOT's Express Lane system to improve travel time reliability, the system has significant gaps, especially in the most congested portions of I-25 through central Denver. Additionally, even in the locations where managed lanes exist, buses would experience issues with weather, traffic incidents, and maintenance and construction that affect system reliability.
- Enhanced bus service would be cost effective and could be delivered incrementally. However, it would still require approximately \$200 million capital investment for stations and buses and approximately \$4 million annually to operate increased service.
- The public is supportive of increased transit options, including bus service, but in addition to, rather than as a substitute for, comprehensive passenger rail.

3.3 LEVEL 2 EVALUATION

Corridors that advanced to Level 2 were refined and engineered to improve geometry and refine station locations; as well as compare ridership, costs, and environmental impacts. Public outreach continued to gather input about the expectations and relative merits of FRPR corridors and the overall system concept. Discussions with federal, state, and local agencies continued. Additionally, the project team engaged environmental resource agencies in pre-NEPA scoping.

In contrast to the Level 1 "fatal flaw" analysis, Level 2 was a "comparative" analysis where the alternatives were compared to recommend a range of best options to discuss with the Colorado State Legislature, discuss with voters, and move forward for detailed analysis in the future NEPA process, as presented in Section 3.3.11.

The Level 2 evaluation is summarized in the evaluation matrix presented in Appendix C. The following subsections describe the criteria, assumptions, descriptions, and comparative evaluation of the Level 2 alternatives.

3.3.1 LEVEL 2 EVALUATION CRITERIA

The Level 2 evaluation covered the same broad categories as the Level 1 evaluation but relied on more quantitative measures to compare alternatives. Metrics, outlined in Table 8: Level 2 Evaluation Criteria, and specific performance measures outlined in Table 9, were informed by past studies in Colorado and across the United States.

Table 8: Level 2 Evaluation Criteria

	<p>L2 – Operational Characteristics (Section 3.3.7)</p> <ul style="list-style-type: none"> • Travel time • Ridership • Operating speed • Reduction in vehicle miles traveled (VMT) • Ability to interconnect with other modes (existing or planned transit) • 2045 population served
	<p>L2 – Community and Environmental Impacts (Section 3.3.8)</p> <ul style="list-style-type: none"> • Community disruption • Utilities and energy • Air quality • Natural environment • Historic • Hazardous materials • Recreational resources • Noise and vibration
	<p>L2 – Financial and Economic Factors (Section 3.3.9)</p> <ul style="list-style-type: none"> • Capital cost • Operating cost • Revenue potential • Cost effectiveness
	<p>L2 – Feasibility and Implementation (Section 3.3.10):</p> <ul style="list-style-type: none"> • Interaction with freight railroad operations/customer access • Ease of implementation • Constructability • System flexibility • Public and political support

The Level 2 criteria included more rigorous qualitative and quantitative analysis to better understand how each alternative performed and compared to one another (Table 9).

Table 9: Level 2 Evaluation Criteria and Performance Measures

Criteria	Measure
Operational Characteristics	
Travel time	<ul style="list-style-type: none"> • Travel time between travel markets: <ul style="list-style-type: none"> ○ Fort Collins–DEN Airport ○ Fort Collins–Downtown Denver ○ Colorado Springs–DEN Airport ○ Colorado Springs–Downtown Denver • End-to-end travel time

Criteria	Measure
Ridership	<ul style="list-style-type: none"> Projected annual ridership Projected weekday ridership Anticipated station boardings/alightings
Reduction in VMT	<ul style="list-style-type: none"> VMT with and without alternative
Ability to interconnect with other modes (existing or planned transit)	<ul style="list-style-type: none"> Ease of transfers/availability and capacity of direct connections to local transit Ease of first/last mile connectivity (applicable to station locations only) Percentage of riders connecting to/from other transit systems Connections with future mobility hubs
2045 population served	<ul style="list-style-type: none"> Number of households within 5 miles of station area
2045 job served	<ul style="list-style-type: none"> Number of jobs within 5 miles of station area
Community and Environmental Impacts	
Community disruption	<ul style="list-style-type: none"> Availability of right-of-way Number of at-grade crossings Ability to use existing infrastructure (mobility hubs, etc.) Miles of residential, business, and commercial land uses adjacent to alignment Number of minority/low-income populations along alignment
Utilities and energy	<ul style="list-style-type: none"> Annual energy consumption (from system)
Air quality	<ul style="list-style-type: none"> Reduction in VMT
Natural environment	<ul style="list-style-type: none"> Acres of protected species habitat along alignment Number of stream crossings, wetland crossings, and floodplain crossings
Historic	<ul style="list-style-type: none"> Number of National Register of Historic Places listed or eligible properties potentially affected Number of historic aged developments potentially impacted (clusters of historic aged properties from assessor records)
Hazardous materials	<ul style="list-style-type: none"> Number of Superfund sites along alignment
Recreational resources	<ul style="list-style-type: none"> Number of parks and open space areas along alignment
Noise and vibration	<ul style="list-style-type: none"> Miles of noise sensitive land uses (sensitive receptors) along alignment
Financial and Economic Factors	
Capital cost	<ul style="list-style-type: none"> Capital cost (right-of-way, construction, stations, rolling stock)
Operating cost	<ul style="list-style-type: none"> Annual operating cost
Feasibility and Implementation	
Interaction with freight railroad operations/customer access	<ul style="list-style-type: none"> Freight conflicts/ability to maintain current and projected freight operations (long term) and ability to serve existing freight customers
Constructability	<ul style="list-style-type: none"> Level of engineering and construction complexity
System flexibility	<ul style="list-style-type: none"> Ability to phase starter system and accommodate future capacity expansion Ability to accommodate secondary and/or commuter rail stations
Public and political support	<ul style="list-style-type: none"> Qualitative feedback through stakeholder meetings, public meetings, etc.

3.3.2 LEVEL 2 ALTERNATIVES: DESIGN AND OPERATING PRINCIPLES

The three corridors advanced from the Level 1 evaluation formed the basis for developing Level 2 alternatives (described in Section 3.3.4):

- BSNF Freight corridor
- BNSF + North I-25 EIS Commuter Rail corridor
- I-25 + E-470 Highway corridor

The Level 2 alternatives were engineered building on the Level 1 corridors. The project team developed and evaluated specific alignments with refined engineering considerations and defined operational characteristics. For purposes of this analysis, each alternative includes nine primary stations (locations varied depending on the alternative). For each alignment, the geometry was refined to improve conditions for passenger rail, especially improved speeds. Station locations along the alignments were refined to maximize intermodal connections, local planning, and to match physical constraints of track geometry and local infrastructure.

RAILSIM train performance simulation software was used to calculate average speeds and travel times along the entire alignment and between stations, considering technical specifications and performance characteristics for the selected train consistently (same for all alternatives), horizontal and vertical geometry of the alignment (vary by alternative), and assumed speed restrictions throughout the corridor based on land use characteristics (vary in locations by alternative). The information developed for the alignments and stations, coupled with operating assumptions that were common among all three alignments, provided the basis for ridership modeling and forecasting using CDOT's New Statewide Travel Forecasting Model.

3.3.3 LEVEL 2 ALTERNATIVES: COMMON OPERATING ASSUMPTIONS

All the alternatives assumed the same operating plan with regard to trainset specifications, technologies and maximum operating speeds, headways and dwell times, and fares. The trainset assumed for Level 2 alternatives was a Siemens Charger diesel-electric locomotive with a maximum speed of 125 mph, using five coaches, with a total passenger capacity of 300. The Siemens Charger was selected as a representative technology for the Level 2 alternatives analysis because it is a common long corridor/intercity diesel-electric locomotive, and its maximum operating speed of 125 mph is compliant with FRA requirements for shared Class I Railroad rights-of-way without full grade or corridor separation. Although higher speed technologies are not precluded in the future, the overall length of the corridor and relatively close distances between stations limit trains operating at sustained high speeds and, therefore, have less benefit to travel times.

The base scenario, which assumes a full build out, includes a double track configuration throughout each alignment. Double track operations allow bi-directional movements to occur simultaneously, where northbound trains operate on a dedicated northbound track, and southbound trains on a dedicated southbound track. In constrained locations, a single track configuration is considered with sidings placed five to six miles apart. A robust service plan was also considered for the full build out FRPR operation, taking advantage of the double track infrastructure. It includes a weekday service of 24 round trips per day and weekend service of 18 round trips per day, generally operating one train per day each direction each hour from 6 am to midnight. The additional 6 round trips during the weekday allows for 30-minute headways in the three-hour afternoon and evening peak periods (e.g., 6 am to 9 am and 4 pm to 7 pm).

Dwell time is the amount of time a train is stopped at a station for passenger boarding and alighting. Dwell time assumptions were also drawn from the ICS Study. Modelers utilized a dwell time of two minutes at major stations (Downtown Denver and Colorado Springs) and one minute at all other stations.²

FRPR assumes a base fare rate of \$0.32 cents per mile. This is generally consistent with the assumed fare and other benchmark services in the ICS Study, including the Capitol Corridor service in California and the Cascades service in the Pacific Northwest.³ Station parking was assumed at two dollars per day.

3.3.4 LEVEL 2 ALTERNATIVES: RIDERSHIP MODELING APPROACH

The FRPR ridership projections were conducted using CDOT's new statewide travel demand model, which is an activity-based model that has been under development for the past several years. The state-of-the-practice model is consistent with complex travel demand modeling for large metropolitan regions, including DRCOG's "Focus" model. It is one of the first activity-based models to be used at the state level in the United States, and FRPR is the first major project in Colorado to use the model (although it has been used and tested in statewide transportation planning). The model provides robust travel information at an individual level to build weekday travel itineraries, including what trips are taken, to what destinations, at what times, for what purpose, what mode, and what route. Because the model was built from Front Range MPO models and Front Range travel surveys, it is especially effective at projecting Front Range travel demand.

The ridership models were built based on the engineering and operating assumptions described earlier. The model underwent months of data-intensive validation and simulations. The baseline modeling provides a benchmark for comparison among the various alignments and stations. The initial model runs for Level 2 evaluation provide context that regardless of alignment, there would be demand for rail service along the Front Range. Demand is highest for commuters, but there is also substantial demand for recreation and special events. Several variables have been tested through the Level 2 analysis, including the sensitivity of the number and location of stations, travel speeds, fares, and headways. These variables, and others, such as land use and multimodal connections around stations, can continue to be refined through future modeling efforts. Refinements are expected to improve performance and ridership. The ridership results presented in this report are likely conservative.

3.3.5 LEVEL 2 ALTERNATIVES

Three alternatives carried forward from the Level 1 evaluation are illustrated in Figure 20. They include:

- BNSF Freight Rail Alternative (turquoise line)
- BNSF + North I-25 EIS Commuter Rail Alternative (yellow line)
- I-25 + E-470 Highway Alternative (purple line)

These alternatives present a range of complete systems that could be developed as is or recombined as the project evolves with different combinations in the South, Central, and North Segments. The alternatives are

² As the Level 2 alternatives evolved, the team determined that additional dwell time of up to 10 minutes would be needed at DUS; this is not reflected in the travel times or ridership modeling projections presented in this report but is noted as an additional refinement that will need to be studied further.

³ In review of other systems, these assumed fares may be up to twice of other peer systems. Reduced fares likely would increase ridership and is a sensitivity could be tested and refined with future modeling efforts. The current fare assumptions provide a reasonable, if conservative, baseline for evaluating the system and alternative alignments.

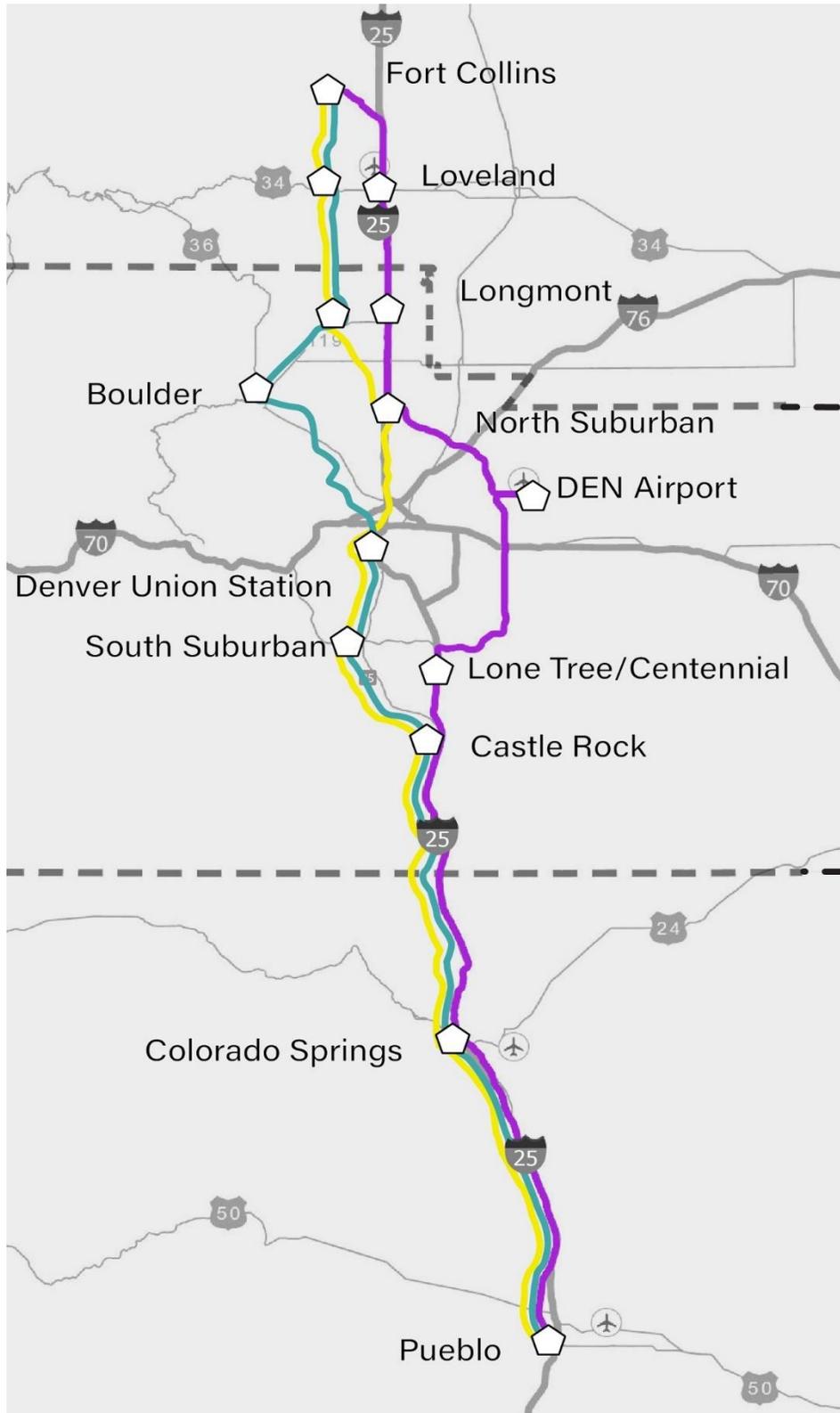
described below in terms of their routes and stations. All alternatives include the same assumptions with regard to technology, headways, and other operating factors. Each has the same number of primary stations that serve the same general travel markets, but station locations differ based on the route and destinations. The Level 2 alternatives have the same design requirements and follow common design criteria. The alignment of each alternative was refined to meet those criteria, optimize geometry, and improve travel speeds/times. Draft design criteria for the FRPR system are included in Appendix D.

As the geometry was improved, the alignments were further adjusted based on topography, land use, and input from local jurisdictions to avoid or minimize community and natural resource impacts and to optimize conceptual station locations. The Level 2 alternatives incorporate design refinements, considerations, and speed/profile modeling, which are also documented in Appendix E. The infrastructure quantities of key features of the Level 2 alternatives are described in Table 10: Comparison of Primary Quantities of Full Build Out for Level 2 Alternatives. These features provide context for comparing the engineering and construction complexity of the alternatives and inform the assessment of impacts and costs that could result from their implementation.

Table 10: Comparison of Primary Quantities of Full Build Out for Level 2 Alternatives

Feature	BNSF Freight Rail Alternative	BNSF + North I-25 EIS Commuter Rail Alternative	I-25 + E-470 Highway Alternative
Alignment Length (miles)			
Route length	190.6	183.6	191.9
Alignment Elevation Profile (by length, miles)			
At-grade	170.4	159.6	171.4
Overpass	3.1	3.1	2.9
Underpass	2.0	1.5	0.5
Major viaduct	13.8	18.2	16.6
Tunnel	1.3	1.3	0.6
Alignment Crossings (by count, number of crossings)			
Highway	37	32	33
Major roads	122	106	65
Local roads	84	82	65
Streams	158	235	131
Alignment Corridor Type (by length, miles)			
Adjacent to greenfield/brownfield conditions	29.1	39.0	17.9
Adjacent to existing roadway corridor	2.5	6.5	143.1
Adjacent to existing RTD corridor	17.7	30.2	7.2
Adjacent to existing freight rail corridor	141.3	107.9	23.8
Right-of-Way (acreage, alignment footprint)			
Rural (double track, 75-ft-wide)	1,141	884	1,011
Urban (double track 60-ft-wide)	473	629	588

Figure 20: Level 2 Front Range Passenger Rail Alignment Alternatives



Source: CDOT Project Team

BNSF FREIGHT RAIL ALTERNATIVE

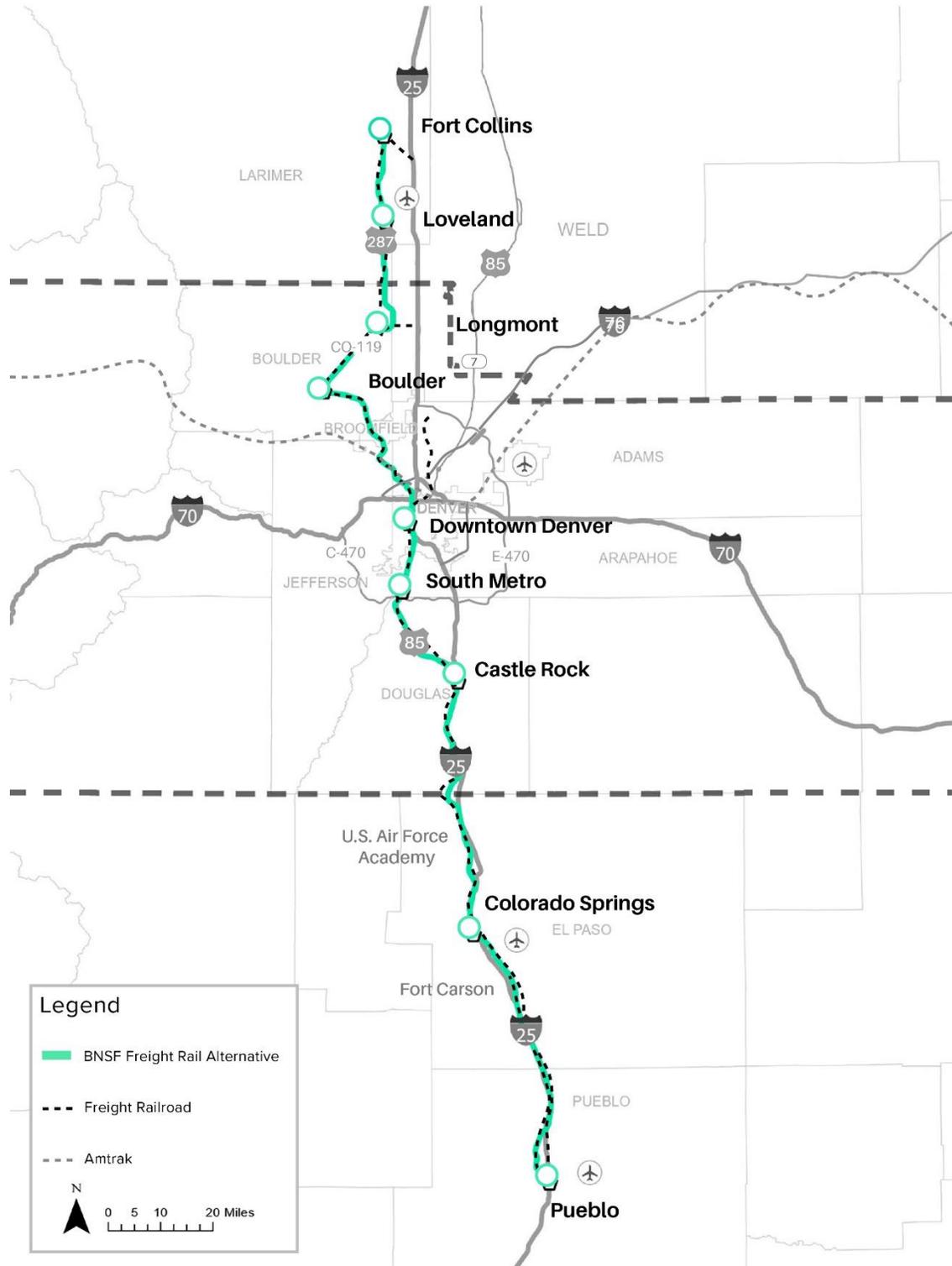
The BNSF Freight Rail Alternative is primarily a freight rail alignment and generally follows the existing BNSF freight rail right-of-way. This corridor was evaluated in Level 1 and met the criteria to be carried forward to Level 2. The alignment was refined in Level 2, primarily in the Central and North Segments. The curvature was adjusted to accommodate higher operating speeds and to mitigate community and environmental impacts. These refinements are documented in Appendix E.

This alternative follows the existing freight rail corridor along the majority of the route from Pueblo to Fort Collins. It begins in Pueblo, following the existing freight corridor to the west of I-25. It continues north with the freight rail, crossing over to the east side of I-25. The alternative proceeds to Colorado Springs, then crosses back over to the west side of I-25 and continues north past Colorado Springs toward Monument. At this point the alignment separates from the existing freight rail corridor and routes around Monument on the west side of I-25. The alignment then goes through a new tunnel through the Palmer Divide and rejoins the existing freight corridor, heading north to Castle Rock. From Castle Rock north, the alignment runs parallel to the freight rail corridor along US 85 into Highlands Ranch and crosses C-470 into Littleton. It continues to follow that freight rail corridor, located parallel to US 85 (Santa Fe Drive) and the RTD Southwest LRT Corridor into downtown Denver, just east of I-25. From downtown Denver (DUS), the alignment follows the existing freight corridor and RTD's planned B Line north and west. The alternative continues northwest to Boulder and then northeast to Longmont, physically parallel to SH 119. The alignment shifts off of the freight rail corridor to the east, generally following 1st Street. The alternative continues north along Weld County Road 1 and through farmlands to bypass Longmont's historic core and then rejoin the existing freight corridor along US 287 north of Weld County Road 2, continuing on the freight rail corridor through Berthoud and Loveland to Fort Collins.

The BNSF Freight Rail Alternative includes the following nine primary station areas, from south to north (see Figure 21):

1. Pueblo
2. Colorado Springs
3. Castle Rock
4. South Metro (RTD C Line end of line Mineral Station)
5. Downtown Denver (Denver Union Station)
6. Boulder
7. Longmont
8. Loveland
9. Fort Collins

Figure 21. BNSF Freight Rail Alternative



Source: CDOT Project Team

The speeds and travel times between these stations are shown in Table 11. The longest distances between stations and fastest average speeds are in the south. The travel speed for the BNSF Freight Rail Alternative, including dwell times at stations, averages about 65 miles per hour.

Table 11: Distances, Travel Times, and Speeds for BSNF Freight Rail Alternative

Station-Station	Distance (miles)	Northbound		Southbound	
		Travel Time (minutes)	Average Speed (mph)	Travel Time (minutes)	Average Speed (mph)
Pueblo–Colorado Springs	43	29.7	87	29.9	86
Colorado Springs–Castle Rock	42	28.5	88	28.2	89
Castle Rock–South Metro	19.5	14.0	84	14.2	82
South Metro–Denver Union Station	14	18.5	46	18.1	47
Denver Union Station–Boulder	27	28.0	59	28.3	58
Boulder–Longmont	12.5	9.4	79	9.5	78
Longmont–Loveland	19.5	15.3	76	15.2	77
Loveland–Fort Collins	13.5	12.7	64	12.7	64
Total	191	169	68	170	67

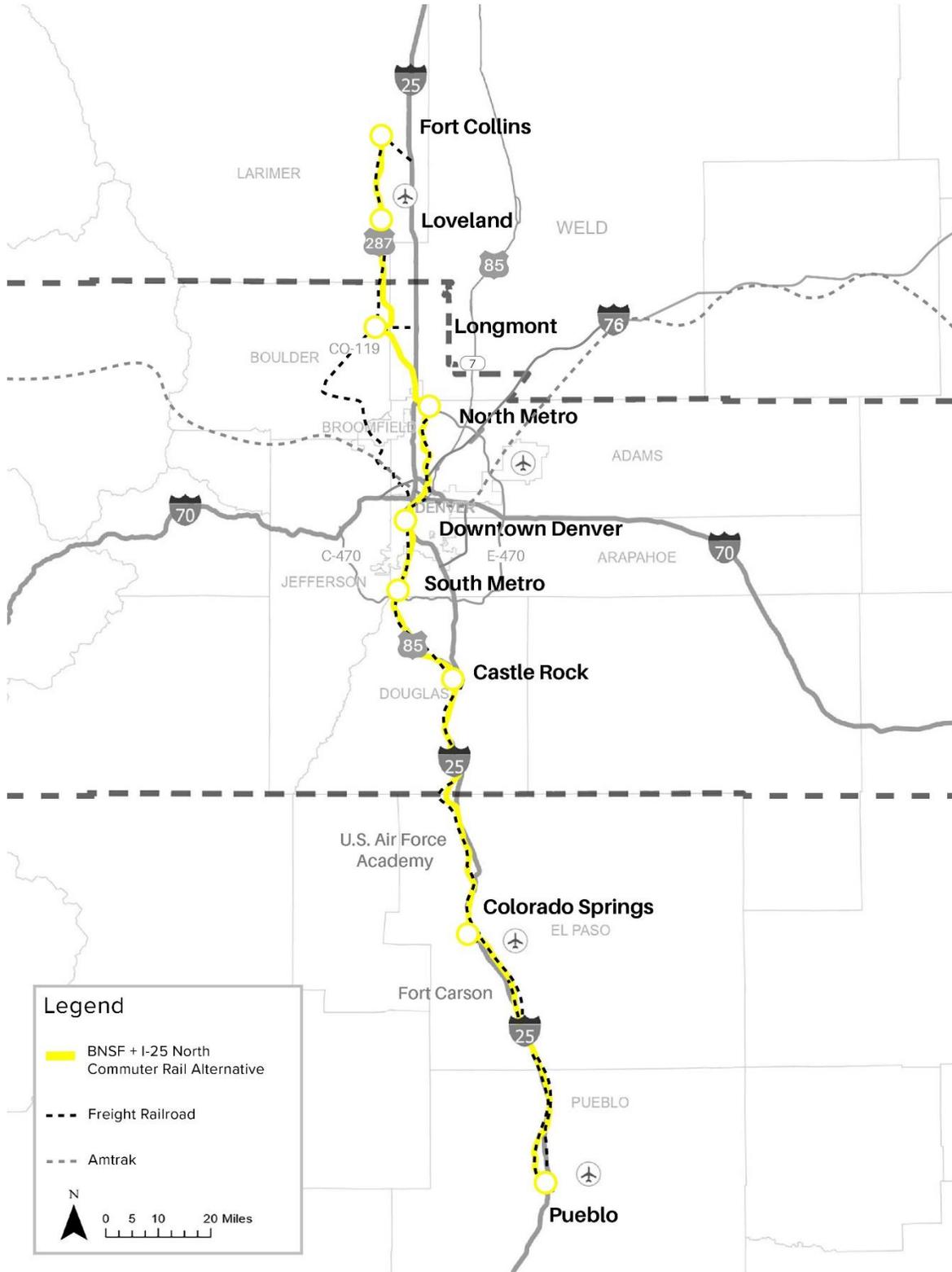
Note: Distances rounded to half-mile. Travel times rounded to tenths, and speeds rounded to whole numbers. Total travel times include dwell times (not included in the station-to-station pairs).

BNSF + NORTH I-25 EIS COMMUTER RAIL ALTERNATIVE

The BNSF + North I-25 EIS Commuter Rail Alternative alignment follows the same alignment as the BNSF Freight Alternative from Pueblo to DUS. As illustrated in Figure 22, this alternative differs from the BNSF Freight Rail Alternative between DUS and Longmont, where it incorporates the general alignment of the North I-25 EIS Commuter Rail alignment. From DUS, the alignment follows the RTD’s existing N Line north to the North Metro station (the end of line for the N Line). The alternative then travels northwest on a greenfield alignment to Longmont, near the old sugar mill. As with the design refinement for the BNSF Freight Rail Alternative, the BSNF + North I-25 EIS Commuter Rail Alternative routes around the City of Longmont’s historic core to the east and then rejoins the existing freight corridor north of Weld County Road 2. The alternative continues along the freight rail corridor located parallel to US 287 to Fort Collins. The nine primary stations in this alternative are:

1. Pueblo
2. Colorado Springs
3. Castle Rock
4. South Metro (RTD C Line end of line Mineral Station)
5. Downtown Denver (Denver Union Station)
6. North Metro (RTD N Line end of line station)
7. Longmont
8. Loveland
9. Fort Collins

Figure 22. BNSF + North I-25 EIS Commuter Rail Alternative



Source: CDOT Project Team

Table 12 presents the distances between stations and fastest average speeds are in the south. The travel speed for the BNSF + North I-25 EIS Commuter Rail Alternative, including dwell times at stations, averages about 65 miles per hour.

Table 12: Distances, Travel Times, and Speeds for BSNF + North I-25 EIS Commuter Rail Alternative

Station-Station	Distance (miles)	Northbound		Southbound	
		Travel Time (minutes)	Average Speed (mph)	Travel Time (minutes)	Average Speed (mph)
Pueblo–Colorado Springs	43	27.7	87	29.9	86
Colorado Springs–Castle Rock	42	28.5	88	28.2	89
Castle Rock–South Metro	19.5	14.0	84	14.2	82
South Metro–Denver Union Station	14	18.5	46	18.1	47
Denver Union Station– North Suburban	21	26	48	26.6	47
North Suburban–Longmont	13	10.2	78	10.0	80
Longmont–Loveland	18	14.0	77	14.1	76
Loveland–Fort Collins	13.5	12.7	64	12.7	64
Total	184	168	66	169	65

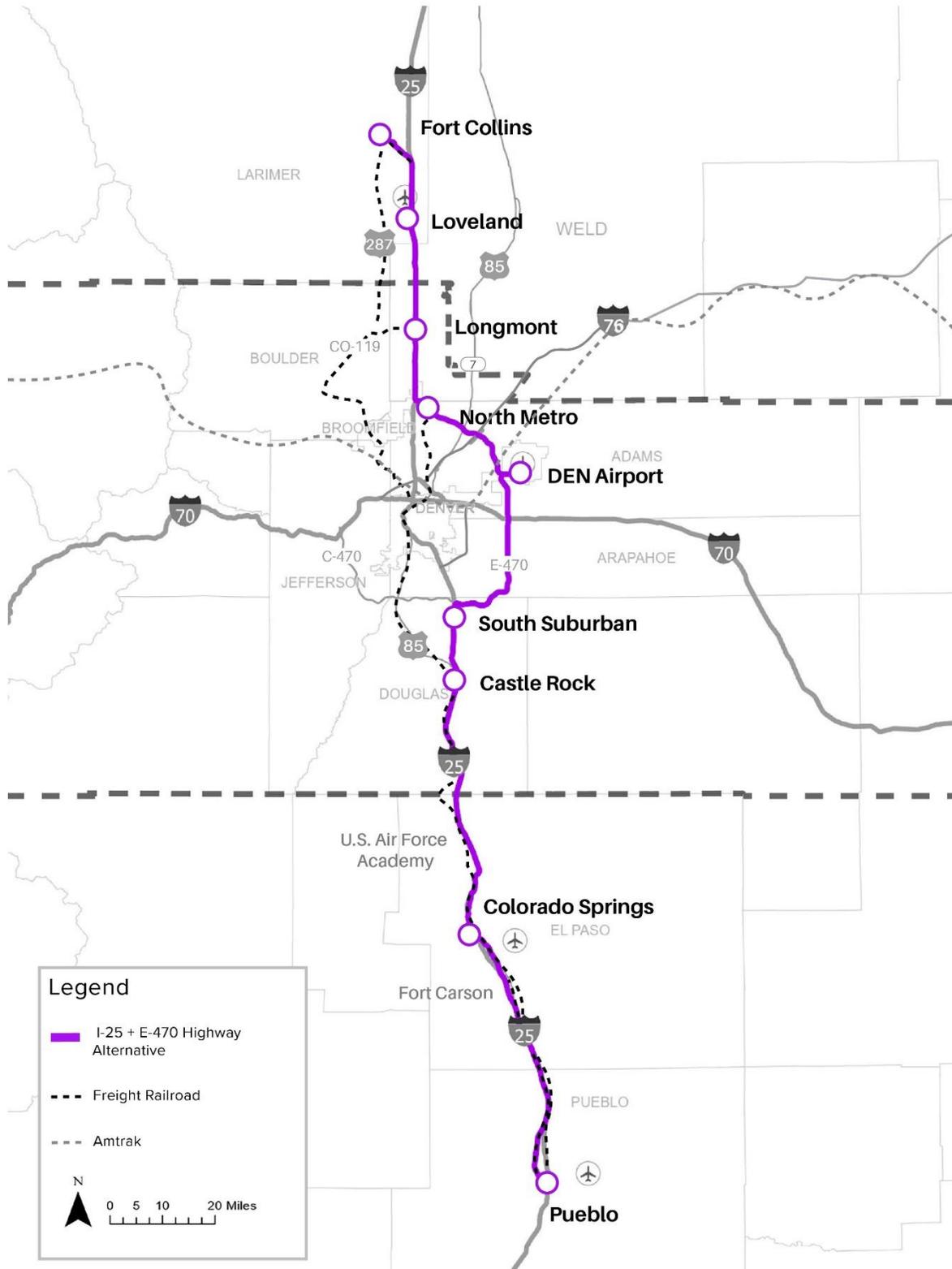
Notes: Distances rounded to half-mile. Travel times rounded to tenths, and speeds rounded to whole numbers. Total travel times include dwell times (not included in the station to station pairs).

I-25 + E-470 HIGHWAY ALTERNATIVE

The I-25 + E-470 Highway Alternative focuses on the I-25 and E-470 highway rights-of-way from Pueblo to Fort Collins. In the South Segment, the alignment follows the existing freight right-of-way through portions of the alignment in Pueblo and Colorado Springs. Through Pueblo, the alignment follows the existing freight corridor for approximately 9 miles before joining to the I-25 right-of-way. The alternative then follows the west side of I-25 for approximately 25 miles, then crosses I-25 back to the existing freight corridor near Fort Carson and follows the rail corridor into Colorado Springs. In northern Colorado Springs, the alternative rejoins the I-25 alignment and runs parallel to I-25 through Monument and Castle Rock to E-470 to the South Suburban Station at RTD’s RidgeGate station. It follows E-470 to the east to DEN Airport. From DEN Airport, the alignment follows E-470 to the North Suburban station (RTD N Line). The alignment travels north along I-25 to CR 40 joining the Great Western Railway freight corridor to Fort Collins. The nine primary stations include:

1. Pueblo
2. Colorado Springs
3. Castle Rock
4. South Suburban
5. DEN Airport
6. North Metro
7. Longmont
8. Loveland
9. Fort Collins

Figure 23. I-25 + E-470 Highway Alternative



Source: CDOT Project Team

This alternative is largely based on the recommended alignment in the 2014 ICS Study, which was optimized through that engineering effort. Additional minor refinements to the alignment were made as documented in Appendix E. The speeds and travel times between these station areas, based on the FRPR operating assumptions, are shown in Table 13.⁴ The overall travel speed for the I-25 + E-470 Highway Alternative, including dwell times at stations for passenger boarding and alighting, averages about 77 miles per hour. Although the longest distances between station areas and fastest average speeds for this alternative are also in the southern portion of the alignment, this alternative achieves higher travel speeds compared to the freight rail alignments, through the Denver and through the northern Colorado communities between Longmont and Fort Collins.

Table 13: Distances, Travel Times, and Speeds for the I-25 + E-470 Highway Alternative

Station-Station	Distance (miles)	Northbound		Southbound	
		Travel Time (minutes)	Average Speed (mph)	Travel Time (minutes)	Average Speed (mph)
Pueblo–Colorado Springs	42	25.2	100	25.6	98
Colorado Springs–Castle Rock	40	27.7	86	27.3	87
Castle Rock–South Suburban	12	8.6	82	8.6	83
South Suburban–DEN Airport	32	24.0	80	24.0	81
DEN Airport–North Suburban	23	18.6	73	18.6	73
North Suburban–Longmont	19	12.6	91	12.5	91
Longmont–Loveland	10	7.7	80	7.7	80
Loveland–Fort Collins	14	10.8	77	11.0	76
Total	191	149	77	149	77

Notes: Distances rounded to half-mile. Travel times rounded to tenths, and speeds rounded to whole numbers. Total travel times include dwell times (not included in the station-to-station pairs). Travel time on RTD’s A Line from the DEN Airport station to DUS would be about 40 minutes, including transfers.

3.3.6 LEVEL 2 EVALUATION RESULTS

The Level 2 evaluation is a comparative analysis that builds upon the Level 1 evaluation. The Level 2 evaluation is a more quantitative than Level 1, and includes criteria to compare the alternatives carried forward using the following categories:

- Operational characteristics
- Community and environmental impacts
- Financial and economic factors
- Feasibility and implementation

⁴ The ICS Study travel times were based on high-speed technologies so were remodeled using the 125 mile-per-hour maximum operating speeds determined appropriate for the FRPR during this study.

The Level 2 evaluation results inform decision-making by providing the relative tradeoffs associated with each of the alternatives carried forward. A matrix of the comparison against the Level 2 criteria (see Section 3.3.1) is presented in Appendix C.

The Level 2 evaluation found that all three Level 2 alternatives are feasible and present a reasonable range of alignment and service options that offer different costs and benefits that should be evaluated in NEPA. The alternatives also provide reasonable opportunities within the geographic segments to refine, adapt, and consolidate alignments and stations to improve system performance. A comparison of the alternatives under the four evaluation categories is presented below. At this level of project development, differences are noted at the project-level with the alignments for the operations, community, and environmental impact categories. The Level 2 alternatives are more similar at the program level in the financial and implementation categories.

3.3.7 LEVEL 2 ALTERNATIVES: OPERATIONAL CHARACTERISTICS

This section compares the projected operations characteristics of Level 2 alternatives. Most of the differences are reflected in ridership projections, such as effects of travel time (generally faster travel times increase ridership), operating speeds (which equate to faster travel times), and markets served (population, jobs, and modal connections). Table 14 provides some key comparisons of ridership among the alternatives.

Table 14: Key Operational Characteristics Comparison among Level 2 Alternatives

Feature	BNSF Freight Rail Alternative	BNSF + North I-25 EIS Commuter Rail Alternative	I-25 + E-470 Highway Alternative
Projected annual ridership	2.2 million	1.5 million	2.2 million
Projected weekday ridership	6,900	4,800	6,800
End-to-end travel time	168 minutes	169 minutes	149 minutes
Average operating speed	66 mph	66 mph	77 mph
Reduction in annual VMT	63 million	43 million	63 million
2045 population served (households within 5 miles of stations)	984,000	975,000	600,000
2045 employment served (jobs within 5 miles of stations)	1.5 million	1.4 million	890,000

Common themes of the ridership projections include:

- There are few end-to-end trips under any alternative, which is reflective of travel patterns within the Front Range MPO regions and confirmed by Streetlight and Census data. More trips occur within the MPO area than between MPO areas, although some interregional demand is projected. Demand may be induced with the presence of a more reliable mode of travel with passenger rail.
- Most of the travel projected is for work (69 percent) or school (19 percent). Recreational or leisure travel represents 12 percent of overall travel demand for passenger rail. Although the state travel demand model is calibrated primarily for typical weekday travel, approximately 20 percent of trips for all Level 2 alternatives is projected to occur on weekends and off-peak periods.
- There is a direct relationship between speed (travel times) and ridership for all alternatives. Higher speeds equate to faster travel times, which equate to increased ridership.

- Ridership is concentrated in the Denver metropolitan area for all alternatives, with more than 50 percent of boardings and alightings occurring in the Central Segment under all alternatives.
- Ridership outside the Denver area is stronger in the North Segment than the South Segment.
- Ridership is projected to increase as the design of the system and its operations are refined.
- The freight rail alignments have greater potential to serve secondary stations. Adding secondary stations to the model increased ridership by approximately 20 percent.
- The frequency of service (headways) is modeled for the 2045 full build out but is likely aggressive for an initial system. Decreasing headways will likely decrease ridership (but also costs).

Differences in ridership are related to three primary issues:

- Substantial demand is projected for both central Denver and DEN Airport. The freight alignments have the ability to serve central Denver with a transfer to DEN Airport at DUS. The I-25 + E-470 Highway Alternative provides direct service to the airport but would not serve downtown directly. While overall ridership is similar, the freight alignments traverse population and employment centers better and have been more supported by the stakeholder coalitions and the Rail Commission.
- Strong ridership for the I-25 + E-470 Highway Alternative is likely correlated to the overall higher travel speeds and shorter travel times between station areas.
- The strong demand between Boulder and Denver and between Longmont and Boulder is reflected in the higher ridership of the BNSF Freight Rail Alternative compared to the BNSF + North I-25 EIS Commuter Rail Alternative.
- Ridership for the South Segment is stronger for the I-25 + E-470 Highway Alternative than the freight alternatives, despite significant stakeholder preference for a central Denver vs. DEN Airport service. The stronger ridership is likely due to the very strong South Suburban station activity, which better serves south Denver, including the DTC.
- All alternatives would result in a significant reduction in VMT through the Front Range region. The reduction in VMT is directly related to ridership, so the higher ridership of the BNSF Freight Rail Alternative and the I-25 + E-470 Highway Alternative are more effective than the BNSF + North I-25 EIS Commuter Rail Alternative with regard to reducing VMT and correlated reduction in greenhouse gas emissions.

Appendix F includes additional modeling methodology information for the alternatives, as well as more detail on the travel demand model and ridership projection process. The Level 2 matrix (included in Appendix C) provides full results of the Level 2 Evaluation. Figure 24 through Figure 26 illustrate ridership patterns for the Level 2 alternatives.

Figure 24. BNSF Freight Rail Alternative Ridership Patterns

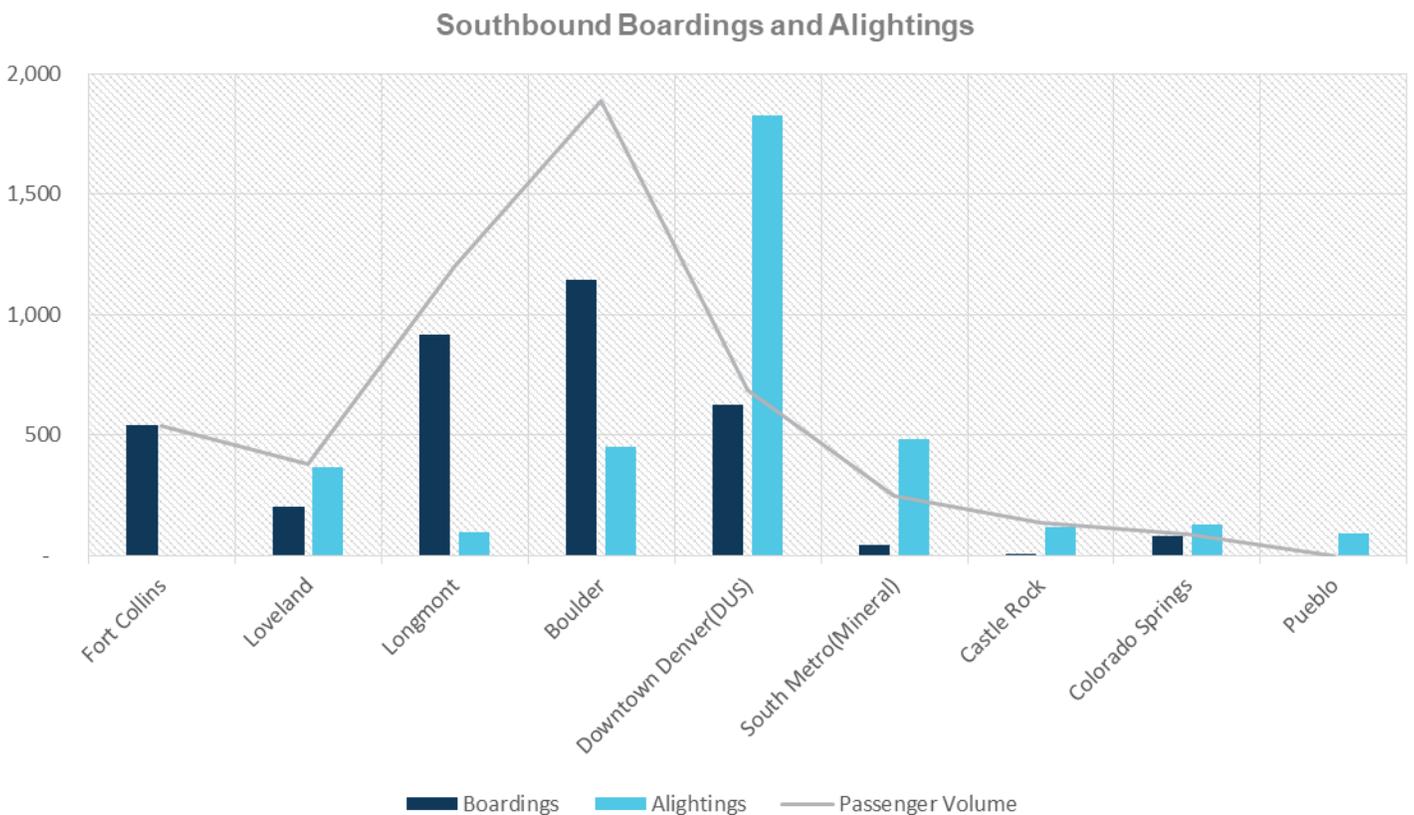
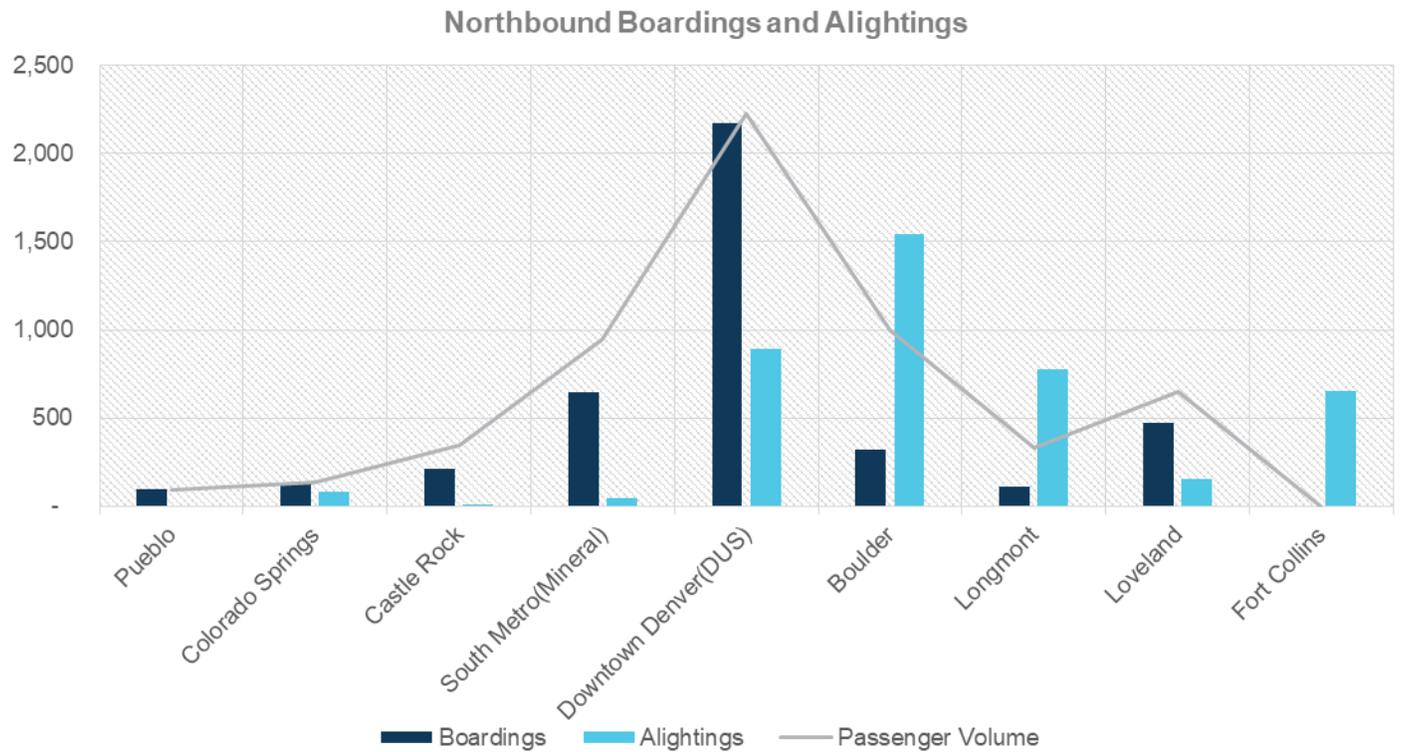
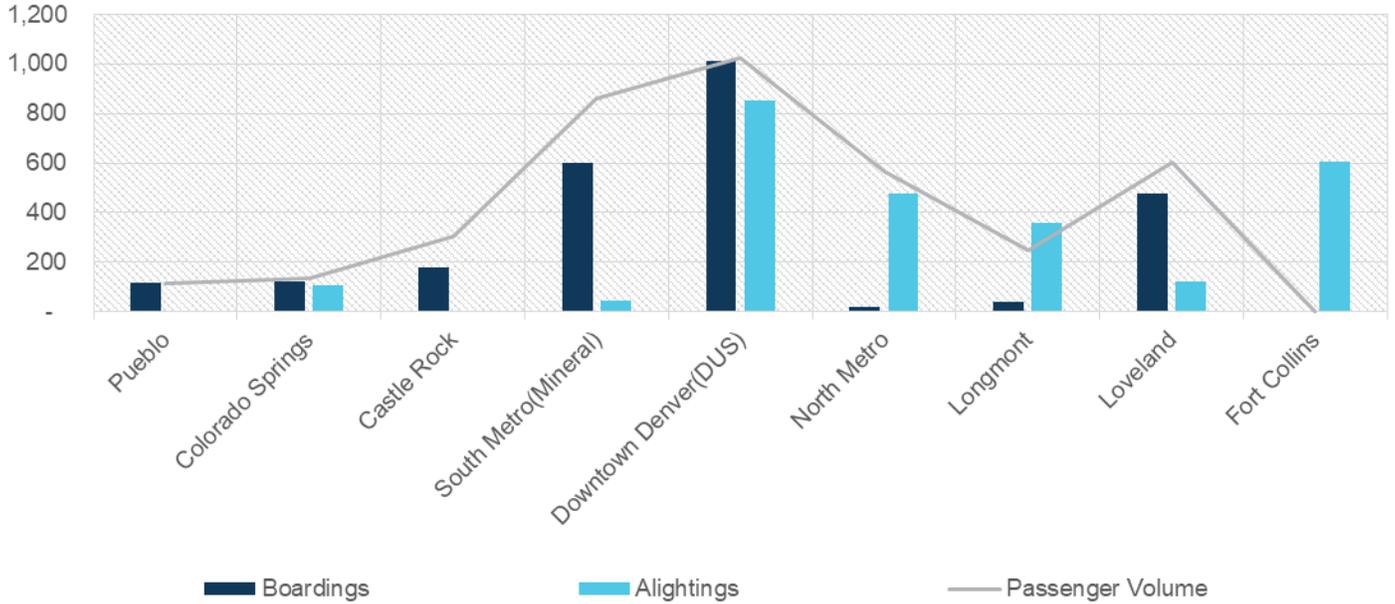


Figure 25. BNSF + North I-25 EIS Commuter Rail Alternative Ridership Patterns

Northbound Boardings and Alightings



Southbound Boardings and Alightings

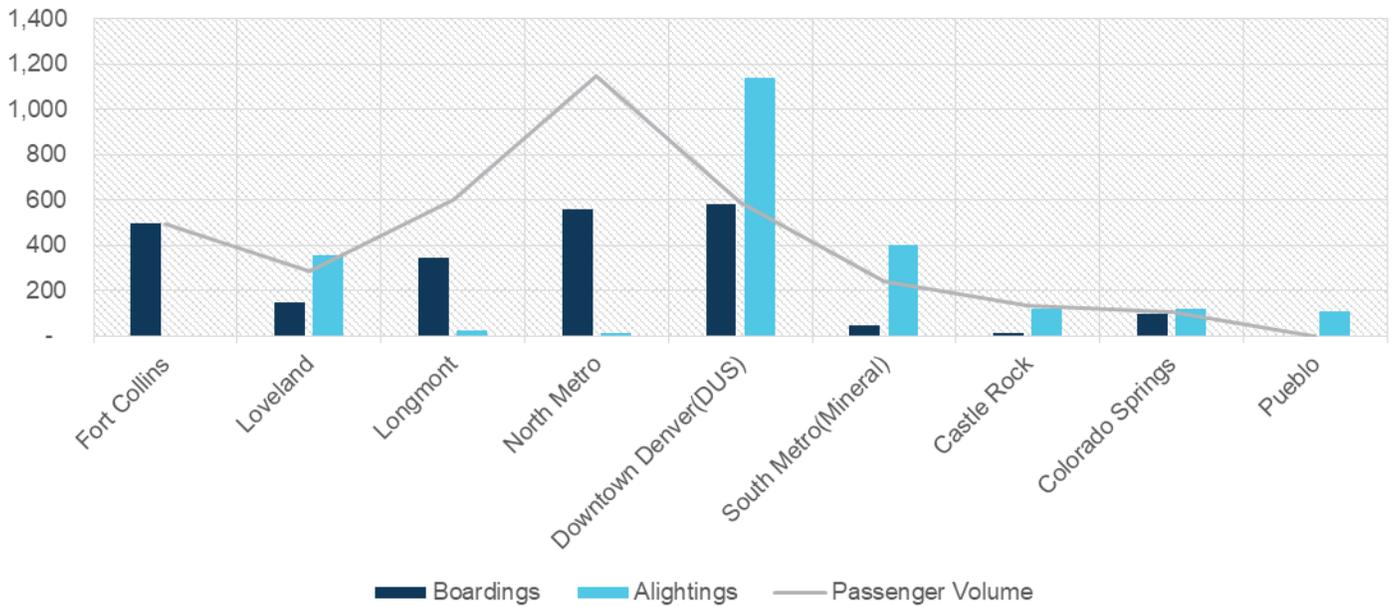
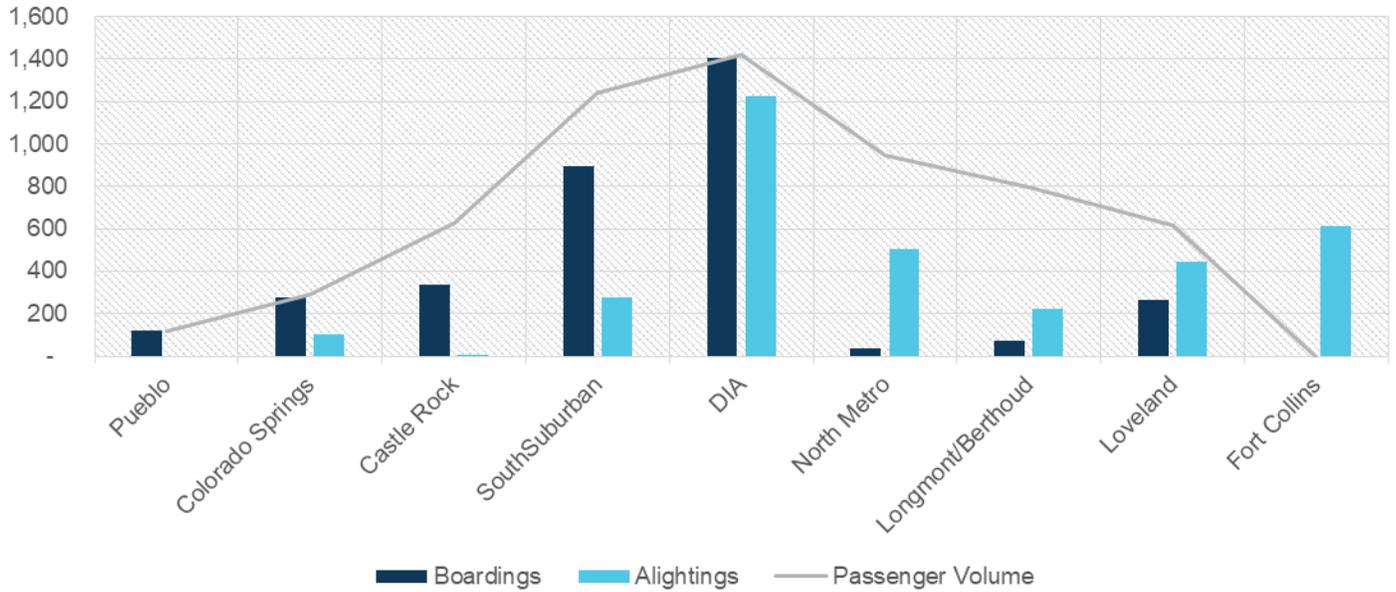
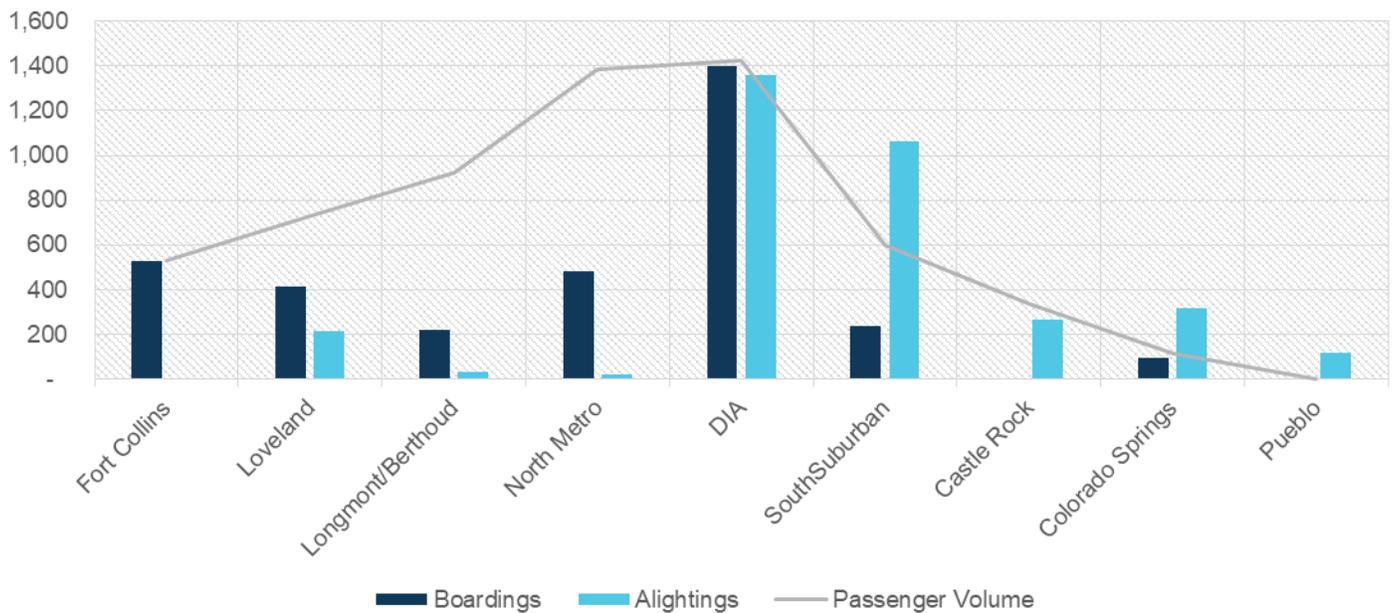


Figure 26. I-25 + E-470 Highway Alternative Ridership Patterns

Northbound Boardings and Alightings



Southbound Boardings and Alightings



3.3.8 LEVEL 2 ALTERNATIVES: COMMUNITY AND ENVIRONMENTAL IMPACTS

Implementing any of the Level 2 alternatives would result in impacts to both natural and community resources. Avoiding and minimizing these impacts was a focus of the Level 2 alternatives development and refinement. It is expected that many of these impacts can be minimized or even avoided through design refinements and other mitigation strategies that can and will be implemented during the NEPA process.

Impact analysis was conducted using GIS overlay of key environmental resources with the alignment footprints. As detailed in the Level 2 evaluation criteria, a number of environmental and community resources were considered that provide context for issues of concern during the NEPA process, early resource agency scoping, and eventual permitting and approvals. Some broad observations of the Level 2 alternatives include:

- Impacts are similar in the South Segment because the alternative alignments are similar. However, the I-25 + E-470 Highway Alignment has less impact to protected species habitat and open space lands in El Paso and Douglas Counties. This may present an avoidance opportunity to refine the freight alignment, just as the highway alignment was adapted to follow the freight corridors through Pueblo and Colorado Springs to minimize impacts and right-of-way acquisition in land constrained areas.
- The freight rail corridor traverses older and more densely developed communities through the Central Segment and, therefore, has more potential for community disruption but also more potential benefit with regard to access and service to community destinations. Passenger rail would not create substantial new impacts to these communities that are already impacted by freight rail noise and traffic disruption.
- Natural resource impacts are greatest with the BNSF Freight Rail Alternative because of its longer alignment west of I-25 through the northern portion of the Central Segment and the North Segment and crossing of major drainages, including the Big Thompson River, Boulder Creek, and St. Vrain Creek and their tributaries. These areas are less affected by the BNSF + North I-25 EIS Commuter Rail Alternative and largely avoided by the I-25 + E-470 Highway Alternative.

Table 15 compares the Level 2 alternatives, and Appendix G provides a detailed accounting of the environmental data and analysis results.

Table 15: Comparison of Environmental Resource Interactions among Level 2 Alternatives

Resource	BNSF Freight Rail Alternative	BNSF + North I-25 EIS Commuter Rail Alternative	I-25 + E-470 Highway Alternative
Air quality	Would reduce regional VMT, which has a measurable effect in reducing air emissions.	Would reduce regional VMT, which has a measurable effect in reducing air emissions; less than other alternatives due to lower projected ridership.	Would reduce regional VMT, which has a measurable effect in reducing air emissions.
Hazardous materials	Alignment encounters one Superfund site (Denver Radium) in the Central Segment.	Alignment encounters one Superfund site (Denver Radium) in the Central Segment.	Alignment encounters one Superfund site (Lowry Landfill) in the Central Segment.
Historic properties	Alignment passes through older neighborhoods and developments with high likelihood of affecting historic properties.	Alignment passes through older neighborhoods and developments with high	Less likelihood of affecting historic properties in the Central Segment due to

Resource	BNSF Freight Rail Alternative	BNSF + North I-25 EIS Commuter Rail Alternative	I-25 + E-470 Highway Alternative
		likelihood of affecting historic properties.	routing of alignment around older Denver developments.
Minority and low-income populations	Passes through minority and low-income populations concentrated within and around Denver where populations are higher and denser.	Passes through minority and low-income populations concentrated within and around Denver where populations are higher and denser.	Fewer low-income and minority populations along alignment because routes around Denver's oldest neighborhoods east along E-470.
Noise and vibration	Approximately 43 miles of alignment next to residential receptors.	Approximately 57 miles of alignment next to residential receptors.	Approximately 42 miles of alignment next to residential receptors.
Parks, open space lands, and trails	Numerous parks and open space areas along alignment in Boulder and northwestern Douglas Counties.	Numerous parks and open space areas along alignment in northwestern Douglas County but fewer in Boulder County.	Few parks or open spaces affected due to easterly route through Denver and north.
Protected species habitat	Impacts Preble's Meadow Jumping Mouse critical habitat in Douglas and El Paso Counties.	Impacts Preble's Meadow Jumping Mouse critical habitat in Douglas and El Paso Counties.	Impacts Preble's Meadow Jumping Mouse critical habitat in Douglas County but avoids impacts in El Paso County.
Residential, business, and commercial land uses	Approximately one-third of alignment is adjacent to developed land uses.	More of alignment is adjacent to developed land uses in Thornton that are avoided by other alternatives.	Approximately one-third of alignment is adjacent to developed land uses.
Streams, wetlands, and floodplains	Most impacts to streams, floodplains, and wetlands of the Level 2 alternatives due to interaction with major drainages in the South and northern portion of the alignment, west of I-25.	High impacts to streams, floodplains, and wetlands but less than the BNSF Freight Rail Alternative because of fewer impacts in Boulder County.	High impacts to streams, floodplains, and wetlands but least of the Level 2 alternatives because alternative routes east through Denver and north.

3.3.9 LEVEL 2 ALTERNATIVES: FINANCIAL AND ECONOMIC FACTORS

Capital and operating costs were estimated for each Level 2 alternative. At this level, the alternatives have similar infrastructure and operating features and, therefore, similar costs. Both capital and operating costs are based on full system build out and high-frequency operating plan for the 2045 design year. As the FRPR Project evolves, cost estimates will be refined and could be scaled to evolve as demand evolves.

Appendix H provides more details on the cost estimates, cost estimating process and methodology, and potential scaling/phasing scenarios.

CAPITAL COST ESTIMATES

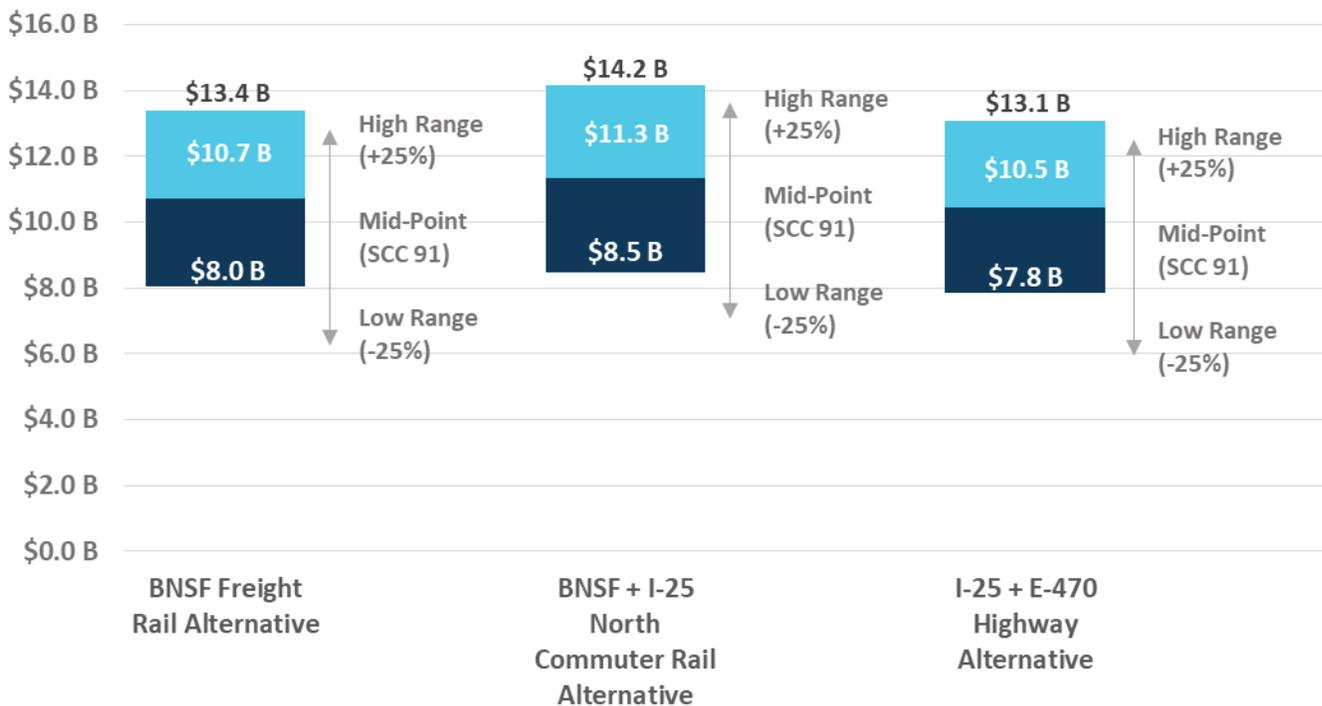
The capital cost estimates include the cost to construct the passenger rail civil and structural elements; build new tracks, stations, and support facilities; purchase and install system control components; acquire vehicles; perform professional services, such as design and construction management; and construct other supporting sitework infrastructure, such as drainage and utilities. In general, capital costs in the estimate assume that the

FRPR system would be constructed with a dedicated double track system, following existing transportation corridors (public roadways, freight and RTD commuter/light rail) where possible.

The capital cost estimates for the Level 2 alternative alignments range from \$7.8 billion to \$14.2 billion in 2020 dollars, or approximately \$44 million to \$80 million per mile, as presented in Figure 27. These cost estimates are for the full build out scenario of a FRPR system from Pueblo to Fort Collins, using conventional rail technology, including all major stations, maintenance and layover facilities, and with a dedicated double track system. It is important to note that this represents the long-term 2045 vision for the FRPR system but it is likely a much smaller investment, in the \$2 billion to \$6 billion range, could provide an incremental path to this vision, and the project team is currently evaluating those options (see Appendix H).

The capital costs are presented as a range, the differences among the ranges relates to the level of accuracy to be expected for an advanced planning level of study. A range of 25 percent, plus-or-minus, has been used to approximate the range of cost that could be expected given the level of concept project definition that has been completed for each Level 2 alternative.

Figure 27: Comparison of Capital Cost Estimate Ranges for Full Build Out of Level 2 Alternatives



Capital costs for the Level 2 alternatives were estimated using the FRA Standard Cost Categories (SCC) format. This format serves as both a structure and a summary for the capital cost estimate and provides a standardized format for comparing FRPR to other intercity passenger rail systems that have used the SCC format (or equivalent). This approach makes it easy to track and control changes over time as the estimate evolves. The SCC format has 10 categories:

- 10. Guideway & Track Elements
- 20. Stations
- 30. Support Facilities

- 40. Sitework & Special Conditions
- 50. Systems
- 60. Right-of-Way (ROW), Land & Existing Improvements
- 70. Vehicles
- 80. Professional Services
- 90. Unallocated Contingency
- 100. Finance Charges (not evaluated in this study)

Table 16 provides the breakdown of the cost estimate according to these categories. The total project cost (SCC 91 in Table 16) includes a 25% unallocated contingency applied to the project subtotal, which establishes the mid-point (most likely) project cost estimate and is considered *the moderate scenario*. At this level of engineering accuracy, a cost ranging approach was applied to the total project cost to develop range from this moderate scenario, with an *optimistic scenario* as the low range (25 percent less than the mid-point), and *the conservative scenario* as the high range (25 percent higher than the mid-point). These ranges are shown in Table 16. As the project evolves, the cost range will become more specific with a narrower range.

Table 16: Comparison of Capital Costs among Level 2 Alternatives under SCC Categories

SCC	Description	BNSF Freight Rail Alternative (in \$ millions)	BNSF + North I-25 EIS Commuter Rail Alternative (in \$ millions)	I-25 + E-470 Highway Alternative (in \$ millions)
10	Guideway and Track	3,745	4,078	3,623
20	Stations	390	350	380
30	Support Facilities	260	260	260
40	Sitework and Special Conditions	657	701	637
50	Systems	348	332	307
51	Construction Subtotal (10-50)	5,401	5,721	5,207
60	Right-of-way	939	1,007	1,001
70	Vehicles	498	498	498
80	Professional Services	1,728	1,831	1,666
81	Subtotal (10-80) (low range)	8,566	9,056	8,372
90	Unallocated Contingency	2,141	2,264	2,093
91	Total Project Cost (mid-point)	10,707	11,320	10,465
	Range of Costs	8,000-13,400	8,500 – 14,200	7,800 – 13,100

While the estimates for the alternatives are similar, there are some differences. The BNSF + North I-25 EIS Commuter Rail Alternative is estimated to be the highest cost (although only marginally so). The higher cost is due primarily to a large viaduct from DUS paralleling the RTD N Line that is required for that alternative compared to the BNSF Freight Alternative. The estimated capital cost of the I-25 + E-470 Highway Alternative is slightly lower than the freight alternatives, primarily due to notably lower estimates for the South Segment portion compared to the freight alignments. The lower cost in the South Segment is mostly offset by higher

costs in the Central Segment associated with the additional length (about 10 miles more than the other alternatives) of the route in central Denver.

OPERATING COST ESTIMATES

Operating costs are estimated to range from \$120 million to \$188 million annually, based on full system build out and a high-frequency service plan. As the alternatives become more refined, assumptions can be made about detailed operating plans, crewing, support staff (maintenance of way and maintenance of equipment), administrative staffing, fuel or power, operators, and governance.

Operating costs were estimated based on research of an average cost per train mile of similar state-sponsored passenger rail services in the United States, which resulted in a \$50.28 per train mile operations and maintenance factor (in 2020 dollars). A train mile is one train traveling one mile. One train traveling a route of 100 miles and returning the same day generates 200 train miles per day. If the train is a daily train, it generates 73,000 train miles per year. The operating costs for the Level 2 alternatives are based on same operating plan (24 round trips per day) and average cost per train mile factor of \$50.28, but vary slightly based on differing route miles as shown in Table 17. A range of operating costs were applied similar to the capital cost estimate with a low, mid, and high range, all of which are factored on the annual train miles and the \$50.28 per train mile, which was defined as the mid-point of the range.

Table 17: Annual Operations and Maintenance Cost Estimates for Level 2 Alternatives

Alternative	Route Miles	Annual Train Miles	Annual Cost Low	Annual Cost Mid	Annual Cost High
BNSF Freight Rail Alternative	190.6	3.10 million	\$125 million	\$156 million	\$ 187 million
BNSF + North I-25 EIS Commuter Rail Alternative	183.6	2.99 million	\$120 million	\$150 million	\$ 180 million
I-25 + E-470 Highway Alternative	191.9	3.11 million	\$125 million	\$156 million	\$ 188 million

FUNDING AND FINANCING

The project team evaluated funding sources and financing mechanisms that could work together to support investment in FRPR as it advances through various stages of development. Appendix I presents a menu of multiple funding sources that could form a financial strategy to pay for an entire project. These include federal programs, state funding sources, legislatively authorized sources (e.g., taxes and fees), value capture, and innovative financing. It is likely that a variety of sources will be required to advance FRPR, as have been used to implement other passenger and commuter rail systems in the United States. Table 18 provides an overview of financial strategies used to implement five passenger rail projects that are comparable to FRPR.

Table 18: Funding and Financing Strategies for Comparable Passenger Rail Systems

Project	Total Capital Costs	Federal Sources	State Funds	Local Sources
Cotton Belt Corridor, Texas (regional passenger rail)	\$1.135 billion	\$139.3 million Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) grants \$908 million financing		\$87.7 million - DART Sales Tax; City Contributions (Plano, Richardson, Addison, Coppell); Naming rights and Advertising

Project	Total Capital Costs	Federal Sources	State Funds	Local Sources
Transbay Terminal Caltrain Extension, California (regional passenger rail)	\$3.94 billion	\$9.4 million FHWA grant \$689.7 million financing	\$625 million authorization and bonds	\$2.616 billion local and regional taxes and fees
South Shore Line – West Lake Corridor Extension, Indiana (commuter rail)	\$945 million	\$355 million FTA grant	\$254.7 million appropriations and program funds	\$335.6 taxes, fees, general funds
Rail Runner Express, New Mexico (commuter rail)	\$135 million		\$125 million state allocation	\$10 million Sandoval county
Front Runner, Utah (commuter rail)	\$1.458 billion	\$489.3 FTA grant		\$968.6 million regional sales tax

3.3.10 LEVEL 2 ALTERNATIVES: FEASIBILITY AND IMPLEMENTATION

Level 2 alternatives were reviewed and compared regarding feasibility and ease of implementation. The evaluation categories are generally qualitative and relate to interactions with freight railroad operations, constructability, system flexibility, and political and public support.

INTERACTIONS WITH FREIGHT RAILROAD OPERATIONS

The BNSF Freight Alternative and BNSF + North I-25 EIS Commuter Rail Alternative follow freight rail corridors and have a high degree of potential interaction with freight operations. The I-25 + E-470 Highway Alternative also interacts with freight corridors, primarily in the Pueblo and Colorado Springs areas. The BNSF Freight Alternative follows existing freight rail corridors for almost 75 percent of its alignment (141 miles) and has the highest degree of interaction with freight railroads. The BNSF + North I-25 EIS Commuter Rail alignment follows the freight corridors for 108 miles of its 184-mile route, and the I-25 + E-470 Highway Alignment includes 24 miles adjacent to freight corridors.

Although the initial design provides dedicated double tracks for each passenger rail and freight rail, which would create minimal if any conflict with freight operations, discussions with the Class I railroads indicate a potential to share right-of-way and potentially even track between passenger and freight rail if the service plan were reduced. (The Class I railroads would not have capacity to accommodate 24 round trips per day with shared track.) However, for this to be considered, more sophisticated rail simulation (Rail Traffic Controller or RTC) modeling needs to be conducted to assess the impact of FRPR on freight operations. In fall 2020, the Rail Commission received a federal Consolidated Rail Infrastructure and Safety Improvement (CRISI) grant to conduct this analysis and determine if and to what degree shared operations and infrastructure might be possible. Another option that is being discussed and could be considered as the project develops is relocating freight operations to separate passenger and freight services. This opportunity exists in the southern portion of the freight corridor (south of Fountain), between Monument and Littleton, and in the North Segment between the BNSF corridor parallel to US 287 and the Union Pacific corridor adjacent to US 85.

CONSTRUCTABILITY

Constructability was reviewed at a high level to determine the complexity of engineering and construction to implement the Level 2 alternatives. All alternatives would be major infrastructure projects that would be complex to phase and construct, particularly in constrained urban areas. The BNSF Freight and BNSF + North

I-25 EIS Commuter Rail Alternatives are likely to be more challenging to construct because they traverse more developed urban areas, and there are some residential, commercial, and transportation infrastructure areas immediately abutting the FRPR construction area, such as between Broadway and DUS in central Denver and in Fort Collins north of Harmony Road. However, there are locations of constraint for all alternatives. While constructability is an issue that will need to be considered as the FRPR Project evolves, it does not differentiate the alternatives greatly. All could be constructed, and all would face challenges.

SYSTEM FLEXIBILITY

System flexibility was reviewed regarding potential operational phasing and expansion opportunities, including the ability of the system to connect to existing and planned local transit or expand passenger rail beyond the initial backbone. These measures were also evaluated in the operational characteristics regarding building and improving ridership. This measure is meant to evaluate the feasibility of a FRPR system to adapt to future needs. Several observations are recorded about the Level 2 alternatives:

- The BNSF Freight Alternative presents the greatest potential to implement a near-term phase of FRPR because a limited service could be established and offered using existing freight tracks.
- The freight rail corridors are more integrated with the RTD system in the Central Segment. FRPR could jointly operate or develop commuter rail corridors that have potential to serve passenger rail with express service and commuter rail with local service.
- The freight rail corridors traverse more established communities that are enthusiastic about, and in some cases actively planning for, reinstating passenger rail on freight corridors. A limited number of secondary stations serving smaller communities boosted ridership projections and did not significantly degrade travel times.
- The I-25 + E-470 Highway Alternative has potential to build on Bustang travel demand and mobility hubs as people transition from regional bus to rail transit.

PUBLIC AND POLITICAL SUPPORT

As noted in Section 5.0 of this report, the level of public and agency interest and engagement in FRPR has been high, and sentiment has been supportive overall. Specific feedback regarding the Level 2 alternatives has been received at segment stakeholder coalition meetings and through the July 2020 online public meeting. Beyond continued expression of support for FRPR overall, feedback has focused on access to the Denver area (specifically downtown Denver or the DEN Airport). The BNSF Freight Alternative and BNSF + North I-25 EIS Commuter Rail Alternative routing to downtown Denver are contrasted with the I-25 + E 470 Highway Alternative that routes east around Denver to the DEN Airport. Both markets are strong from public support and ridership perspectives.

When asked about the alignments in the non-scientific July 2020 online public meeting survey, nearly twice as many respondents identified downtown Denver as their top destination, followed by DEN Airport, and the DTC (Figure 28). The importance of the Denver region as the central hub of FRPR activity is reflected in public feedback and is consistent with ridership projections, which indicate more than half of rail activity (boardings and alightings) would occur at the Denver metropolitan area stations.

Figure 28. Online Survey Top FRPR Destination

WHERE WOULD YOU MOST WANT THE ALIGNMENT OF FRONT RANGE RAIL TO GO?

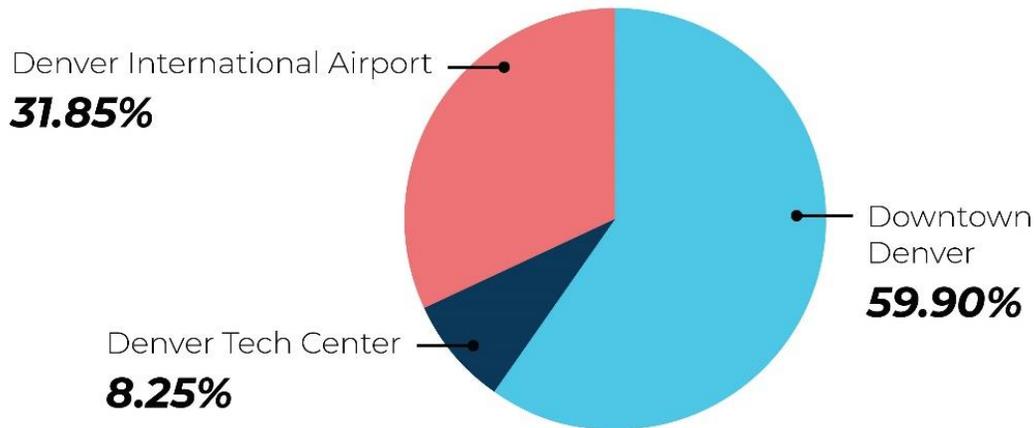
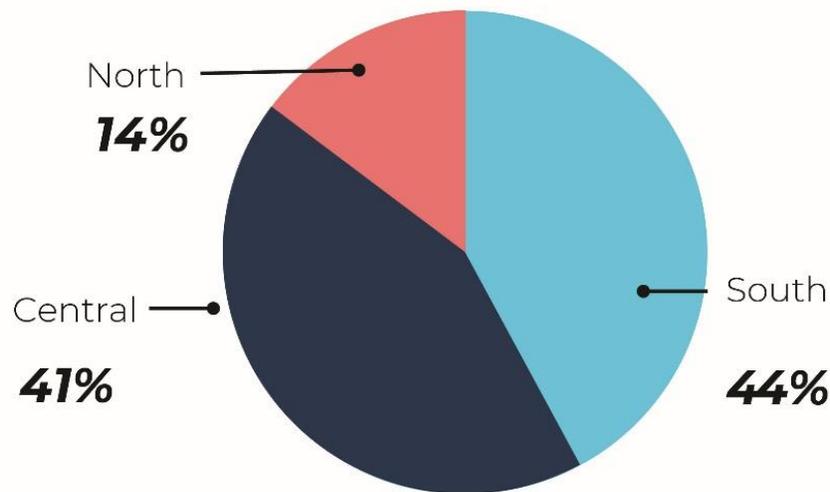


Figure 29. Online Survey Participants by Geographic Segment

GEOGRAPHIC DISTRIBUTION OF MEETING PARTICIPANTS



Although meeting participants came from across the Front Range (and particularly the South Segment, as noted in Figure 29), more than half of survey respondents indicated Denver and DEN Airport as the top destinations. Three times as many respondents identified Denver as their top destination compared to the airport (Figure 30).

Figure 30. Top Destinations for FRPR from Online Public Meeting Survey

WHERE WOULD YOU BE MOST LIKELY TO GO ON FRONT RANGE PASSENGER RAIL?

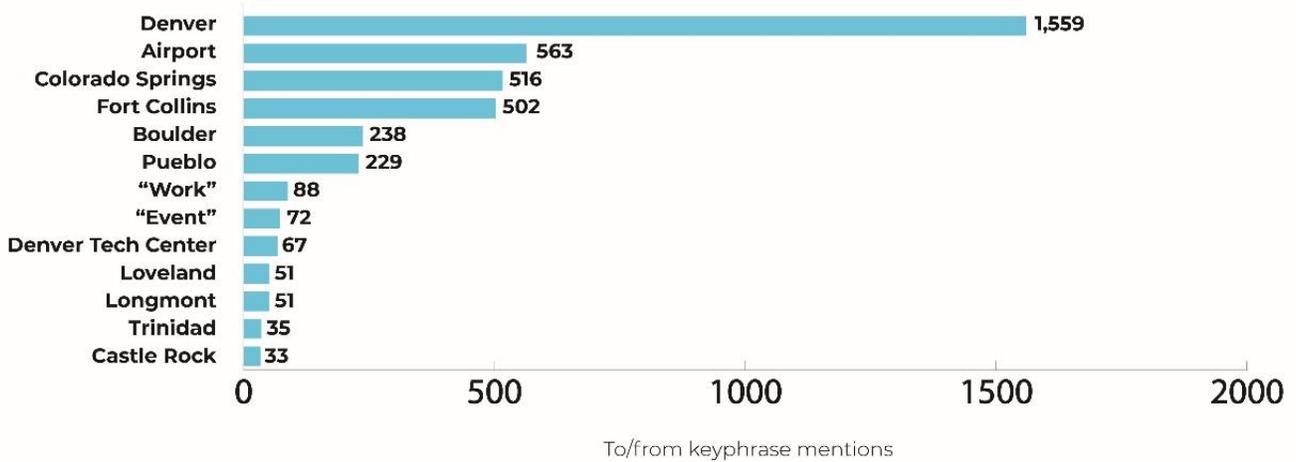
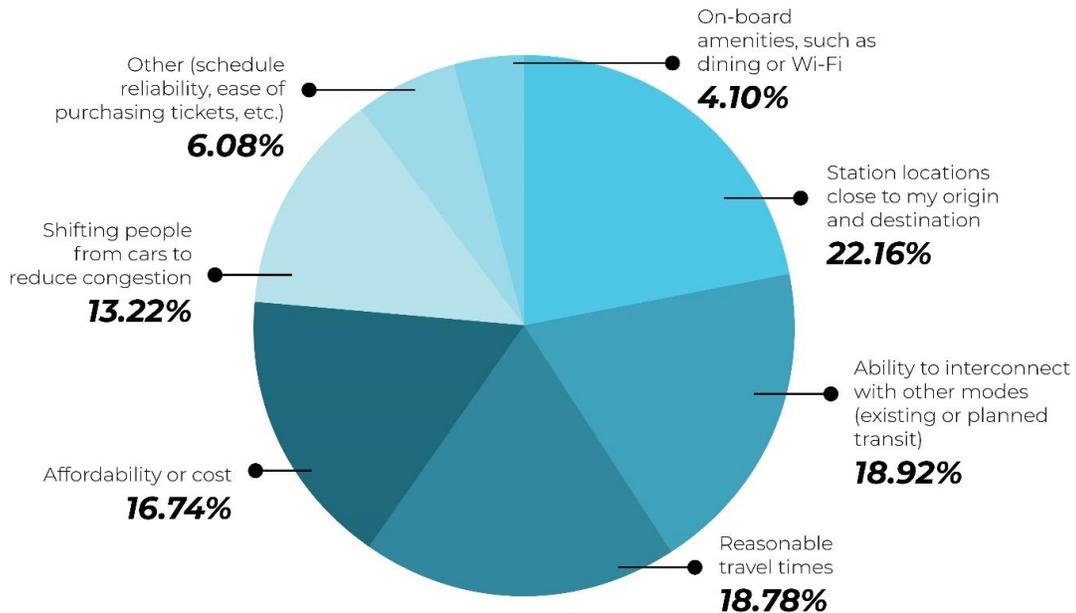


Figure 31. Online Survey Responses about Important Operational Considerations

WHERE ARE THE MOST IMPORTANT OPERATIONAL CONSIDERATIONS TO YOU?

7,003 total selections



This emphasis on the Denver station locations is reinforced by the responses to the survey question, "What are the most important operational considerations to you?" As illustrated in Figure 31, the top three most selected characteristics are "stations close to my origin and destination," "ability to interconnect with other modes (existing or planned transit)," and "reasonable travel times." These responses are consistent with a focus on

DUS as a central hub and with the reasons cited by stakeholders in segment stakeholder meetings, especially in Colorado Springs, for the preference. It is noted that by far the highest participation in the online public meeting was from Colorado Springs, which accounted for more than one-third of the total respondents.

The tradeoffs of the alignments through the Central Segment between downtown Denver and DEN Airport has also been a subject of discussion at all segment stakeholder coalition meetings, although the input has varied based on the specific interests of stakeholders in the geographic areas, as summarized below.

South Segment. Stakeholders, especially in the Colorado Springs area, have a strong preference for routes to downtown Denver compared to the DEN Airport. This preference is based on a desire to connect the state's two largest metropolitan area economies directly and efficiently—that is, traveling from Colorado Springs to downtown Denver in a direct and fast manner—as well as concerns about competition with the Colorado Springs Airport and, to a lesser degree, the Pueblo Airport. In Pueblo and south to Trinidad, sentiment is less focused on specific Denver destinations and more with how FRPR connects southern Colorado to the Front Range, especially Colorado Springs and Denver, and integrate with the Amtrak Southwest Chief service to serve destinations south, including Trinidad, La Junta, and New Mexico.

Central Segment. The preference for downtown Denver or the DEN Airport is mixed in the Central Segment coalition stakeholder meetings, particularly with the City and County of Denver representatives who support both destinations; however, Planning and Department of Transportation and Infrastructure staff prefer DUS and airport staff prefer DEN Airport. Within the Central Segment stakeholder coalition, there is also interest in serving employment and population centers in the DTC, which is not directly served by either the freight or E-470 alignment. Boulder greatly prefers the BNSF Freight Rail Alternative that routes to Boulder; Longmont has also expressed preference for the BNSF Freight Rail Alternative but not as strongly as Boulder.

North Segment. Stakeholders in the North Segment identify with northern Colorado as an independent region from Denver and view Denver as a mega region with many dispersed destinations. While the merits of downtown Denver compared to DEN Airport have been discussed (with support for both) with the North Segment stakeholder coalition, attention has been more about intraregional travel among northern Colorado communities, with a secondary focus on access to and from Denver. MPO regional travel surveys and stakeholder experience with vanpools and commuting within the region indicate most commuting in the NFRMPO area occurs within northern Colorado, such as between Loveland and Fort Collins, rather than to Denver. For the commuting that does occur to Denver, destinations are varied with many carpool/vanpool pairings. Multiple options could be viable for accessing downtown Denver from northern communities including: the BNSF Freight Rail Alternative through Boulder, the BNSF + North I-25 EIS Commuter Rail Alternative along I-25 (RTD N Line), or DEN Airport from I-25 along E-470. The North Segment stakeholders understand the various paths to access downtown Denver affect interactions between northern communities. Thornton, and Broomfield, and Greeley have expressed interest in the I-25 alignment to Longmont. Additionally, these same communities noted support for the BNSF + North I-25 EIS Commuter Rail Alignment. Other area communities have expressed interest in the long-planned commuter rail along the freight corridor adjacent to US 287 that is common to both the BNSF Freight Rail and the BNSF + North I-25 EIS Commuter Rail Alternatives.

3.3.11 ALTERNATIVES RECOMMENDED TO CARRY FORWARD FOR NEPA EVALUATION

All three Level 2 alternatives are recommended to carry forward into NEPA, with some refinements described in Section 6.0. Refinements from the Level 1 corridors have resulted in Level 2 alternatives that can reasonably meet the FRPR Project vision. The Level 2 alternatives present a reasonable range of alignment and service

options that offer different costs and benefits. The alternatives also present opportunities within the geographic segments to refine, adapt, and consolidate alignments and stations to improve system performance.

- BNSF Freight Rail Alternative is recommended because it best meets purpose and need to serve population centers; is easier to phase with shorter independently useful segments; and presents the best opportunity for partnerships and complementary services among the Class I railroads, RTD, and Amtrak.
- I-25 + E-470 Highway Alternative is recommended as a reasonable alternative to the freight corridor and presents options for use of CDOT right-of-way and leveraging CDOT's investment in Bustang and I-25 mobility hubs if railroad right-of-way is not feasible or agreements cannot be negotiated. This alternative also has high ridership but would be harder to phase and does not serve high-demand central Denver destinations, residents, and jobs. Outside of Denver, the I-25 corridor presents opportunities for smart growth land use planning in developing communities growing toward I-25.
- BNSF + North I-25 EIS Commuter Rail Alternative is also recommended. Although it has lower ridership than the BNSF Freight Rail Alternative, primarily because the Louisville-Boulder-Longmont market is not served, it has some support and potential for optimizing with RTD's N Line. Ridership may also be affected by slower operating speed from DUS through Commerce City to Thornton, which is somewhat offset by the shorter end-to-end distance.

4.0 GOVERNANCE OPTIONS

One of the most significant issues to be resolved in the implementation of regional passenger rail is the question of who the responsible party or parties will be for managing, constructing, and operating the system. A regional rail system inherently goes farther and cuts across multiple jurisdictional boundaries. The FRPR spans 180 miles between Pueblo and Fort Collins. Implementing a successful passenger rail system will require forming partnerships among the state, MPOs, counties, municipalities, and the private sector.

Governance and policy decisions are crucial to continue the progress of this FRPR Project. Establishing a governance program is the next step. Appendix J contains an analysis of the program governance options evaluated for the FRPR Project, as well as review of governance models used by other regional passenger rail programs that informed the options developed for the FRPR Project.

The initial efforts to identify and vet potential governance alternatives resulted in discussions around these four basic concepts that could be pursued, pending additional agency, stakeholder, and political input:

- **Public Rail Authority** – This option would require legislation to create a Public Rail Authority in state statute. With the creation of the Public Rail Authority, targeted rail authorities like a Front Range Rail Authority or other geographically defined rail authority could be formed to plan, design, fund, finance, build, operate and maintain a passenger rail system. This type of authority would be developed through contracts among participating entities that would then be required to file under the State's Department of Local Affairs.
- **Front Range Passenger Rail Authority (FRPRA)** – This approach is similar in structure to a more comprehensive public rail authority, but it would immediately authorize in state statute the structure for a specific Front Range Passenger Rail Authority (single step process). Among the other enabling provisions in this statute would be language to allow the authority to plan, design, fund, finance, build, operate, and maintain a Front Range Passenger Rail system.

- **Rail Transportation Enterprise** – This approach would create a statutorily authorized Rail Transportation Enterprise within CDOT that would have its own independent Board of Directors with full operating and financing powers. It should be noted, however, that the Colorado State Constitution restricts the amount of public grants an enterprise can receive to 10 percent of its total state revenues. This approach would be similar to the existing High-Performance Transportation Enterprise (HPTE) and the Bridge Enterprise structure at CDOT today. The recently passed Proposition 117 (New Enterprise Requirements) could change certain aspects of this option; however, sufficient information on implementation of the proposition is not yet available.
- **Expand Current Commission Authority** – This approach would simply amend the current statutory authority of the Southwest Chief and Front Range Passenger Rail Commission to expand its directive to further review the options above and allow more in-depth evaluation before recommending an approach for advancing the implementation for FRPR. An outcome of this process could be to establish a Joint Powers Authority.
- **2020 Senate Bill draft** – Proposed bill language in 2020 combined several elements from the first and second options listed above. The language authorized creating a Rail District encompassing counties along the Front Range. The Rail District would be granted the authority to refer measures to local government ballots.

The Southwest Chief and Front Range Passenger Rail Commission was leaning toward supporting the Front Range Passenger Rail Authority before the COVID-19 pandemic required shutdowns and the 2020 legislative discussion failed to materialize. In resuming governance discussions, the project team has identified a number of success strategies and near-term steps the Rail Commission, CDOT, and stakeholders can take to develop and advance governance options, as outlined in Appendix J. Strategies focus on alignment, stakeholder engagement and education, and building support and partnerships.

5.0 STAKEHOLDER AND PUBLIC INPUT

The Rail Commission sets direction for the FRPR Project and is actively involved in developing and promoting communication materials. The Rail Commission holds monthly meetings, which serve as a primary method of advancing the FRPR Project and reporting progress. These meetings are open to the public, and the Rail Commissioners are active in publicizing and engaging their representative constituents in discussions regarding FRPR.

The FRPR Project undertook a robust stakeholder and public engagement process to understand and consider the numerous interests represented along the corridor and within each of the geographic segments. Input received from stakeholder coalition meetings and public engagement surveys and meetings influenced the FRPR alternatives evaluation and was a key metric in comparing alternatives.

In addition, the project team held dozens of one-on-one interviews, meetings, and briefings with key stakeholders and individual agencies and organizations. These one-on-one meetings were targeted to specific topics and interests for those agencies and organizations.

Feedback from stakeholders and the public shows a great deal of interest and support in the prospect of the FRPR. Agencies also indicate high but more measured interest and support for FRPR based on challenges of developing and implementing large public transportation projects.

5.1 AGENCY COORDINATION

5.1.1 STAKEHOLDER COALITIONS

Segment coalitions of representative stakeholders and decision-makers were created representing the local jurisdictions, organizations, and interest groups in each geographic segment (South, Central, and North). The segments allowed for discussion of the unique local context and interests that shape transportation and community needs in those areas and the role FRPR might play in the regions. The segment coalition members provided input on project-related issues and served as liaisons between the FRPR project and members of their community. Four rounds of segment coalition meetings (one for each segment) took place in December 2019, January 2020, April 2020, and September 2020, supporting the project visioning, Level 1 alternatives evaluation, and Level 2 alternatives evaluation. In addition to the segment coalitions, a broad corridor coalition of policy- and executive-level representatives from jurisdictions, agencies, and organizations along the full project limits of the FRPR (Fort Collins to Pueblo) was convened. The corridor coalition members considered community-focused interests while providing cohesive, corridor-wide input.

The coalitions served as a platform for (1) understanding all stakeholders' interests around FRPR and community issues, (2) providing all stakeholders the same information on the project, (3) obtaining stakeholders' feedback on the project, and (4) seeking to develop mutually agreeable solutions, concepts, and opportunities among stakeholders.

5.1.2 FEDERAL AND RESOURCE AGENCY ENGAGEMENT

The project team engaged U.S. Department of Transportation agencies, including FHWA, FTA, and FRA, that might be a Lead Agency for a NEPA process and federal approval. The project team coordinated with all three agencies so that the pre-NEPA planning and project development were consistent with common planning practices and could be transitioned easily into a future NEPA phase regardless of the role the agencies would assume during NEPA (lead or cooperating). Each of the individual agencies' planning processes have a NEPA-like process for defining a project or program purpose and for developing, evaluating, and recommending alternatives. The alternatives analysis approach was multidisciplinary and considered and incorporated:

- Environmental and community values
- Minimization of impacts
- Mitigation strategies that could be employed to improve alternatives

Executive Order (EO) 13807, Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects, was signed in 2017 and sets goals for improving the efficiency of NEPA. A major component of EO 13807 is the requirement for federal agencies to process environmental reviews and decisions for major infrastructure projects as "One Federal Decision". Several documents have been developed concurrently with the FRPR Project development and alternatives analysis process to support the future NEPA phase, including an Agency Coordination Plan and a Public Involvement Plan.

In addition to local jurisdictions and U.S. Department of Transportation agencies, the project team coordinated with numerous state, federal, and local resource agencies with oversight or permitting jurisdiction over the FRPR Project. This early scoping with resource agencies helped inform the permitting timeline and milestones that will be required as the project advances through NEPA approvals.

5.2 PUBLIC ENGAGEMENT

The Rail Commission and stakeholder coalition meetings, along with the project website (frontrangepassengerrail.com), served as a foundation for relaying information about the project and receiving public input. Additionally, the Rail Commission and CDOT sponsored three surveys to gauge awareness and interest in FRPR and seek ideas about how to implement FRPR.

The first online survey was conducted by CDOT from July 22, 2019, to September 30, 2019. Nearly 7,000 people completed this survey. Survey respondents were self-selected, meaning that those with interest completed the survey although it was not statistically representative of Front Range residents. More than half of the respondents already use public transit in the region, and nearly all (95 percent) support FRPR for its opportunity to help solve congestion and environmental concerns. Most (92 percent) of the respondents reported interest in using FRPR if it were available. Benefits ranked as most important in the survey included (in descending order): improved air quality, reliable travel times, expanded travel choices, increased safety, connect existing services, and economic development.

In October 2019, the Rail Commission contracted with RBI/Magellan to conduct a statistically significant sample of likely voters in the 2020 general election across 13 Front Range counties to gauge willingness of Front Range residents to support FRPR as both a concept and funding priority. This public opinion survey is considered representative of Front Range voters with a margin of error of +/- 5 percent. For this survey, 85 percent of respondents expressed support for FRPR as a mode of transportation for residents and communities along the Front Range, and more than 60 percent supported a sales tax increase to fund the system.

In July 2020, an online public meeting was held (June 29 through July 31, 2020) to share background information, update users on the current project status, and ask the users to provide their feedback on Level 2 alternatives through interactive comment maps, surveys and/or comment forms. More than 8,000 users visited the online meeting, and many (nearly 2,000) visited more than once, indicating sustained interest in FRPR. Some general themes came up consistently and include the following priorities: affordability (both for potential users and throughout project development); access to the rail and station accessibility within communities along the Front Range; reasonable travel times; and construction costs and funding. Appendix K includes a summary of the online meeting and input.

6.0 NEXT STEPS

The alternatives analysis conducted for this phase of the FRPR Project has done much to advance passenger rail in Colorado. FRPR is technically feasible. The vision can be realized using existing transportation corridors to minimize community and environmental impacts, and the public overwhelmingly supports the concept. Next steps for the project development will set the project up for success.

6.1 ADVANCING AN INITIAL PHASE

As noted in Section 3.3.3, the Level 2 alternatives were developed based on a robust operating plan of 24 end-to-end round trips per day. The Class I railroads, who participated as part of this study through the Rail Commission, have suggested that this aggressive service plan is not likely needed for an “opening day” service. They advised that with reduced headways, it might be possible for FRPR to operate alongside freight operations with a much smaller investment than the full double track build out. This initial phase, in the \$2 billion to \$6 billion range, could provide an incremental path to this vision, and the project team is currently evaluating those options (see Appendix H).

In order to fully assess the potential for shared operations and opportunities for FRPR to operate without degrading freight operations, the Class I railroads requested that the FRPR Project conduct rail simulation modeling using Rail Traffic Controller (RTC) modeling software. RTC is a tool used by the railroads to test rail operational plans and proposed infrastructure arrangements by realistically simulating train operations. It is the only rail simulation software recognized by FRA to validate and support federally funded rail infrastructure improvement projects. FRA indicated that this level of modeling is needed before the FRPR Project can be “NEPA ready” and to provide necessary inputs for a Service Development Plan, which would need to be conducted for the NEPA Preferred Alternative.

Additionally, infrastructure requirements and cost estimates would be refined in the next levels of analysis. Refinements would include more research on the topics of terrain challenges, right-of-way acquisition, operational analysis, community input and more detail on station area planning, considerations for track and structure sharing with freight and/or RTD corridors, and potential hybrid alignment combinations that could be assembled by combining specific segments from each Level 2 alternative.

This pre-NEPA phase is extremely important to focus the EIS process: it limits the number of alternatives that need to be engineered in the NEPA phase, and it engages stakeholders to build consensus and provide input on the recommendations prior to formal NEPA scoping.

The Rail Commission applied for and received a CRISI program grant to conduct the RTC modeling. This effort is expected to start in 2021 and take approximately 11 months.

During this time, CDOT and the Rail Commission will sharpen ridership projections, cost estimates, and engineering designs/speed profiles to match the revised service plans. Ridership projections will also refine station assumptions, including additional development around stations, additional secondary stations, and integration with existing and planned transit.

In conjunction with project development refinements, CDOT and the Rail Commission will continue the important work of fostering awareness and support for FRPR and building on public momentum and stakeholder enthusiasm. The combination of policy, program, and project development actions taken during this study help set the stage for the NEPA process, which is a foundational step in project approval and funding.

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APPENDICES

- A. Past Colorado Passenger Rail Studies**
- B. Level 1 Evaluation Matrix**
- C. Level 2 Evaluation Matrix**
- D. System Design Criteria**
- E. Level 2 Design Refinements**
- F. Ridership Modeling**
- G. Level 2 Environmental Evaluation Documentation**
- H. Cost Estimates**
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- J. Governance**
- K. Online Public Meeting Summary**

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