MAY 2022

Rockford to Dubuque Passenger Rail Extension

Feasibility Study

Prepared by Quandel Consultants

ECIA

Illinois Department of Transportation

www.ecia.org

CONTENTS

APPENDICES:

1. INTRODUCTION

The East Central Intergovernmental Association (ECIA), a tri-state Metropolitan Planning Organization (MPO) located at the boundary intersections of the states of Iowa, Illinois and Wisconsin, has completed a feasibility analysis for implementation of competitive intercity passenger rail service between Chicago, Illinois and Dubuque, Iowa as a potential way to meet the evolving transportation needs of eastern Iowa and northwestern Illinois including growing urbanization; changes in traditional employment sectors; a surge in personal travel; an expanded global economy; increasing construction, maintenance, and fuel costs; and climate change awareness. The proposed service would support regional goals such as providing reliable and convenient alternative transportation options, reducing highway congestion and associated emissions, facilitating economic growth, catalyzing development and improving access between communities, and promoting connectivity with other transportation modes.

Illinois Department of Transportation (IDOT) is conducting a study for the implementation of intercity passenger rail service between Chicago and Rockford. Initiation of the Chicago to Rockford study motivated the formation of a Passenger Rail Committee (PRC) and the commissioning of this feasibility study to evaluate a potential extension of the proposed Chicago to Rockford service to Dubuque. ECIA serves as the lead agency of the PRC, and the member agencies include:

- Blackhawk Hills Regional Council
- City of Dubuque
- City of East Dubuque
- City of Galena
- City of Freeport
- Dubuque Chamber of Commerce
- ECIA
- Greater Freeport Partnership
- Illinois DOT
- NW Illinois Economic Development
- Jo Daviess County
- Region 1 Planning Council of Rockford
- Ride the Rail

1.1 Study Methodology

The PRC commissioned Quandel Consultants Inc. with support from Images, Inc. and ESH Consult (the study team) to complete a Passenger Rail Feasibility Study (the Study). The study team considered input from the PRC to ensure the evaluated preferred service alternative was in line with their expectations and supported the interests of the region. The study team met regularly with the PRC throughout the study to present findings and obtain input on the analysis.

The study team also conducted two rounds of Focus Group meetings. Participants were members of the public associated with businesses and organizations along the corridor. The first round consisted of a series of meetings in May 2021 to gain insight into the public's perspective of new passenger rail service between Rockford and Dubuque. Each meeting began with a presentation to provide background information on the scope and limits of the Study as well as general information about the corridor and potential route alignments within the corridor. This was followed by open discussions on passenger rail service, economic development, and other issues and goals to be addressed by the Study. A detailed summary of these events can be found in Appendix A.

The second round was held in March 2022. The purpose of this round of Focus Group meetings was to present the original participants the results of the study. While the first round was to gather information, the second round was to provide closure. The events included a presentation on the study process, selected alternative, proposed station locations, estimated ridership, capital costs, operating and maintenance costs, potential funding sources, next steps for the project, and potential service benefits.

The study progressed through the following steps, which also correspond to the organization of this report.

a. Stakeholder and Public Engagement
b. Route Alternatives
c. Service Alternatives
d. Feasibility Analysis of Selected Route and Service Alternative
    a. Station and Layover Facility
    b. Infrastructure Improvements
    c. Vehicles
    d. Capital Cost Estimates
    e. Operations and Maintenance Cost Estimates
    f. Ridership and Revenue Estimates
    g. Public Benefit Estimates
e. Recommendations and Path Forward

1.2 Key Assumptions

The Study is limited in scope to the analysis of the Rockford to Dubuque segment, referred to in this report as the Dubuque Extension, as an extension to the proposed Chicago to Rockford service. Analysis of alternative routes or services east of Rockford are not considered. Details of the proposed Chicago to Rockford service such as route, travel time, schedule, style of operations, equipment, and frequency have a direct impact on the operations and ridership estimates of the studied extension. The Chicago to Rockford study is still underway at the conclusion of the Study. Some information was provided by IDOT regarding the details of the Chicago Rockford service to advise this study. Specifically, the proposed Chicago to Rockford service is to operate over privately owned railroad infrastructure via Union Pacific Railroad (UP) track and is to be an intercity, as opposed to commuter, style service. IDOT also provided a proposed schedule for service between Chicago and

Rockford to support the development of a schedule for the Dubuque Extension. The Study assumes a two round trip per day service with trains leaving Chicago and Dubuque each morning and evening.

1.3 Primary Goal

The primary goal of the Study is to understand if passenger rail can be competitive with other common modes of transportation between Dubuque and Chicago. Current transportation options include automobile, intercity bus, and commercial air with private automobile being the most popular mode by far. According to Google Maps, the driving time between Chicago Union Station and the Dubuque Intermodal Transportation Center is estimated between three hours (under ideal traffic conditions) and four hours (under heavy traffic conditions) following the most direct route via U.S. Route 20 between Dubuque and Rockford and via Interstate 90 between Rockford and Chicago. Bus transportation between Dubuque and Chicago is currently offered by Burlington Trailways. For both directions, Burlington Trailways lists a travel time of 5 hours, including one transfer in Davenport, Iowa, and a fare of $51.[1] Other less expensive, but slower options are also offered. American Airlines currently operates once daily service between Chicago–O'Hare and Dubuque Regional Airport listing travel times between 59 minutes and 1 hour and 2 minutes[2]. The lowest round trip fare found at the time of this report is $273. Chicago is currently the only destination available from Dubuque Regional Airport. Therefore, this Study aims to determine if passenger rail service between Chicago and Dubuque is automobile competitive at a reasonable ticket price.

1.4 Limitations

The Study is a feasibility-level evaluation of the Dubuque Extension. An objective of the Study is to provide an initial evaluation of the proposed service to advise decision makers on whether to advance the project to further phases. At this early stage of evaluation, the analysis was limited in several respects:

1. Existing railroad infrastructure and operations information was limited. The two host railroads along the preferred route were contacted to provide information to advise the Study. Burlington Northern Santa Fe (BNSF) provided information regarding operating speeds, train frequencies and existing infrastructure. The Study team did not receive information from Canadian National (CN) which is the host railroad for the majority of the preferred route. Because of this the Study team applied assumptions from similar Midwest Intercity Passenger Rail (IPR) projects to estimate freight operations and capital investment needs.

2. Public engagement was limited to interviews with focus groups composed of local business and government leadership and members of the public identified by the PRC. Public meetings and surveys were not part of this analysis.

[1] https://trailways.com/webstore/purchase/schedules

[2] https://www.aa.com/homePage.do

3. The Chicago to Rockford study has not been completed. Therefore, limited information regarding the anticipated conclusions of that Study was provided by IDOT and, where applicable information was not available, assumptions were made.

4. Since Amtrak is currently the only provider of Midwest IPR service, all calculations which reference data from similar routes are based on services for which Amtrak is the operator.

5. The Study applies a Parametric Demand Model to calculate and estimate ridership and revenue. This methodology is based on a proportional adjustment of historic ridership from comparable existing corridors and not a more detailed population gravity demand model.

2. ROUTE ALTERNATIVES

A single preferred route selection is needed to analyze the feasibility of the Dubuque Extension. Three railroad route alternatives could support passenger rail service between Rockford and Dubuque. They are:

- Alternative A: Rockford-Freeport-Galena-Dubuque (via CN, BNSF, CN)
- Alternative B: Rockford-Davis Junction-Savanna-Dubuque (via CN, CP/BNSF, BNSF, CN)
- Alternative C: Rockford-Flagg Center-Savanna-Dubuque (via CN, CP/BNSF, BNSF, CN)

Figure 1: Rockford to Dubuque route alternatives

2.1 Alternative A:

Alternative A is 96.8 total miles on CN track from Rockford to Portage, BNSF between Portage and East Dubuque, and CN from East Dubuque to cross the Mississippi River and enter Dubuque. This is the shortest, fastest existing rail route between the two cities and the only route that serves the cities of Freeport and Galena. Amtrak's former Black Hawk service used this route.

The 82-mile Rockford to Portage portion of the route on CN is FRA Class 3 single mainline track with a Centralized Traffic Control (CTC) signal system, Positive Train Control System (PTC), and includes five sidings to accommodate train meets. These sidings are located in:

- Seward – 7,700 feet
- Freeport – 8,260 feet
- Lena – 7,210 feet
- Scales Mound – 7,250 feet
- Galena – 5,460 feet

The physical attributes of this segment are conducive to supporting a shared-use freight- passenger rail corridor.

The 67-mile segment between Rockford and Scales Mound is relatively flat and composed mostly of tangent track, with 27 curves. The geometry is more complex between the 15-mile segment between Scales Mound and Portage, where the railroad generally follows the course of the East Fork Galena River and Galena River, descending approximately 300 feet to the where it joins BNSF track at Portage. With 34 curves, many of which are relatively tight and arranged adjacent to each other in reversing geometries, maximum train speeds are limited.

From Portage, the route utilizes BNSF's two-track Northern Transcontinental mainline for 12.5 miles to East Dubuque along the east bank of the Mississippi River. This is a busy segment which handles between 30 and 40 trains per day traveling between Chicago and ports in the Pacific Northwest. The geometry is composed of generally tangent track and gentle curvature.

At East Dubuque, the route leaves the BNSF right of way, curves through an 851-foot tunnel, crosses the two BNSF main tracks at-grade, and then crosses the Mississippi River on CN's 6-span, 1,535-foot-long Dubuque Rail Bridge which includes a 356-foot swing-span.

2.2 Alternative B:

At approximately 113 miles, Alternative B is 17 miles longer as compared to Alternative A. It uses the joint CP/BNSF single-track branch line south from Rockford to Davis Junction, where it turns west and continues via the CP's single main track to Savanna, Illinois. The track between Rockford and Davis Junction is currently non-signalized. From Davis Junction to Savanna, the route is also single track and non-signalized. There are few existing sidings between Rockford and Savanna. At Savanna, Alternative B joins the busy BNSF two-main track Northern Transcontinental for 27.5 miles and is the same as Alternative A from where the CN line joins the

BNSF line in Portage into Dubuque. The segment between Rockford and Davis Junction is lightly used, is not signalized, and is maintained to marginal standards. Significant capital expenditures are expected to be required to upgrade this segment, including installation of CTC and PTC system, to be able to operate passenger trains via this alternative. Additional investment to expand capacity on CP between Davis Junction and Savanna may also be necessary. Since this alternative utilizes the BNSF Northern Transcontinental for 27.5 miles between Savanna and East Dubuque, as opposed to 12.5 miles for Alternative A, it is more likely that capacity improvements are required to minimize train delays from conflicts with freight traffic on the BNSF segment for this alternative. Crucially, this route alternative does not pass through the population centers and tourist destinations of Freeport and Galena.

2.3 Alternative C:

Alternative C, at 122 miles, is the longest of the three alternatives. Like Alternative B, it uses joint CP/BNSF single-track branch line south from Rockford to Davis Junction but then continues along the branch line south to Flagg Center (located northwest of Rochelle). At Flagg Center, the route uses a connecting track to join the BNSF Northern Transcontinental route. Alternative C follows this route through Savanna, from which it is the same as Alternative B. Between Flagg Center and Savanna, the BNSF Northern Transcontinental route is a busy railroad but with only a single main track with several long sidings to meet or pass trains. Significant capital expenditures are expected to be required to upgrade, signalize, and install PTC on the railroad between Rockford and Flagg Center to improve capacity to handle passenger trains via this alternative. As with Alternative B, there is the potential that this route requires capacity improvements on the BNSF segment. Also, this route does not have the potential to service Freeport and Galena.

2.4 Selected Alternative

Alternative A was selected as the preferred route. It is the most direct existing rail route between Rockford and Dubuque and serves the largest population centers and tourist attractions in the region. Alternatives B and C are anticipated to require more capital investment than Alternative A and result in much longer travel times.

3. SERVICE ALTERNATIVES

A screening-level analysis was completed to narrow down the potential service alternatives to a single preferred service alternative. The preferred service alternative was then carried forward for further analysis where preliminary estimates of capital cost, trip time, and revenue demand were calculated. The alternative screening included three selection criteria:

1. Travel time – Calculated as a function of maximum passenger train speed and number of station stops
2. Capital Cost – Screening-level estimated cost of infrastructure investment and vehicle procurement necessary to implement the service alternative
3. Revenue/Ridership – Screening-level estimate of ridership and revenue demand associated with the service alternative

Four service alternatives were considered:

1. Primary station stops at 79 MPH maximum speeds on CN
2. Primary and select secondary station stops at 79 MPH maximum speeds on CN
3. Primary station stops at 90 MPH maximum speeds on CN
4. Primary and select secondary station stops at 90 MPH maximum speeds on CN

The select secondary station stops included in Alternatives 2 and 4 are Winnebago, Lena, and Warren.

Details of the screening analysis are described below:

3.1 Travel Time

Total trip times were calculated between Chicago and Dubuque for each service alternative. Trip time estimates between Rockford and Chicago were provided by IDOT. The average trip time of the four trips between Chicago and Rockford is 1 hour 57 minutes. A 3-minute dwell time was added for passenger pickup and drop-off at the Rockford Station. Therefore, 2 hours was the assumed total trip time for service between Chicago and Rockford for the purposes of schedule development.

Westbound		Station	Eastbound	
7:50 AM	5:40 PM	Chicago	8:40 AM	6:37 PM
8:37 AM	6:38 PM	Elgin	7:40 AM	5:44 PM
8:55 AM	6:56 PM	Huntley	7:19 AM	5:23 PM
9:16 AM	7:17 PM	Belvidere	6:57 AM	5:01 PM
9:39 AM	7:40 PM	Rockford	6:38 AM	4:42 PM

Table 1: Concept Chicago to Rockford service schedule

Travel time between Rockford and Dubuque was calculated using a train performance calculator. Maximum operating speeds were analyzed at 79MPH and 90MPH on CN between Rockford and Portage. In all four scenarios, speeds were limited to 79 MPH on the BNSF portion of the route due to the high freight traffic volumes of 30 to 40 trains per day. Station dwell times were defined as 2 minutes at primary stations and 30 seconds at secondary stations.

Maximum passenger train operating speeds as governed by track geometry were calculated using formulas from the American Railway Engineering and Maintenance-of-Way Association (AREMA)[3]. Curve modifications to allow faster passenger train speeds would be required as part of capital improvements. The Study assumes

[3] *AREMA Manual Section 3.3.1 (2011)*

3 inches maximum superelevation and 5 inches maximum unbalance for single level passenger cars. The 15-mile segment between Scales Mound and Portage is the most restrictive area as the track generally follows the path of the East Fork Galena River and the Galena River descending toward the Mississippi River. Speeds through this segment, which includes 38 total curves and numerous tight reversing curves, would be limited to between 45 and 25 MPH.

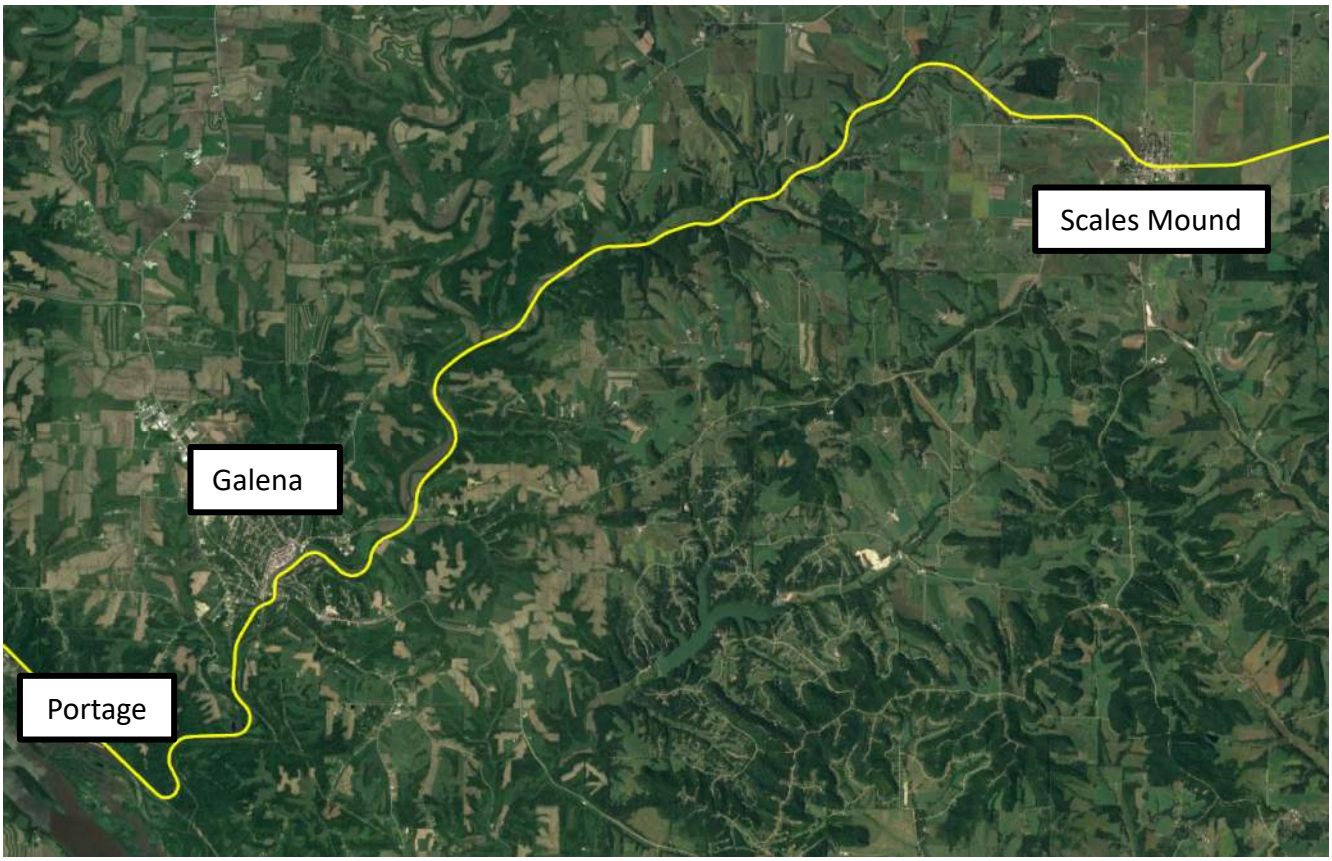

Figure 2: The preferred route (yellow) includes 34 curves in the 15-mile segment between Scales Mound and Portage

A total of twenty minutes of schedule pad was added to the modeled travel time between Dubuque and Rockford to account for train delays resulting from freight traffic and routine maintenance. As operating agreements will need to be negotiated with both CN and BNSF individually, it is anticipated that both railroads will seek schedule pad for operations on their segment. Ten minutes were added for the segment between Rockford and Galena, which is single-track with five sidings. All five sidings are less than two miles long and would generally require a passenger train to slow dramatically or come to a complete stop in the event of a meet with a freight train. An additional ten minutes also applied to the 17-mile segment from Galena to Dubuque. Although this segment is much shorter, it includes entry onto BNSF track near Portage, travel on the

high traffic BNSF line, reentry onto CN territory in East Dubuque, and travel over the single-track Dubuque Rail Bridge over the Mississippi.

A summary of the travel time for each service alternative is included in Table 2. Train performance calculator output charts and a sample detailed schedule for the first alternative are included in Appendix B.

Service Alternative	Travel Time - Dubuque to Chicago Union Station (Travel time Dubuque to Rockford; Travel time Rockford to Chicago)
Primary station stops at 79 MPH maximum speeds on CN	**3'58"** (1' 58"; 2' 0")
Primary and select secondary station stops at 79 MPH maximum speeds on CN	**4'03"** (2' 03"; 2' 0")
Primary station stops at 90 MPH maximum speeds on CN	**3'52"** (1' 52"; 2' 0")
Primary and select secondary station stops at 90 MPH maximum speeds on CN	**3'57"** (1' 57"; 2' 0")

Table 2: Travel time for each service Alternative

3.2 Capital Costs

For the screening analysis a range of rough-order-of-magnitude (ROM) capital costs were estimated using the Federal Railroad Administration (FRA) Standard Cost Categories (SCC). The capital cost estimating is discussed in greater detail in Section 4.4 of this report.

FRA Standard Cost Category
10 Guideway & Track Elements
20 Stations, Stops, Terminals, Intermodals
30 Support Facilities: Yards, Shops, Admin. Bldgs
40 Sitework & Special Conditions
50 Systems
60 ROW, Land, Existing Improvements
70 Vehicles
80 Professional Services
90 Unallocated Contingency
100 Finance Charges

Table 3: FRA Standard Cost Categories

3.3 Estimated Ridership

Screening-level ridership and revenue estimates were also calculated for each of the four service alternatives to advise the selection of a preferred alternative. This calculation applied an abbreviated version of the methodology described in Section 4.6. As opposed to the full methodology, which was only conducted for the preferred alternative once it was selected, this abbreviated methodology applied comparison to fewer reference services and cities and applied less detailed proportional calculations based off those reference services and cities.

3.4 Preferred Alternative

The four considered services are summarized below in Table 4. The 79 MPH alternative without secondary stops was selected by the Study team and the PRC as the preferred alternative. Primary considerations in this selection were that the 90 MPH service did not result in large enough improvement to travel time or estimated ridership and revenue to justify the dramatically higher estimated capital costs. Similarly, the inclusion of the secondary stops was not anticipated to have a large enough impact on ridership and revenue to justify the increased capital cost and travel time.

Service Alternative	Travel Time - Dubuque to Chicago Union Station	Screening-level estimated capital cost	Screening-level Annual Ridership Range	Screening-level Annual Revenue Range
Primary station stops at 79 MPH maximum speeds on CN	3’58”	$279-377M	85-95K	$2.0-2.4M
Primary and select secondary station stops at 79 MPH maximum speeds on CN	4’03”	+2%	90-100K	$2.2-2.5M
Primary station stops at 90 MPH maximum speeds on CN	3’52”	+36%	88-98K	$2.1-2.5M
Primary and select secondary station stops at 90 MPH maximum speeds on CN	3’57”	+38%	93-104K	$2.3-2.6M

Table 4: Service alternative comparison with the preferred alternative highlighted

4. FEASIBILITY ANALYSIS OF PREFERRED ALTERNATIVE

The preferred alternative was evaluated in further detail for potential station sites and layouts, infrastructure investment and associated costs, operating and maintenance costs, estimated ridership and revenue demand, and anticipated public benefits.

4.1 Stations and Support Facilities

Population centers along the preferred route were considered for their potential to host a station serviced by the proposed service. Although there are historic depot buildings in Dubuque and Freeport, they have been repurposed and are under private ownership. The Galena station building, which was used by historic passenger services, is owned by the City of Galena and currently leased with the stipulation that it will be used as a passenger depot should a passenger service be reinitiated. It was assumed that all stations served by this service would require the construction of platform facilities. As the considered service is to include a train arriving in Dubuque each evening and departing Dubuque each morning, a layover facility will be needed in Dubuque for the overnight servicing of trains.

4.1.1 Station Site Considerations

Candidate station locations along the preferred route were included in this Study based on their potential to meet passenger demands and stimulate ridership for the proposed service. Locations were evaluated primarily based on population of the area around the station site. Sites were also evaluated for their potential to meet tourism induced travel demand or to act as a park-and-ride location, providing service into Chicago for a large area. This section of the report describes the physical and operational attributes at each station site candidate.

Candidate station sites were assessed for their ability to accommodate the minimum facilities requirements. Concept-level plan layouts for each site were produced to illustrate the ability of the evaluated site to host these minimum facility requirements. These concept-level plans address the ability of potential station locations to accommodate minimum stations facilities, including:

- 200-foot platform (2 cars), preferred 500-foot platform (6 cars)
- Parking area with disability space (space count to be determined during design)
- Platform Tactile Edge and ADA compliant path from parking area
- Static location signage and parking lot striping

Figure 3: Map of candidate station locations

4.1.2 Primary Station Locations

Four locations were identified as Primary Station Locations to be included in any considered alternative based on their population and tourist generated travel demand.

4.1.2.1 Dubuque

Dubuque is the western terminus and largest population center of the proposed service. Three potential station locations were considered near the downtown area. An historic station building still exists in Dubuque, but it is currently utilized by the National Mississippi River Museum & Aquarium and is now separated from the CN tracks by Ice Harbor Drive, and it was therefore not considered. Figure 4 identifies the three evaluated candidate station locations.

Alternative 1: This alternative makes use of the existing Dubuque Intermodal Transportation Center facilities, which include a ticket window, indoor and outdoor seating, public restrooms, and parking facilities. The Dubuque Intermodal Transportation Center was constructed with consideration for passenger train access and would provide connectivity with The Jule (the bus and shuttle transit service serving the city of Dubuque) and intercity bus service. Access to this station location would require reconstruction of the north leg of the wye track highlighted in Figure 4.

Alternative 2: This alternative, located at the Port of Dubuque site, make use of the Existing City of Dubuque Parking Ramp.

Alternative 3: This alternative is located adjacent to the Diamond Jo Casino on track owned by the City of Dubuque. The city purchased the property in 1994 and retained the track for potential utilization as a station track. This site has several advantages:

1. There is sufficient room to berth a full train set and be clear of any mainline operations
2. There is substantial security in the area
3. There is available parking adjacent to the site
4. The casino has offered space inside their building for a waiting area, ticket machines, and crew check-in
5. There is room for a high-level platform and ramps

Due to these substantial advantages, the Alternative 3 site was selected as the preferred alternative and used to complete schedule timing, crew turn analysis, and station/layover costs.

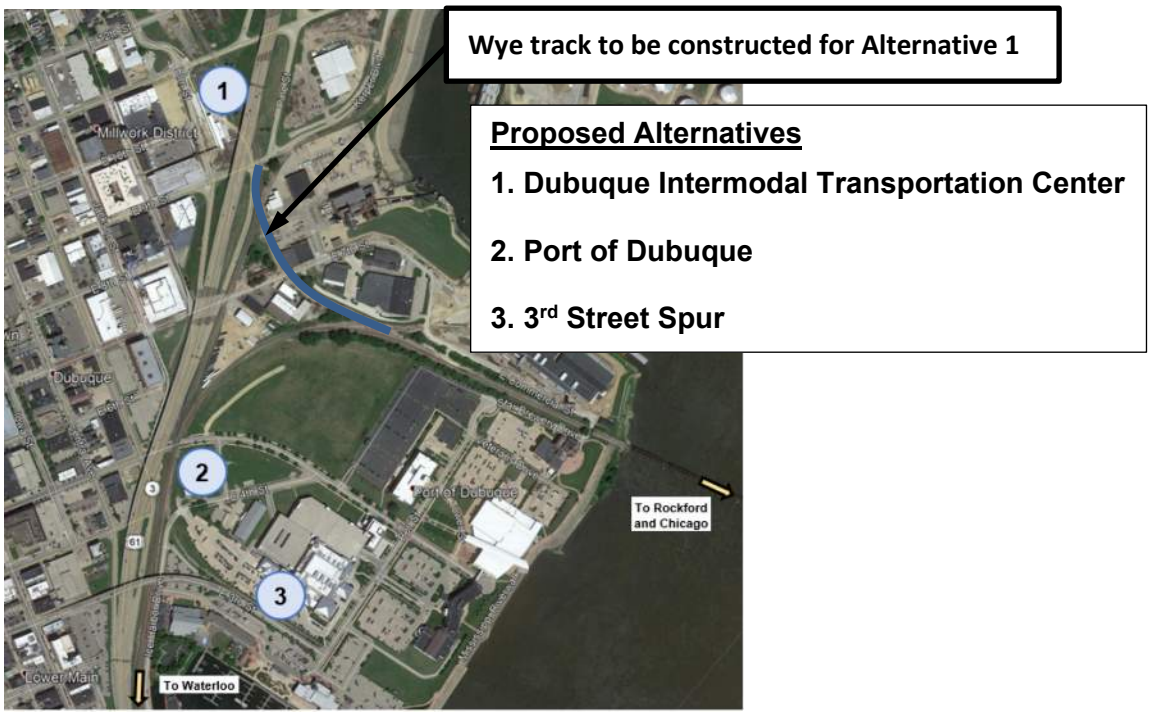

Figure 4: Potential Dubuque Station locations

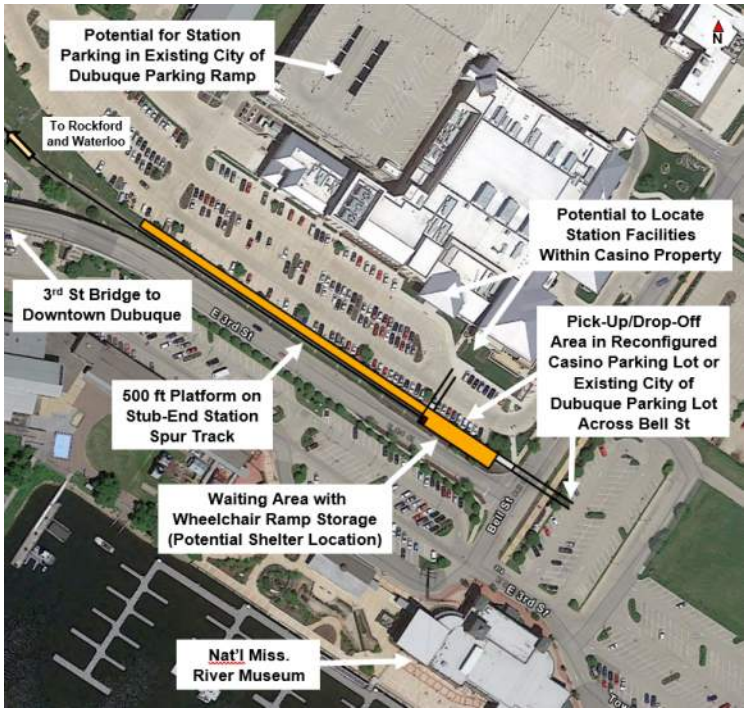

Figure 5:Dubuque Station – 3rd Street Spur alternative conceptual layout

4.1.2.2 Galena

The City of Galena is a popular tourist destination, especially in the summer and fall. Although the population of Galena is 3,308[4], the city hosts approximately 1 million tourists annually,[5] many of whom travel from Chicago. Two platform configurations were evaluated. Both of these scenarios have similar costs with the east platform option better connected with the historic depot and the west platform option better connected with the adjacent parking area.

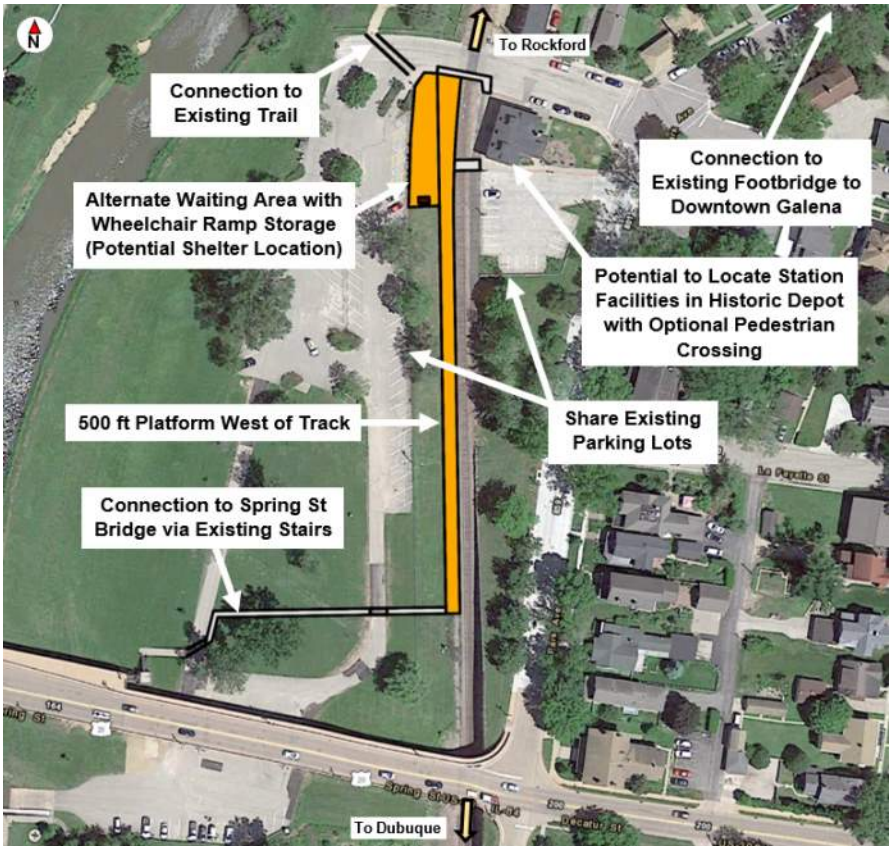

Figure 6: Galena Station conceptual layout

Galena is known for its well-preserved 19th-century buildings like the 1826 Dowling House. The Italianate Ulysses S. Grant Home was a gift from local citizens to the Civil War general who later became a U.S. president. Horseshoe Mound, on the outskirts of Galena, offers views of three states. Other mounds, thought to be ancient ceremonial sites, can be seen at Casper Bluff. Galena is also known for its one-of-a-kind restaurants with more than 57 unique dining opportunities.[6]

[4] https://data.census.gov/cedsci/all?q=Galena%20city,%20Illinois

[5] http://www.cityofgalena.org/en/our_community/visitor_information/

[6] https://www.visitgalena.org

Figure 7: Historic Galena passenger depot

4.1.2.3 Freeport

Freeport is a city of 23,973 people[7] and is the largest population center between Rockford and Dubuque along the preferred route. Freeport was served by the former Amtrak Black Hawk as well as earlier historic services. Freeport has a significant downtown district including access to shops and restaurants.

While the existing depot building has been remodeled for business use and is owned privately, there is ample space adjacent to the track for a platform on the opposite side of the tracks. The city previously commissioned a Study of potential locations for a rail station when early discussions of restoration of the Black Hawk service began. While the location recommended by that Study has since been sold, it is adjacent to the location depicted in Figure 8.

[7] https://data.census.gov/cedsci/all?q=Freeport%20city,%20Illinois

Figure 8: Freeport Station conceptual layout

4.1.2.4 Rockford

For the purposes of this analysis, it is assumed that a station in Rockford would be constructed as part of the IDOT sponsored Chicago to Rockford service. Therefore, potential Rockford station locations were not evaluated. As the proposed Chicago to Rockford service in anticipated to enter Rockford on the UP construction of a connection between UP and CN will be necessary and is addressed in Section 4.2.4.

4.1.3 Secondary Station Locations

Additional candidate station locations were evaluated for potential inclusion in the Dubuque extension. Of these Winnebago, Lena, and Warren were included in service alternatives 2 and 4 as addressed in Section 3.

4.1.3.1 East Dubuque

A potential station in East Dubuque was considered for the sole purpose of providing a "safety valve" for when westbound train service may be disrupted by Dubuque Rail Bridge operations when the swing span is open for navigable waterway traffic, or in the case of a significant bridge operating failure. The site could also prove useful if delays are encountered crossing the BNSF mainline before entering the tunnel. Such delays, although

infrequent, could be significant and providing passengers the opportunity to disembark at East Dubuque would a much-preferred alternative to waiting out the delay on a stopped train within sight of Dubuque.

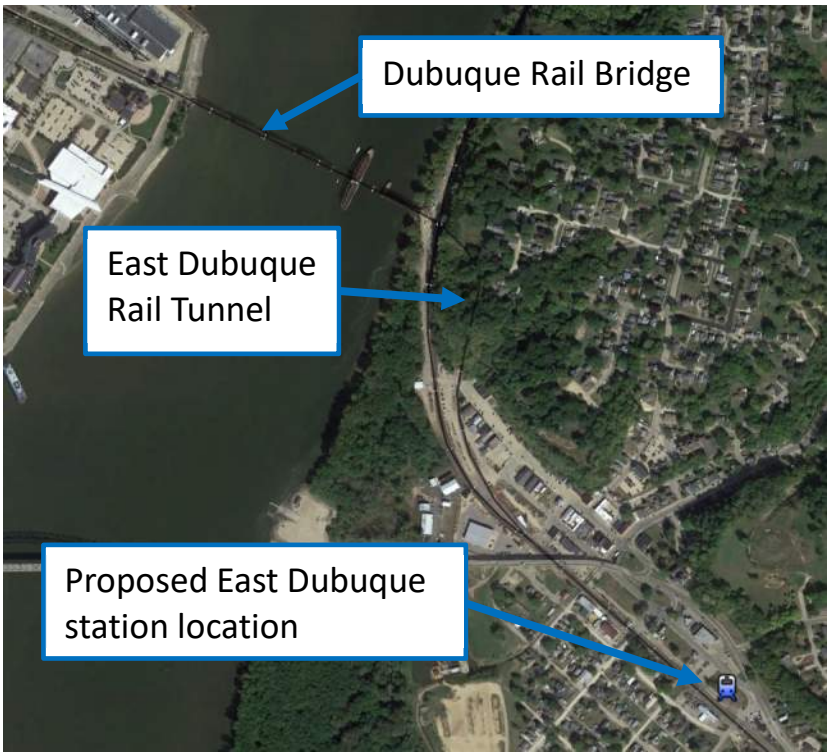

Figure 9: Proposed East Dubuque Station Location

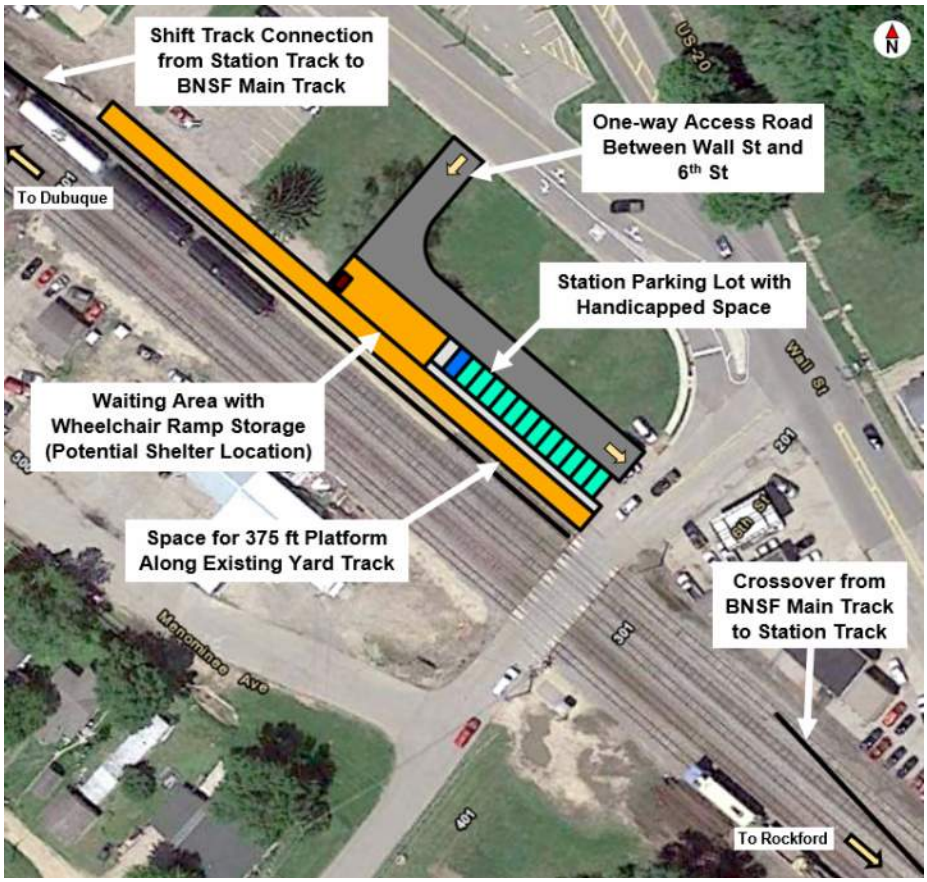

Figure 10: East Dubuque Station conceptual layout

4.1.3.2 Warren

Warren is a village of 1,323 people[8] located less than one mile from the Wisconsin border on Illinois Route 78. Although the population of Warren normally would be too small to justify a station by itself, a station located in the Warren area was considered for its potential to serve people living in the greater regional area, including southwest Wisconsin, for access to Chicago. Residents of the large southwest Wisconsin area wishing to travel into Chicago would be able to drive to Warren, park, and then travel into the city by train, avoiding traffic and the cost of parking in the city.

Warren also has an active downtown area adjacent to the proposed station site. There was considerable support from the Warren elected officials who met with the survey team to discuss the advantages of providing a stop to service a very large regional area with few highway options and no easy access to the nationwide rail network. The Village was open to discussions on parking, access to local shops and food services, station maintenance, and security.

[8] https://www.census.gov/search-results.html?searchType=web&cssp=SERP&q=Warren%20village,%20Illinois

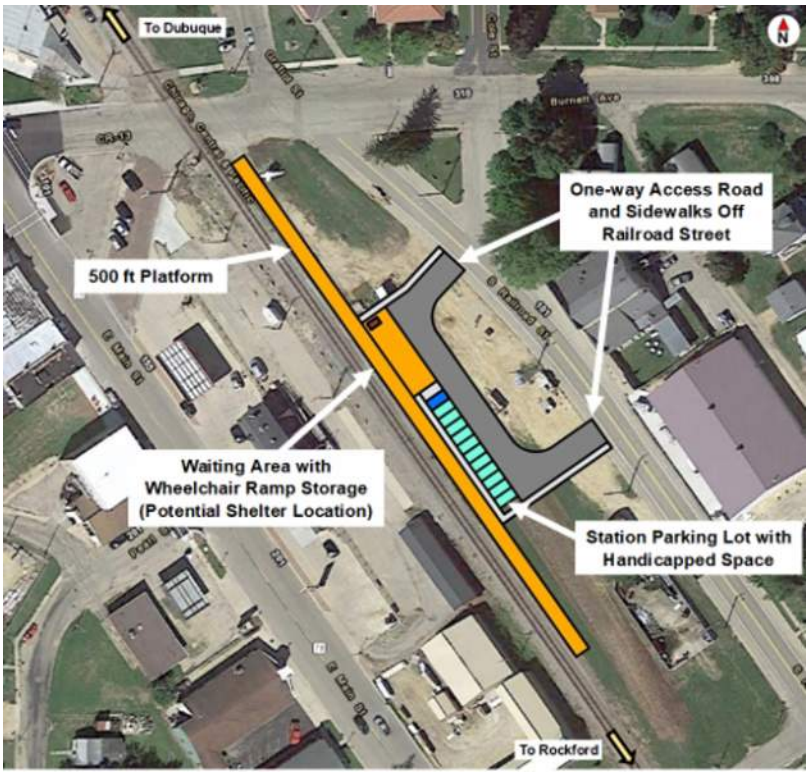

Figure 11: Warren Station conceptual layout

4.1.3.3 Lena

Lena is a village of 2,772 people[9] located roughly halfway between Warren and Freeport. Lena was previously a stop on historic passenger rail services and was considered for a flag stop. Lena has parking available and direct access to the CN tracks cutting through town. There is an adjacent downtown with stores and activity and potential space within the existing parking lot for a shelter.

[9] https://www.census.gov/search-results.html?searchType=web&cssp=SERP&q=Lena%20village,%20Illinois

Figure 12: Downtown Lena

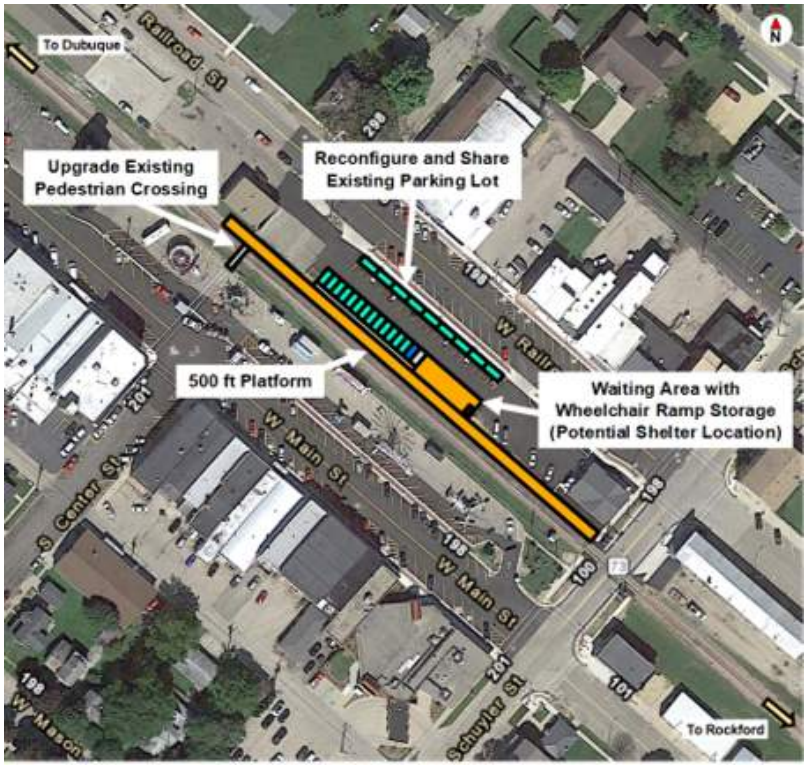

Figure 13: Lena Station conceptual layout

4.1.3.4 Winnebago

Winnebago is a village of 2,940 people[10] located within the Rockford Metropolitan Statistical Area[11] and approximately 8.5 miles from downtown Rockford. This location was considered as a secondary station site primarily for its potential utility for serving passengers driving to the station from the surrounding area and not wishing to drive into downtown Rockford due to parking costs and space limitations.

Figure 14: Winnebago Station conceptual layout

4.1.4 Dubuque Layover Facility

The proposed service would include one train arriving in Dubuque each evening and leaving Dubuque each morning, one train set would need to be parked and serviced in Dubuque overnight. Maintenance services will include fueling, cleaning of coaches, daily inspection and testing of train and engine systems, and minor repairs. The layover facility will require a single track, a platform for accessing the train, and provisions for dumping toilets, filling water tanks, and fueling engines. Regular service and maintenance of the train will be conducted at the Chicago Maintenance Facility, which already has facilities and staff for these more extensive services.

The layover facility described in Section 4.1.4 was estimated to include the following elements:

- Two service platforms
- 480V stand-by power connection
- Fueling facilities

[10] *https://data.census.gov/cedsci/profile?g=1600000US1782491*

[11] *https://www2.census.gov/programs-surveys/metro-micro/reference-maps/2020/state-maps/17_Illinois_2020.pdf*

- Toilet dumping facilities
- Crew room and parking area
- Turnout and signal control point diverging from CN mainline providing access to the facility

4.2 Infrastructure Improvements

Improvements to the existing infrastructure composing the preferred route would be necessary to accommodate passenger service.

4.2.1 Assumptions for Infrastructure Improvements

Several key assumptions were used to estimate capital improvements necessary for implementation of passenger service and are included in the estimated cost of the project:

- The BNSF portion of the corridor was considered adequate to support passenger service without improvements because it is a two-track, signalized railroad with PTC and maintained to FRA Class 4 Safety Standards. Due to existing freight traffic volumes on this segment, 90 MPH maximum operating speeds on this segment was not considered practicably attainable.
- CN territory between Rockford and Portage was evaluated for both 79MPH and 90MPH maximum passenger train speeds for use in the service alternative analysis discussed in Section 3.
- Construction of a new rail connection between UP and CN track in Rockford will be necessary for the service to act as an extension of the future Chicago to Rockford service.
- Improvements or repairs to CN Bridge over the Mississippi River in Dubuque and the East Dubuque rail tunnel were not anticipated to be necessary to accommodate the proposed passenger service and were not included in the estimated project cost.

4.2.2 Guideway & Track Elements

Maximum allowable passenger train speeds are governed by FRA Track Classification rules. These rules include specifications and requirements for the condition of the track such as: the percentage of ties in good condition, tolerances for the gage distance between the rails, and track alignment tolerances. Table 5 shows the FRA track safety classifications for both freight and passenger maximum speeds.

FRA Track Classification	Freight	Passenger
Excepted Track	10 mph	Not Allowed
Class 1 Track	10 mph	15 mph
Class 2 Track	25 mph	30 mph
Class 3 Track	40 mph	60 mph
Class 4 Track	60 mph	80 mph
Class 5 Track	80 mph	90 mph
Class 6 Track	N/A	110 mph
Class 7 Track	N/A	125 mph
Class 8 Track	N/A	160 mph
Class 9 Track	N/A	200 mph

Table 5: FRA track classifications and maximum authorized speeds

Based on observations during the field inspection, it was assumed that CN track between Rockford and Portage is currently maintained to Class 3 standards. The CN segment is composed of 81.2 miles of mainline track and 6.8 miles of siding track split between five sidings. Improvements to the CN segment to achieve FRA Class 4 or 5 condition include tie replacement, track resurfacing, track undercutting, curve superelevation modification, siding relocation, and rail replacement.

- Rail replacement – It is anticipated that all existing mainline rail will need to be replaced with new, heavier weight rail to support reliable passenger service in both the 79 MPH and 90 MPH scenario. All rail in the existing sidings will need to be replaced to provide better ride quality for passenger trains both scenarios.
    - Replace 88 track miles, constituting 100% mainline and siding track.
- Tie replacement – Old and broken ties will need to be replaced to comply with Class 4 and 5 standards.
    - 79 MPH scenario
        - Replace 40% of existing ties on mainline track
        - Replace 66% of existing ties on four existing sidings
    - 90 MPH scenario –
        - Replace 66% of existing ties on all mainline and siding tracks

Figure 15: Photo taken near the Alworth Rd. crossing from an adjacent road depicting split ties

- Track undercutting – The ballast material that supports the ties and rail commonly becomes fouled with finer grain material , that inhibits the track structure's ability to drain water. Based on field observations, this work will be necessary on some portions of the railroad if Class 4 or 5 geometry specifications are to be reliably maintained.
    - 79 MPH scenario – 10 track miles of track undercutting
    - 90 MPH scenario – 15 track miles of track undercutting

- Drainage Improvements – Fouled ballast is generally indicative of an issue with the ability of water to drain from the track structure. Additionally, locations of standing water were observed during the field inspection. Improvements to existing ditches and drainage infrastructure are anticipated to be necessary to provide for reliable passenger service.
    - 79 MPH and 90 MPH Scenario – 10 track miles of drainage improvements

- Elevate and surface curves – It is anticipated that the superelevation of all curves will need to be increased to accommodate desired passenger train speeds in the 79 MPH and 90 MPH scenarios.
    - 79 MPH and 90 MPH Scenario – 16 track miles of elevating and surfacing curves

Figure 16: Photo taken from the E Roberts Rd Crossing depicting track with fouled ballast and a ditch with standing water

All existing turnouts and diamonds on CN track are anticipated to require replacement regardless of operating speed. New turnouts are recommended at all siding locations.

With the introduction of faster moving passenger trains to the existing freight corridor, fencing is recommended where the route passes through towns to mitigate the potential for pedestrian strike incidents. Fencing would be included in Freeport, Lena, Warren, Apple River, and Scales Mound.

In the case of the 90 MPH service alternative, it is anticipated that the existing sidings would need to be shifted to provide a minimum of 15-foot track center spacing between the mainline and the siding. Lengthening of two of the existing sidings to provide for passing passenger train movements with minimal trip time impact was also included as part of the 90 MPH service alternative.

Highway-railroad grade crossings are common sources of maintenance issues. It was estimated that all existing grade crossings on the CN segment would be rehabilitated as part of the improvements to accommodate passenger rail service. New crossing panels would be installed and roadway approaches would be resurfaced. Active warning devices are in place on all existing public crossings on this corridor.

The CN portion of the route between Rockford and the connection with BNSF includes approximately 50 bridges and large culverts, including roadway grade separations, drainage structures, and river bridges. Many of these structures are showing signs of aging and deterioration. Issues noted during the field inspection

include rusting bridge members, spalling concrete, and exposed rebar (Figure 187 through 20). Detailed structural inspections were not conducted as part of this Study. Given the condition of the observed structures, it is anticipated that some portion of the existing structures will either need to be rehabilitated or replaced to provide for reliable passenger service and avoid speed restrictions. It was estimated that 12 bridges would require substantial rehabilitation work and 5 bridges would require replacement.

Figure 17: E Yellow Creek Rd crossing – East of Freeport. Concrete spalling and rusting of the steel girder is evident.

Figure 18: S Browns Mill Rd Crossing – East of Freeport. Deterioration of concrete piers is visible.

Figure 19 & Figure 20: One of several bridges of the East Fork Galena River east of Galena. Deterioration of the concrete pier and rusting of the steel members is visible.

4.2.3 Systems

Positive Train Control (PTC) is a signal system feature which forces automatic stopping of trains in instances when the train operator fails to obey a signal or exceeds the maximum authorized speed for a segment of track. PTC is federally mandated on railroads operating passenger services. Both the BNSF and CN track to be utilized for the service are equipped with PTC systems for the majority of the preferred route. The exception is the approximately 1.5-mile segment between East Dubuque and the proposed Dubuque Station.

The siding extensions included in the 90 MPH service alternatives would require relocation of the turnout and installation of new signal system control points at the new proposed siding end locations. Construction of the new control points is included in the cost estimate.

Active warning devices are in place on all existing public crossings on this corridor but are likely not configured for trains traveling at faster passenger speeds. Costs are included to adjust crossings gate activation mechanisms to accommodate passenger trains.

4.2.4 Rockford Connection

IDOT confirmed with the Study team that the proposed Chicago to Rockford service will enter Rockford on the UP. Implementation of a Rockford to Dubuque passenger service as an extension of the Chicago to Rockford service would require construction of a connection between UP and CN track in Rockford. Construction of the connection would require reconstruction and signalization of a lightly used a minimally maintained segment of UP track, the repair or replacement of three bridges along this segment, construction of new track connecting the two railroads, and installation of two new control points. This work is summarized in Figure 21

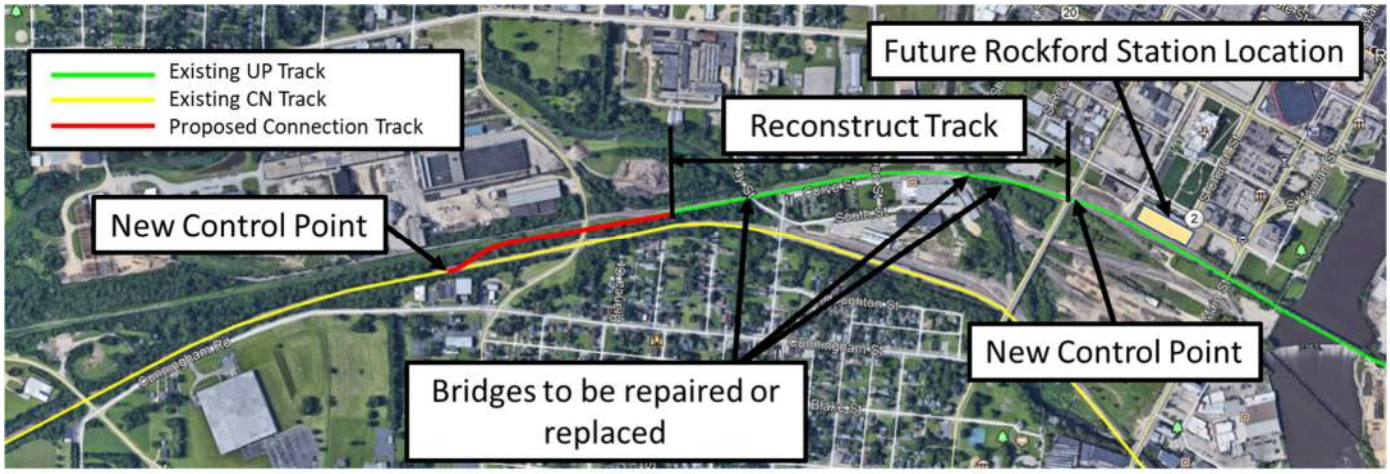

Figure 21: Proposed Rockford Connection

4.3 Vehicles

IDOT noted that new rolling stock will be procured for the proposed Chicago to Rockford service; therefore, the same rolling stock will be used for the extension to Dubuque. Two train sets will be necessary to support the proposed two round trip per day service. At the time this report was written, IDOT did not have information on the trainset consist. A consist of one locomotive and four cars was assumed for cost estimating purposes. One of the cars will be a cab/coach, a car providing for control of the locomotive from the opposite end of the train, as it is anticipated turning the trainset around or running the locomotive to the other end will not be feasible at the Dubuque terminal. Costs for Siemens Charger locomotives, which are currently in used on Amtrak Midwest services, and Siemens Venture cars which are currently on order for utilization by Amtrak Midwest services, were assumed. The cost estimate assumes that the procurement of the new trainsets will be shared evenly between the two services east and west of Rockford; therefore 50% of the total procurement costs are applied to this project.

4.4 Capital Costs

Capital costs were estimated for the Rockford to Dubuque passenger rail service following the Federal Railroad Administration's (FRA's) Standard Cost Categories, presented in Improvements to the existing infrastructure composing the preferred route would be necessary to accommodate passenger service.

Capital costs were based on an estimate of infrastructure improvements that would be necessary to accommodate the service on the existing BNSF and CN rail corridors. The recommended infrastructure improvements and associated cost estimates were completed by the study team without input from the railroads. The study team was not granted access to railroad property; therefore existing conditions were viewed from publicly accessible locations and aerial imagery. Infrastructure improvements include rehabilitation and upgrades to track, bridge and signals, construction of station and layover facility, construction of a new connection between UP and CN track in Rockford, and the acquisition of rolling stock. The capital cost estimate includes design costs, program management costs, construction management costs, and integration, testing and commissioning costs. These costs were calculated as a percentage of construction cost. Contingency costs were also included and were calculated as a percentage of total cost for each Standard Cost Category. Their purpose is to account for items and conditions that cannot be identified with certainty during the conceptual design phase of the project.

FRA Standard Cost Categories
10 Guideway & Track Elements
20 Stations, Stops, Terminals, Intermodals
30 Support Facilities: Yards, Shops, Admin. Bldgs
40 Sitework & Special Conditions
50 Systems
60 ROW, Land, Existing Improvements
70 Vehicles
80 Professional Services
90 Unallocated Contingency
100 Finance Charges

Table 6: FRA Standard Cost Categories

4.4.1 Guideway & Track Elements

An estimate of trackwork necessary to provide for passenger service as detailed in Section 4.2.2 was generated.

4.4.2 Stations, Stops, Terminals, Intermodals

Estimated costs to construct new stations and platforms were developed for the locations discussed in Section 4.1. Although historic depot buildings exist at several of these proposed station locations, these facilities are now privately owned. Utilization of these facilities would require the purchase and rehabilitation of the property as well as construction of new stations platforms. Therefore, it was assumed that new station facilities would be constructed with facilities on public property and railroad right-of-way and would not require the acquisition of private property.

The cost estimate includes the cost of constructing the station platform and parking facilities. In the case of Dubuque and Galena, it was anticipated that existing parking facilities would be utilized for the station. Although there is the potential for construction of shelters or additional station buildings at these sites, the estimate did not include these costs.

4.4.3 Support Facilities

An estimate of the layover facility to be constructed in Dubuque and described in Section 4.2.4 was estimated.

4.4.4 Professional Services

Professional services were estimated to cover design costs, program management costs, construction management and oversight costs, and integration, testing and commissioning costs. These costs are included in the estimate as a percentage of construction cost. Table 7 presents the assumptions used to calculate Professional Services costs.

Professional Services	Cost as a Percentage of Construction Cost
Design Engineering (Categories 10, 40, 50, 60)	5%
Design Engineering for Stations and Facilities (Categories 20 AND 30)	10%
Program Management	2%
Construction Management & Inspection	10%
Engineering Services During Construction	1%
Integration, Testing, Commissioning	1%

Table 7: Professional services costs as a percentage of construction cost categories.

4.4.5 Contingency

Allocated contingency costs are calculated at 30% of the total capital cost for each FRA Standard Cost Category. An unallocated contingency of 5% is added to categories 10 through 80.

4.4.6 Capital Costs Summary

The total estimated capital cost of the preferred service alternative, including contingencies and professional service costs, is $281,540,000 and $380,907,000. A summary of the cost estimate by cost category is included in Table 8. A detailed buildup of costs, including the items defined in this section, is included as Appendix B.

Item	Cost - Low ($000)	Cost - High ($000)
10 Guideway & Track Elements	$169,936	$229,913
20 Stations, Stops, Terminals, Intermodals	$3,027	$4,095
30 Support Facilities: Yards, Shops, Admin. Bldgs	$912	$1,233
40 Sitework & Special Conditions	$12,985	$17,569
50 Systems	$9,621	$13,016
60 ROW, Land, Existing Improvements	$0	$0
70 Vehicles	$36,437	$49,298
80 Professional Services	$35,216	$47,645
90 Unallocated Contingency	$13,407	$18,138
100 Finance Charges	$0	$0
Total	**$281,540**	**$380,907**

Table 8: Capital cost estimate for preferred service alternative, by FRA cost category, in thousands of dollars.

4.5 Operating and Maintenance Costs

The annual costs of operating the Dubuque Extension were calculated for the preferred service alternative by referencing the operating and maintenance costs of similar existing Midwest intercity services originating from Chicago provided by Amtrak for use in this Study. Operating, Maintenance and Construction costs for passenger rail projects are typically funded through federal and state subsidies to supplement revenues generated from ticket sales, similar to other modes of public transportation such as transit and air travel.

4.5.1 Metrics

Historic operation and maintenance costs of the referenced comparable services were extrapolated based on quantitative metrics. These metrics were applied to estimate the cost of operating the Dubuque Extension. These metrics included:

- Train miles: 140,160 miles per year
  - Calculated for Rockford to Dubuque segment of the route
  - 140,160 miles per year (2 daily round trips over the 96-mile route)
  - The entirety of costs calculated using this metric were attributed to the Rockford-Dubuque Extension
- Trains per day: 4
  - Costs shared with the Chicago-Rockford Service
  - Two round trips per day
  - 50% of costs calculated applying this metric were attributed to the Rockford-Dubuque Extension

- Stations: 4
    - Dubuque, Galena, Freeport were attributed wholly to the Rockford-Dubuque Extension
    - 50% each of Rockford and Chicago stations were attributed to the Rockford-Dubuque Extension
- Estimated annual ridership: 108,200 passengers
    - This number was the average of the low and high ridership estimate detailed in Section 4.6.2

4.5.2 Results

Annual operating and maintenance costs for the Dubuque Extension were estimated by cost item by extrapolating from an average of the referenced comparable services based on the specified unit. Estimated costs are presented by cost item in Table 9. Due to this being a feasibility-level analysis, a high range and low range estimated cost is presented for each item. All costs are in 2021 dollars.

Item	Metric	Annual Cost - Low	Annual Cost - High
Host Railroads - Access	Train miles	$651,100	$880,900
Fuel	Train miles	$444,550	$601,450
Train & Engine Crew Labor	Trains/day	$1,940,550	$2,625,450
Car & Locomotive Maintenance and Turnaround	Train miles	$2,048,500	$2,771,500
Onboard Services - Crew	Trains/day	$347,650	$470,350
Route Advertising	Ridership	$99,450	$134,550
Stations	Stations	$747,150	$1,010,850
Passenger Services	Ridership	$568,650	$769,350
Regional/Local Police	Ridership	$131,750	$178,250
Terminal Yard Operations and Maintenance	Trains/day	$22,100	$29,900
Insurance	Train miles	$178,500	$241,500
	Total:	**$7,180,000**	**$9,710,000**

Table 9: Estimated annual operating and maintenance costs for the Rockford to Dubuque extension of the proposed Chicago to Rockford service by cost item

4.6 Ridership and Revenue Demand

One of the pivotal quantitative elements of corridor overall feasibility is the demand analysis, consisting of anticipated ridership, revenue, and passenger-miles traveled. A simplistic parametric comparison approach is the most practical and cost-effective means of providing a feasibility-level estimate of Dubuque Extension demand and is the methodology applied in this Study. Potential future follow-on studies would likely use a more traditional (and substantially more costly) zero-based Population-Gravity Demand Model.

This section of the Feasibility Report will describe initial raw estimates of anticipated ridership; complex adjustments to improve forecast accuracy; calculation of estimated revenue generated and rail passenger-miles traveled.

4.6.1 Modeling Methodology

The ridership modeling sought to estimate ridership and revenue attributable to the Dubuque Extension. This analysis considered trips originating from or with a destination of stations west of Rockford on the proposed extension. It was anticipated, and then demonstrated in the Demand Study results, that virtually all of trips involving stations on the proposed extension are originating or terminating east of Rockford and the majority are going to or coming from the greater Chicago area.

This analysis applied a Parametric Demand Model to calculate and estimate ridership and revenue. Comparable existing Midwest corridors were identified as well as cities along these routes of comparable size to those to potentially be included in the Dubuque Extension. The ridership of the sample cities was proportionally adjusted for population and distance of those sample cities to and from Chicago versus the selected subject cities. The raw result was then adjusted upward or downward proportional to the sample city's average speed to and from Chicago versus that corresponding to the Dubuque Extension preliminary schedule included in Section 3.1. Due to Galena being a popular tourist destination, initial ridership estimate of trips terminating in Galena were multiplied upwards 2.5 times. Source ridership for the Midwest sample services was provided by Amtrak for application in this analysis. The ridership data applied was from 2015 through 2019.

The initial Dubuque Ridership Model results forecast an annual total ridership of between 91 and 111 thousand. More than half of all trips (54 thousand annually) originate or terminate at the terminal station of Dubuque. Daily total annual Dubuque Extension ridership ranges from 250 to 300 passengers, noting obviously that in high travel seasons, especially weekends, the number would be double to triple that amount and in mid-week, off-peak seasons may be as low as half.

4.6.2 Ridership Model Results

The results of the Ridership Model, in terms of annual and average daily trips terminating at each station, are presented in Table 10. The estimated daily trips is an average value for the entire year and it should be anticipated that during high travel seasons and especially on weekends, the actual daily ridership would be double to triple that amount and in mid-week, off-peak seasons it may be as low as half.

Station	Estimated Annual Trips - Low	Estimated Annual Trips - High	Estimated Daily Trips - Low	Estimated Daily Trips - High
Dubuque	54,000	66,000	148	181
Galena	10,700	13,100	29	36
Freeport	32,700	39,900	90	109
Total	**97,400**	**119,000**	**267**	**326**

Table 10: Ridership Model Results

The revised Dubuque Ridership Model results forecast an annual total ridership of between 97,000 and 119,000. More than half of all annual trips, 54,000, originate or terminate at the terminal station of Dubuque.

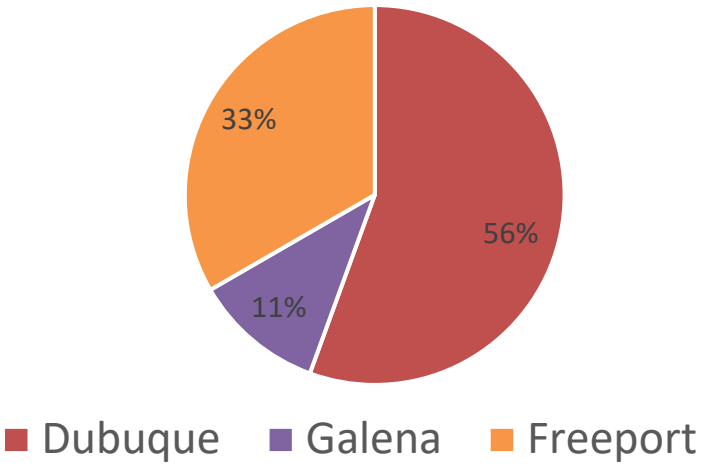

Table 11: Pie chart depicting Dubuque Extension city as a percentage of total ridership

4.6.3 Passenger-Mile and Revenue Estimates

Total passenger-miles, which represent the number of trips multiplied by the route miles associated with each trip, were calculated for the Dubuque Extension and applied to generate an estimate of annual revenue of the service. Since the referenced services offer different fares depending on circumstance, charging more for tickets bought closer to departure and during peak demand times, and offer business class, revenue was not generated based off an estimated ticket price. Based on historic data from referenced corridor, a rate of $0.20 per passenger mile was applied to calculate revenue as a function of passenger-miles. The results of this analysis is presented as Table 12.

Station	Estimated Passenger Miles - Low	Estimated Passenger Miles - High	Estimated Annual Revenue - Low	Estimated Annual Revenue - High
Dubuque	8,841,000	10,806,000	$1,779,000	$2,174,000
Galena	1,670,000	2,041,000	$336,000	$411,000
Freeport	3,601,000	4,401,000	$725,000	$886,000
Total	**14,112,000**	**17,248,000**	$2,840,000	$3,471,000

Table 12: Passenger-mile and revenue model results

The Dubuque Demand Model forecasts annual total passenger-miles between 14.1 and 17.2 million generating annual passenger revenue ranging from $2.8 to $3.5 million. The estimated revenue corresponds to an average ticket price of approximately $30. That compares to a cost of approximately $105 to drive the 179 miles between Dubuque and Chicago applying the 2022 IRS standard mileage rates.[12]

4.7 Public Benefits

An important element of determining feasibility of a potential new passenger rail corridor is estimating the anticipated public benefits produced by the service.

There are four major categories of quantitative benefit that were identified and modeled:

- Construction-period (temporary) job creation
- Operational-period (post-construction) permanent job creation
- Safety benefit resulting from highway accident reduction due diverted automobile trip
- Air quality benefit from diverted automobile trips

In addition to the quantified categories, several benefits of the service were identified but were not quantified. Quantification and determination of the monetary value of these benefits would generally require analysis beyond the scope of this Study and which is more appropriate for later phases of project development.

- Increased tourism enabled by improved accessibility
- Generally increased regional economic activity resulting in additional tax generation
- The potential for longer-term future Transit-Oriented Development (TOD) near stations
- Improved productivity for passengers switching their trips from automobile to rail
- Reduced roadway congestion

[12] https://www.irs.gov/newsroom/irs-issues-standard-mileage-rates-for-2022

4.7.1 Construction-period (Temporary) Job Creation

The number of jobs to be created during the design and construction phases of the project was estimated based on the estimated capital costs. The target was to first estimate the number of annual direct construction jobs and then forecast the additional jobs likely to results from economic activity and needs generated by the construction jobs.

The quantification of the construction-period job creation was based on the labor component of the estimated capital construction cost. Total created job-years were calculated by applying average wage rates in 2021 dollars, by discipline, to the estimated labor costs.[13] Percentage of labor versus materials and anticipated duration of work were estimated for each cost category. After applying the process to the respective categories, a base number of new temporary jobs was estimated for each cost category. Table 13 summarizes key inputs and outputs of the Construction-Period Job Creation Model.

Category	Capital cost	Labor cost	Average category wage cost	Estimated job-years	Approximate construction duration (years)	Jobs Created
10 Guideway & Track Elements	$202,485.00	$76,944	$67,850.00	1,134	2.5	454
20 Stations, Stops, Terminals, Intermodals	$3,561.00	$1,353.00	$67,850.00	20	3	7
30 Support Facilities: Yards, Shops, Admin. Bldgs	$1,073.00	$408.00	$67,850.00	60	3	2
40 Sitework & Special Conditions	$12,704.00	$4,828.00	$67,850.00	71	2.5	28
50 Systems	$11,319.00	$4,301.00	$67,850.00	63	3	21
80 Professional Services	$41,430.00	$41,430.00	$94,990.00	436	4	109
Total:				**1,731**		**621**

Table 13: Construction-period job creation inputs and results

The model results predict that a total of approximately 1,731 job-years and 621 independent jobs are to be created as a direct result of project construction.

4.7.2 Operational Period (Permanent) Job Creation

To quantify the economic benefit to the region resulting from the creation of new, permanent jobs the total direct number of positions expected to be created by the operation of the Dubuque Extension was calculated.

[13] https://www.bls.gov/oes/current/oes472073.htm

This analysis identified how many of these positions would be based along the Dubuque Extension and how many would be based on the Chicago end of the service.

Key direct and support job categories necessary to operate the service were identified and typical staffing requirements for each category were estimated applying knowledge of operations of similar passenger rail services. The jobs estimate was limited to those which are attributable to the extension of the future Chicago to Rockford service to Dubuque. Additionally, the number (and location) of the incremental direct jobs benefiting the study area versus those at the Chicago terminal region was identified. Table 14 summarizes key outputs of the Operational-Period Job Creation Model.

Category	Operational Period Jobs	Operational Period Jobs - Rockford-Dubuque Region
Host Railroads - Maintenance of Way	3	2
Train & Engine Crew Labor	7	4
Car & Locomotive Maintenance and Turnaround	11	4
Train & Engine Crew Labor	6	4
Onboard Services - Crew	3	3
Stations - Staff	4	3
Total:	**34**	**20**

Table 14: Operational-period job creation input and results

The model results estimate that a total of 34 jobs will be created directly by the Rockford-Dubuque Extension, and, of these, 20 will be based locally between Rockford and Dubuque.

An estimate of the anticipated wages resulting from permanent operational-period jobs in the subject corridor's area, contributing to improving the local economy, was also generated. This calculation was based on the calculated operations and maintenance costs defined in Section 4.5.2, applying the average of the high and low estimated cost values. The percentages of each cost category attributable to labor as well as the anticipated percentage of that category's work that would be based in communities along the subject corridor were estimated to calculate the regional annual wage income benefit. The results of this analysis are summarized as Table 15.

Category	Metric	Estimated Labor Component by Item	Percentage in the Rockford-Dubuque Region	Rockford-Dubuque Region Annual Wages
Train & Engine Crew Labor	Trains/day	$1,726,000	50%	$863,000
Car & Locomotive Maintenance and Turnaround	Train miles	$1,722,000	25%	$430,500
Onboard Services - Crew	Trains/day	$326,000	50%	$163,000
Route Advertising	Ridership	$47,000	0%	$0
Stations	Stations	$415,500	40%	$166,200
Passenger Services	Ridership	$381,000	25%	$95,250
Regional/Local Police	Ridership	$121,500	50%	$60,750
Terminal Yard Operations and Maintenance	Trains/day	$58,000	25%	$14,500
	Total:	**$4,797,000**		**$2,552,600**

Table 15: Annual wage income regional benefit summary

4.7.3 Automobile Accident Reduction Safety Benefit

Since a large percentage of the anticipated passenger rail service ridership would be by passengers who otherwise would have traveled by car, a safety benefit is attributable to the service due to avoided automobile accidents. Through statistical analysis the number of serious, non-fatal as well as fatality-causing accidents avoided each year was estimated and then monetize by assigning a dollar value benefit to the avoided accidents.

The ridership estimate of the Demand Model was applied to estimate the number of automobile trips avoided in terms of annual vehicle miles traveled (VMT). For calculation of avoided VMT, the Demand Model results were reduced by 5% reflecting the number of trips that it is estimated would be induced by the service. The results were further reduced 2% to consider between ridership diverted from the existing intercity bus service available from Dubuque and Dubuque and Galena group charter bus trips. An average automobile occupancy of 1.3 passengers per vehicle was also applied to the calculation of avoided VMT.

National statistics on accident occurrences per VMT were applied to the calculated avoided VMT estimate the annual number of avoided serious and fatal accidents. A monetized value, in 2021 dollars, of these avoided accidents was applied to calculate the total value.[14] This analysis is summarized in Table 16.

[14] https://injuryfacts.nsc.org/all-injuries/costs/guide-to-calculating-costs/data-details/

Avoided VMT	Annual non-fatal accidents avoided	Non-fatal accident safety benefit	Annual fatal accidents avoided	Fatal accident safety benefit	Total Safety Benefit
11,480,000	9.4	$3,295,000	0.16	$1,858,000	**$5,153,000**

Table 16: Avoided automobile accidents

The automobile accident reduction safety model forecasts an annual average of nearly 9.5 serious non-fatal accidents each year and one fatal accident every 6 years, for a combined monetized value of over $5 million per year.

4.7.4 Auto Trip Reduction Air Quality Benefit

The reduction in automobile trips defined in the calculation of the reduced accident safety benefit also results in a reduction in vehicle emissions. The diversion of travelers from automobiles results in a reduction in the production of pollutants which contribute to global warming, reduced air quality, and which have adverse health impacts. Avoidance of these emissions has public health and societal benefits which, applying guidance from the U.S. Department of Transportation, was quantified and ascribed a dollar value. Analysis of these avoided vehicle emissions must also consider emissions produced by operation of the passenger rail service. Anticipated locomotive emissions from the passenger rail service were quantified and a cost was calculated. The locomotive emissions cost was subtracted from the passenger vehicle avoided emissions monetary benefit to determine a monetized net benefit.

Average vehicle emission rates per mile were applied to the calculated avoided annual VMT to quantify the total avoided emissions.[15] Emission dollar value rates assigned by the U.S. Department of Transportation were applied to the calculated emission quantities to determine a value of avoided emissions.[16] Since the cost of these emissions depends on the year changes based on the analyzed year and emissions are more expensive in future years, a hypothetical first year of service of 2028 was used in these calculations. The analysis focused on three pollutants:

1. NO_x: Nitrogen oxides are a respiratory irritant and react with other chemicals in the air to produce acid rain.[17]
2. CO_2: Carbon dioxide is a greenhouse gas, emission of which contributes to global warming.[18]
3. $PM_{2.5}$: Inhalation of particulate matter, especially particles less than 2.5 micrometers in diameter, is associated with negative impacts to heart and lung function.[19]

[15] *New and Small Starts Evaluation and Rating Process Final Policy Guidance – August 2013, U.S. Department of Transportation – Federal Transit Administration*

[16] *Benefit-Cost Analysis Guidance for Discretionary Grant Programs, U.S. Department of Transportation, 2021*

[17] *https://www.epa.gov/no2-pollution/basic-information-about-no2*

[18] *https://www.epa.gov/ghgemissions/overview-greenhouse-gases*

[19] *https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm*

A similar analysis was conducted for emissions produced by operation of the proposed passenger service. This analysis applied the fuel consumption calculated by the RTC computer program for operation between Rockford and Dubuque as part of the modeling conducted to develop a schedule as described in Section 3.1. Emissions quantities were then calculated by applying per gallon emission rates for modern, Tier IV diesel locomotives.[20]

Emission quantity and value calculations are included in Table 17. The Rockford to Duque extension is estimated to result in $296,000 of annual air quality benefits from avoided passenger vehicle emissions.

Avoided Passenger Vehicle Emissions			
Avoided Annual Vehicle Miles Traveled: 11,480,000	**NOx**	**PM2.5**	**CO2**
Avoided Passenger Vehicle Emissions (metric tons):	3.21	0.11	4,196
Emission Damage Cost ($/ton)	$17,500	$829,800	$59
Avoided Emissions Value:	$56,200	$95,200	$247,600
Total value of avoided passenger vehicle emissions:			$399,000
Passenger Rail Service Locomotive Emissions			
Annual Locomotive Diesel Fuel Consumption: 84,400 Gallons	**NOx**	**PM2.5**	**CO2**
Locomotive Emissions (metric tons):	1.75	0.03	858
Emission Damage Cost ($/ton)	$17,500	$829,800	$59
Avoided Emissions Value:	$30,600	$21,800	$50,600
Value of passenger locomotive emissions:			$103,000
Net value of avoided emissions:			**$296,000**

Table 17: Air quality benefit calculation

4.7.5 Qualitative Public Benefits

There are several benefits of the service that were identified but were not quantified. Quantification and determination of the monetary value of these benefits would generally require analysis beyond the scope of this Study and which is more appropriate for later phases of project development.

4.7.5.1 Potential for Increased Tourism

One of the most universally anticipated benefits according to key regional stakeholders is increased tourism. The ability to promote a new twice daily, reliable, comfortable, and safe form of transportation between

[20] *Emissions Factors for Locomotives – Technical Highlights, United States Environmental Protection Agency, 2009*

greater Chicago and the significant tourist destinations of Galena and Dubuque has the potential to broaden the appeal of these destinations and to enable targeting new market segments for weekend or longer recreation visits. The Dubuque Extension would support access to tourist destinations such as the Fenelon Place Elevator Co. Cable Car, the Diamond Joe Casino, the National Mississippi River Museum & Aquarium, and Mississippi River excursion cruises in Dubuque and the Ulysses S. Grant Home, the Galena/Jo Daviess County Museum, trolley tours, and the historic main street in Galena.

4.7.5.2 Anticipated Increased Local Economic Activity

Similar to the potential for new train service to increase the tourism attractiveness of Dubuque and Galena, there is the potential for all three Dubuque Extension served communities to attract and retain residents because of the significantly improved access to the Chicago area. The service has the potential to catalyze increased regional economic activity and generate more sales tax and property tax revenue. In addition to providing residents of Dubuque, Galena and Freeport a more comfortable and affordable transportation alternative for their business and recreational trips to greater Chicago, passenger rail would also provide a new means of access for family and friends wishing to visit.

4.7.5.3 Potential for Future Transit-Oriented-Development Near Stations

The opportunity of enabling Transit-Oriented Development (TOD), the provision of higher-density residential, commercial, or mixed use has become increasingly recognized as a long-term benefit of rail transit systems. It should be cautioned that such redirection and increased density focus typically occurs primarily at high-frequency, heavily patronized stations, most commonly around urban rail or occasionally at Commuter Rail nodes. Notwithstanding, there have been some attractive and successful joint-use or TOD-like projects at Amtrak intercity stations.

4.7.5.4 Improved User Productivity Resulting from Auto Trips Diverted to Rail

Although travel times via the proposed service are not anticipated to be significantly faster than traveling by car, passengers will have the benefit of not being occupied by the driving task while traveling. As a result, passengers will be able to otherwise occupy themselves and some will be able to do productive work. The increase in productive time is quantifiable with more detailed modeling of ridership and calculation of the anticipated proportion of business travel and the anticipated time spent working for business travelers.

4.7.5.5 Reduced Roadway Congestion

By diverting automobile trips, the Duque Extension would reduce congestion along the corridor. This results in a benefit to all travelers, not just those utilizing the service, by reducing roadway travel times. Galena representatives report that long backups on the roads accessing the town are common during tourist season. The Dubuque Extension would contribute to mitigating this issue and provide travelers an alternative travel mode to avoid the congestion.

5. RECOMMENDATIONS AND PATH FORWARD

5.1 Federal Funding Opportunities

On November 15th, 2021, President Biden signed the Infrastructure Investment and Jobs Act (IIJA). The bill is a historic opportunity to invest in transportation infrastructure and expand opportunities for IPR travel in this country, providing over eight times the dedicated funding levels for IPR from The American Recovery and Reinvestment Act (ARRA) of 2008, which was the last time significant federal funds were invested in IPR. The completion of this Feasibility Study is a first step in realizing the potential for the Dubuque Extension and is timed well for seeking federal funding opportunities through IIJA. Because IPR is not funded through formula programs (pre-determined federal dollars appropriated to states based on population), most projects will rely on competitive grants. These grants require an application, review by the U.S. Department of Transportation, and award based on pre-defined merit and selection criteria. IPR competitive grants are administered through FRA. The following is a summary of grant programs available through the IIJA that future phases of the Dubuque Extension project would be eligible. Additional information is available at *Building a Better America – A Guidebook to the Bipartisan Infrastructure Law for State, Local, Tribal, and Territorial Governments, and Other Partners*[21].

Federal-State Partnership for Intercity Passenger Rail – This funding program broadens a previous program (which had been limited to publicly owned assets supporting IPR) to now include the planning, environmental review, design, and construction of existing and proposed IPR projects. The program provides $36 billion over five years.

Consolidated Rail Infrastructure and Safety Improvement (CRISI) – CRISI is an existing competitive grant program that will be expanded under the IIJA to $5 billion over five years. The program is eligible to a broad range of applicants leading projects intended to improve the safety, efficiency and reliability of intercity passenger and freight rail. Class 1 railroads are not eligible. Funds can be used for planning, NEPA, design and construction projects.

Local and Regional Project Assistance Grants (RAISE) – The IIJA continues this successful competitive grant program that provides supplemental funding for projects with significant local/regional impact. Projects typically funded through RAISE consist of multi-million dollar final design and construction; however, there is a small portion of the funding set aside for planning, preliminary engineering and NEPA work. The program will provide $7.5 billion over five years.

Amtrak National Network – This new grant program provides $16 billion over five years to fund capital projects aimed at eliminating Amtrak's backlog of deferred maintenance of rolling stock, facilities, stations, and

[21] *https://www.whitehouse.gov/wp-content/uploads/2022/01/BUILDING-A-BETTER-AMERICA_FINAL.pdf*

infrastructure outside of the Northeast Corridor. If Chicago Union Station is utilized as the terminal station, Amtrak rolling stock is used, and/or Amtrak personnel provide services to support the proposed Chicago-Rockford-Dubuque service, these grants could support this project.

Restoration and Enhancement Grant Program – This program is limited to operating expenses for service startup related to train engineer staffing, train dispatching, station management and overhead. This grant program would only be applicable if the Dubuque Extension nears implementation in the next 5-6 years.
On February 7, 2022 the FRA announced a Request for Information for the Corridor Identification and Development Program[22] to "facilitate the development of intercity passenger rail corridors" including the following components:

- *A process for eligible entities to submit proposals for the development of intercity passenger rail corridors;*
- *a process for FRA to review and select such proposals;*
- *criteria for determining the level of readiness for Federal financial assistance of intercity passenger rail corridors;*
- *a process for preparing service development plans (SDPs);*
- *the creation of a pipeline of intercity passenger rail corridor projects;*
- *planning guidance;*
- *such other features as FRA considers relevant.*

This program will set the stage for projects prioritized by the IIJA competitive grant programs.

FRA competitive grants over the past several years have required a minimum local match funding of 20% of the project cost. It is unknown if IIJA grant programs will continue this trend or reconsider 100% federally funded projects (similar to the ARRA program). In preparation for potential federal grant applications project proponents should identify a lead agency for future phases of the project that would serve as the grantee and capture local funding to provide as match. Grant preparedness and selection criteria require letters of support and funding commitment letters as part of the application.

5.2 State Funding Opportunities

Further work evaluating the Dubuque extension is also eligible for funding through the IDOT Statewide Planning and Research Funds. These funds are used to support planning and research activities for making transportation investment decisions and are made available through a competitive grant application process.[23]

[22] *https://www.federalregister.gov/documents/2022/02/07/2022-02450/request-for-information-for-the-corridor-identification-and-development-program*

[23] *https://idot.illinois.gov/transportation-system/transportation-management/planning/index*

5.3 Recommended Next Steps

Establishment of the Dubuque Extension using federal funding would require following FRA's Service Development Planning and NEPA process, which includes evaluation of the project at the preliminary engineering level of development for environmental and public impacts prior to advancement to Final Design and Construction phases.

To further prepare the Project for FRA's competitive grants available through IIJA, the suggested next phase of the project is completing a more advanced study following FRA's service planning guidance. It would apply, build upon, and refine the findings of this feasibility report to generate a Preliminary Service Development Plan containing the following sections:

- Introduction
- Purpose and Need
- Service Rationale
- Alternatives Analysis
- Planning Methodology
- Ridership and Revenue
- Operations
- Stations
- Conceptual Engineering/Capital Programming
- Operating & Maintenance Costs/Capital Replacement Forecast
- Public Benefits

Project stakeholders could also consider including a Return-on-Investment analysis following the APTA/AASHTO methodology[24] for creating a business case for intercity passenger rail development.

[24] https://www.apta.com/research-technical-resources/high-speed-passenger-rail/resources/