

Appendix A:

Selected Preferred Route Options - Potential Populations Served by State



Table of Contents

1. Introduction.....A-1

2. Existing and New Services by State.....A-3

3. Potential Populations ServedA_5

4. References.....A_6

Figures

Figure 1-1. Baseline Network.....A-2

Figure 1-2. Network of Selected Preferred Route OptionsA-2

Tables

Table 2-1. Number of Intercity Passenger Rail Services Accessible by StateA-3

Table 3-1. Population in the Baseline Network and Network of Selected Preferred Route Options by State.....A-5

1. Introduction

Appendix A documents the passenger rail services that could be available and the populations that could be served with the baseline network compared to the network of selected preferred route options. The baseline network consists of two components: (1) the existing passenger rail network of 15 long-distance routes, 30 state-supported routes, and the Northeast Corridor (NEC) and (2) three baseline projects (Figure 1-1).

Baseline projects include any committed new operational links or service upgrades to the existing network that have met the following requirements:

- Federal environmental review and decision – a National Environmental Policy Act process that culminated in a Federal Railroad Administration (FRA)-approved and signed Record of Decision for an Environmental Impact Statement, Finding of No Significant Impact for an Environmental Assessment, or Categorical Exclusion;
- Applicable operating and capital investment commitment agreement(s) with host railroad(s);
- Full capital funding for the operating segment, including equipment; and
- Operating funding for initial service implementation.

If a committed new operational link or service upgrade did not meet any of these parameters, but the project's sponsor had a legal obligation to FRA to initiate service, the project was included in the baseline network. The baseline projects identified by the Amtrak Daily Long-Distance Service Study (the Study) include:

- Brightline (Florida): Orlando to Miami via West Palm Beach, Florida;
- California High-Speed Rail Minimum Operating Segment: Merced to Bakersfield, California; and
- Gulf Coast Passenger Rail (New Orleans, Louisiana, to Mobile, Alabama).

The network of selected preferred route options includes the baseline network plus the 15 selected preferred route options identified by the Study (Figure 1-2). The selected preferred route options are conceptual and require additional planning and analysis to determine actual alignments; further analysis and identification of funding would be necessary to advance the selected preferred route options through project planning and project development activities prior to implementation.

Appendix A: Selected Preferred Route Options - Potential Populations Served by State

Figure 1-1. Baseline Network



Figure 1-2. Network of Selected Preferred Route Options



2. Existing and New Services by State

Table 2-1 shows the number of existing long-distance, state-supported, NEC, and baseline project services by state and the increase in the number of services that would be available with new long-distance routes identified as part of the network of selected preferred route options. **A state is served by a passenger rail service if that service stops at a station located within the state.**

General Transit Feed Specification (GTFS) data from Amtrak as of July 12, 2024, were used for the analysis of existing Amtrak passenger rail routes and station locations (Amtrak 2024). GTFS data are a group of text files that identify the routes, trips, stops/stations, and stopping patterns associated with service provided by an operator, such as Amtrak. GTFS data were used to identify the stations served by each route and the state in which each station is located. If a route served a station within a given state (based on the GTFS data), that route was counted as an intercity passenger rail service accessible by the state. This approach allowed for determining the states served by each existing long-distance, state-supported, and NEC route using the GTFS data.

For the selected preferred route options, potential station locations were selected as follows:

- **Segments in the Baseline Network:** For segments of selected preferred route options that align with the baseline network, existing stations in the baseline network were included in the selected preferred route option. For segments of selected preferred route options that overlap with existing and committed Amtrak state-supported service, those existing state-supported stations were included for the selected preferred route option where they support long-distance operations and an average station spacing of approximately 50 miles (calculated from the average station spacing of existing Amtrak long-distance routes) with each station serving a population of at least 20,000 people. Stations that exclusively serve commuter or metro rail services were not included.
- **New Segments Consistent with Discontinued Routes:** For new segments that include portions of discontinued long-distance routes that no longer have service, the discontinued station locations were included where they accommodated an average station spacing of approximately 50 miles with each station serving a population of at least 5,000 people.
- **New Segments where Long-Distance Passenger Rail Service has not Operated:** For new segments with no existing Amtrak service and no discontinued operations, potential new stations were selected based on an average station spacing of approximately 50 miles with each station serving a population of at least 5,000 people.

Table 2-1. Number of Intercity Passenger Rail Services Accessible by State

State	Existing Routes (Baseline Network)					Selected Preferred Route Options	Total Number of Routes Associated with the Network of Selected Preferred Route Options
	Long-Distance	State-Supported	NEC	Baseline Projects	Total Number of Existing Routes		
Alabama	1	0	0	1	2	4	6
Alaska	0	0	0	0	0	0	0
Arizona	3	0	0	0	3	2	5
Arkansas	1	0	0	0	1	0	1
California	5	3	0	1	9	2	11
Colorado	2	0	0	0	2	5	7
Connecticut	0	2	2	0	4	0	4
Delaware	5	2	2	0	9	1	10

Appendix A: Selected Preferred Route Options - Potential Populations Served by State

State	Existing Routes (Baseline Network)					Selected Preferred Route Options	Total Number of Routes Associated with the Network of Selected Preferred Route Options
	Long-Distance	State-Supported	NEC	Baseline Projects	Total Number of Existing Routes		
District of Columbia	6	6	2	0	14	1	15
Florida	3	0	0	1	4	2	6
Georgia	4	0	0	0	4	3	7
Hawaii	0	0	0	0	0	0	0
Idaho	1	0	0	0	1	2	3
Illinois	8	8	0	0	16	3	19
Indiana	3	1	0	0	4	2	6
Iowa	2	0	0	0	2	2	4
Kansas	1	0	0	0	1	2	3
Kentucky	2	0	0	0	2	2	4
Louisiana	3	0	0	1	4	4	8
Maine	0	1	0	0	1	0	1
Maryland	6	2	2	0	10	1	11
Massachusetts	1	4	2	0	7	0	7
Michigan	0	3	0	0	3	1	4
Minnesota	1	1	0	0	2	4	6
Mississippi	2	0	0	1	3	4	7
Missouri	2	2	0	0	4	3	7
Montana	1	0	0	0	1	2	3
Nebraska	1	0	0	0	1	2	3
Nevada	1	0	0	0	1	1	2
New Hampshire	0	2	0	0	2	0	2
New Jersey	5	4	2	0	11	2	13
New Mexico	3	0	0	0	3	4	7
New York	6	9	2	0	17	2	19
North Carolina	4	2	0	0	6	0	6
North Dakota	1	0	0	0	1	1	2
Ohio	3	0	0	0	3	2	5
Oklahoma	0	1	0	0	1	3	4
Oregon	2	1	0	0	3	1	4
Pennsylvania	7	4	2	0	13	2	15
Rhode Island	0	0	2	0	2	0	2
South Carolina	4	0	0	0	4	0	4
South Dakota	0	0	0	0	0	2	2
Tennessee	1	0	0	0	1	3	4
Texas	2	1	0	0	3	9	12
Utah	1	0	0	0	1	2	3
Vermont	0	2	0	0	2	0	2
Virginia	6	5	0	0	11	1	12
Washington	2	1	0	0	3	2	5
West Virginia	2	0	0	0	2	0	2
Wisconsin	1	2	0	0	3	1	4
Wyoming	0	0	0	0	0	3	3

Note: A state is served by a passenger rail service if that service stops at a station located within the state.

3. Potential Populations Served

Table 3-1 lists the potential population served by the baseline network and by the network of selected preferred route options by state, as well as the additional population served by the network of selected preferred route options compared to the baseline network. The analysis to summarize the population in the baseline network by state included the following steps:

1. Identify stations in the baseline network.
2. Establish catchment areas around stations in the baseline network.
 - Stations inside a metropolitan statistical area (MSA) have a 30-mile radius catchment.
 - Stations outside an MSA have a 50-mile radius catchment.
3. Identify the Census Tracts within the service area of the baseline network.
 - Overlay all the station catchments in the baseline network over the 2020 U.S. Census Bureau Census Tracts.
 - Identify all Census Tracts whose centroid falls within the station catchments in the baseline network. These are the Census Tracts that are served by the baseline network.
4. Use the first two digits of the Federal Information Processing System (FIPS) code associated with each Census Tract to determine the state in which each Census Tract is located. Sum the population of all Census Tracts associated with a given state and within the baseline network. Population data are from the U.S. Census Bureau's 2020 Decennial Census (U.S. Census Bureau 2020).

The analysis to summarize the population in the network of selected preferred route options by state followed the same process, except that the stations in the network of selected preferred route options are defined as the stations in the baseline network plus the stations served by the 15 selected preferred route options. Potential new stations of the selected preferred route options expand the passenger rail network and increase the population with access to passenger rail. Where the selected preferred route options align with the baseline network, they do not serve additional people. However, the selected preferred route options do provide an additional passenger rail trip and increase the frequency of passenger rail service.

The network of selected preferred route options may increase the population with access to passenger rail in states that do not have a potential new station. This is due to the size of the 30- or 50-mile radius catchment areas. Catchment areas may cover multiple states. For example, the network of selected preferred route options increases the population with access to passenger rail service in Arkansas and West Virginia even though there is not a new station stop in either state.

Table 3-1. Population in the Baseline Network and Network of Selected Preferred Route Options by State

State	Population in Baseline Network	Population in Network of Selected Preferred Route Options	Potential Increase in Population Served
Alabama	2,188,000	4,519,000	2,331,000
Alaska	0	0	0
Arizona	3,579,000	6,641,000	3,062,000
Arkansas	1,532,000	1,588,000	56,000
California	37,550,000	37,644,000	94,000
Colorado	3,985,000	5,389,000	1,404,000
Connecticut	3,606,000	3,606,000	0
Delaware	607,000	607,000	0
District Of Columbia	690,000	690,000	0
Florida	16,194,000	18,472,000	2,278,000
Georgia	6,825,000	9,365,000	2,540,000
Hawaii	0	0	0

Appendix A: Selected Preferred Route Options - Potential Populations Served by State

State	Population in Baseline Network	Population in Network of Selected Preferred Route Options	Potential Increase in Population Served
Idaho	229,000	1,333,000	1,104,000
Illinois	12,266,000	12,266,000	0
Indiana	5,184,000	5,693,000	509,000
Iowa	1,464,000	2,243,000	779,000
Kansas	2,059,000	2,417,000	358,000
Kentucky	971,000	2,621,000	1,650,000
Louisiana	2,711,000	4,377,000	1,666,000
Maine	735,000	735,000	0
Maryland	5,667,000	5,667,000	0
Massachusetts	6,665,000	6,665,000	0
Michigan	8,353,000	8,353,000	0
Minnesota	4,232,000	5,000,000	768,000
Mississippi	2,289,000	2,327,000	38,000
Missouri	4,651,000	5,845,000	1,194,000
Montana	234,000	846,000	612,000
Nebraska	1,470,000	1,720,000	250,000
Nevada	689,000	2,918,000	2,229,000
New Hampshire	1,313,000	1,313,000	0
New Jersey	8,131,000	8,131,000	0
New Mexico	1,282,000	1,573,000	291,000
New York	18,547,000	18,547,000	0
North Carolina	8,018,000	8,177,000	159,000
North Dakota	469,000	695,000	226,000
Ohio	7,109,000	11,079,000	3,970,000
Oklahoma	1,717,000	3,385,000	1,668,000
Oregon	3,188,000	3,327,000	139,000
Pennsylvania	9,975,000	9,990,000	15,000
Rhode Island	1,097,000	1,097,000	0
South Carolina	4,697,000	4,697,000	0
South Dakota	0	602,000	602,000
Tennessee	1,360,000	6,031,000	4,671,000
Texas	21,626,000	23,971,000	2,345,000
Utah	2,479,000	2,956,000	477,000
Vermont	633,000	633,000	0
Virginia	7,894,000	8,152,000	258,000
Washington	7,030,000	7,336,000	306,000
West Virginia	1,008,000	1,108,000	100,000
Wisconsin	3,199,000	3,199,000	0
Wyoming	0	406,000	406,000
Total	247,397,000	285,952,000	38,555,000

Note: Values rounded to the nearest thousand people.

4. References

Amtrak. 2024. Amtrak General Transit Feed Specification. Accessed July 12, 2024. <https://content.amtrak.com/content/gtfs/GTFS.zip>.

U.S. Census Bureau. 2020. *Decennial Census (2020)*. <https://data.census.gov/>.

Appendix B: Prioritized Inventory of Capital Projects and Estimated Capital Costs



Table of Contents

1	Introduction.....	B-1
2	Selected Passenger Service-Required Capital Projects.....	B-1
2.1	Guideway and Track Elements (SCC 10).....	B-1
2.2	Stations and Terminals (SCC 20).....	B-2
2.3	Support Facilities (SCC 30).....	B-4
2.4	Communications and Signaling (SCC 50).....	B-5
2.5	Vehicles (SCC 70).....	B-7
2.6	Shared Capital Projects.....	B-8
3	Daily Cardinal and Sunset Limited Service.....	B-12
4	Capital Cost Estimates.....	B-13
5	References.....	B-15

Tables

Table 2-1. FRA Standard Cost Categories Applied.....	B-1
Table 2-2. FRA Class of Track - Maximum Operating Speeds.....	B-2
Table 2-3. FRA SCC 10 Guideway and Track Elements Route Miles.....	B-2
Table 2-4. FRA SCC 20 Stations and Terminals.....	B-3
Table 2-5. FRA SCC 20 Stations and Terminals by Selected Preferred Route Option.....	B-4
Table 2-6. FRA SCC 30 Support Facilities: Yards, Shops, Administration Buildings.....	B-5
Table 2-7. FRA SCC 30 Support Facilities: Yards, Shops, Administration Buildings by Selected Preferred Route Option.....	B-5
Table 2-8. FRA SCC 50 Communications and Signaling Upgrades.....	B-6
Table 2-9. FRA SCC 50 Communication & Signal Systems for Upgrades for Selected Preferred Route Options.....	B-6
Table 2-10. Selected Preferred Route Option Train Consist Makeup.....	B-7
Table 2-11. Vehicle Requirements by Selected Preferred Route Option.....	B-8
Table 2-12. Shared Capital Projects by Selected Preferred Route Option.....	B-9
Table 3-1. Estimated Equipment Needs for Daily Service on the Cardinal and Sunset Limited.....	B-12
Table 4-1. Range of Selected Capital Cost Estimates by Selected Preferred Route Option (millions FY 2025 dollars).....	B-14

1 Introduction

Appendix B documents the selected passenger service-required capital projects and estimated capital costs of the selected preferred route options identified by the Amtrak Daily Long-Distance Service Study (the Study). The selected passenger service-required capital projects and costs identified do not represent the full range of capital projects that may be needed to implement a selected preferred route option, including potentially significant projects related to track capacity and other operational improvement projects. Substantial additional planning, analysis, and coordination with stakeholders will be required to identify the full range of capital projects and costs required to implement a selected preferred route option.

2 Selected Passenger Service-Required Capital Projects

The Federal Railroad Administration (FRA) organized and reported selected passenger service-required capital projects for the selected preferred route options using Standard Cost Categories (SCCs) (FRA 2016). Table 2-1 presents the SCCs included in the Study.

Table 2-1. FRA Standard Cost Categories Applied

FRA Standard Cost Category	Description
10	Guideway and Track Elements
20	Stations and Terminals
30	Support Facilities: Yards, Shops, Administration Buildings
50	Communications and Signaling
70	Vehicles
80	Professional Services

The SCCs included in the identification of selected passenger service-required capital projects for the selected preferred route options are SCC 10 Guideway and Track Elements, SCC 20 Stations and Terminals, SCC 30 Support Facilities, SCC 50 Communications and Signaling, and SCC 70 Vehicles.

The selected passenger-service required capital projects for the selected preferred route options do not include SCC 40 Sitework and Special Conditions or SCC 60 Right-of-Way, Land, Existing Improvements. Project activities associated with SCC 40 (demolition, clearing, utilities, etc.) or SCC 60 (purchase or lease of real estate, or relocation of existing households and businesses) are associated with site-specific information. The Study did not identify site-specific locations for stations, maintenance facilities, or other selected passenger service-required projects. As such, activities associated with SCC 40 and SCC 60 cannot be estimated separately from SCC 10, SCC 20, SCC 30, or SCC 50 as part of the Study. Thus, the Study assumed that activities associated with SCC 40 and SCC 60 are included within the activities of SCC 10, SCC 20, SCC 30, or SCC 50.

For SCC 80 Professional Services, costs were not identified by selected passenger service-required capital projects but provided programmatically by route. SCC 80 programmatic costs include a range of activities: service planning; project environmental/survey; conceptual and preliminary engineering; final design; construction administration; engineering inspection; startup, certification, and commissioning; contract administration; and insurance. Cost estimates for SCC 80 are included in Chapter 4.

2.1 Guideway and Track Elements (SCC 10)

FRA Class of Track (49 Code of Federal Regulations [CFR] Part 213— Track Safety Standards, Subpart 213.9-Classes of Track, Operating Speed Limits) was the basis for identifying potential track upgrades. Table 2-2

Appendix B: Prioritized Inventory of Capital Projects and Estimated Capital Costs

presents maximum operating speeds by FRA Class of Track. Track Class 4 is the minimum track class required for passenger rail operations, with a maximum operating speed of 80 miles per hour (mph).

Table 2-2. FRA Class of Track - Maximum Operating Speeds

FRA Class of Track	Maximum Operating Speed (miles per hour)	
	Passenger	Freight
1	15 mph	10 mph
2	30 mph	25 mph
3	60 mph	40 mph
4	80 mph	60 mph

Route segmentation was analyzed between endpoints using the U.S. Department of Transportation (DOT) FRA Safety Map (DOT 2024), along with data provided in railroad employee timetables and track charts. In the absence of railroad-specific details, the Crossing Inventory and Accident Reports Database (FRA 2024) was used to identify current train operating speeds.

FRA identified existing track segments proposed as being utilized for the selected preferred route options requiring upgrade to Track Class 4. Improvements identified in SCC 10 are for upgrading and improving existing track to Track Class 4. In addition, potential new at-grade track connections were identified between railroad subdivisions that do not currently exist. Table 2-3 presents the route miles of improvements and upgrades to Track Class 4 and new track connections for each of the selected preferred route options. All track segments currently below Track Class 4 would be upgraded to Track Class 4 except in instances where an upgrade would be impractical (e.g., in congested urban and/or terminal areas). Improvements identified do not include capacity improvement projects to accommodate existing or future traffic, structural improvements, or grade crossing improvements.

Table 2-3. FRA SCC 10 Guideway and Track Elements Route Miles

Selected Preferred Route Option	Proposed Total Route Miles	Route Miles of New Connections and Track Upgrades to Track Class 4
Chicago - Miami	1,531	140
Dallas/Fort Worth - Miami	1,507	393
Denver - Houston	1,088	26
Los Angeles - Denver	1,423	45
Phoenix - Minneapolis/St. Paul	2,135	174
Dallas/Fort Worth - New York	1,907	443
Houston - New York	1,841	259
Seattle - Denver	1,647	38
San Antonio - Minneapolis/St. Paul	1,292	84
San Francisco - Dallas/Fort Worth	1,906	85
Detroit - New Orleans	1,244	250
Denver - Minneapolis/St. Paul	1,143	683
Seattle - Chicago	2,314	32
Dallas/Fort Worth - Atlanta	855	0
El Paso - Billings	1,390	0

2.2 Stations and Terminals (SCC 20)

SCC 20 includes upgrades to existing Amtrak stations and new stations for the selected preferred route options. Existing Amtrak stations were assumed to be used by the selected preferred route options in segments where they share alignment with existing long-distance, NEC, or state-supported services. For the Study, FRA identified upgrades to existing Amtrak stations to accommodate the selected preferred route option as described in Table 2-4.

Appendix B: Prioritized Inventory of Capital Projects and Estimated Capital Costs

Where the selected preferred route option expands the passenger rail network into new markets not served by the existing passenger rail network, FRA included new stations spaced approximately every 50 miles in cities with populations greater than 5,000 people. FRA also included station locations from discontinued long-distance routes and existing state-supported routes where they overlapped the selected preferred route options and support long-distance operations at an average station spacing of 50 miles. No upgrades were considered for stations located on Amtrak's Northeast Corridor (NEC). Upgraded and new stations and platforms include Americans with Disabilities Act (ADA) compliance considerations. Assumptions for new stations include construction of new station platforms (low-level platforms approximately 1,220 feet in length), and station facilities based on the categories of passenger rail stations identified in *Amtrak Station Planning and Development Guidelines* (Amtrak 2022a) and include:

- Category 1 Large Station: Staffed station located in dense urban downtowns with connections to existing transit services. Facility elements include a large station building with operator offices, sheltered waiting rooms and restrooms, platform(s) with canopy(ies), parking, and site lighting.
- Category 2 Medium Station: Staffed station. Facility elements include a medium station building with operator offices, sheltered waiting rooms and restrooms, platform(s) with canopy(ies), parking, and site lighting.
- Category 3 Caretaker Station: Unstaffed station that typically serves long-distance passenger rail corridors with limited rail service. Facility elements include a station building with sheltered waiting rooms, restrooms, platform(s) with canopy(ies), parking, and site lighting.
- Category 4 Shelter Station: Unstaffed station that typically serves small communities along long-distance or intercity passenger rail corridors. Facility elements include a sheltered waiting room, platform(s) with canopy(ies), parking, and site lighting.
- Note: The Study did not assume new shelter stations for selected preferred route options as they do not support long-distance schedules with late night service and variability in long-distance train operations.

Table 2-4 presents the passenger rail station improvement types for new and upgraded stations.

Table 2-4. FRA SCC 20 Stations and Terminals

Station Improvement Type	Description	Use Case
New Station	Category 1 Large Station	▪ New large terminal stations located at terminals of selected preferred route options
New Station	Category 2 Medium Station	▪ New staffed stations with ticket offices ▪ Located where new stations would include crew base and enroute servicing activities
New Station	Category 3 Caretaker Station	▪ New unstaffed station with ticketing machine ▪ Located where new stations are not terminals of selected preferred route options and do not include crew base and enroute servicing activities
Existing Station Upgrade	Upgrade to Category 1 Large Station	▪ Existing stations located at selected preferred route option terminals where existing stations are not categorized as Category 1 Large Stations
Existing Station Upgrade	Upgrade to Category 2 Medium Station	▪ Existing stations not categorized as Category 1 or 2 stations where selected preferred route options would include crew based and enroute servicing activities
Existing Station Upgrade	Upgrade to Category 3 Caretaker Station	▪ Existing Category 4 shelter stations

Table 2-5 presents the number of new stations and existing station upgrades for each selected preferred route option.

Table 2-5. FRA SCC 20 Stations and Terminals by Selected Preferred Route Option

Selected Preferred Route Option	Number of Stations	Existing Stations	New Stations			Existing Station Upgrades		
			1 Large	2 Medium	3 Care-taker	1 Large	2 Medium	3 Care-taker
Chicago - Miami	37	21	0	1	15	1	0	5
Dallas/Fort Worth - Miami	35	17	0	1	17	0	0	1
Denver - Houston	21	5	0	1	15	1	0	1
Los Angeles - Denver	24	9	0	2	13	0	0	3
Phoenix - Minneapolis/St. Paul	32	9	1	3	19	0	0	2
Dallas/Fort Worth - New York	33	17	0	1	15	0	1	3
Houston - New York	42	26	0	2	14	2	1	6
Seattle - Denver	29	16	0	1	12	0	0	4
San Antonio - Minneapolis/St. Paul	28	10	0	2	16	0	0	1
San Francisco - Dallas/Fort Worth	29	16	1	1	11	0	0	4
Detroit - New Orleans	30	10	0	2	18	1	0	0
Denver - Minneapolis/St. Paul	20	2	0	3	15	0	0	0
Seattle - Chicago	34	19	1	2	12	0	2	5
Dallas/Fort Worth - Atlanta	15	11	0	1	3	1	0	0
El Paso - Billings	23	7	1	1	14	0	0	1

2.3 Support Facilities (SCC 30)

New maintenance and enroute crew change and service facilities were identified for the selected preferred route options. Amtrak advised that new maintenance facilities should be planned at long-distance route endpoints, as Amtrak's existing maintenance facilities cannot accommodate additional long-distance passenger trains. The new maintenance facilities would include a car washer building, maintenance facility building, consist shop area, car shop area, wheel truing shop area, and locomotive shop area.

Support services accommodations in the maintenance facility building include commissary; train crew management and administration offices, locker rooms, employee lounge, and quiet room; mechanical management and administration locker rooms, and spare parts inventory warehouse; loading dock for commissary and warehouse use; on-board services management and administration offices; training room; employee lunchroom/breakroom; and employee parking. Existing enroute train servicing facilities along the selected preferred route option would be used whenever available. In addition, new enroute train servicing locations were selected at station locations on selected preferred route options to ensure the train reaches an existing or a new enroute train servicing facility approximately every 6 hours.

Maintenance facility programming includes tracks for train movements to and from the buildings along with yard storage tracks. Table 2-6 presents the support facility improvement types for new and upgraded support facilities.

Table 2-6. FRA SCC 30 Support Facilities: Yards, Shops, Administration Buildings

Support Facility Improvement Type	Description	Use Case
New Maintenance Facilities	Maintenance Facility / Yard Type A	▪ Servicing for one or two long-distance passenger trains
New Maintenance Facilities	Maintenance Facility / Yard Type B	▪ Servicing for three or four long-distance passenger trains
Existing Maintenance Facilities	New Construction: Yard Track	▪ Track exterior to the maintenance facility ▪ Storage tracks allocated dependent upon number of long-distance passenger trains served
Existing Maintenance Facilities	New Construction: Yard Track #10 Turnouts	▪ Turnouts to support maintenance facility exterior tracks and storage tracks
Enroute Train Servicing Locations	Enroute Train Servicing	▪ Train servicing includes fueling (by truck), food provisioning, garbage pick-up, and watering facilities

Table 2-7 presents the locations and types of new endpoint maintenance facilities, along with the quantities of existing and new enroute train servicing locations, for each selected preferred route option.

Table 2-7. FRA SCC 30 Support Facilities: Yards, Shops, Administration Buildings by Selected Preferred Route Option

Selected Preferred Route Option	New Maintenance Facilities		Enroute Train Servicing Locations	
	Type A 1 or 2 trains	Type B 3 or 4 trains	Existing	New
Chicago - Miami	Chicago (2) Miami (2)	N/A	2	2
Dallas/Fort Worth - Miami	Miami (2)	Dallas (4)	3	1
Denver - Houston	Houston (2)	Denver (4)	1	1
Los Angeles - Denver	Los Angeles (1)	Denver (4)	1	2
Phoenix - Minneapolis/St. Paul	Phoenix (1)	Minneapolis (3)	2	4
Dallas/Fort Worth - New York	New York City (1)	Dallas (4)	6	1
Houston - New York	Houston (2) New York City (2)	N/A	4	4
Seattle - Denver	Seattle (2)	Denver (4)	3	1
San Antonio - Minneapolis/St. Paul	San Antonio (1)	Minneapolis (3)	2	2
San Francisco - Dallas/Fort Worth	San Francisco (1)	Dallas (4)	1	3
Detroit - New Orleans	Detroit (1) New Orleans (1)	N/A	0	3
Denver - Minneapolis/St. Paul	N/A	Denver (4) Minneapolis (3)	0	3
Seattle - Chicago	Seattle (2) Chicago (2)	N/A	5	3
Dallas/Fort Worth - Atlanta	Atlanta (1)	Dallas (4)	1	1
El Paso - Billings	El Paso (1) Billings (1)	N/A	2	1

Note: In some cases, there are overlapping maintenance facilities and enroute train servicing locations on selected preferred route options. As a result, cumulative maintenance facilities and enroute train servicing location totals are not additive.

2.4 Communications and Signaling (SCC 50)

FRA Class of Track (49 CFR Part 213—Track Safety Standards, Subpart 213.9—Classes of Track, Operating Speed Limits) was the basis for identifying potential communications and signaling upgrades. Route segmentation was analyzed between endpoints using the DOT FRA Safety Map (DOT 2024), along with data

Appendix B: Prioritized Inventory of Capital Projects and Estimated Capital Costs

provided in railroad employee timetables and track charts. In the absence of railroad-specific details, the Crossing Inventory and Accident Reports Database (FRA 2024) was used to identify existing rail signal and positive train control (PTC) systems. FRA identified existing track segments proposed as being utilized for the selected preferred route options requiring wayside signal systems that support PTC systems. New connections in communications and signals were identified between railroad subdivisions that do not currently exist.

For railroads that have implemented PTC on their network but maintain segments without PTC intended for long-distance passenger rail service, FRA included communication and signals to upgrade the rail signal system with PTC. For railroads that have yet to implement PTC on their network, the installation of a rail signal system with PTC as well as a PTC-compatible dispatch system and back-office system were identified.

Table 2-8 presents the types of signaling systems (SCC 50) identified for the selected preferred route options.

Table 2-8. FRA SCC 50 Communications and Signaling Upgrades

FRA SCC	Description	Use Case
Signaling Upgrade	Control point - Universal Crossover with Signals & PTC	Applied to a railroad segment location that requires installation of a signalized location (with PTC), with a pair of single crossovers (one right hand and one left hand) that are arranged sequentially in multi-track territory and provide the ability to change from one track to another.
Signaling Upgrade	Control Point - Single Turnout with Signals & PTC	Applied to a railroad segment location that requires installation of a signalized location (with PTC), with a single switch that provides the ability to change from one track to another.
Signaling Upgrade	Intermediate Signal with PTC	Applied to railroad segment locations that require installation of a block signal(s) between control points spaced 2.5 to 3.0 miles and help provide spacing between trains moving in the same direction.
Systems Upgrade	Dispatch System	Applied to railroad segments with no documented evidence available of CTC and/or PTC systems
Systems Upgrade	PTC Back Office System	Applied to railroad segments with no documented evidence available of CTC and/or PTC systems

Table 2-9 presents the route miles of signaling and communications upgrades by selected preferred route option.

Table 2-9. FRA SCC 50 Communication & Signal Systems for Upgrades for Selected Preferred Route Options

Selected Preferred Route Option	Proposed Total Route Miles	Route Miles of Signaling and Communications Upgrades
Chicago - Miami	1,531	108
Dallas/Fort Worth - Miami	1,507	171
Denver - Houston	1,088	211
Los Angeles - Denver	1,423	122
Phoenix - Minneapolis/St. Paul	2,135	293
Dallas/Fort Worth - New York	1,907	266
Houston - New York	1,841	79
Seattle - Denver	1,647	110
San Antonio - Minneapolis/St. Paul	1,292	374
San Francisco - Dallas/Fort Worth	1,906	265
Detroit - New Orleans	1,244	8
Denver - Minneapolis/St. Paul	1,143	709
Seattle - Chicago	2,314	790
Dallas/Fort Worth - Atlanta	855	7
El Paso - Billings	1,390	751

2.5 Vehicles (SCC 70)

Based on current Amtrak services, bi-level and single-level types of passenger equipment would be used to provide similar accommodations on the selected preferred route options. Passenger rail vehicles for the selected preferred route options include diesel locomotives and both single- and bi-level locomotive-hauled cars, including:

- Passenger Cars with Ticketed Space (single-level);
- Passenger Cars with Ticketed Space (bi-level);
- Dining Car (single-level);
- Dining Car (bi-level);
- Café Car (single-level);
- Café Car (bi-level);
- Sleeping Car (single-level);
- Sleeping Car and Transition/Sleeper (bi-level); and
- Baggage Car.

The number of trainsets needed to operate a selected preferred route option was calculated by adding the estimated runtime to an 8-hour layover time (as provided by Amtrak), dividing by the 24-hour headway, and including a 25 percent allocation for spare trainsets. Selected preferred route options that would operate on the NEC would use single-level compatible equipment. Other selected preferred route options would use bi-level equipment and consists that accommodate the number of nights the selected preferred route options would operate. The consists listed in Table 2-10 are based on an analysis of Amtrak Fiscal Year (FY) 2019 consist data (Amtrak 2022b) and represent maximum typical lengths for vehicle acquisition costs. Amtrak FY 2019 consist data were used because it was the most recent available data for long-distance service that was not impacted by COVID-19 related service reductions. Amtrak reduced most long-distance routes to three days per week, beginning October 1, 2020, due to COVID-19. Daily service was restored in summer 2021. Long-distance service was reduced again on nine long-distance routes in January 2022 due to COVID-19; daily service was restored to all nine of these routes by fall 2022.

Table 2-10. Selected Preferred Route Option Train Consist Makeup

One Night Route	Two Night Route	Northeast Corridor Compatible Single Level
2 locomotives	2 locomotives	2 locomotives
1 baggage car	1 baggage car	1 baggage car
3 sleeping cars	3 sleeping cars	3 sleeping cars
1 dining car	1 dining car	1 dining car
1 café car (café/sightseer)	1 café car (café/sightseer)	1 café car (café/sightseer)
3 passenger cars	4 passenger cars	4 passenger cars
	1 transition/sleeper	
Total Consist Length		
2 locomotives + 9 cars	2 locomotives + 11 cars	2 locomotives + 10 cars

Table 2-11 presents the number of vehicles, including spares, needed to operate the long-distance passenger services on the selected preferred route options.

Table 2-11. Vehicle Requirements by Selected Preferred Route Option

Selected Preferred Route Option	Locomotives	Baggage Cars	Single Level				Bi Level			
			Passenger Car	Sleeping Car	Dining Car	Café Car	Passenger Car	Sleeping Car	Dining Car	Café Car
Chicago - Miami	10	5	-	-	-	-	20	20	5	5
Dallas/Fort Worth - Miami	10	5	-	-	-	-	15	15	5	5
Denver - Houston	8	4	-	-	-	-	12	12	4	4
Los Angeles - Denver	10	5	-	-	-	-	15	15	5	5
Phoenix - Minneapolis/St. Paul	13	7	-	-	-	-	25	26	7	7
Dallas/Fort Worth - New York	13	7	25	26	7	7	-	-	-	-
Houston - New York	13	7	25	26	7	7	-	-	-	-
Seattle - Denver	10	5	-	-	-	-	20	20	5	5
San Antonio - Minneapolis/St. Paul	10	5	-	-	-	-	15	15	5	5
San Francisco - Dallas/Fort Worth	13	7	-	-	-	-	25	26	7	7
Detroit - New Orleans	8	4	-	-	-	-	12	12	4	4
Denver - Minneapolis/St. Paul	8	4	-	-	-	-	12	12	4	4
Seattle - Chicago	13	7	-	-	-	-	25	26	7	7
Dallas/Fort Worth - Atlanta	8	4	-	-	-	-	12	12	4	4
El Paso - Billings	10	5	-	-	-	-	15	15	5	5

2.6 Shared Capital Projects

The selected passenger service-required capital projects identified in this section may be shared by multiple selected preferred route options. For example, consider the potential new station in Billings, Montana, for the El Paso - Billings selected preferred route option. The capital project for that potential new station would be included in or “shared” by the potential new station in Billings, Montana, for the Seattle - Chicago selected preferred route option. Table 2-12 shows the quantity of shared capital projects by selected preferred route option for SCC 10 Guideway and Track Elements, SCC 20 Stations and Terminal, SCC 30 Support Facilities, and SCC 50 Communications and Signaling. Substantial additional planning, analysis, and coordination with stakeholders would be required to identify the potential for shared use of capital projects. Shared use of passenger rail vehicles for the selected preferred route options (SCC 70 Vehicles) was not identified in this Study and would be identified as part of a more detailed service development plan in coordination with Amtrak.

Appendix B: Prioritized Inventory of Capital Projects and Estimated Capital Costs

Table 2-12. Shared Capital Projects by Selected Preferred Route Option

Selected Preferred Route Option	10 Guideway and Track Elements		20 Stations and Terminals		30 Support Facilities		50 Communications and Signaling	
	Route Miles of Shared Track Improvements		Number of Shared New or Upgraded Stations		Number of Shared Maintenance Facilities		Route Miles of Shared Comms/Signals/PTC Improvements	
	Quantity	Shared Selected Preferred Route Options	Quantity	Shared Selected Preferred Route Options	Quantity	Shared Selected Preferred Route Options	Quantity	Shared Selected Preferred Route Options
Chicago - Miami	52	Houston - New York	11	Dallas/Fort Worth - Miami, Houston - New York, Detroit - New Orleans, Dallas/Fort Worth Atlanta	2	Dallas/Fort Worth - Miami, Seattle - Chicago	2	Houston - New York
Dallas/Fort Worth - Miami	-	-	8	Dallas/Fort Worth - Miami, Houston - New York, Detroit - New Orleans, Dallas/Fort Worth - Atlanta	2	Chicago - Miami, Dallas/Fort Worth - New York, San Francisco - Dallas/Fort Worth, Dallas/Fort Worth - Atlanta	5	Dallas/Fort Worth - Atlanta
Denver - Houston	-	-	6	Phoenix - Minneapolis/St. Paul, Houston - New York, El Paso - Billings	2	Los Angeles - Denver, Houston - New York, Denver - Minneapolis/ St. Paul	88	El Paso - Billings
Los Angeles - Denver	-	-	3	Seattle - Denver, Denver - Minneapolis/St. Paul, El Paso - Billings	1	Denver - Houston, Denver - Minneapolis/ St. Paul	119	Denver - Minneapolis/ St. Paul
Phoenix - Minneapolis/St. Paul	39	Denver - Minneapolis/St. Paul	10	Denver - Houston, San Francisco - Dallas/Fort Worth, Denver - Minneapolis/St. Paul, El Paso - Billings	1	San Antonio - Minneapolis/St. Paul, Denver - Minneapolis/St. Paul	18	Denver - Minneapolis/St. Paul

Appendix B: Prioritized Inventory of Capital Projects and Estimated Capital Costs

Selected Preferred Route Option	10 Guideway and Track Elements		20 Stations and Terminals		30 Support Facilities		50 Communications and Signaling	
	Route Miles of Shared Track Improvements		Number of Shared New or Upgraded Stations		Number of Shared Maintenance Facilities		Route Miles of Shared Comms/Signals/PTC Improvements	
	Quantity	Shared Selected Preferred Route Options	Quantity	Shared Selected Preferred Route Options	Quantity	Shared Selected Preferred Route Options	Quantity	Shared Selected Preferred Route Options
Dallas/Fort Worth - New York	-	-	4	San Antonio - Minneapolis/St. Paul, Detroit - New Orleans	2	Dallas/Fort Worth - Miami, Houston - New York, San Francisco - Dallas/Fort Worth, Dallas/Fort Worth - Atlanta	-	-
Houston - New York	230	Chicago - Miami, Detroit - New Orleans	14	Chicago - Miami, Dallas/Fort Worth - Miami, Denver - Houston, Detroit - New Orleans, Dallas/Fort Worth - Atlanta	1	Dallas/Fort Worth - New York	2	Chicago - Miami
Seattle - Denver	-	-	2	Los Angeles - Denver	1	Seattle - Chicago	-	-
San Antonio - Minneapolis/St. Paul	-	-	1	Dallas/Fort Worth - New York	1	Phoenix - Minneapolis/St. Paul	-	-
San Francisco - Dallas/Fort Worth	-	-	2	Phoenix - Minneapolis/St. Paul	1	Dallas/Fort Worth - Miami, Dallas/Fort Worth - New York, Dallas/Fort Worth - Atlanta	-	-
Detroit - New Orleans	178	Houston - New York City	18	Chicago - Miami, Dallas/Fort Worth - New York, Houston - New York City	-	-	-	-
Denver - Minneapolis/St. Paul	39	Phoenix - Minneapolis/St. Paul	9	Phoenix - Minneapolis/St. Paul, El Paso - Billings	2	Denver - Houston, Phoenix - Minneapolis/St. Paul	154	Los Angeles - Denver, Phoenix - Minneapolis/St. Paul
Seattle - Chicago	-	-	1	El Paso - Billings	2	Chicago - Miami, Seattle - Denver	12	El Paso - Billings

Appendix B: Prioritized Inventory of Capital Projects and Estimated Capital Costs

Selected Preferred Route Option	10 Guideway and Track Elements		20 Stations and Terminals		30 Support Facilities		50 Communications and Signaling	
	Route Miles of Shared Track Improvements		Number of Shared New or Upgraded Stations		Number of Shared Maintenance Facilities		Route Miles of Shared Comms/Signals/PTC Improvements	
	Quantity	Shared Selected Preferred Route Options	Quantity	Shared Selected Preferred Route Options	Quantity	Shared Selected Preferred Route Options	Quantity	Shared Selected Preferred Route Options
Dallas/Fort Worth - Atlanta	-	-	2	Chicago - Miami, Dallas/Fort Worth - Miami, Houston - New York City	1	Dallas/Fort Worth - Miami, Dallas/Fort Worth - New York City, San Francisco - Dallas/Fort Worth	5	Dallas/Fort Worth - Miami
El Paso - Billings	-	-	9	Denver - Houston, Los Angeles - Denver, Phoenix-Minneapolis/St. Paul, Denver - Minneapolis/St. Paul, Seattle - Chicago	-	-	100	Denver - Houston, Seattle - Chicago

3 Daily Cardinal and Sunset Limited Service

The Cardinal currently requires two trainsets to operate three days a week. Increasing the frequency to daily service would likely require one additional trainset. The Sunset Limited currently requires three trainsets to operate, plus through cars from the Texas Eagle, which sends one sleeping car and one coach car to Los Angeles on the Sunset Limited three days a week. Daily service would likely require two additional trainsets and approximately four additional through cars. Major terminals also must maintain spare cars to account for maintenance and repairs of equipment for the Cardinal and Sunset Limited. The fleet requires a spare ratio of approximately 20 percent.

Table 3-1 shows the equipment needs for a typical consist of three day per week service and daily service. The equipment needs are derived from Amtrak's average train consist data for Cardinal and Sunset Limited routes as of FY 2022, reflect bi-directional operations, and do not consider Amtrak's ongoing long-distance fleet replacement efforts (Amtrak 2022b). The equipment requirements do not account for any spare equipment. While Amtrak currently operates two diesel locomotives for both the Cardinal and Sunset Limited, Amtrak could operate one diesel locomotive because of the capabilities of the new diesel equipment. On the Cardinal route, only one electric locomotive is required for the current three-day per week service and daily service, as it is only needed for the service between Washington, DC, and New York, New York.

Independent of this Study, in 2023 daily Cardinal and daily Sunset Limited services were selected in FRA's Corridor Identification and Development Program for advancing project planning activities. As part of this program, Amtrak will develop detailed estimates of capital and operating and maintenance costs for daily Cardinal and Sunset Limited service.

Table 3-1. Estimated Equipment Needs for Daily Service on the Cardinal and Sunset Limited

Equipment	Typical Consist	Three Day per Week Equipment Requirements	Daily Equipment Requirements
Cardinal			
Electric Locomotives (ACS 64)	1	1	1
Diesel Locomotives (ALC 42 or P42)	1	2	3
Amfleet II Coach	2	4	6
Amfleet II Lounge	1	2	3
Viewliner I Sleeper	1	2	3
Viewliner Combination Sleeper	1	2	3
Sunset Limited: New Orleans - Los Angeles			
P42 Locomotives	2	6	10
Baggage Car	1	3	5
Superliner Coach	1	3	5
Superliner Lounge	1	3	5
Superliner Dining Car	1	3	5
Superliner Sleeper	1	3	5
Sunset Limited: San Antonio - Los Angeles, Through Cars for Texas Eagle			
Superliner Coach	1	3	5
Superliner Sleeper	1	3	5

Source: Amtrak 2022b.

4 Capital Cost Estimates

The capital cost estimates of selected passenger service-required capital projects are high-level, order-of-magnitude cost estimates of the selected preferred route options. Cost estimates could be further refined during subsequent stages of project planning and development. FRA organized and reported capital cost estimates using SCCs. Table 2-1 presents the SCCs used in development of the capital cost estimates for the selected preferred route options. The SCCs included in the identification of selected passenger service-required capital projects for the selected preferred route options are SCC 10 Guideway and Track Elements, SCC 20 Stations and Terminals, SCC 30 Support Facilities, SCC 50 Communications and Signaling, and SCC 70 Vehicles.

Table 4-1 summarizes the cost estimates of the selected preferred route options by SCC in FY 2025 dollars. The low range includes 35 percent allocated contingency. The high range includes the 35 percent allocated contingency and an additional 30 percent unallocated contingency to account for unforeseen circumstances that impact project delivery. The capital cost estimates for the selected preferred route options do not include SCC 40 Sitework and Special Conditions or SCC 60 Right-of-Way, Land, Existing Improvements. Project activities associated with SCC 40 (demolition, clearing, utilities, etc.) or SCC 60 (purchase or lease of real estate, or relocation of existing households and businesses) are associated with site-specific information. The Study did not identify site-specific locations for stations, maintenance facilities, or other selected passenger service-required projects. As such, activities associated with SCC 40 and SCC 60 cannot be estimated separately from SCC 10, SCC 20, SCC 30, or SCC 50 as part of the Study. Thus, the Study assumed that activities associated with SCC 40 and SCC 60 are included within the activities of SCC 10, SCC 20, SCC 30, or SCC 50.

These cost estimates, presented by selected preferred route option, cannot be summed to determine the total capital cost estimates by selected preferred route option, or for the entire network of selected preferred route options. They are a snapshot of selected passenger service-required capital cost estimates identified by the Study. They do not represent the full range of capital projects that may be needed to implement a selected preferred route option, including potentially significant projects related to track capacity and other operational improvement projects. Substantial additional planning, analysis, and coordination with stakeholders will be required for further refinement and accuracy of the capital cost estimates.

In 2023, daily Cardinal and daily Sunset Limited services were selected in FRA's Corridor Identification and Development Program for advancing project planning activities. As part of this program, Amtrak will develop detailed estimates of capital costs for daily Cardinal and Sunset Limited service.

Appendix B: Prioritized Inventory of Capital Projects and Estimated Capital Costs

Table 4-1. Range of Selected Capital Cost Estimates by Selected Preferred Route Option (millions FY 2025 dollars)

Selected Preferred Route Option	SCC 10 Guideway and Track Elements	SCC 20 Stations and Terminals	SCC 30 Support Facilities	SCC 50 Communications and Signaling	SCC 70 Vehicles	SCC 80 Professional Services
Chicago - Miami	\$469 - 610	\$424 - 551	\$350 - 455	\$37 - 48	\$647 - 841	\$641 - \$834
Dallas/Fort Worth - Miami	\$1,048 - 1,362	\$408 - 530	\$431 - 560	\$41 - 53	\$549 - 713	\$889 - 1,156
Denver - Houston	\$70 - 91	\$379 - 492	\$431 - 560	\$55 - 72	\$439 - 571	\$462 - 601
Los Angeles - Denver	\$247 - 322	\$316 - 411	\$441 - 573	\$21 - 28	\$549 - 713	\$519 - 675
Phoenix - Minneapolis/St. Paul	\$539 - 701	\$573 - 746	\$464 - 603	\$111 - 144	\$846 - 1,100	\$844 - 1,097
Dallas/Fort Worth - New York	\$1,688 - 2,194	\$332 - 431	\$432 - 561	\$85 - 111	\$741 - 963	\$1,173 - 1,525
Houston - New York	\$828 - 1,077	\$669 - 870	\$376 - 489	\$32 - 42	\$741 - 963	\$915 - 1,189
Seattle - Denver	\$101 - 132	\$272 - 353	\$431 - 560	\$43 - 56	\$647 - 841	\$464 - 603
San Antonio - Minneapolis/St. Paul	\$291 - 378	\$340 - 442	\$437 - 568	\$99 - 128	\$549 - 713	\$577 - 750
San Francisco - Dallas/Fort Worth	\$226 - 293	\$391 - 509	\$454 - 590	\$71 - 92	\$846 - 1,100	\$620 - 806
Detroit - New Orleans	\$828 - 1,076	\$531 - 691	\$356 - 463	\$3 - 4	\$439 - 571	\$1,713 - 2,227
Denver - Minneapolis/St. Paul	\$2,911 - 3,784	\$354 - 460	\$548 - 713	\$172 - 224	\$439 - 571	\$655 - 852
Seattle - Chicago	\$170 - 221	\$509 - 662	\$363 - 472	\$185 - 240	\$846 - 1,100	\$783 - 1,019
Dallas/Fort Worth - Atlanta	\$ -	\$182 - 236	\$427 - 556	\$3 - 4	\$439 - 571	\$330 - 429
El Paso - Billings	\$ -	\$404 - 525	\$329 - 428	\$194 - 253	\$549 - 713	\$479 - 623

Note: Capital cost estimates include selected passenger service-required capital projects of the selected preferred route options identified by the Study. They do not represent the full range of capital projects that may be needed to implement a selected preferred route option. Capital cost estimates do not include capacity improvement projects to accommodate existing or future traffic, structural improvements, grade crossing improvements, or freight railroad onboard positive train control improvement projects.

SCC 80 Professional Services costs are included in vehicle, station and maintenance facilities, and selected passenger rail route infrastructure capital cost estimate ranges in Chapter 6 of the Final Report to Congress.

5 References

Amtrak 2022a *Amtrak Station Planning and Development Guidelines*. Version 4. January 2022.

Amtrak 2022b. Operating Management System Consist Detail FY 2019 and FY 2022 for long-distance trains. Business confidential information provided by Amtrak.

DOT. 2024. FRA Safety Map. <https://fragis.fra.dot.gov/gisfrasafety/>.

FRA. 2016. *Capital Cost Estimating Guidance for Project Sponsors*. <https://railroads.dot.gov/elibrary/capital-cost-estimating-guidance-final>.

FRA. 2024. Crossing Inventory and Accident Reports Database. <https://safetydata.fra.dot.gov/OfficeofSafety/PublicSite/Crossing/Crossing.aspx>.

Appendix C:

Estimated O&M Costs and Public Benefits



FRA
LONG-DISTANCE
SERVICE STUDY

Table of Contents

1	Introduction.....	C-1
2	O&M Cost Estimates.....	C-1
3	Public Benefits by Selected Preferred Route Option.....	C-3
3.1	Jobs and Earnings.....	C-3
3.2	Equity	C-6
3.3	Rail Accessibility	C-11
3.4	Safety	C-16
4	References.....	C-17

Tables

Table 2-1. O&M Functions.....	C-1
Table 2-2. Annual O&M Cost Estimates by Selected Preferred Route Option (millions FY 2025 dollars)....	C-2
Table 2-3. Annual O&M Cost Estimates for Daily Cardinal and Sunset Limited Service (millions FY 2025 dollars).....	C-2
Table 3-1. Estimated Range of Jobs Years Generated by Construction of Selected Preferred Route Options.....	C-4
Table 3-2. Estimated Range of Earnings Generated by Construction of Selected Preferred Route Options (millions FY 2025 dollars).....	C-4
Table 3-3. Estimated Range of Jobs Years Generated by Operation of Selected Preferred Route Options...	C-5
Table 3-4. Estimated Earnings Generated by Operation of Selected Preferred Route Options (millions FY 2025 dollars).....	C-5
Table 3-5. Equity: Estimated Additional Population Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 1a)	C-7
Table 3-6. Equity: Estimated Additional Population Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 1b).....	C-8
Table 3-7. Equity: Estimated Additional Population Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 2a)	C-9
Table 3-8. Equity: Estimated Additional Population Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 2b).....	C-10
Table 3-9. Rail Accessibility: Estimated Additional Population, and Institutions Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 1a)	C-12
Table 3-10. Rail Accessibility: Estimated Additional Population, and Institutions Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 1b).....	C-13
Table 3-11. Rail Accessibility: Additional Population and Institutions Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 2a).....	C-14
Table 3-12. Rail Accessibility: Additional Population and Institutions Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 2b)	C-15
Table 3-13. Number of Stations Where Long-Distance Rail is a New Option by Selected Preferred Route Option.....	C-16
Table 3-14. Annual Crashes Avoided by Selected Preferred Route Option (Net).....	C-17

1 Introduction

Appendix C documents the operating and maintenance (O&M) cost estimates and potential public benefits of the selected preferred route options identified by the Amtrak Daily Long-Distance Service Study (the Study). The O&M cost estimates are high-level, order-of-magnitude cost estimates of the selected preferred route options. Cost estimates could be further refined during subsequent stages of project planning and development. The O&M cost estimates, as well as the selected passenger service-required capital project cost estimates (found in Appendix B), are an input into the public benefits analysis to estimate the benefits of constructing selected passenger service-required capital projects and operating the selected preferred route options.

2 O&M Cost Estimates

O&M cost estimates for selected preferred route options are based on Fiscal Year (FY) 2019 costs and service characteristics for existing Amtrak long-distance routes. The Federal Railroad Administration (FRA) identified unit costs associated with over 100 operating statistics for existing long-distance routes, including statistics associated with labor hours, vehicle trips, passenger boardings, station shifts, train miles, locomotive use, and more (Amtrak 2019). Costs are based on the conceptual service characteristics of the selected preferred route option, including run times, frequency, number of vehicles, and stations served by the selected preferred route option.

- **Conceptual Services:** Route miles, estimated run times, and frequency (one train per day).
- **Vehicle Requirements:** Estimated number of trainsets and car types.
- **Stations:** Estimated number of staffed and unstaffed stations.

FRA organized and reported O&M cost estimates into seven functions (Table 2-1).

Table 2-1. O&M Functions

Function	Description
Maintenance of Way, Fuel	▪ Maintenance of track, signals, power, communications, structures ▪ Fuel consumed by locomotive
Maintenance of Equipment, Yard & Train Movement	▪ Maintenance of coach, sleeper, food service, and baggage cars; yard crews for movement of trains at route terminals
On Board Services Labor	▪ Coach, sleeper, and food service staff
Train & Engine Crew Labor	▪ Conductors and train engineers
Stations	▪ Staffing and maintenance of stations
On Board Services Non-Labor, Sales, Info & Reservations	▪ Food & beverage commissary; ticket sales; passenger information
Police, Environmental & Safety	▪ Amtrak police

For the Study, Amtrak costs for corporate overhead, marketing (except Sales and Information & Reservations), and information technology are fixed costs that would not change with the addition of the selected preferred route options.

Table 2-2 and Table 2-3 summarize the annual O&M cost estimates for the selected preferred route options and for daily Cardinal and Sunset Limited service, respectively. Substantial additional planning, analysis, and coordination with stakeholders will be required for further refinement and accuracy of the O&M cost estimates.

In 2023, daily Cardinal and daily Sunset Limited services were selected in FRA's Corridor Identification and Development Program for advancing project planning activities. As part of this program, Amtrak will develop detailed estimates of O&M costs for daily Cardinal and Sunset Limited service.

Appendix C: Estimated O&M Costs and Public Benefits

Table 2-2. Annual O&M Cost Estimates by Selected Preferred Route Option (millions FY 2025 dollars)

Selected Preferred Route Option	Maintenance of Way & Fuel	Maintenance of Equipment, Yard & Train Movement	On Board Services Labor	Train & Engine Crew Labor	Stations	On Board Services Non-Labor, Sales, Info & Reservations	Police, Environmental & Safety	Total O&M Cost Estimate
Chicago – Miami	\$10 - \$14	\$22 - \$31	\$13 - \$18	\$15 - \$22	\$8 - \$12	\$7 - \$10	\$2 - \$4	\$78 - \$110
Dallas/Fort Worth – Miami	\$10 - \$14	\$22 - \$31	\$13 - \$18	\$15 - \$22	\$7 - \$10	\$4 - \$5	\$2 - \$4	\$72 - \$103
Denver – Houston	\$7 - \$10	\$21 - \$30	\$9 - \$12	\$11 - \$16	\$3 - \$5	\$6 - \$8	\$2 - \$3	\$59 - \$83
Los Angeles – Denver	\$9 - \$13	\$21 - \$30	\$11 - \$15	\$14 - \$20	\$5 - \$7	\$7 - \$10	\$2 - \$3	\$68 - \$97
Phoenix – Minneapolis/St. Paul	\$14 - \$19	\$30 - \$43	\$17 - \$24	\$20 - \$28	\$6 - \$9	\$5 - \$7	\$4 - \$5	\$95 - \$135
Dallas/Fort Worth – New York	\$13 - \$18	\$30 - \$43	\$16 - \$22	\$19 - \$27	\$6 - \$9	\$10 - \$14	\$4 - \$5	\$98 - \$138
Houston – New York	\$13 - \$18	\$30 - \$43	\$15 - \$22	\$18 - \$26	\$9 - \$13	\$10 - \$14	\$4 - \$5	\$100 - \$141
Seattle – Denver	\$11 - \$15	\$22 - \$31	\$14 - \$20	\$17 - \$24	\$5 - \$7	\$4 - \$5	\$2 - \$4	\$75 - \$106
San Antonio – Minneapolis/St. Paul	\$8 - \$12	\$21 - \$30	\$11 - \$15	\$14 - \$19	\$5 - \$6	\$4 - \$5	\$2 - \$3	\$64 - \$91
San Francisco – Dallas/Fort Worth	\$12 - \$17	\$30 - \$43	\$15 - \$21	\$18 - \$26	\$5 - \$7	\$7 - \$11	\$4 - \$5	\$92 - \$130
Detroit – New Orleans	\$8 - \$11	\$21 - \$30	\$10 - \$13	\$12 - \$17	\$7 - \$10	\$2 - \$3	\$2 - \$3	\$62 - \$88
Denver – Minneapolis/St. Paul	\$7 - \$10	\$21 - \$30	\$9 - \$12	\$11 - \$15	\$4 - \$6	\$2 - \$3	\$2 - \$3	\$56 - \$80
Seattle – Chicago	\$15 - \$21	\$27 - \$38	\$18 - \$25	\$21 - \$30	\$7 - \$9	\$6 - \$8	\$4 - \$5	\$96 - \$136
Dallas/Fort Worth – Atlanta	\$5 - \$8	\$21 - \$30	\$7 - \$10	\$9 - \$13	\$4 - \$5	\$6 - \$9	\$2 - \$3	\$55 - \$78
El Paso – Billings	\$9 - \$13	\$21 - \$30	\$11 - \$15	\$14 - \$20	\$5 - \$7	\$1 - \$2	\$2 - \$3	\$63 - \$89

Table 2-3. Annual O&M Cost Estimates for Daily Cardinal and Sunset Limited Service (millions FY 2025 dollars)

Selected Preferred Route Option	Maintenance of Way & Fuel	Maintenance of Equipment, Yard & Train Movement	On Board Services Labor	Incremental Cost for Daily Service				Incremental O&M Cost Estimate for Daily Service	Total O&M Cost Estimate for Daily Service
				Train & Engine Crew Labor	Stations	On Board Services Non-Labor, Sales, Info & Reservations	Police, Environmental & Safety		
Daily Cardinal	\$13 - \$15	\$6 - \$7	\$4 - \$5	\$1 - \$1	\$8 - \$8	\$2 - \$2	\$1 - \$1	\$35 - \$39	\$70 - \$75
Daily Sunset Limited	\$18 - \$24	\$10 - \$14	\$7 - \$9	\$1 - \$1	\$4 - \$5	\$7 - \$7	\$2 - \$3	\$49 - \$63	\$109 - \$122

3 Public Benefits by Selected Preferred Route Option

FRA estimated public benefits of restoring or enhancing intercity passenger rail transportation for each selected preferred route option. Public benefits considered in the Study include jobs and earnings, equity, rail accessibility, and safety benefits. The Study identified potential benefits resulting from the construction, operation, availability, and use of the network of selected preferred route options in the following categories:

- **Jobs and Earnings.** The potential number of jobs and amount of earnings from constructing and operating each selected preferred route option.
- **Equity.** The potential change in access to long-distance passenger rail service if the selected preferred route options were implemented, based on station catchment areas (30 miles around station areas in metropolitan statistical areas [MSAs]; 50 miles around station areas outside of MSAs).
- **Rail Accessibility.** The potential change in access to institutions from long-distance passenger rail service if the selected preferred route options were implemented, based on station catchment areas.
- **Safety Benefits.** The potential number of crashes avoided by shifting passengers from automobile and bus to rail if the selected preferred route options were implemented.

3.1 Jobs and Earnings

Implementation of the selected preferred route options could generate new jobs and earnings. FRA considered the potential number of jobs and earnings that could result from constructing and operating the selected preferred route options. To estimate these benefits, FRA analyzed:

- Jobs and earnings generated by constructing the selected passenger service-required capital projects of each selected preferred route option.
- Jobs and earnings generated by operating the selected preferred route option.

Jobs are measured in job years. A job year is employment for one person for one year. The Study used RIMS II multipliers from the U.S. Bureau of Economic Analysis to help estimate potential jobs and earnings associated with the selected preferred route options (U.S. Bureau of Economic Analysis 2023). The jobs and earnings are the combined direct impacts, indirect impacts, and induced impacts from the construction and annual operation of the selected preferred route options.

- **Direct Impact:** The activity generated by the construction industry at the construction site or by the operator at their facilities due to the increased expenditure.
- **Indirect Impact:** The activity generated by other industries that supply the construction industry or operator with inputs by vendors and suppliers, such as equipment, steel, and concrete.
- **Induced Impact:** The activity generated through consumption (consumer goods and services, food, etc.) due to the activity generated by the expenditure in the construction industry or operator through the direct and indirect impacts. Jobs supported by workers' spending on food, clothes, and housing are induced impacts.

Table 3-1 summarizes the estimated range of job years generated by the construction of the selected preferred route options. Jobs generated by construction are temporary and last for the duration of the construction activity. Table 3-2 summarizes the estimated earnings from the jobs generated by the construction of the selected preferred route options. FRA identified only a subset of capital projects needed for passenger service on the selected preferred route options. They are a snapshot of selected passenger service-required capital cost estimates identified by the Study. They do not represent the full range of capital projects that may be needed to implement a selected preferred route option, including potentially significant projects related to track capacity and other operational improvement projects. As a result, the construction benefits associated with the selected

Appendix C: Estimated O&M Costs and Public Benefits

preferred route options do not account for the full range of capital costs likely needed to implement a selected preferred route option. The estimates of jobs and earnings from construction are based on capital cost estimates. Those selected preferred route options with the largest capital cost estimates have the highest jobs and earnings.

Table 3-1. Estimated Range of Jobs Years Generated by Construction of Selected Preferred Route Options

Selected Preferred Route Option	Direct	Indirect	Induced	Total
Chicago – Miami	6,760 - 8,788	5,445 - 7,079	9,853 - 12,809	22,058 - 28,676
Dallas/Fort Worth – Miami	16,306 - 21,197	10,053 - 13,069	20,298 - 26,388	46,657 - 60,654
Denver – Houston	4,662 - 6,061	3,757 - 4,884	6,820 - 8,866	15,239 - 19,811
Los Angeles – Denver	7,795 - 10,133	5,606 - 7,288	10,531 - 13,691	23,932 - 31,112
Phoenix – Minneapolis/St. Paul	12,603 - 16,384	8,963 - 11,652	16,940 - 22,022	38,506 - 50,058
Dallas/Fort Worth – New York	19,412 - 25,236	12,285 - 15,970	24,569 - 31,940	56,266 - 73,146
Houston – New York	17,244 - 22,208	11,018 - 14,221	21,797 - 28,112	50,059 - 64,541
Seattle – Denver	7,497 - 9,745	5,661 - 7,360	10,341 - 13,443	23,499 - 30,548
San Antonio – Minneapolis/St. Paul	10,456 - 13,593	6,949 - 9,034	13,485 - 17,530	30,890 - 40,157
San Francisco – Dallas/Fort Worth	8,874 - 11,536	6,964 - 9,053	12,552 - 16,318	28,390 - 36,907
Detroit – New Orleans	10,929 - 14,207	7,072 - 9,194	14,097 - 18,326	32,098 - 41,727
Denver – Minneapolis/St. Paul	33,056 - 42,972	18,610 - 24,193	39,435 - 51,266	91,101 - 118,431
Seattle – Chicago	12,055 - 15,672	8,541 - 11,104	16,023 - 20,830	36,619 - 47,606
Dallas/Fort Worth – Atlanta	3,790 - 4,927	3,224 - 4,191	5,654 - 7,351	12,668 - 16,469
El Paso – Billings	7,640 - 9,932	5,497 - 7,146	10,295 - 13,383	23,432 - 30,461
Total	179,079 - 232,591	119,645 - 155,438	232,690 - 302,275	531,414 - 690,304

Note: Capital cost estimates are an input into the jobs generated by construction of selected preferred route options. Capital cost estimates include selected passenger service-required capital projects of the selected preferred route options identified by the Study. They do not represent the full range of capital projects that may be needed to implement a selected preferred route option. Capital cost estimates do not include capacity improvement projects to accommodate existing or future traffic, structural improvements, grade crossing improvements, or freight railroad onboard positive train control improvement projects.

Table 3-2. Estimated Range of Earnings Generated by Construction of Selected Preferred Route Options (millions FY 2025 dollars)

Selected Preferred Route Option	Direct	Indirect	Induced	Total
Chicago – Miami	\$577 - \$750	\$392 - \$509	\$545 - \$708	\$1,514 - \$1,967
Dallas/Fort Worth – Miami	\$1,287 - \$1,673	\$704 - \$916	\$1,122 - \$1,459	\$3,113 - \$4,048
Denver – Houston	\$400 - \$521	\$270 - \$351	\$377 - \$490	\$1,047 - \$1,362
Los Angeles – Denver	\$634 - \$824	\$400 - \$520	\$582 - \$757	\$1,616 - \$2,101
Phoenix – Minneapolis/St. Paul	\$1,024 - \$1,332	\$639 - \$831	\$937 - \$1,218	\$2,600 - \$3,381
Dallas/Fort Worth – New York	\$1,548 - \$2,013	\$862 - \$1,121	\$1,358 - \$1,766	\$3,768 - \$4,900
Houston – New York	\$1,362 - \$1,756	\$776 - \$1,002	\$1,205 - \$1,554	\$3,343 - \$4,312
Seattle – Denver	\$608 - \$791	\$407 - \$530	\$572 - \$743	\$1,587 - \$2,064
San Antonio – Minneapolis/St. Paul	\$831 - \$1,080	\$492 - \$640	\$746 - \$969	\$2,069 - \$2,689
San Francisco – Dallas/Fort Worth	\$731 - \$950	\$502 - \$653	\$694 - \$902	\$1,927 - \$2,505
Detroit – New Orleans	\$887 - \$1,153	\$496 - \$645	\$779 - \$1,013	\$2,162 - \$2,811
Denver – Minneapolis/St. Paul	\$2,581 - \$3,355	\$1,286 - \$1,671	\$2,181 - \$2,835	\$6,048 - \$7,861
Seattle – Chicago	\$962 - \$1,251	\$611 - \$794	\$886 - \$1,152	\$2,459 - \$3,197
Dallas/Fort Worth – Atlanta	\$322 - \$419	\$234 - \$304	\$313 - \$406	\$869 - \$1,129
El Paso – Billings	\$618 - \$803	\$393 - \$511	\$569 - \$740	\$1,580 - \$2,054
Total	\$14,372 - \$18,671	\$8,464 - \$10,998	\$12,866 - \$16,712	\$35,702 - \$46,381

Note: Capital cost estimates are an input into the earnings generated by construction of selected preferred route options. Capital cost estimates include selected passenger service-required capital projects of the selected preferred route options identified by the Study. They do not represent the full range of capital projects that may be needed to implement a selected preferred route option. Capital cost estimates do not include capacity improvement projects to accommodate existing or future traffic, structural improvements, grade crossing improvements, or freight railroad onboard positive train control improvement projects.

Appendix C: Estimated O&M Costs and Public Benefits

Jobs and earnings generated by the operation of the selected preferred route options are estimated on an annual basis. Table 3-3 summarizes the estimated range of annual job years generated by the operation of the selected preferred route options. Jobs generated by operations last for the duration of the operation of the selected preferred route option. Table 3-4 summarizes the estimated annual earnings from the jobs generated by the operation of the selected preferred route options. The estimates of jobs and earnings are based on O&M cost estimates. Those selected preferred route options with the largest O&M cost estimates have the highest jobs and earnings.

Table 3-3. Estimated Range of Jobs Years Generated by Operation of Selected Preferred Route Options

Selected Preferred Route Option	Direct	Indirect	Induced	Total
Chicago – Miami	655 - 928	266 - 376	474 - 672	1,395 - 1,976
Dallas/Fort Worth – Miami	604 - 856	246 - 348	440 - 623	1,290 - 1,827
Denver – Houston	496 - 702	201 - 284	359 - 508	1,056 - 1,494
Los Angeles – Denver	572 - 811	233 - 330	416 - 589	1,221 - 1,730
Phoenix – Minneapolis/St. Paul	784 - 1,110	321 - 455	575 - 815	1,680 - 2,380
Dallas/Fort Worth – New York	816 - 1,156	332 - 470	594 - 841	1,742 - 2,467
Houston – New York	838 - 1,187	340 - 482	609 - 862	1,787 - 2,531
Seattle – Denver	620 - 878	253 - 359	453 - 642	1,326 - 1,879
San Antonio – Minneapolis/St. Paul	536 - 760	218 - 309	390 - 553	1,144 - 1,622
San Francisco – Dallas/Fort Worth	766 - 1,084	312 - 441	558 - 791	1,636 - 2,316
Detroit – New Orleans	521 - 738	212 - 300	379 - 536	1,112 - 1,574
Denver – Minneapolis/St. Paul	471 - 667	192 - 271	343 - 486	1,006 - 1,424
Seattle – Chicago	782 - 1,109	322 - 456	577 - 818	1,681 - 2,383
Dallas/Fort Worth – Atlanta	477 - 676	192 - 272	342 - 485	1,011 - 1,433
El Paso – Billings	520 - 737	213 - 301	381 - 539	1,114 - 1,577
Total	9,458 - 13,399	3,853 - 5,454	6,890 - 9,760	20,201 - 28,613

Table 3-4. Estimated Earnings Generated by Operation of Selected Preferred Route Options (millions FY 2025 dollars)

Selected Preferred Route Option	Direct	Indirect	Induced	Total
Chicago – Miami	\$29 - \$41	\$17 - \$24	\$26 - \$37	\$72 - \$102
Dallas/Fort Worth – Miami	\$27 - \$38	\$16 - \$22	\$24 - \$34	\$67 - \$94
Denver – Houston	\$22 - \$31	\$13 - \$18	\$20 - \$28	\$55 - \$77
Los Angeles – Denver	\$25 - \$36	\$15 - \$21	\$23 - \$32	\$63 - \$89
Phoenix – Minneapolis/St. Paul	\$35 - \$50	\$21 - \$29	\$31 - \$45	\$87 - \$124
Dallas/Fort Worth – New York	\$36 - \$52	\$21 - \$30	\$32 - \$46	\$89 - \$128
Houston – New York	\$37 - \$53	\$22 - \$31	\$33 - \$47	\$92 - \$131
Seattle – Denver	\$28 - \$39	\$16 - \$23	\$25 - \$35	\$69 - \$97
San Antonio – Minneapolis/St. Paul	\$24 - \$34	\$14 - \$20	\$21 - \$30	\$59 - \$84
San Francisco – Dallas/Fort Worth	\$34 - \$48	\$20 - \$28	\$31 - \$43	\$85 - \$119
Detroit – New Orleans	\$23 - \$33	\$13 - \$19	\$21 - \$29	\$57 - \$81
Denver – Minneapolis/St. Paul	\$21 - \$30	\$12 - \$17	\$19 - \$27	\$52 - \$74
Seattle – Chicago	\$35 - \$50	\$21 - \$29	\$32 - \$45	\$88 - \$124
Dallas/Fort Worth – Atlanta	\$21 - \$30	\$12 - \$17	\$19 - \$27	\$52 - \$74
El Paso – Billings	\$23 - \$33	\$14 - \$19	\$21 - \$29	\$58 - \$81
Total	\$420 - \$598	\$247 - \$347	\$378 - \$534	\$1,045 - \$1,479

3.2 Equity

Implementation of the selected preferred route options could serve additional people in disadvantaged communities. As illustrated in Table 3-5 through Table 3-8, the following metrics describe how the selected preferred route options could enhance equity by showing both the additional population and the additional share of population served by passenger rail in the network of selected preferred route options compared to the baseline network.

- U.S. rural population not located within 75 miles of a large airport, or not located within 25 miles of a small airport. A large airport is defined as one with least 0.25 percent of total passenger boardings in the United States in a year, and small airports are any other airport with scheduled commercial service, as defined by the Bureau of Transportation Statistics (BTS) (BTS 2023a).
- U.S. rural population not served by an interstate highway.
- U.S. rural population not served by an interstate highway or airport.
- Overall U.S. rural population.
- U.S. population in areas of persistent poverty.
- U.S. population in historically disadvantaged communities.

For this Study, communities were identified as being served by passenger rail if they were within catchment areas around station locations. Catchment areas were defined as an area 30 miles around stations in MSAs and 50 miles around stations outside of MSAs. The population served included the population of Census Tracts within the catchment areas of the baseline network or the network of selected preferred route options.

The metrics were calculated using Geographic Information System (GIS) analysis of the selected preferred route option, market data, and a GIS database developed through the Study. In addition, the U.S. Department of Transportation (DOT) Justice40 Rail Explorer (DOT 2023b), the Equitable Transportation Community mapping tool (DOT 2023a), and the CEJST (CEQ 2022) were applied to identify areas of persistent poverty and historically disadvantaged populations.

The definition of the network of selected preferred route options used in Table 3-5 through Table 3-8 is the baseline network plus the catchment areas of all stations served by the 15 selected preferred route options. This definition is more precise than the one used in analysis of the network of selected preferred route options that was shared during the regional working group meetings in February 2024, because station locations had not been identified for every selected preferred route option at that time. Previously, where station locations had not been identified along proposed new segments, a 50-mile buffer along new segments was used to define the network of selected preferred route options in those areas rather than more precise 30-mile and 50-mile radius catchments around stations. Because station locations for each of the selected preferred route options have since been identified, the more precise definition for the network of selected preferred route options is used here.

Appendix C: Estimated O&M Costs and Public Benefits

Table 3-5. Equity: Estimated Additional Population Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 1a)

Selected Preferred Route Option	Rural population not located within 75 miles of a large airport, or not located within 25 miles of a small airport ^a		Rural population not served by an interstate highway		Rural population not served by an interstate highway or by an airport	
	Additional Population ^b	Percent Increase	Additional Population ^b	Percent Increase	Additional Population ^b	Percent Increase
Chicago – Miami	393,000	2.5%	608,000	3.3%	288,000	2.9%
Dallas/Fort Worth – Miami	417,000	2.6%	341,000	1.9%	200,000	2.0%
Denver – Houston	174,000	1.1%	216,000	1.2%	120,000	1.2%
Los Angeles – Denver	60,000	0.4%	20,000	0.1%	17,000	0.2%
Phoenix – Minneapolis/St. Paul	278,000	1.8%	390,000	2.1%	215,000	2.1%
Dallas/Fort Worth – New York	193,000	1.2%	376,000	2.0%	74,000	0.7%
Houston – New York	689,000	4.3%	535,000	2.9%	394,000	3.9%
Seattle – Denver	63,000	0.4%	60,000	0.3%	12,000	0.1%
San Antonio – Minneapolis/St. Paul	513,000	3.2%	462,000	2.5%	301,000	3.0%
San Francisco – Dallas/Fort Worth	59,000	0.4%	54,000	0.3%	29,000	0.3%
Detroit – New Orleans	602,000	3.8%	555,000	3.0%	285,000	2.8%
Denver – Minneapolis/St. Paul	236,000	1.5%	259,000	1.4%	180,000	1.8%
Seattle – Chicago	106,000	0.7%	49,000	0.3%	37,000	0.4%
Dallas/Fort Worth – Atlanta	118,000	0.7%	87,000	0.5%	71,000	0.7%
El Paso – Billings	61,000	0.4%	46,000	0.3%	33,000	0.3%
Total U.S. Population for each Metric ^c	15,845,000		18,366,000		10,011,000	

^a A large airport is defined as one with least 0.25 percent of total passenger boardings in the United States in a year, and small airports are any other airport with scheduled commercial service, as defined by BTS (BTS 2023a).

^b Population values are rounded to the nearest one thousand people.

^c This value is the total U.S. population for each metric described in the column headings and serves as the denominator for calculating the percent change (by selected preferred route option) and percent served (network of selected preferred route options compared to baseline network totals).

Appendix C: Estimated O&M Costs and Public Benefits

Table 3-6. Equity: Estimated Additional Population Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 1b)

Selected Preferred Route Option	Rural population not located within 75 miles of a large airport, or not located within 25 miles of a small airport ^a		Rural population not served by an interstate highway		Rural population not served by an interstate highway or by an airport	
	Population Served ^b	Percent of Total Population Served	Population Served ^b	Percent of Total Population Served	Population Served ^b	Percent of Total Population Served
Baseline Network, Total Population Served	5,323,000	33.6%	6,843,000	37.3%	2,960,000	29.6%
Network of Selected Preferred Route Options, Total Population Served	8,532,000	53.8%	10,152,000	55.3%	4,784,000	47.8%

The selected preferred route options overlap each other. As a result, the total value for the network of selected preferred route options does not equal the sum of selected preferred route options.

^a A large airport is defined as one with least 0.25 percent of total passenger boardings in the United States in a year, and small airports are any other airport with scheduled commercial service, as defined by BTS (BTS 2023a).

^b Population values are rounded to the nearest 1,000 people.

Appendix C: Estimated O&M Costs and Public Benefits

Table 3-7. Equity: Estimated Additional Population Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 2a)

Selected Preferred Route Option	Rural population		Population residing in areas of persistent poverty		Population in historically disadvantaged communities	
	Additional Population ^b	Percent Increase	Additional Population ^b	Percent Increase	Additional Population ^b	Percent Increase
Chicago – Miami	1,243,000	3.2%	1,902,000	2.5%	2,393,000	2.4%
Dallas/Fort Worth – Miami	822,000	2.1%	1,368,000	1.8%	1,452,000	1.5%
Denver – Houston	435,000	1.1%	576,000	0.8%	667,000	0.7%
Los Angeles – Denver	123,000	0.3%	729,000	1.0%	944,000	0.9%
Phoenix – Minneapolis/St. Paul	652,000	1.7%	934,000	1.2%	1,112,000	1.1%
Dallas/Fort Worth – New York	986,000	2.6%	1,350,000	1.8%	1,148,000	1.2%
Houston – New York	1,228,000	3.2%	1,710,000	2.2%	1,994,000	2.0%
Seattle – Denver	191,000	0.5%	285,000	0.4%	379,000	0.4%
San Antonio – Minneapolis/St. Paul	813,000	2.1%	699,000	0.9%	881,000	0.9%
San Francisco – Dallas/Fort Worth	213,000	0.6%	812,000	1.1%	1,105,000	1.1%
Detroit – New Orleans	1,554,000	4.0%	2,319,000	3.0%	2,403,000	2.4%
Denver – Minneapolis/St. Paul	406,000	1.1%	191,000	0.3%	98,000	0.1%
Seattle – Chicago	205,000	0.5%	190,000	0.2%	123,000	0.1%
Dallas/Fort Worth – Atlanta	206,000	0.5%	452,000	0.6%	399,000	0.4%
El Paso – Billings	154,000	0.4%	401,000	0.5%	79,000	0.1%
Total U.S. Population for each Metric ^a	38,413,000		76,125,000		99,566,000	

^a This value is the total U.S. population for each metric described in the column headings and serves as the denominator for calculating the percent change (by selected preferred route option) and percent served (network of selected preferred route options compared to baseline network totals).

^b Population values are rounded to the nearest 1,000 people.

Table 3-8. Equity: Estimated Additional Population Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 2b)

Selected Preferred Route Option	Rural population		Population residing in areas of persistent poverty		Population in historically disadvantaged communities	
	Population Served ^a	Percent of Total Population Served	Population Served ^a	Percent of Total Population Served	Population Served ^a	Percent of Total Population Served
Baseline Network, Total Population Served	18,045,000	47.0%	54,316,000	71.4%	76,965,000	77.3%
Network of Selected Preferred Route Options, Total Population Served	25,208,000	65.6%	64,279,000	84.4%	87,817,000	88.2%

The selected preferred route options overlap each other. As a result, the total value for the network of selected preferred route options does not equal the sum of selected preferred route options.

^a Population values are rounded to the nearest 1,000 people.

3.3 Rail Accessibility

The following types of rail access changes are summarized in Table 3-9 through Table 3-12 by selected preferred route option:

- Net change in the number of people who have access to passenger rail services.
- Net change in the population on U.S. tribal lands who have access to passenger rail services (American Indian and Alaska Native Land, American Indian Tribal Subdivisions, Bureau of Indian Affairs Regional Boundaries, Oklahoma Tribal Statistical Areas).
- Net change in the number of medical centers served (only Level I or II trauma centers, facilities with “Cancer” and/or “Veteran” in the name).
- Net change in the number of higher education institutions served (public and private not-for-profit higher education institutions).
- Net change in the number of historically black colleges and universities (HBCU).
- Net change in the number of tribal colleges and universities.
- Net change in Department of Defense sites, commonly referred to as military installations, and includes installations, ranges, training areas, bases, forts, camps, armories, etc., based on the BTS Military Bases dataset (BTS 2023b).
- Net change in the number of National Park Service lands served (national parks, national recreation areas, and national preserves).
- Net change in the number of stations in small communities (non-MSA areas).

The definition of the network of selected preferred route options used in Table 3-9 through Table 3-12 is the baseline network plus the catchment areas of all stations served by the 15 selected preferred route options. This definition is more precise than the one used in analysis of the network of selected preferred route options that was shared during the regional working group meetings in February 2024, because station locations had largely not been identified for every selected preferred route option at that time. Previously, where station locations had not been identified along proposed new segments, a 50-mile buffer along new segments was used to define the network of selected preferred route options in those areas rather than more precise 30-mile and 50-mile radius catchments around stations. Because station locations for each of the selected preferred route options have since been identified, the more precise definition for the network of selected preferred route options is used here.

Note: There are many types of national park units, and future studies may expand the types of national park units reviewed beyond the three used in the Study (National Parks, National Recreation Areas, and National Preserves).

Appendix C: Estimated O&M Costs and Public Benefits

Table 3-9. Rail Accessibility: Estimated Additional Population, and Institutions Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 1a)

Selected Preferred Route Option	Additional population that would have access to passenger rail service	Additional population on U.S. tribal lands that would have access to passenger rail service	Number of additional medical centers served by passenger rail ^a	Number of additional higher education institutions served by passenger rail ^b
	in thousands	in thousands		
Chicago – Miami	6,640	27	9	72
Dallas/Fort Worth – Miami	4,220	137	10	54
Denver – Houston	2,520	54	7	22
Los Angeles – Denver	3,225	0	3	16
Phoenix – Minneapolis/St. Paul	4,932	29	14	55
Dallas/Fort Worth – New York	5,824	1,025	13	104
Houston – New York	5,491	14	9	65
Seattle – Denver	1,656	10	3	19
San Antonio – Minneapolis/St. Paul	2,659	1,444	5	50
San Francisco – Dallas/Fort Worth	3,716	16	6	22
Detroit – New Orleans	9,561	72	17	122
Denver – Minneapolis/St. Paul	1,738	10	5	24
Seattle – Chicago	1,094	42	2	24
Dallas/Fort Worth – Atlanta	810	0	2	13
El Paso – Billings	2,035	29	4	22

^a Medical centers include only Level I or II trauma centers.

^b Higher education institutions include public and private not-for-profit higher education institutions.

Appendix C: Estimated O&M Costs and Public Benefits

Table 3-10. Rail Accessibility: Estimated Additional Population, and Institutions Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 1b)

Selected Preferred Route Option	Population that would have access to passenger rail service	Population on U.S. tribal lands that would have access to passenger rail service	Number of medical centers served by passenger rail ^a	Number of higher education institutions served by passenger rail ^b
	Population Served in thousands	Population Served in thousands	Number Served	Number Served
Baseline Network, Total Population or Institutions Served	247,400	1,886	502	2,742
Network of Selected Preferred Route Options, Total Population or Institutions Served	285,955	3,794	576	3,237

The selected preferred route options overlap each other. As a result, the total value for the network of selected preferred route options does not equal the sum of selected preferred route options.

^a Medical centers include only Level I or II trauma centers.

^b Higher education institutions include public and private not-for-profit higher education institutions.

Appendix C: Estimated O&M Costs and Public Benefits

Table 3-11. Rail Accessibility: Additional Population and Institutions Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 2a)

Selected Preferred Route Option	Number of additional HBCU institutions served by passenger rail	Number of additional tribal universities served by passenger rail	Number of additional military installations served by passenger rail ^a	Number of additional National Park Service lands served by passenger rail ^b	Number of additional passenger rail stations in small communities ^c
Chicago – Miami	10	0	11	1	5
Dallas/Fort Worth – Miami	4	0	45	0	5
Denver – Houston	1	0	11	1	9
Los Angeles – Denver	0	0	8	3	7
Phoenix – Minneapolis/St. Paul	0	3	12	1	14
Dallas/Fort Worth – New York	3	0	12	0	3
Houston – New York	3	0	27	0	5
Seattle – Denver	0	0	7	2	8
San Antonio – Minneapolis/St. Paul	0	1	6	0	11
San Francisco – Dallas/Fort Worth	0	1	6	1	5
Detroit – New Orleans	12	0	37	1	7
Denver – Minneapolis/St. Paul	0	0	9	2	11
Seattle – Chicago	0	2	4	2	11
Dallas/Fort Worth – Atlanta	2	0	2	0	2
El Paso – Billings	0	0	11	2	6

^a Department of Defense sites include installations, ranges, training areas, bases, forts, camps, and armories.

^b National Parks Service lands include national parks, recreation areas, and preserves.

^c Small communities are defined as non-MSA areas.

Appendix C: Estimated O&M Costs and Public Benefits

Table 3-12. Rail Accessibility: Additional Population and Institutions Served by the Network of Selected Preferred Route Options Compared to the Baseline Network (Part 2b)

Selected Preferred Route Option	Number of HBCU institutions served by passenger rail	Number of tribal colleges and universities served by passenger rail	Number of military installations served by passenger rail ^a	Number of National Park Service lands served by passenger rail ^b	Number of passenger rail stations in small communities ^c
	Number Served	Number Served	Number Served	Number Served	Number Served
Baseline Network, Total Population or Institutions Served	72	23	408	63	110
Network of Selected Preferred Route Options, Total Population or Institutions Served	95	29	545	75	209

The selected preferred route options overlap each other. As a result, the total value for the network of selected preferred route options does not equal the sum of selected preferred route options.

^a Department of Defense sites include installations, ranges, training areas, bases, forts, camps, armories.

^b National Parks Service lands include national parks, recreation areas, and preserves.

^c Small communities are defined as non-MSA areas.

Table 3-13 lists the number of communities where a selected preferred route option would provide passenger rail access that did not previously exist; the preferred network provides an entirely new transportation option. This is considered an option value, as it gives residents the ability to choose rail travel, an option unavailable in the baseline network.

For communities that already have access to passenger rail service via the baseline network, the selected preferred route option could become a redundancy, or an additional option, providing more opportunities for travel. In addition, the selected preferred route option could provide a redundancy as an alternate mode for travel when a primary mode is compromised or unavailable due to weather or other unforeseen challenges.

Table 3-13. Number of Stations Where Long-Distance Rail is a New Option by Selected Preferred Route Option

Selected Preferred Route Option	Number of Stations Not Currently Served by Passenger Rail	Option Value	
		Number of Stations Where Selected Preferred Route Option is a New Mode Option ^a	Redundancy Number of Existing Stations adding New Service
Chicago - Miami	16	14	21
Dallas/Fort Worth - Miami	18	15	17
Denver - Houston	16	14	5
Los Angeles - Denver	15	8	9
Phoenix - Minneapolis/St. Paul	23	20	9
Dallas/Fort Worth - New York	16	15	17
Houston - New York	16	15	26
Seattle - Denver	13	6	16
San Antonio - Minneapolis/St. Paul	18	18	10
San Francisco – Dallas/Fort Worth	13	11	16
Detroit - New Orleans	20	15	10
Denver - Minneapolis/St. Paul	18	16	2
Seattle - Chicago	15	14	19
Dallas/Fort Worth - Atlanta	4	3	11
El Paso - Billings	16	8	7

^a The number of stations where the selected preferred route option is a new mode option does not include stations where Amtrak Thruway bus service is available (Amtrak 2018).

3.4 Safety

The diversion of travelers from highway to rail transfers travelers from a mode with a higher risk of crash to one with a lower risk. As a result, full implementation of the network of selected preferred route options could translate into a reduction of about 886 crashes per year, although this value may represent some overlaps in the number of crashes among the selected preferred route options, since it cannot be predicted exactly where a crash may occur. This could save about six lives and about 261 injury crashes annually. The estimate used BTS 2021 data on the crash rate per 100,000,000 miles for highway and the crash rate for passenger rail (BTS 2023c). Table 3-14 summarizes the number of fatal crashes avoided, and the number of non-fatal crashes avoided by selected preferred route option.

Table 3-14. Annual Crashes Avoided by Selected Preferred Route Option (Net)

Selected Preferred Route Option	Number of Fatal Crashes	Number of Crashes Involving Injury	Property Damage Only Crashes	Total Number of Crashes
Chicago – Miami	(0.6)	(27.7)	(59.1)	(87.4)
Dallas/Fort Worth – Miami	(0.3)	(9.2)	(26.7)	(36.2)
Denver – Houston	(0.3)	(14.7)	(33.3)	(48.3)
Los Angeles – Denver	(0.4)	(20.9)	(46.6)	(67.9)
Phoenix – Minneapolis/St. Paul	(0.4)	(15.5)	(42.3)	(58.2)
Dallas/Fort Worth – New York	(0.9)	(46.0)	(94.1)	(141.0)
Houston – New York	(0.9)	(48.4)	(97.8)	(147.1)
Seattle – Denver	(0.2)	(7.3)	(24.4)	(31.9)
San Antonio – Minneapolis/St. Paul	(0.2)	(6.7)	(21.0)	(27.9)
San Francisco – Dallas/Fort Worth	(0.5)	(22.5)	(52.4)	(75.4)
Detroit – New Orleans	(0.2)	(5.4)	(18.1)	(23.7)
Denver – Minneapolis/St. Paul	(0.1)	(4.0)	(15.0)	(19.1)
Seattle – Chicago	(0.4)	(14.0)	(40.4)	(54.8)
Dallas/Fort Worth – Atlanta	(0.4)	(19.1)	(39.3)	(58.8)
El Paso – Billings	(0.1)	(0.0)	(9.0)	(8.7)
Total Crashes Avoided (Net)	(5.9)	(261.4)	(619.5)	(886.4)

4 References

- Amtrak. 2018. The Amtrak Network. “Thruway Connecting Services.” <https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/Maps/Amtrak-System-Map-1018.pdf>.
- Amtrak. 2019. Monthly Performance Report: FY 2019. November 2019. <https://www.amtrak.com/content/dam/projects/dotcom/english/public/documents/corporate/monthlyperformancereports/2019/Amtrak-Monthly-Performance-Report-September-2019.pdf>.
- BTS. 2023a. DB1B Market 2019 Air Passenger Data. Bureau of Transportation Statistics. Accessed March 2023. https://www.transtats.bts.gov/TableInfo.asp?gnoyr_VQ=FHK&QO_fu146_anzr=b4vvtv0%20n0q%20Qr56v0n6v10%20f748rB&V0s1_b0yB=D.
- BTS. 2023b. “Military Bases.” <https://geodata.bts.gov/datasets/usdot:military-bases/about>.
- BTS. 2023c. “Transportation Fatalities by Mode.” <https://www.bts.gov/content/transportation-fatalities-mode>.
- CEQ. 2022. Climate and Economic Justice Screening Tool (CEJST). <https://screeningtool.geoplatform.gov/en/about#3/33.47/-97.5>.
- DOT. 2023a. Equitable Transportation Community mapping tool. <https://www.transportation.gov/priorities/equity/justice40/etc-explorer>.
- DOT. 2023b. Justice40 Rail Explorer. <https://www.arcgis.com/apps/webappviewer/index.html?id=fd9810f673b64d228ac072bead46f703>.
- U.S. Bureau of Economic Analysis. 2023. “RIMS II Multipliers based off the Benchmark Input-Output Table for the Nation.” <https://apps.bea.gov/regional/rims/rimsii/>.