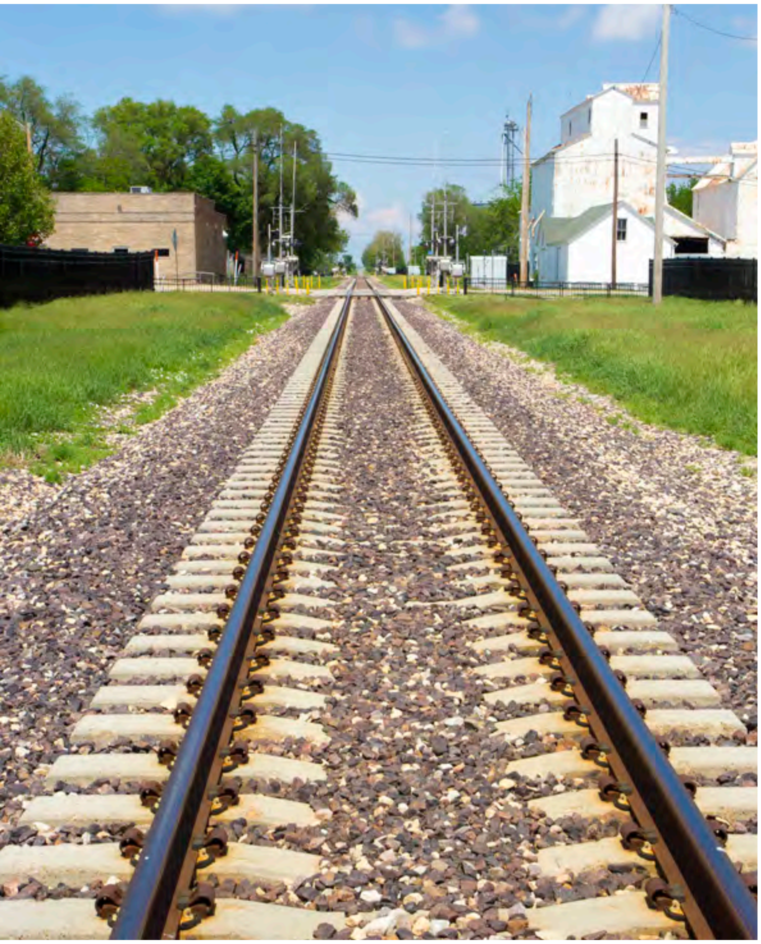


Iowa City-North Liberty Passenger Rail Conceptual Feasibility Study Final Study

HDR

October
2016

Contents

Executive Summary

The purpose of the *Iowa City-North Liberty Passenger Rail Conceptual Feasibility Study* (the Study) is to examine the conceptual feasibility of a passenger rail service operating between Iowa City, Iowa, and North Liberty, Iowa. The corridor under consideration in this study is the Cedar Rapids & Iowa City Railway (CRANDIC), an active freight railroad over which no passenger rail services are offered at present. The 7.1-mile CRANDIC Corridor Study Area (the Corridor) is between Gilbert Street in central Iowa City, Iowa, and Forever Green Road in North Liberty, Iowa.

CRANDIC, the Iowa Department of Transportation (Iowa DOT), and the Metropolitan Planning Organization of Johnson County, Iowa (MPOJC) selected HDR as its consultant team for the Study. The railroad, Iowa DOT, MPOJC, and other local project stakeholders participated in, contributed to, and informed the development of the Study through coordination with HDR during the life of the project.

The Study was divided into the following tasks, which culminated in this report:

- **Background** – Describe the background of recently completed and ongoing passenger rail feasibility study of the Corridor.
- **Existing Corridor Conditions** – Describe the existing conditions and infrastructure on the CRANDIC Corridor.
- **Conceptual Equipment and Service Plan** – Describe the general characteristics of the mode of passenger rail service and equipment selected by stakeholders and its applicability to service in the Corridor.
- **Conceptual Cost Estimate** – Develop the probable conceptual capital and operations and maintenance costs for the selected mode of passenger rail service assessed for potential implementation on the Corridor, and identify potential alternatives that could reduce the capital cost to implement the service.
- **Federal Safety and Governance Regulatory Requirements** – Describe the basic federal regulatory requirements for the implementation of passenger rail service selected for potential implementation on the Corridor.

Applicability of the Passenger Rail Mode and Equipment to the Corridor

One passenger rail mode in use on other passenger rail corridors across the U.S. was studied and analyzed for potential applicability to the CRANDIC Corridor between Iowa City and North Liberty and is described in detail later in this Study. This mode is commuter rail transit using self-propelled Diesel Multiple Unit (DMU) railcar equipment.

The applicability of this passenger rail mode and equipment type to the Corridor took into account the following considerations:

- Typical service range
- Typical station spacing
- Maximum and average operating speeds
- Typical service frequency
- Typical average capacity per vehicle
- Typical technology characteristics
- Typical corridor and infrastructure requirements
- Typical capital costs for service implementation, which were determined in prior study of the Corridor to be the likely lowest cost option when compared to other passenger rail modes
- Typical annual operations and maintenance costs, which were determined in prior study of the Corridor to be the likely lowest cost option when compared to other passenger rail modes

The typical operating range for commuter rail transit using self-propelled DMU trains is up to 50 miles and service is typically provided every 30 or more minutes. The typical average capacity per vehicle is between 75 and 90 passengers, or between 150 and 180 passengers for a two-car trainset, which is being studied for implementation on the Corridor. The type and intensity of land uses in the Corridor suggest a passenger rail service with fairly long station spacing and peak period focused service, a service pattern that is characteristic of commuter rail transit. DMU trains are versatile and typically offer performance characteristics suitable to likely station spacing in the Corridor and they provide a suitable capacity and flexibility to expand train length as necessary. Maximum speeds are typically up to 79 mph, and DMUs can also operate efficiently at lower maximum and average operating speeds that would be more likely suited to the Corridor.

Implementation and Operating and Maintenance Costs
A conceptual capital cost estimate to implement passenger rail service between Iowa City and North Liberty, and an associated conceptual annual Operations & Maintenance (O&M) cost was developed for the Study.

The conceptual capital cost for implementation of a passenger rail service between Iowa City and North Liberty based on other recently implemented commuter rail corridors and rail industry projects in the U.S. and a conceptual level analysis of the attributes of the CRANDIC Corridor is $40.06 million, in 2016 dollars. Conceptual annual operations and maintenance costs for the first year of passenger rail operations are expected to be $1.39 million, in 2016 dollars. Both are shown in Figure ES-1 below.

Figure ES-1: Conceptual Cost Summary for Passenger Rail Implementation on the CRANDIC Corridor (Iowa City-North Liberty) in 2016 Dollars

COST COMPONENT	TOTAL (IN 2016 DOLLARS)
Conceptual Capital Cost to Implement Passenger Rail Service on the CRANDIC Corridor	$40,060,558
Conceptual Annual Operations and Maintenance Cost on the CRANDIC Corridor	$1,392,650

Passenger rail service in the CRANDIC Corridor between Iowa City and North Liberty could be considered for implementation in the future by stakeholders, based upon need for the service and the availability of funding for construction and implementation. Alternatives to the conceptual capital cost estimate were developed during the Study, which may potentially reduce the upfront capital cost experience for passenger rail implementation. The acquisition of reconditioned secondhand DMU equipment, if available, could potentially lower the capital cost for procurement of equipment. Conceptual capital costs could potentially be reduced further by phasing some improvements to track and bridge infrastructure.

Next Steps
Project stakeholders will determine the feasibility of further study of the potential for implementation of passenger rail service on the Iowa City-North Liberty Corridor. More detailed future analysis and study could include ridership and revenue forecasts, more detailed or modified cost estimates, benefit cost analysis and financial plan, strategies for determining the availability of and methods for securing public and private project funding, comprehensive operating plan, conceptual station designs and infrastructure engineering, environmental fatal-flaws analysis and screening, and the potential for phased implementation of passenger rail service including additional frequencies in the Iowa City-North Liberty Corridor and the potential extension of services north to the Eastern Iowa Airport in Cedar Rapids, and downtown Cedar Rapids.

1. Background

The *Iowa City-Cedar Rapids Passenger Rail Conceptual Feasibility Study* completed by the Cedar Rapids & Iowa City Railway (CRANDIC), Metropolitan Planning Organization of Johnson County, Iowa (MPOJC), the Iowa Department of Transportation (Iowa DOT), and other local stakeholders in October 2015 explored the conceptual feasibility of a passenger rail service operating in the existing CRANDIC freight railroad Corridor between central Iowa City, North Liberty, and the Eastern Iowa Airport at Cedar Rapids, Iowa – 20.5 miles. The development of the Iowa City-Cedar Rapids study and an associated workshop enabled stakeholders of the proposed passenger service to identify likely potential types of passenger rail mode and service for the Corridor, and to understand the representative range of general capital and operating maintenance costs, service frequencies, service capabilities, and the regulatory environment and funding environment for a passenger rail service in the CRANDIC Corridor. Consult the *Iowa City-Cedar Rapids Passenger Rail Conceptual Feasibility Study* for additional details.

In July 2016, CRANDIC, MPOJC, Iowa DOT, and other local stakeholders refined their approach to subsequent study of passenger rail implementation in the Corridor based upon the findings of the I*owa City-Cedar Rapids Passenger Rail Conceptual Feasibility Study*, and the outcome of the stakeholder workshop and additional internal coordination. Stakeholders decided to next study the feasibility of an incremental passenger rail service implementation for daily commuter rail service with six potential stations and the use of DMU equipment over 7.1 miles of the CRANDIC Corridor between Gilbert Street in central Iowa City and Forever Green Road in North Liberty. CRANDIC and Iowa DOT selected HDR as its consultant team for the *Iowa City-North Liberty Passenger Rail Conceptual Feasibility Study* (the Study), as they had done for the previous Iowa City-Cedar Rapids study. The railroad, Iowa DOT, and other local project stakeholders participated in the Study through coordination with HDR.

The proposed passenger rail service explored in this Study would utilize existing CRANDIC trackage. Potential station stops would be located in the Corridor, as recommended by stakeholders CRANDIC, MPOJC, and Iowa DOT. The goal of the Study's stakeholders is to:

- Identify and describe the likely appropriate type of passenger rail service and equipment that meets the passenger rail vision for the Corridor.
- Understand the conceptual capital cost to construct and implement the service.
- Understand the conceptual annual operations and maintenance costs of the service.
- Identify potential alternatives that could reduce the conceptual capital cost to implement service.
- Select a conceptual equipment and service plan.
- Identify potential station locations.
- Understand the general regulatory requirements for implementing the selected type of service.

More detailed analysis and study for potential implementation of passenger rail services on in the Corridor, including ridership and revenue forecasts, more detailed or modified cost estimates, benefit cost analysis and financial plan, availability of project funding from public and private sources, comprehensive operating plan, conceptual station designs and engineering, environmental fatal-flaws analysis and screening, and the potential implementation of passenger rail service north of North Liberty over an existing CRANDIC route or an alternate route between North Liberty, the Eastern Iowa Airport at Cedar Rapids, and downtown Cedar Rapids, may be explored by project stakeholders in future study phases.

2. Existing Corridor Conditions

This section describes existing conditions of the CRANDIC Corridor between Iowa City and North Liberty, including the condition of the CRANDIC infrastructure, demographics and geographic characteristics of the service area, and other connecting transportation infrastructure and services. It includes a brief history of previous passenger rail transportation services in the Corridor.

2.1 Corridor Service Area, Intersections, and Connectivity

The CRANDIC Corridor connects Iowa City and North Liberty, in Johnson County, Iowa. According to U.S. Census data, the Iowa City Metropolitan Statistical Area, which includes Iowa City, Coralville, North Liberty, and outlying areas in Johnson and Washington counties, was estimated to have a population of 166,498 as of July 1, 2015[1]. The Iowa City Metropolitan Statistical Area is one of the State of Iowa's fastest growing metropolitan areas. The nearby Cedar Rapids Metropolitan Area adjoining the Iowa City Metropolitan Statistical Area on the north, was estimated to have a population of 266,040 as of July 1, 2015[2].

The north-south CRANDIC Corridor, and the parallel Interstate Highway 380 Corridor, sit astride growing residential, commercial, and light industrial development – particularly in Iowa City, Coralville, and North Liberty.

The Iowa City-North Liberty segment of the CRANDIC Corridor intersects with:

- **Universities** – including the University of Iowa in Iowa City and the University of Iowa Oakdale Campus at Oakdale.
- **Employment** – including access to several major area employers.
- **Shopping Destinations** – including downtown Iowa City, the Iowa River Landing in Coralville, and Coral Ridge Mall in Coralville.
- **Recreation and Entertainment** – including University of Iowa sporting and cultural events, and access to parks and multi-use trails.
- **Hospitals** – including the University of Iowa Hospitals and Clinics, Iowa City Veterans Administration Hospital, and Mercy Hospital in the Iowa City area.

A passenger service in the CRANDIC Corridor could potentially relieve vehicular congestion and improve traffic safety on parallel Interstate 380 between Iowa City and North Liberty and on connecting Interstate 80 between Coralville and Iowa City, and also provide a transportation alternative to driving for students, workers, business and leisure travelers, retail shoppers, the elderly, and hospital patients. A passenger rail service in the CRANDIC Corridor could also reduce travel times and provide a transportation alternative for current and potential future area commuters who drive to Iowa City and the University of Iowa facilities from North Liberty, Oakdale, and Coralville, and other outlying locations. Many of these commuters are presently transit dependent, as they drive to Iowa City and park their vehicles in parking lots and then continue their commute on local transit buses.

Passenger rail service on the CRANDIC between Iowa City and North Liberty could also potentially provide multimodal connectivity with existing and future rail, transit, intercity bus services, and trails in the area, as generally described below.

Intercity Passenger Rail – Implementation of a twice-daily intercity passenger rail service between Chicago and Moline, Illinois (Quad Cities of Illinois and Iowa), and Iowa City, Iowa, is presently under study by Iowa DOT and the Illinois Department of Transportation (Illinois DOT). Passenger rail service on CRANDIC could terminate at Dubuque Street, one block south of a potential Iowa City station for the intercity passenger rail service, which would provide a transfer point between the two services.

---

1 U.S. Census, Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2015 – United States – Metropolitan Statistical Area; 2015 Population Estimates; U.S. Census website (http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF); accessed August 1, 2016

2 Ibid.

Public Transit – Passenger rail service on the CRANDIC could potentially provide access to and enhance existing and future connecting public transit systems in the Corridor. Potential connections could be made with Iowa City Transit buses at Iowa City; University of Iowa CAMBUS network at Iowa City; and Coralville Transit buses at Iowa City, Coralville, and North Liberty[3].

Intercity Buses – Burlington Trailways and Greyhound serve the Court Street Transportation Center on Court Street in downtown Iowa City, which is located in close proximity to the CRANDIC Corridor. Megabus serves the Coralville Transit Intermodal Facility on Quarry Road in Coralville, which is located in close proximity to the CRANDIC Corridor.

Trails – Passenger rail service on the CRANDIC Corridor could potentially provide access to the area's recreational trail network for pedestrians and bicycles, including the Iowa River Trail, North Ridge Trail, North Liberty Trail, and other trails.

2.2 Corridor History

The Cedar Rapids & Iowa City Railway (CRANDIC) Corridor was constructed as a high-speed interurban rail line between its namesake cities by the Iowa Railway & Light Company during 1903 and 1904. The railroad provided electrified passenger and freight service over the 27 miles between Iowa City and Cedar Rapids via North Liberty starting on August 13, 1904[4]. The map in Figure 1 below shows the route of the CRANDIC Corridor and its proximity to other rail lines in the region today. The bold red line identifies the CRANDIC Corridor Study Area between Iowa City and North Liberty.

Figure 1: CRANDIC Corridor Between Iowa City, North Liberty, and Cedar Rapids

Source: HDR

3 *Iowa Commuter Transportation Study; Iowa Department of Transportation, December 2014*
4 *Cedar Rapids & Iowa City Railway (CRANDIC) website; www.crandic.com; July 27, 2016*

The height of CRANDIC interurban operations began when the railroad upgraded its passenger car fleet in 1939, via the acquisition of second-hand high-speed electric interurban cars, and the initiation of faster and more efficient service[5]. Figure 2 below shows a high-speed interurban car crossing the Iowa River at Iowa City.

Figure 2: High-Speed Interurban Car on the CRANDIC at Iowa City

Source: CRANDIC (William D. Middleton Photo)

By 1944, CRANDIC operated 17 interurbans each way daily, which provided almost hourly service between Cedar Rapids and Iowa City, from approximately 5 a.m. until 12 midnight[6]. Owing to the surging popularity of the automobile and the dominance of hard-surfaced roadways in the immediate post World War II era, CRANDIC ridership declined markedly by the early 1950s and passenger rail service was discontinued altogether on May 30, 1953[7]. The full dieselization of the remaining freight railroad operations soon followed. For more information about the history of the CRANDIC Corridor, please reference the previous *Iowa City-Cedar Rapids Passenger Rail Conceptual Feasibility Study*. Details about the present ownership and operation of the CRANDIC Corridor between Iowa City and North Liberty can be found in Section 2.3.10 of this Study.

2.3 Present General Corridor Characteristics

The segment of the CRANDIC Corridor under consideration for potential implementation of passenger rail service in this Study includes the segment of CRANDIC Division 2 between Gilbert Street in central Iowa City (Milepost 25.8) and Forever Green Road on the south side of North Liberty (Milepost 18.7), for a total of 7.1 miles. This section contains an assessment of the present general characteristics and conditions of the CRANDIC Corridor, as noted during desktop analysis of available aerial imagery and a field observation conducted in July 2016.

2.3.1 Timetable Stations

Timetable stations on CRANDIC Division 2 and their railroad milepost location within the CRANDIC Corridor are listed in Table 2 below.

5 Cedar Rapids & Iowa City Railway (CRANDIC) website; www.crandic.com; July 27, 2016
6 Cedar Rapids & Iowa City Railway (CRANDIC) website; www.crandic.com; July 27, 2016
7 Ibid.

Table 2: CRANDIC Division 2 Timetable Stations in the Iowa City-North Liberty Corridor

TIMETABLE STATION	CRANDIC MILEPOST
Iowa City	25.1
Coralville	22.9
Great Lakes	22.3
Oakdale	19.8

Source: CRANDIC

Note that the CRANDIC Division 2 Timetable Station location for North Liberty is located outside of the CRANDIC Corridor study area at CRANDIC Milepost 16.7.

2.3.2 Track Configuration

The CRANDIC Corridor between Iowa City and North Liberty is comprised of a single main track with sidings to accommodate meet-pass events between trains, switching of online freight customers, and to stage and store rail cars. Short sidings exist on the Corridor at Iowa City and Coralville.

CRANDIC does not maintain yards for classifying, staging, and meeting trains on the Corridor.

The profile of the Iowa City-North Liberty Corridor is characteristic of the standard of construction employed to develop electrified interurban railroads in Iowa in the early 20th century. Main track grades up to 2.06 percent and curve sharpness (curvature) up to 14 degrees exist on the CRANDIC Corridor. Segments of the Corridor in Iowa City and Coralville closely parallel public roadways and waterways.

Figure 3 below demonstrates a typical interurban railroad profile on the CRANDIC Corridor, with a 6.5 degree curve and 1 percent grade over the Iowa Avenue overpass in Iowa City (Milepost 24.7).

Figure 3: Curvature and Grade on the CRANDIC Corridor at Iowa Avenue in Iowa City

Source: HDR

Figure 4 below demonstrates the proximity of the CRANDIC Corridor to public roadways at First Avenue in Coralville (Milepost 23.06).

Figure 4: Proximity of the CRANDIC Corridor to Public Roadways at First Avenue in Coralville

Source: HDR

Figure 5 below demonstrates the proximity of the CRANDIC Corridor to waterways. Pictured is the CRANDIC Corridor along the east bank of the Iowa River in Iowa City (Milepost 25.4). Note that the Iowa Interstate Railroad also crosses over the CRANDIC Corridor and the adjacent Iowa River at this location.

Figure 5: Proximity of CRANDIC Corridor to Waterways

Source: HDR

2.3.3 Existing Track Characteristics

The CRANDIC Corridor main track between Gilbert Street in Iowa City (Milepost 25.8) and Forever Green Road in North Liberty (Milepost 18.7) consists primarily of 90 to 112 lb./yd. jointed rail. Rail in sidings is 100 lb./yd. rail or smaller. Timber ties and crushed rock ballast are used on main tracks and sidings[8]. Track curves

8 *Cedar Rapids & Iowa City Railway Track Chart*

are constructed with superelevation, which is the difference between the heights of track. Superelevation is typically employed on railroad curves to allow trains to operate at higher speeds than would otherwise be attainable if the railroad profile was flat or level. The minimum track superelevation in the CRANDIC Corridor Study Area is 0.25 inch. Track unbalance refers to the amount of superelevation that would be necessary for a train to reach a balanced condition through a curve. CRANDIC operates with no track unbalance, as operating speeds are low enough in the Corridor at present that current track curvature and elevations meet FRA-approved superelevation requirements. Main track switches to sidings and industrial trackage are mostly No. 9 or smaller hand-throw turnouts.

Approximately 0.5 mile of CRANDIC main track was recently rehabilitated west of Rocky Shore Drive in Iowa City (Milepost 23.8) as shown in Figure 6 below.

Figure 6: CRANDIC Corridor Main Track Structure in Iowa City

Source: HDR

2.3.4 Bridges and Drainage Structures

There are 24 known bridges and drainage structures that have been identified on the CRANDIC Corridor Study Area between Gilbert Street in Iowa City (Milepost 25.8) and Forever Green Road in North Liberty (Milepost 18.7), including 7 bridges and approximately 17 culverts, as estimated by CRANDIC[9]. Bridge superstructure types vary and include through-plate girders (TPG), deck-plate girders (DPG), steel beam spans, and reinforced concrete spans. The majority of bridges have open decks. Track culverts vary in size and condition, but mostly act to convey local drainage through the railroad embankment. Track ditches are also present along the majority of the Corridor. A typical track ditch consists of a swale located near the ballast shoulder that matches the grade changes of the rails, effectively allowing ballast and subgrade drainage to occur. There are some areas along the Corridor where ditches are filled in and will require cleaning to improve local site drainage. There are no rail tunnels on the CRANDIC Corridor.

The most prominent bridge on the Corridor is shown in Figure 7 below — the four-span deck-plate girder Iowa River Bridge in Iowa City (Milepost 24.7).

9 *Cedar Rapids & Iowa City Railway Bridge and Structures Inventory, 2015-2016*

Figure 7: Iowa River Bridge in Iowa City

Source: HDR

A typical culvert on the Corridor is shown in Figure 8 below – 36" Diameter Circular Concrete Culvert (CCP) near Coralville (Milepost 21.4).

Figure 8: Typical Culvert near Coralville

Source: HDR

An inventory of bridges and known drainage structures in the CRANDIC Corridor are identified and described by type in Tables 3 and 4, respectively.

Table 3: Bridges on the CRANDIC Corridor

MILEPOST	SUPERSTRUCTURE DESCRIPTION	DECK TYPE	CROSSING FEATURE	CROSSING NAME
23.30	1-43' SBM, 4-50'-8" SBM, 1-31'-9" SBM	Ballast	Water	Clear Creek
23.80	1-35'-9" TPG	Open	Roadway	Rocky Shore Drive
24.60	1-22' SBM, 1-34'-6" SBM, 1-24'-6" SBM	Open	Roadway	Riverside Drive
24.70	4-74'-6" DPG	Open	Water	Iowa River
24.80	1-14' TPG, 1-24'-9" TPG, 1-20'-3" TPG, 1-24'-6" TPG, 1-17' TPG	Open	Roadway	Iowa Avenue
24.90	1-19'-6" RC, 1-20'-10" RC, 1-19'-6" RC	Ballast	Pedestrian	University Library pedestrian underpass
25.75	3-24'-8" SBM	Open	Water	Ralston Creek

Source: CRANDIC

Bridge Type Notes:
DPG – Deck Plate Girder
RC – Reinforced Concrete Span
SBM – Steel Beam Span
TPG – Through Plate Girder

Table 4: Drainage Structures on the CRANDIC Corridor

MILEPOST	CULVERT DESCRIPTION	CROSSING TYPE	LENGTH (FEET)
18.90	1-1.25' CCP	Water	30
19.30	1-1.5' VCP	Water	43
19.50	1-3' CCP	Water	86
20.00	1-0.67' CCP	Water	72
20.50	1-1.5' VCP	Water	50
21.35	1-2' SSP	Water	54
21.40	1-3' CCP	Water	40
21.41	1-1.5' CMP	Water	42
21.60	1-2' CCP	Water	94
21.75	1-6' CCP	Water	75
22.00	1-4' CMP	Water	67
22.30	1-2' CMP	Water	85
22.33	1-1.5' SSP	Water	70
22.40	2-4' CCP	Water	81
24.45	1- CCP (Unknown diameter)	Water	71
24.69	1-8'x8' RCB	Pedestrian	50
24.71	1-5'x7' RCB	Pedestrian	27

Source: CRANDIC

Drainage Structures Notes:
CCP – Circular Concrete Pipe
CMP – Corrugated Metal Pipe
SSP – Smooth Steel Pipe
VCP – Vitrified Clay Pipe

2.3.5 At-Grade Roadway Crossings

At-grade roadway crossings with the CRANDIC include public roadways which are protected by active warning devices and private crossings which are protected by passive warning devices. A total of 23 at-grade crossings have been identified in the CRANDIC Corridor between, and including, Gilbert Street in Iowa City (Milepost 25.8) and Forever Green Road in North Liberty (Milepost 18.7), as noted by CRANDIC[10].

Public crossings are typically protected by active warning devices, including crossbucks, flashing light signals, and bells. Pedestrian sidewalk protection is minimal in the Corridor.

Private crossings are protected by passive warning devices, including crossbucks only or crossbucks and stop signs.

Grade crossing surfaces are typically concrete panels or hot-mix asphalt (HMA) on public crossings and HMA, timber, or gravel on private crossings.

Figure 9 below shows the typical active warning devices and concrete grade crossing surface used on the CRANDIC Corridor. Pictured is the Forever Green Road grade crossing in North Liberty (Milepost 18.8).

Figure 9: Typical CRANDIC Corridor Active Grade Crossing at Forever Green Road in North Liberty

Source: HDR

Figure 10 below shows the typical passive warning devices and timber/HMA grade crossing surface used on the CRANDIC Corridor. Pictured is the Postal Road grade crossing in Oakdale (Milepost 19.8).

10 *Cedar Rapids & Iowa City Railway Grade Crossing Inventory, 2016*

Figure 10: Typical CRANDIC Corridor Passive Grade Crossing at Postal Road in Oakdale

Source: HDR

An inventory of the existing location, type, and signal infrastructure for each at-grade roadway crossing in the CRANDIC Corridor is shown in Table 5 below.

Table 5: Inventory of At-Grade Roadway Crossings in the CRANDIC Corridor Between Iowa City and North Liberty

ROADWAY	CRANDIC MILEPOST	FRA GRADE CROSSING NUMBER	TYPE OF CROSSING	EXISTING GRADE CROSSING INFRASTRUCTURE
Gilbert Street	25.78	607299C	Active (Public)	Crossbucks, bells, and flashing light signals
Lafayette Street Alley	25.70	Not Assigned	Passive (Private)	Crossbucks
Dubuque Street	25.66	607300U	Passive (Public)	Crossbucks
Clinton Street	25.59	840196P	Passive (Public)	Crossbucks
Capitol Street	25.50	840192M	Passive (Public)	Crossbucks
Court Street	25.15	840191F	Passive (Public)	Crossbucks and stop sign
Burlington Street	25.10	840190Y	Active (Public)	Crossbucks, bells, and flashing light signals
University Library Access	25.00	909194Y	Passive (Public)	Crossbucks and stop sign
Kings Material South Entrance	23.21	Not Assigned	Passive (Private)	No signage
Kings Material North Entrance	23.20	840182G	Passive (Private)	No signage
First Avenue (Iowa River Power House Entrance)	23.06	840181A	Active (Public)	Crossbucks, bells, and flashing light signals
Quarry Road	22.92	840180T	Passive (Private)	Crossbucks and yield signs

First Avenue	22.90	840179Y	Active (Public)	Crossbucks, bells, and flashing light signals
Seventh Avenue	22.30	909184T	Passive (Public)	Crossbucks and stop signs
Tenth Street	21.80	840177K	Active (Public)	Crossbucks, bells, and flashing light signals
Twelfth Avenue	20.70	840173H	Active (Public)	Crossbucks, bells, and flashing light signals
Lynncrest Drive	20.30	909032W	Passive (Public)	Crossbucks and stop signs
North Ridge Trail	20.15	840262A	Passive (Public)	Crossbucks and stop signs
Substation Tiffin-Tharp	19.95	Not Assigned	Passive (Private)	No signage
Postal Road	19.80	840261T	Passive (Public)	Crossbucks and yield signs
Oakdale Boulevard	19.70	840260L	Active (Public)	Crossbucks, bells, and flashing light signals
University Parkway	19.27	840259S	Active (Public)	Crossbucks, bells, flashing light signals, and gates
Forever Green Road	18.70	840258K	Active (Public)	Crossbucks, bells, flashing light signals, and gates

Source: CRANDIC

2.3.6 Wayside Signaling and Wayside Asset Protection Devices

The CRANDIC Corridor is not equipped with a wayside signal system or wayside asset protection devices.

2.3.7 Fiber and Utilities

A fiber optic line exists in the CRANDIC right-of-way for the length of the Corridor. Several utilities exist within, parallel to, or cross the Corridor. The proximity of the fiber and utility infrastructure to the railroad is shown in the view of the CRANDIC Corridor near North Liberty in Figure 11 below.

Figure 11: Fiber Optic and Utility Infrastructure in the CRANDIC Corridor near North Liberty

Source: HDR

2.3.8 Right-of-Way

The CRANDIC right-of-way generally varies from 50 to 100 feet in width. CRANDIC owns additional adjacent property in Iowa City and other locations.

Right-of-way fencing through urban sections of the Corridor is no longer complete. The right-of-way in urban areas is frequently crossed by pedestrians at locations other than roadway grade crossings.

2.3.9 Freight Railroad Method of Operation

Method of Operation generally identifies the operating system or practice employed to operate a specified segment of railroad. The Method of Operation for the CRANDIC Corridor varies by segment. The limits and type of each Method of Operation currently in effect, as well as the ownership and operators of the CRANDIC Corridor, are identified in Table 6 below.

Table 6: CRANDIC Corridor Method of Operation, Owners, and Operators

LIMITS	OWNING RAILROAD	OPERATING RAILROAD	LINE DESIGNATION	METHOD OF OPERATION
Iowa City (Gilbert Street), Start of CRANDIC Corridor Study Area (Milepost 25.8) – Iowa City (Milepost 25.0)	Cedar Rapids & Iowa City Railway	Iowa Interstate Railroad	IAIS Hills Industrial Spur	Yard Limits; Rule 6.28
Iowa City (Milepost 25.0) – North Liberty (Forever Green Road), End of CRANDIC Corridor Study Area (Milepost 18.7)	Cedar Rapids & Iowa City Railway	Cedar Rapids & Iowa City Railway	CRANDIC Division 2	Yard Limits; Track Permit

Source: CRANDIC

Freight railroad operations in the CRANDIC Corridor are made at slow speeds, in accordance with the Methods of Operation identified above. IAIS dispatchers in Cedar Rapids supervise operations on the IAIS Hills Industrial Spur in Iowa City, but do not provide main track authority. CRANDIC yard managers in Cedar Rapids authorize main track authority over CRANDIC Division 2 between Iowa City and North Liberty via track permit.

No locomotive number-of-axle restriction is in place on the CRANDIC Corridor's main track between Iowa City and North Liberty; however, four-axle locomotives are typically operated on this segment. Tonnage restrictions include a maximum gross weight of 286,000 lbs. per railcar between Iowa City and North Liberty and 263,000 lbs. per railcar within Iowa City and beyond to Hills, outside of the Study Area. No vertical clearance restrictions were identified on the CRANDIC Corridor by CRANDIC.

2.3.10 Train Operations

The present volume and frequency of typical freight train operations in the CRANDIC Corridor – from south to north – is described in this section.

The portion of the CRANDIC Corridor operated by IAIS under agreement as its Hills Industrial Spur in central Iowa City (Milepost 25.8 – Milepost 25.0) is served approximately twice weekly by an IAIS local train based at the IAIS Iowa City Yard outside of the Study Area. City Carton Recycling, a cardboard recycler at Milepost 25.4, is the only active freight rail shipper on this segment presently. CRANDIC anticipates serving freight customers on this segment of the CRANDIC Corridor and on the connecting CRANDIC Hills Line immediately outside of the Study Area with a CRANDIC local train based in Iowa City concurrent with the expiration of the operating agreement with IAIS in October 2016.

The portion of the CRANDIC Corridor operated as its CRANDIC District 2 between Iowa City (Milepost 25.0) and Forever Green Road in North Liberty (Milepost 18.7) does not presently have any active online rail customers. CRANDIC stores "frac" sand cars at Coralville and other locations in the Corridor, as required.

CRANDIC did not identify any likely future freight services or activities that would be performed on the CRANDIC Corridor between Gilbert Street in Iowa City (Milepost 25.8) and Forever Green Road in North Liberty (Milepost 18.7).

Passenger trains do not presently operate over any segment of the CRANDIC Corridor.

3. Conceptual Equipment and Service Plan

In the previous *Iowa City-Cedar Rapids Passenger Rail Conceptual Feasibility Study*, the service characteristics of streetcar, light rail transit, and commuter rail transit modes were identified and described and were considered for their applicability for a passenger rail service on the CRANDIC Corridor. During development of the *Iowa City-Cedar Rapids Passenger Rail Conceptual Feasibility Study*, and subsequent project coordination, stakeholders identified the Diesel Multiple Unit (DMU) equipment of the commuter rail transit mode as a potential option for a Phase 1 passenger rail service between Iowa City and North Liberty. This DMU equipment and an associated conceptual Service Plan for the Iowa City-North Liberty CRANDIC Corridor are the subjects of this section.

3.1 Conceptual Equipment Plan

Equipment for the potential passenger rail service implementation would include three new self-propelled DMU coach railcars, which will be used to assemble one trainset of two railcars for the Iowa City-North Liberty passenger rail service, and one spare car which will be staged at the CRANDIC Shops in Cedar Rapids. One trainset would be required to protect potential scheduled operations of the passenger rail service between Iowa City and North Liberty as outlined in the conceptual Service Plan presented later in this section and the third, or spare, car would be used to accommodate regular equipment maintenance schedules at the CRANDIC Shops outside of the Corridor at Cedar Rapids.

The new DMU commuter train consist would operate in a push-pull configuration, which allows the train to be operated from control cabs at either end, thus eliminating the need to turn trains at terminal points in Iowa City and North Liberty. Typical new DMU railcars are 85 feet in length and have a seating capacity of 75 to 85 on average, including accommodations for disabled persons in wheelchairs, and often bicycle storage and a lavatory.

The three DMU cars would be designated as FRA Compliant, meaning that they would meet the current Federal Railroad Administration (FRA) safety regulations that are generally built around specifications providing the structural integrity to withstand a crash between passenger trains and freight trains on shared-use corridors. While the Study assumes that the CRANDIC Corridor between Iowa City and North Liberty would be designated passenger rail only, the acquisition of FRA Compliant passenger cars could potentially be required later by FRA, if CRANDIC decides to restore its common carrier obligation and host freight rail operations on this segment in the future.

A typical two-car trainset of new FRA Compliant DMU equipment recently constructed by Nippon Sharyo and the Sumitomo Corporation and to be operated in revenue service by Sonoma-Marin Area Rail Transit (SMART) in the San Francisco Bay Area of California beginning in 2016 is shown in Figure 12 below[11]. Passenger rail equipment of this type and configuration is what has been explored in this Study for potential implementation on the CRANDIC Corridor.

11 *http://www.nipponsharyousa.com/tp101216.htm*

Figure 12: Typical Two-Car Trainset of New FRA Compliant DMU Equipment

Source: Sonoma-Marin Area Rail Transit

3.2 Conceptual Service Plan

This section presents a conceptual Service Plan for operation of a daily passenger rail service using DMU equipment on the 7.1-mile CRANDIC Corridor between Iowa City and North Liberty.

The Study's conceptual Service Plan for the Iowa City-North Liberty service assumes the following:

- The CRANDIC Corridor between Gilbert Street in Iowa City and Forever Green Road in North Liberty would be passenger rail only, with the potential for redevelopment as a shared-use corridor with freight trains, if the need for freight rail service arises in the future.
- The CRANDIC Corridor between Gilbert Street in Iowa City and Forever Green Road in North Liberty would have Track Warrant Control (TWC) as its Method of Operation, allowing a CRANDIC dispatcher or manager to provide exclusive main track occupancy to the crew of the passenger train. Implementation of a wayside Centralized Traffic Control (CTC) signal system and Positive Train Control (PTC) overlay will not be required, as would be the case for a shared-use corridor with passenger and freight trains.
- Passenger trains would be operated as a push-pull turnaround service and no meet-pass events would occur for passenger trains between Iowa City and North Liberty; only one passenger train would operate on the Corridor at a time.
- Passenger train speeds would not exceed 40 mph.
- Operating schedules of approximately 30 minutes running time between terminal stations at Dubuque Street in Iowa City and Forever Green Road in North Liberty, including the time necessary for station stops at intermediate stations, are assumed.
- Time necessary for crew to change ends at the Iowa City and North Liberty termini is assumed to be 15 minutes.
- Level boarding would be provided at the six potential stations locations identified by CRANDIC and other stakeholders for the Study, including:
  - Dubuque Street (Iowa City) - Southern Terminus (Note that while the CRANDIC Corridor study area extends south to Gilbert Street, a potential location for the southern terminus of the service within the Corridor has been identified by stakeholders at nearby Dubuque Street to the north).
  - Library/Burlington Street (Downtown Iowa City/University of Iowa)
  - VA Hospital
  - Coralville
  - Oakdale Commuter
  - Forever Green Road (North Liberty) – Northern Terminus

- During hours of non-operation, the in-service passenger train would layover, be refueled using Direct Truck to Locomotive (DTL) fueling, and receive routine light maintenance and interior cleaning at the North Liberty Station. It is assumed that the in-service passenger trainset would be deadheaded empty between North Liberty Station, the CRANDIC Shops in Cedar Rapids (which is located outside of the Iowa City-North Liberty Corridor), and the North Liberty Station, as a means of facilitating equipment rotation and maintenance cycles at Cedar Rapids, once weekly. In this process, one of the railcars on the in-service trainset would be swapped out with the spare railcar staged at the CRANDIC Shops to create the next week's in-service trainset of two cars. The deadhead between North Liberty Station and the CRANDIC Shops at Cedar Rapids is approximately 18 miles on CRANDIC Division 2 and is estimated to take 2.5 hours, each way. The time estimated for the deadhead is based upon the present current maximum authorized speed of 10 mph on CRANDIC Division 2 between Forever Green Road in North Liberty and the CRANDIC Shops in Cedar Rapids and accounts for likely potential delays that could be incurred by operating through a major freight railroad terminal area in Cedar Rapids.

3.2.1 Conceptual Passenger Rail Service Schedule

A conceptual passenger train schedule for the CRANDIC Corridor based upon the Service Plan assumptions listed in the section above has been created for this Study, which also takes into account potential transportation needs for the public during peak hours. Ridership and revenue projections and additional stakeholder coordination would be required in future study to determine specific demand for the service and a schedule best matched to the needs of the public.

Conceptual southbound passenger train schedules between North Liberty and Iowa City and conceptual northbound passenger train schedules between Iowa City and North Liberty are shown in Tables 7 and 8, respectively.

Table 7: Conceptual Southbound Passenger Train Schedule – North Liberty to Iowa City

SOUTHBOUND TRAIN NUMBER	DEPART NORTH LIBERTY (FOREVER GREEN ROAD)	ARRIVE IOWA CITY (DUBUQUE STREET)
2	6:00 a.m.	6:30 a.m.
4	7:30 a.m.	8:00 a.m.
6	9:00 a.m.	9:30 a.m.
8	10:30 a.m.	11:00 a.m.
10	2:00 p.m.	2:30 p.m.
12	3:30 p.m.	4:00 p.m.
14	5:00 p.m.	5:30 p.m.
16	6:30 p.m.	7:00 p.m.

Source: HDR

Table 8: Conceptual Northbound Passenger Train Schedule – Iowa City to North Liberty

NORTHBOUND TRAIN NUMBER	DEPART IOWA CITY (DUBUQUE STREET)	ARRIVE NORTH LIBERTY (FOREVER GREEN ROAD)
1	6:45 a.m.	7:15 a.m.
3	8:15 a.m.	8:45 a.m.
5	9:45 a.m.	10:15 a.m.
7	11:15 a.m.	11:45 a.m.
9	2:45 p.m.	3:15 p.m.
11	4:15 p.m.	4:45 p.m.
13	5:45 p.m.	6:15 p.m.
15	7:15 p.m.	7:45 p.m.

Source: HDR

Railroad operations modeling and analysis would be required in future study to confirm the feasibility of the conceptual passenger train schedules identified above and to determine passenger train arrival and departure times at intermediate stations in the Corridor.

3.2.2 Conceptual Train Crew Plan

The conceptual Service Plan developed for this Study assumes that two CRANDIC train crews (each with one engineer and one conductor) would be necessary to operate the conceptual passenger train schedule between Iowa City and North Liberty identified in the section above, as follows:

- Morning Crew
  - Comes on duty at the CRANDIC Shops in Cedar Rapids at 4 a.m.
  - Deadheads by CRANDIC crew vehicle or taxi service from the CRANDIC Shops in Cedar Rapids to North Liberty Station, arriving 5 a.m.
  - Operates between North Liberty and Iowa City from the time of the first daily scheduled southbound departure from North Liberty at 6 a.m. to the time of the 11:45 a.m. northbound arrival at North Liberty.
  - Deadheads by CRANDIC crew vehicle or taxi service from North Liberty Station at 12:15 p.m. and goes off duty at the CRANDIC Shops in Cedar Rapids at 1:15 p.m.
  - 9.25 hours on-duty time.

- Afternoon Crew
  - Comes on duty at CRANDIC Shops in Cedar Rapids at 12:30 p.m.
  - Deadheads by CRANDIC crew vehicle or taxi service from the CRANDIC Shops in Cedar Rapids to North Liberty Station, arriving at 1:30 p.m.
  - Operates between North Liberty and Iowa City from the time of the daily scheduled southbound departure from North Liberty at 2 p.m. to the time of the last northbound arrival at North Liberty at 7:45 p.m.
  - Deadheads by CRANDIC crew vehicle or taxi service from North Liberty Station at 8:45 p.m. and goes off duty at the CRANDIC Shops in Cedar Rapids at 9:45 p.m.
  - 9.25 hours on-duty time.

It is assumed that the crews above would work additional hours once weekly to deadhead the empty in-service passenger train between North Liberty Station, the CRANDIC Shops in Cedar Rapids, and the North Liberty Station, as a means of facilitating equipment rotation and maintenance cycles at Cedar Rapids. The deadhead between North Liberty Station and the CRANDIC Shops at Cedar Rapids on CRANDIC Division 2 is estimated to take 2.5 hours, each way.

This estimate did not consider train crew rotation cycles, or any additional train crew labor (extra board) that would be necessary to operate the conceptual passenger train schedule above. This estimate is for planning purposes only and would be subject to CRANDIC labor and union agreements.

3.2.3 Stations Concept

The conceptual Service Plan developed for this Study assumes that potential passenger rail stations for the Iowa City-North Liberty Corridor would include platforms, platform canopy (over one-quarter the length of the platform), lighting, signage, and ticketing machine, as would be typically constructed for commuter rail services. Concrete platforms are elevated for level boarding with passenger rail equipment, comply with the requirements of the Americans with Disabilities Act (ADA), meet recent American Railway Engineering and Maintenance-of-Way Association (AREMA) design requirements, and are single-face and 300 feet in length. Single-face platforms allow for boarding from one side of the main track only, and are typical on commuter rail corridors with only one main track, as is the case with the CRANDIC Corridor. Potential future station buildings, parking facilities, and land acquisition for station development were not included in this Study.

In consideration of the 7.1-mile length of the Corridor and the typical spacing of stations on other passenger rail corridors hosting commuter rail service, and inputs from received from stakeholders in previous study of the Corridor, six stations were assumed. The following general locations identified by CRANDIC and other stakeholders could potentially host a station:

- Dubuque Street (Iowa City) – Southern Terminus
- Library/Burlington Street (Downtown Iowa City/University of Iowa)
- VA Hospital
- Coralville
- Oakdale Commuter
- Forever Green Road (North Liberty) – Northern Terminus

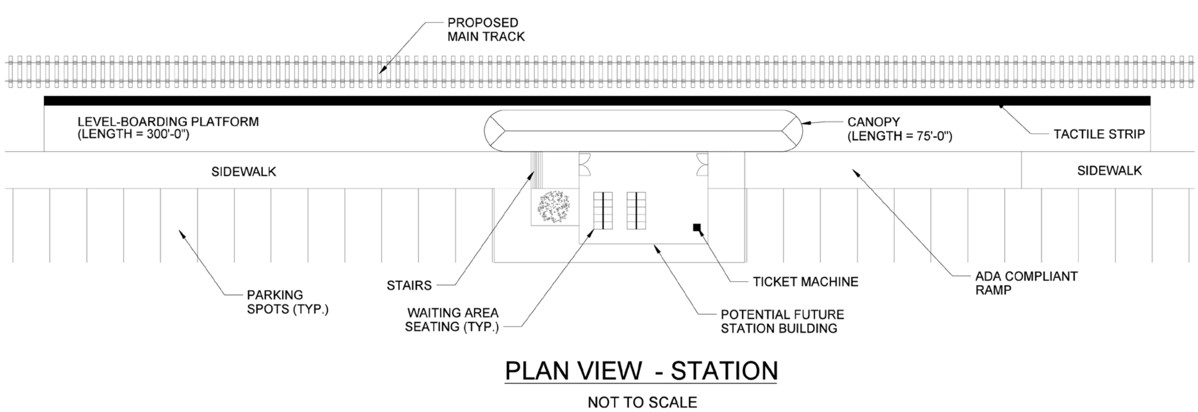
Figure 13 below shows these potential stations in the context of the Corridor.

Figure 13: Potential Stations in the Context of the Corridor

Source: HDR

Based upon the assumptions identified above, a typical station layout concept for potential implementation in the Corridor is shown in Figure 14 below.

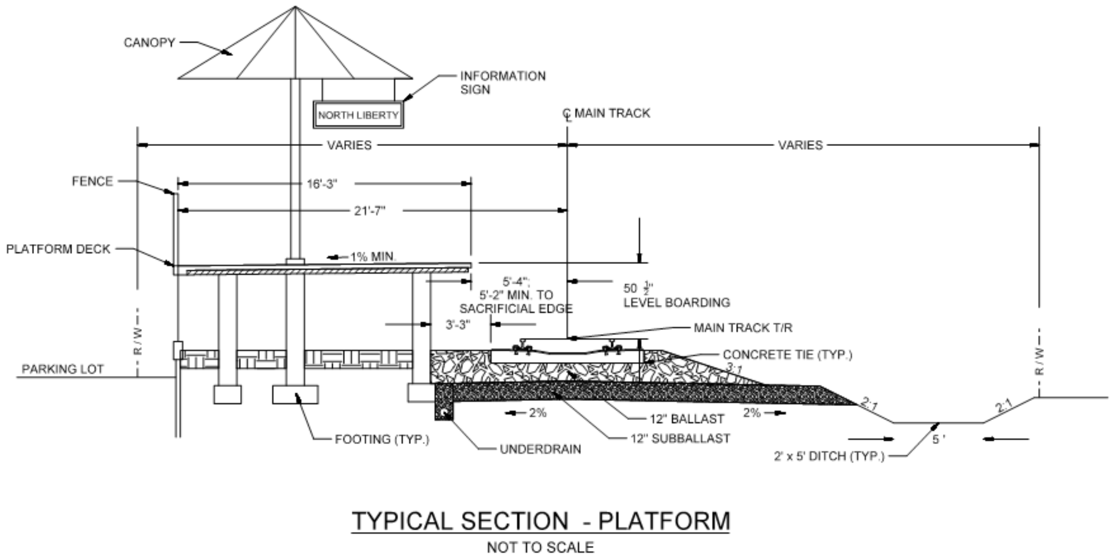
Figure 14: Typical Station Site Layout Concept



Source: HDR

Based upon the assumptions identified above, a typical station platform concept for potential implementation in the Corridor is shown in Figure 15 below.

Figure 15: Typical Station Platform Concept



Source: HDR

Actual station site locations and station requirements and amenities in the Corridor would be identified through coordination with project stakeholders in future study.

3.2.4 Layover and Maintenance Facility Concept

The conceptual Service Plan developed for this Study assumes that incorporation of a layover and maintenance facility to accommodate the potential passenger rail service on the Iowa City-North Liberty Corridor. A layover and maintenance facility is where passenger rail rolling stock is maintained and staged between scheduled operations and is also used as a train operations base that accommodates the transit system workforce and all administrative, management, and control functions. A layover and maintenance facility typically includes:

- Combined shop and office building for use as an equipment maintenance and train operations base
- Parking for vehicles
- Track(s) to stage and maintain equipment
- Track access pad(s)
- Potable water and general utility services
- Electrical service for standby power, as required
- Perimeter security fencing
- Site lighting

This project assumes that the existing CRANDIC Shops and offices in Cedar Rapids (outside of the CRANDIC Corridor, and located approximately 18 miles north of the proposed passenger rail station at Forever Green Road in North Liberty) will be used to maintain passenger rail equipment and to provide a location for an operations base; therefore, development of a new layover and maintenance facility for a passenger rail service in the CRANDIC Corridor was not considered.

As outlined earlier in the Service Plan section, it is assumed that the passenger rail trainset in service will layover at the North Liberty Station in periods of non-operation and that Direct Truck to Locomotive (DTL) fueling, routine light maintenance, and car cleaning can be facilitated at this location. A small utility building is assumed at the North Liberty Station to support these requirements. The conceptual Service Plan assumes that one of the cars in the two-car in-service trainset will be swapped out with the spare railcar staged at the CRANDIC Shops and receive heavy maintenance and cleaning at the existing CRANDIC Shops in Cedar Rapids, and that a deadhead move once weekly between North Liberty, Cedar Rapids, and North Liberty would be required to facilitate this equipment rotation.

4. Infrastructure and Equipment Requirements and Conceptual Cost Estimate

This section identifies infrastructure and equipment requirements and associated conceptual capital and operations and maintenance costs for the mode of potential passenger rail service identified in Section 3 and potential applicability of that mode to the 7.1-mile CRANDIC Corridor between Gilbert Street in Iowa City and Forever Green Road in North Liberty.

The requirements of the Iowa City-North Liberty service and the related cost experience is representative of other commuter rail projects, and is dependent on the use of the existing CRANDIC freight railroad infrastructure within the Corridor.

4.1 Capital Cost Estimate Approach

The conceptual capital costs presented in this section are applicable to the potential passenger service mode identified in Section 3, for the implementation of commuter rail service on the Corridor. The quantities developed for the estimate are based upon conceptual level analysis of the CRANDIC Corridor and application of typical U.S. railroad industry standard approaches and typical costs on other projects. The conceptual capital cost includes the rehabilitation of CRANDIC infrastructure as appropriate and construction of new infrastructure in the Corridor. This section includes the methodology and assumptions for deriving the capital costs and potential infrastructure and equipment requirements for each category. Estimated capital costs for right-of-way acquisition, easements, site preparation, and potential earthwork are not included in this estimate. CRANDIC presently owns the right-of-way in the CRANDIC Corridor between Iowa City and North Liberty and some adjacent property at locations along the CRANDIC Corridor.

Potential rehabilitation and construction of CRANDIC infrastructure in the Corridor to accommodate implementation of passenger rail service is described below.

4.1.1 Rehabilitation of Structures and Track

The Corridor's existing track structure, which at present hosts only minimal local freight railroad operations, would require track and track structures components to be renewed or upgraded to support the implementation of passenger rail service. This is necessary to meet federal regulations for passenger rail services, to provide for adequate safety, reliability, and ride quality for the commuter rail mode, and to reduce regular and capital maintenance program cost after operation commences.

Bridge rehabilitation is primarily centered on the conversion of existing open-deck bridges to ballast-deck bridges to provide for passenger ride quality and reduce on-going maintenance costs. For the CRANDIC Corridor, the estimate assumes converting open-deck bridges to ballast decks. This concept is consistent with bridge infrastructure improvements made on other passenger rail corridors in the U.S. Additionally, the two bridge replacements proposed within the estimate consistent with previous structures replacements on CRANDIC's network. Other nominal bridge improvements and conditional work are also included in this estimate.

As far as track rehabilitation, current tie condition and main track rail size warrant the replacement of track ties and rail along the CRANDIC Corridor. Presently, no freight traffic moves through the Corridor that would normally impede construction crews. Instead, these crews can work under complete curfew, or without interruption from train traffic. In light of that condition, total track renewal, via a Track Renewal Train (TRT), presents itself as a viable option for track construction. The TRT removes existing ties and plows a uniform subgrade for new ties, all while relaying new ties and rail along the Corridor — essentially creating a "skeletonized" track. Ballast dumping and track surfacing occur after the track has been constructed. The TRT offers a simple and cost-effective way to construct track in a constrained urban corridor with limited access points. Owing to these facts, the TRT is a more attractive option than conventional stick building track, as the latter method would be slower than automated track construction methods and would require many access points along the right-of-way to allow for the transport of equipment, new materials, and waste. In an urban environment, multiple access points may require additional permitting and easement agreements. Additional permitting and real estate costs could offset any savings created by conventional track stick building. These ancillary costs were not looked at as part of this Study. A typical TRT operation is shown in Figure 16 below.

Figure 16: Typical Track Renewal Train with "Skeletonized" Track

Source: HDR

This estimate considers the economics of a total track renewal, and focuses on installing new concrete ties construction and 115 lb./yd. CWR via the use of the TRT. Concrete ties were assumed as installation of these ties in a passenger rail corridor would allow for increased track tie spacing when compared to installation of standard wood ties, resulting in the installation of fewer ties, and typically longer tie life and long-term track maintenance cost savings. The use of new 115 lb./yd. CWR, which has been used on other U.S. passenger rail corridors, was assumed to eliminate existing legacy jointed rail in the Corridor, enhance track reliability, provide better passenger ride quality, and to realize long-term maintenance cost savings. It is assumed that CRANDIC or a potential passenger rail operator will replace any concrete ties and relay rail through routine maintenance cycles in future years.

The assumed rehabilitation scope is identified below:

- Four bridge deck conversions from existing open-deck bridges to ballast-deck bridges at Milepost 24.6, Milepost 24.7, Milepost 24.8, and Milepost 25.75
- Miscellaneous bridge repairs
- Miscellaneous culvert repairs and replacements
- Ditching and drainage work

- Track undercutting at other spot locations, as needed
- Track surfacing over the entire Corridor

Potential construction of infrastructure on in the CRANDIC Corridor is described below.

4.1.2 Construction of Track Structures and Track

New infrastructure construction and upgrades are typically required when implementing passenger rail service on a freight only corridor. Main track rail replacement is assumed to be 115 lb./yd. continuously welded rail (CWR). Track derails are also included in the estimate, as a means to physically separate the passenger rail only Corridor between Iowa City and North Liberty from CRANDIC's connecting freight only network.

The assumed construction scope is identified below:

- Two new bridges:
  - Milepost 23.8 – previously considered for replacement in past passenger rail study of the Corridor, per CRANDIC
  - Milepost 24.9 – this structure is a candidate for replacement in order to reduce maintenance costs and enhance pedestrian traffic flows
- Three culvert replacements (including removals) to enhance site drainage and minimize long-term maintenance costs:
  - Milepost 20.50
  - Milepost 21.40
  - Milepost 22.33
- Main track rail replacement (7.1 miles) – 115 lb./yd. CWR and concrete ties on 30" spacing
- CWR joint elimination
- Two new main track derails near Gilbert Street in Iowa City and Forever Green Road in North Liberty, for physical separation of the passenger rail only Corridor from the rest of CRANDIC's freight-only network

Note that any existing turnouts to existing sidings, yard tracks, or industrial tracks in Iowa City and North Liberty will not be retained, upgraded, or replaced during construction. The estimate assumes all turnouts will be removed from service when the 7.1-mile Corridor becomes passenger rail only.

The estimate includes a credit for scrapping existing rail and other unneeded track materials to help offset construction costs, resulting in nearly a credit of nearly $0.48 million toward construction costs.

4.1.3 Equipment

This cost includes procurement of three new self-propelled FRA Compliant DMU coach railcars required to operate the Iowa City-North Liberty passenger rail service (two cars to assemble an in-service trainset to protect scheduled operations and one spare car to protect maintenance cycles) based upon the conceptual Service Plan presented previously in Section 3, and is based upon a recent industry transaction in which Sonoma-Marin Area Rail Transit in the San Francisco Bay Area of California procured similar DMU equipment for use on its commuter rail network[12].

4.1.4 Signaling and Communications

Passenger rail corridors in the U.S. typically include active warning signal equipment at all public at-grade crossings to enhance safety and limit the potential for collisions and other accidents with vehicles and pedestrians. This category includes the cost of at-grade crossing automatic warning devices (with constant warning time devices), where applicable. Cost for equipment at public at-grade crossings assumes the rehabilitation of and upgrade of existing active warning signal equipment, as appropriate, to include crossbucks, bells, flashing light signals, and gates. Cost includes all signal materials and any corresponding

12 *http://www.nipponsharyousa.com/tp101216.htm*

power drops, along with labor necessary for construction. Cost includes an intertie for preemption of traffic signals at three grade crossings in the Corridor, but traffic signal costs are not included in this estimate and are assumed to be the responsibility of the municipalities. Cost assumes private at-grade crossings, which are not open to the public and typically host minimal volumes of vehicular and pedestrian traffic, will include passive warning devices, including crossbucks and stop signs.

It is assumed that the Iowa City-North Liberty Corridor will be passenger only, with only one passenger train operating on the line at a time, no meet-pass events between passenger trains, and a Method of Operation to include Track Warrant Control (TWC) facilitated by a CRANDIC dispatcher or manager using existing CRANDIC communications infrastructure. Therefore, implementation of a wayside Centralized Traffic Control (CTC) signal system and Positive Train Control (PTC) overlay will not be required, as would be the case for a shared-use corridor with passenger and freight trains. Wayside asset protection devices are also not required, and therefore also not included in the estimate. No improvements to the existing wayside radio communications and telecommunications networks are included in the estimate.

4.1.5 Stations

The cost to construct six potential passenger rail stations identified by stakeholders for the Iowa City-North Liberty Corridor includes platforms, platform canopy (over one-quarter the length of the platform), lighting, signage, and ticketing machine as would be typically constructed for U.S. commuter rail services and as is necessary to support the conceptual Service Plan in Section 3 of this Study. Concrete platforms are elevated for level boarding with passenger rail equipment, comply with the requirements of the Americans with Disabilities Act (ADA), meet recent American Railway Engineering and Maintenance-of-Way Association (AREMA) design requirements, and are single-face and 300 feet in length. Conceptual cost for a potential future station building, parking facility, and land acquisition for station development were not estimated in this Study. Actual station site locations and station requirements and amenities in the Corridor would be identified through coordination with project stakeholders in future study.

4.1.6 Layover and Maintenance Facility

The conceptual Service Plan developed in Section 3 of this Study assumes that the existing CRANDIC Shops and offices in Cedar Rapids (outside of the CRANDIC Corridor, and located approximately 18 miles north of the proposed passenger rail station at Forever Green Road in North Liberty) will be used to maintain passenger rail equipment, stage spare passenger rail equipment, and provide a location for an operations base, and that the in-service trainset would layover at the North Liberty Station during periods of non-operation. Therefore, the capital cost to develop a new layover and maintenance facility for a passenger rail service in the CRANDIC Corridor was not estimated. The conceptual cost to acquire the likely additional tools and equipment (i.e. special equipment jacks and tools, potential modifications to a shop maintenance pit, and different tooling for wheel truing) necessary to maintain the selected DMU passenger rail equipment at the existing CRANDIC Shops is included in the estimate. The estimate also includes a small utility building at the North Liberty Station to support light maintenance and cleaning activities for the in-service trainset during periods of non-operation.

4.1.7 Grade Crossing Surface and Approaches

This section's cost is applicable to the replacement of timber and asphalt crossing surfaces, with concrete panels (i.e. private crossings), and for other roadway surface and approach improvements at existing at-grade road/rail crossings, in order to enhance safety, improve component reliability, and to realize long-term maintenance cost savings. The estimate assumed the reuse of existing concrete panels at crossings presently so equipped in the Corridor. Also assumed in the estimate, a Track Renewal Train (TRT) will upgrade track ties at 21 of the 23 grade crossings, replacing existing wood crossing ties with concrete ties.

Grade crossing improvements at Burlington Street in Iowa City and First Avenue in Coralville were not included in this estimate due to complex traffic patterns and traffic densities at these locations. These two crossings will instead receive transition tie sets between the existing wood ties and new concrete ties at the crossing approaches.

4.1.8 Fencing
This cost is applicable to construction of new fencing in the right-of-way through the urban or high-traffic sections of the Corridor to discourage trespassing and encroachment on railroad property, enhance railroad and public safety and security, and to reduce the likelihood of accidents involving trespassers.

4.1.9 Professional Services
This cost includes preliminary and final design, environmental review and permitting, and project management for design and construction of a passenger rail service in the Corridor. It also includes the professional services cost for equipment procurement and associated project management.

4.1.10 Contingency
Contingency was applied to the estimated conceptual cost by line item within each category to account for potential cost variability. In instances when costs were better understood, based upon other recent railroad industry projects and subject to less variability, a lower contingency was applied.

Contingency was not applied to Professional Services costs for the construction and equipment segments of the project.

4.2 Operations and Maintenance Cost Approach
The conceptual Operations and Maintenance costs presented in this section are applicable to the potential passenger service mode identified in Section 3, which includes commuter rail transit with DMUs. The conceptual costs developed for this estimate are based upon conceptual level analysis of the CRANDIC Corridor and application of typical U.S. railroad and transit industry standard approaches and typical Operations and Maintenance costs on other projects. This section identifies what is included and what is not included in the annual Operations and Maintenance costs for each category.

Annual Operations and Maintenance costs typically cover all aspects of daily passenger rail service delivery and maintenance, including:

- Equipment operation
  - Fully burdened operating department labor consisting of two full-time engineers and two full-time conductors.
    - Assumes $160,000/year (burdened at 2.0) for each train service employee.
  - Fuel for equipment operation based on:
    - Train miles to protect the regular operating schedule between Iowa City and North Liberty (40,880 miles/year) and equipment rotation once weekly between North Liberty and Cedar Rapids to accommodate maintenance cycles (1,872 miles/year).
    - Fuel consumption rate of 3 mpg for operation of a two-car DMU trainset.
    - An estimated multiplier of $2.50 per gallon.
- Routine vehicle maintenance
  - Fully burdened mechanical department labor consisting of one full-time electrician and one full-time laborer.
    - Assumes $30/hour for electrician and $15/hour for laborer or $125,000/year and $62,500/year fully burdened at 2.0.
  - Capital spare parts including diesel engine parts, wheel sets, etc.
    - Assumes $5000/month as an industry average.
  - Consumables including brake shoes, filters, air hoses, seat covers, etc.
    - Assumes $5000/month as an industry average.
- Routine track, bridge, and right-of-way maintenance at $230,000 per year, including:
  - Replacement of curve-worn rail.
    - Assumes one CWR stick per year, although this will not be needed in the short-term horizon.
  - Track tie replacement.
    - Assumes 100 concrete ties per year, although tie cycles would not likely be needed in the short-term horizon.

- Track surfacing
- Track undercutting
  - For mud spot removal or other fouled ballast.
- Track inspection
- Grade crossing maintenance.
- Routine bridge maintenance, inspections, and repairs
  - Footwalk and handrail securement.
  - Drift removal.
- Culvert inspections, cleaning, and repairs
- Track ditch cleaning
- Brush cutting, weed spraying, and other vegetation removal
- Maintenance of signal and communications infrastructure at $90,000 per year, including:
  - Crossing equipment inspections, testing, and routine repairs
  - Traffic control center expenses

The annual O&M cost developed for this Study does not include:

- Operating, Maintenance-of-Way, Mechanical, and Signal Department Management – existing CRANDIC management team assumed adequate to accommodate the needs of the passenger rail service in the Corridor.
- Extra board operating department labor to protect vacancies on regular train crew assignments.
- Maintenance-of-Way and Signal Department Forces – existing CRANDIC departmental forces assumed adequate to accommodate the needs of the passenger rail service in the Corridor.
- Station Maintenance – assumes that municipalities and entities along the Corridor would be responsible for the cost to maintain stations and station facilities, which would also include utilities, landscaping and snow removal, cleaning, and security.
- Costs for insurance, overhead, marketing, advertising, and police.

4.3 Presentation of Conceptual Cost Estimate

This section presents the conceptual capital cost estimate for the construction and implementation of passenger rail service on the CRANDIC Corridor between Iowa City and North Liberty and an estimated conceptual annual Operations and Maintenance (O&M) cost to support the service.

4.3.1 Conceptual Capital Cost Estimate

The conceptual capital cost estimate to implement passenger rail service on the Corridor between Iowa City and North Liberty is approximately $40.06 million. The capital cost estimate is identified by category and line item in 2016 dollars, in Table 9 below. Alternatives to the capital cost estimate presented below and associated potential cost savings are discussed in Section 4.4.

Table 9: Conceptual Capital Cost Estimate – Iowa City to North Liberty Passenger Rail Service Implementation (2016 Dollars)

DESCRIPTION	LINE ITEM DESCRIPTION	LINE ITEM ESTIMATED COST	LINE ITEM CONTINGENCY	TOTAL ESTIMATED COST (IN 2016 DOLLARS)
10 - TRACK STRUCTURES & TRACK				
10.1 - Track Structure: Bridge Repairs	Ballast deck conversions and misc. system bridge repairs	$2,038,040	15%	$2,343,746
10.2 - Track Structure: New Bridges	New structures at MP 23.8 and MP 24.9	$492,400	15%	$566,260
10.3 - Track Structure: Culverts and Drainage Structures	Culvert replacements and track ditch cleaning	$240,740	15%	$276,851

10.4 - Track Structure: Miscellaneous	N/A	$-	15%	$-
10.5 - Track: New Construction	115RE CWR on concrete ties (30" O.C.) via TRT, remove and dispose of turnouts, remove and dispose of track, track salvage credit, new derails, and CWR welds/ joint reduction	$8,370,003	10%	$9,207,003
10.6 - Track: Rehabilitation - Ballast and surfacing	N/A	$-	10%	$-
10.7 - Track: Rehabilitation - Component Replacement	N/A	$-	10%	$-
Total for Category 10 - TRACK STRUCTURES & TRACK				$12,393,860
20 - STATIONS & TERMINALS				
20.1 - Stations	6 - Ticketing machines	$163,080	20%	$195,696
20.2 - Platforms	6 - 300' length level boarding platforms	$1,652,250	20%	$1,982,700
20.3 - Canopy	6 - 75' length canopies	$355,500	20%	$426,600
20.4 - Signage and Lighting	Station signage and lighting	$619,800	20%	$743,760
Total for Category 20 - STATIONS & TERMINALS				$3,348,756
30 - SUPPORT FACILITIES				
30.1 - Maintenance Facilities (New)	Construction of utility building at North Liberty	$50,000	25%	$62,500
30.2 - Maintenance Facilities (Improvements)	Tools and equipment for DMU railcar maintenance at Cedar Rapids	$200,000	25%	$250,000
Total for Category 30 - SUPPORT FACILITIES				$312,500
40 - SITEWORK				
40.1 - Corridor Fencing	6' fencing along entire corridor	$852,000	10%	$937,200
Total for Category 40 - SITEWORK				$937,200
50 - COMMUNICATIONS & SIGNALING				
50.1 - Power Drops	Power drops for 11 passive crossings and 2 preemptive signaling interties	$130,000	20%	$156,000
50.2 - Grade crossing protection	Grade crossing protection at 21 crossings, with the addition of two interties	$4,016,000	20%	$4,819,200
Total for Category 50 - COMMUNICATIONS & SIGNALING				$4,975,200
60 - GRADE CROSSING IMPROVEMENTS				
60.1 - Crossing Panels	Addition of concrete crossing panels at 5 existing timber-panel crossings	$310,990	10%	$342,089
60.2 - Crossing Surface & Approaches	Proposed work for crossing surfaces, approaches, and cross tie improvements at 21 crossings; Burlington Street and 1st Avenue were not included due to complex traffic patterns at locations	$1,884,060	10%	$2,072,466
Total for Category 60 - GRADE CROSSING IMPROVEMENTS				$2,414,555
70 - PROFESSIONAL SERVICES (CONSTRUCTION)				
70.1 - Preliminary Design/ NEPA	30% Design work	$1,070,731	5%	$1,124,268
70.2 - Final Design	100% Design work	$718,815	5%	$754,756
70.3 - Project management for design and construction	Project management	$234,449	5%	$246,171
70.4 - Construction administration & management	Construction management	$468,897	5%	$492,342
Total for Category 70 - PROFESSIONAL SERVICES (CONSTRUCTION)				$2,617,537

80 - EQUIPMENT				
80.1 - Equipment Procurement	3 new FRA-compliant DMU cars	$10,662,000	20%	$12,794,400
80.2 - Equipment Reconditioning	N/A	$-	20%	$-
Total for Category 80 - EQUIPMENT				$12,794,400
90 - PROFESSIONAL SERVICES (EQUIPMENT)				
90.1 - Professional Services: Equipment	Professional services cost of acquiring 3 new FRA-Compliant DMU cars	$266,550	0%	$266,550
Total for Category 90 - PROFESSIONAL SERVICES (EQUIPMENT)				$266,550
Total Capital Costs: Category 10 - 90				**$40,060,558**

Source: HDR

4.3.2 Conceptual Annual O&M Cost Estimate

The conceptual annual O&M cost estimate to support passenger rail service on the Corridor is approximately $1.39 million. Note that the annual O&M cost was developed for the first year of passenger rail service operation and is represented in 2016 dollars. The conceptual annual O&M would escalate for inflation for all subsequent years and are projected for 15 years only. The conceptual annual O&M estimate is identified by line item in Table 10 below.

Table 10: Conceptual Annual O&M Cost – Iowa City to North Liberty Passenger Rail Service (2016 Dollars)

CATEGORY	DESCRIPTION	TOTAL ESTIMATED COST (IN 2016 DOLLARS)
100	**OPERATIONS & MAINTENANCE**	
100.1	Track Structure: Bridge Repair	$100,000
100.2	Track Structure: Culverts and Drainage Structures	$15,000
100.3	Track Structure: Miscellaneous	$5,000
100.4	Track: New Construction	$35,000
100.5	Track: Rehabilitation - Ballast and surfacing	$75,000
100.6	Track: Rehabilitation - Component Replacement	$79,450
100.7	Maintenance Facilities	$10,000
100.8	Wayside Signaling	$75,000
100.9	Traffic Control and Dispatching	$15,000
100.10	Communications	$-
100.11	O&M Costs (Train Service/Mechanical Labor, Fuel, Equipment Spare Parts, Consumables, etc.)	$983,200
	CATEGORY 100 CONTINGENCY (0%)	**$-**
	TOTAL O&M COSTS (Category 100)	**$1,392,650**

Source: HDR

4.4 Alternatives to Infrastructure and Equipment Requirements and Conceptual Cost Estimate

This section identifies alternatives to the infrastructure and equipment requirements and the associated conceptual capital cost estimate presented above, which may potentially reduce upfront capital costs for passenger rail implementation and allow for a varied equipment procurement strategy and a phased plan of infrastructure improvements for the CRANDIC Corridor between Iowa City and North Liberty.

4.4.1 Equipment Procurement Alternative

The conceptual capital cost estimate developed for this Study assumed that three new self-propelled DMU railcars would be procured for implementation of passenger rail service on the Corridor between Iowa City and North Liberty.

Procurement of secondhand DMU equipment and reconditioning it for use on the Corridor could provide an alternative to acquiring new equipment and provide a capital cost savings. Secondhand DMU equipment, the potential conceptual capital cost for its procurement and reconditioning, and likely approach for acquiring secondhand equipment are described in this section.

As with the new DMU equipment and conceptual Service Plan described earlier in this Study, the alternative equipment approach would include three self-propelled secondhand DMU coach railcars, which will be used to assemble one trainset of two railcars for the Iowa City-North Liberty passenger rail service, and one spare car which will be staged at the CRANDIC Shops in Cedar Rapids. One trainset would be required to protect potential scheduled operations of the passenger rail service between Iowa City and North Liberty and the third, or spare, car would be used to accommodate regular equipment maintenance schedules at the CRANDIC Shops outside of the Corridor at Cedar Rapids.

The reconditioned secondhand DMU commuter train consist would also operate in a push-pull configuration, which allows the trains to be operated from either end, thus eliminating the need to turn trains at terminal points in Iowa City and North Liberty. Typical secondhand DMU railcars are 85 feet in length and have a seating capacity of 75 to 90 on average, including accommodations for disabled persons in wheelchairs. Some secondhand DMUs may have a lavatory and bicycle storage. Reconditioning of DMU equipment typically includes updates to the railcar's air brake system, upgrades to event recorders, modifications required to comply with the requirements of the Americans with Disabilities Act (ADA), interior cosmetic changes and improvements (i.e. seating, flooring, lighting, and signage), exterior cosmetic changes and improvements (i.e. color scheme, signage, etc.), and a comprehensive cleaning to the interior and exterior.

A typical two-car trainset of reconditioned secondhand DMU equipment (Budd Rail Diesel Cars [RDCs], in this instance) operated by TriMet on its Westside Express Service (WES) in the Portland, Oregon, area is shown in Figure 17 below. Budd RDC passenger rail equipment of this type and configuration is what has been explored in this Study for potential alternative implementation on the CRANDIC Corridor.

Figure 17: Typical Two-Car Trainset of Secondhand DMU Equipment

Source: TriMet

The conceptual cost estimate for acquiring and reconditioning three secondhand Budd RDC cars for passenger rail service implementation on the CRANDIC Corridor is approximately $1.62 million per car. The conceptual estimate presented in Table 11 below was developed from a recent industry estimate, in which TriMet sought to procure and recondition two secondhand Budd cars from Dallas Area Rapid Transit (DART) in 2016[13]. Note that a higher 12 percent cost for professional services was applied to the capital cost to account for the additional coordination with equipment suppliers and additional inspections of used passenger rail equipment that would likely be required.

Table 11: Conceptual Cost Estimate for the Procurement and Reconditioning of Three Budd RDC Cars for the Iowa City-North Liberty Passenger Rail Implementation

CATEGORY	ESTIMATED COST (IN 2016 DOLLARS)	CONTINGENCY	TOTAL ESTIMATED COST (IN 2016 DOLLARS)
Equipment: Procurement (3 cars secondhand Budd RDC cars at $750,000 each)	$2,250,000	50%	$3,375,000
Equipment: Reconditioning (3 cars reconditioning at $250,000 each)	$750,000	50%	$1,125,000
Equipment: Professional Services (Procurement, Project Management)	$360,000 (12% of cost of equipment procurement and reconditioning before contingency applied)	None	$360,000
		Total	**$4,860,000**

Source: HDR

Based upon the alternative approach presented above, the procurement of three secondhand reconditioned RDC Budd cars ($4,860,000) versus the conceptual capital cost estimate to acquire three new FRA Compliant DMU railcars ($13,060,950) could result in a potential cost savings of $8,200,950.

It is important to note though that the actual and estimated capital cost to acquire and recondition secondhand Budd RDC cars for use by transit agencies has fluctuated considerably in the last 20 years, and this wide variability should be considered by stakeholders for any similar procurement of equipment for passenger rail service implementation on the CRANDIC Corridor. For example, Trinity Railway Express (TRE), in Dallas, Texas, acquired and rehabilitated 13 Budd cars in 1996, for a capital cost of $1.8 million per car in 1996 dollars[14]. Sonoma-Marin Area Rail Transit in the San Francisco Bay Area of California studied the potential of acquiring 14 secondhand reconditioned Budd cars for use as an interim fleet in 2009, and discovered that total procurement and refurbishment costs could potentially be $3.5 million to $4.5 million per car[15].

Note also that the supply of secondhand Budd cars and associated replacement capital spare parts are likely to be limited now and in the future, and that the time necessary to acquire a matched set of three Budd cars and appropriate spare parts could be considerable. Secondhand passenger rail equipment is typically acquired from transit agencies, railroads, and rail equipment sellers. Specific availability and the actual cost to procure secondhand Budd equipment for use on the CRANDIC Corridor is subject to coordination with these parties in future study.

4.4.2 Bridge Rehabilitation Alternatives

The conceptual capital cost estimate developed for this Study assumed that ballast-deck bridges are best suited for this Corridor owing to consideration of passenger ride quality, while also having the advantage of

13 TriMet wants to buy used trains from Dallas to bolster WES service; The Oregonian; May 23, 2016; http://www.oregonlive.com/commuting/index.ssf/2016/05/trimet_wants_to_buy_used_train.html

14 Sonoma-Marin Area Rail Transit District, Use of Budd RDCs as an Interim Fleet; June 18, 2009

15 Ibid.

lowering maintenance costs and extending bridge life. For these reasons it was assumed that all open-deck bridges would be converted to ballast-deck bridges, except for the following structures requiring replacement:

- Bridge 23.8 – previously considered for replacement in past passenger rail study of the Corridor, per CRANDIC
- Bridge 24.9 – this structure is a candidate for replacement in order to reduce maintenance costs and enhance pedestrian traffic flows

If the preference is not to implement the ballast-deck bridges conversions and to instead replace open-deck bridge ties (on Bridges 24.6, 24.7, 24.8, and 25.75) as an alternative approach, there would be a potential cost savings of approximately $1.66 million. In addition, if the preference is not to replace Bridges 23.8 and 24.9 and only perform bridge tie replacement (Bridge 23.8) and ballast retainer installation (Bridge 24.9), then there would be a potential cost savings of approximately $0.48 million. If both bridge alternatives were chosen over ballast-deck conversion and bridge construction, as listed in the base capital cost estimate, the potential cost savings could be approximately $2.14 million.

4.4.3 Track Construction Alternatives

The conceptual capital cost estimate developed for this Study assumed installation of 115 lb./yd. CWR on concrete ties with a 30" spacing on the main track. This would be constructed via Track Renewal Train (TRT). Constrained right-of-way limits and limited access in the urban rail corridor contributed to this decision, eliminating the need for additional permitting and real estate efforts, saving budget and streamlining construction. The alternative to TRT construction is track stick building.

Manual track building (stick building track) will largely see cost savings efficiencies since all the track work will be conducted via a long-term track curfew. Wood-tie stick building would potentially result in cost savings of $2.57 million. This is due in large part to the previous main line new track construction, which was completed in 2013, between Milepost 23.2 and Milepost 23.8. The roughly 0.6 miles of new track (wood track ties on 115 lb./yd. CWR) will not require immediate renewal or replacement. Additionally, no new wood ties track construction will be needed through any of the upgraded at-grade roadway crossings. By contrast, concrete-tie track stick building will potentially result in cost savings of approximately $0.26 million, as all 7.1 miles of track and crossings would require new concrete ties and 115 lb./yd. CWR to maintain a uniform track structure.

4.4.4 At-Grade Roadway Crossings Alternatives

Consistent with typical TRT practices, the conceptual capital cost estimate developed for this Study assumed a complete track renewal at existing at-grade crossings, with the crossings being upgraded to concrete ties on 115 lb./yd. CWR. In this approach, existing at-grade crossings would be renewed by pulling the existing concrete crossing panels, replacing the wood ties with concrete ties, relaying new rail, replacing the concrete panels, and paving up to 10 feet of feathered HMA. This would result in a uniform track structure and even replacement tie-cycle through all crossings. To reduce costs, the base capital cost estimate assumed that the two busy crossings in the Corridor (Burlington Street in Iowa City and First Avenue in Coralville) would be left in place while all of the other crossings will see the complete track renewal.

It is important to note that if TRT methods are not used for construction, wood tie stick building would eliminate the need to upgrade any wood ties and rail at existing at-grade crossings with concrete panels; existing timber panel crossings would still require the upgrade to concrete crossing panels with related profile work. This method would potentially yield a cost savings of approximately $1.66 million; additional rail welds have been accounted for in wood-tie stick building costs in Section 4.4.2. By contrast, concrete-tie stick building (through at-grade roadway crossings) would likely have similar costs to the TRT approach, with the addition of more CWR rail welds. The additional rail welds have been accounted for in concrete-tie stick building costs in Section 4.4.2.

4.5 Additional Potential Future Phased Implementations

Additional future phased passenger rail service implementations and phased infrastructure improvements beyond those identified and described for this Study could potentially include:

- Increased service frequencies or expansion of stations and station access for the Iowa City-North Liberty (Phase 1) service on the CRANDIC Corridor.
- Potential construction of a Phase 2 service on the CRANDIC Corridor from Forever Green Road in North Liberty north to the Eastern Iowa Airport in Cedar Rapids.
- Potential construction of a Phase 3 service from the Eastern Iowa Airport in Cedar Rapids north to downtown Cedar Rapids potentially using segments of the CRANDIC Corridor and other active and inactive rail corridors in Linn County, creating a complete corridor service between central Iowa City and central Cedar Rapids.
- Potential construction of a new wye and spur track from the existing (Phase 1) CRANDIC Corridor in Coralville north to the Iowa River Landing, a new mixed-use development in Coralville, during or independent of Phases 2 and 3 identified above.
- Potential phasing of additional track and bridge infrastructure improvements during Phase 2 or Phase 3.

A range of conceptual capital and annual operations and maintenance costs for each additional potential phased service implementation identified above were not developed for this Study.

5. Federal Safety and Governance Regulatory Requirements

This section describes the basic federal regulatory requirements of the Federal Transit Administration (FTA) for the implementation and operation of a passenger rail service, including provisions that require future federal approvals if federal funding is obtained. The section also describes the general federal regulatory requirements that are triggered for locating passenger rail service on an active freight railroad (like CRANDIC), and, if the freight rail services are no longer required, the requirements for abandonment of common-carrier service. This section concludes with a description of the general Environmental Review process for permitting, constructing, and implementing passenger rail service.

A proposed rail passenger service on the CRANDIC Corridor may be impacted by one or more of two federal agencies, listed below:

- Federal Transit Administration (FTA)
- Surface Transportation Board (STB)

A third agency, the Federal Railroad Authority (FRA), is generally focused upon the general railway system, and has no authority over transit or urban rail passenger services operating totally outside of that system. When a rail passenger service operates within, or crosses right-of-way within the general railway system, that passenger rail system falls within FRA jurisdiction. Because the passenger rail service explored in this Study does not meet those conditions, FRA regulations are not anticipated to apply to the type of service under study on a passenger rail only corridor. In the future, if a shared-use passenger and freight rail operation is sought for the Iowa City-North Liberty Corridor, then FRA would have jurisdiction and FRA safety regulations and other requirements would apply.

The possible role of the FTA and STB in the establishment and operation of a potential passenger rail service on the CRANDIC Corridor is summarized in the following sections.

5.1 Federal Transit Administration

The FTA planning requirements would be applied to the project if capital funding for the implementation of passenger rail service is pursued from one of the three FTA capital improvement programs identified below:

- New Starts: New or extended Commuter Rail Transit (CRT), Bus Rapid Transit (BRT), Light Rail Transit (LRT), Streetcar, and heavy rail (RRT) projects with a total cost exceeding $250 million and a New Starts Funding request exceeding $75 million.
- Small Starts: Same range of modes with a total budget less than $250 million and Small Starts funding request less than $75 million.
- Core Capacity: Increased capacity by 10 percent for a project at or exceeding capacity or will be within five years.

The discussion in this Study will be limited to the New Starts and Small Starts, as Core Capacity is not relevant to the potential for passenger rail implementation in the CRANDIC Corridor.

All New Starts and Small Starts projects must follow a rigorous analysis in order to compete for funding in this competitive grant program. These programs are described in greater detail in the previous *Iowa City-Cedar Rapids Passenger Rail Conceptual Feasibility Study*.

Any project receiving FTA funding is subject to FTA oversight through project planning, design, and testing. Although the FTA maintains oversight for the grants that it awards, the grant administration and project management responsibility is assigned to the grantee. The FTA defines oversight as a continuous review and evaluation of grantee and FTA processes to ensure compliance with statutory, administrative, and regulatory requirements. For New Starts projects, this activity is generally led by a Project Management Oversight Consultant (PMOC) reporting the FTA regional office. In this role, the PMOC supplements the FTA technical staff, monitoring the overall schedule, and budget.

The grantee is required to develop a Project Management Plan (PMP) that defines in detail how it will manage the project. FTA provides guidance in development of the manual in FTA Circular 5200.1. FTA has also developed several documents that may guide the development of the PMP and overall project management, including:

- FTA Quality Management System Guidelines
- FTA Project and Construction Management Guidelines
- Construction Project Management Handbook

While the grantee has some discretion in establishing its management approach, once the document is accepted by FTA the grantee cannot deviate from the PMP. The elements of the PMP are identified below:

- Basis for project (project description, financial plan, and legal authority for implementation)
- Environmental Documentation/Mitigation Plan
- Design Control Plan
- Design Change and Configuration Control
- Project Controls
- Cost Control Procedures
- Schedule Control Procedures
- Risk Control Procedures
- Dispute and Conflict Resolution
- Project Delivery and Procurement
- Labor Relations and Policies
- Construction of Fixed Infrastructure
- System Integration, Pre-Revenue Operations and Revenue Service
- Grantee Technical Capacity and Capability
- Quality Assurance/Quality Control
- Safety and Security Plan
- Real Estate Acquisition and Management Plan
- Fleet Management Plan

Many of the items defined in the PMP are deliverables that must be approved by the FTA before entry into Final Design. A checklist identifying those deliverables is included in Figure 18 below.

Figure 18: New Starts Project Planning and Development Checklist

NEW STARTS PROJECT PLANNING AND DEVELOPMENT
CHECKLIST OF PROJECT SPONSOR SUBMITTALS TO FTA TO ENTER FINAL DESIGN (FC)

PRODUCTS	***FTA CONCURRENCE DATE***	***REFERENCE (Regulations, Guidance and Other Resources)***
COMPLETION OF PRELIMINARY ENGINEERING	-	
Project Definition/Scope	-	
Project Plans, Drawings, Design Criteria, Standards and Specifications with refined project definition for overall project, tracks or routes, stations, stops and other structures		• FTA P&CM Guidelines (Chapter 4) • Full Funding Grant Agreement Guidance 5200.1A (Chapter 2)
Master Permitting Plan and Schedule		
Geotechnical Baseline Report		
Documentation of passenger level boarding design for all stations and/or satisfactory determination of infeasibility for one or more stations and satisfactory alternative plan for accessibility		• 49 CFR Pars 27, 37 & 38 • 36 CFR 1191 & 1192 • DOT Disability Law Guidance. "Full-Length, Level-Boarding Platforms in New Commuter and Intercity Rail Stations" (09/01/05) • Association of American Railroads (ARR) Clearance Plates A-F, H & L • DoD Strategic Rail Corridor Network (STRACNET) clearance profile
Project Cost, Schedule and Financial Plan	-	• FTA P&CM Guidelines (Chapter 4) • Standard Cost Categories for Capital Projects • Alternatives Analysis Technical Guidance (Part II.3)
Capital Cost Estimate and Project Schedule in Original Format and Standard Cost Category (SCC) Format (refined and updated to support final design request)		
Summary of O&M Cost Assumptions/ Productivities (if O&M costs changed since approval to enter PE)		• Alternatives Analysis Technical Guidance (Part II.4) • Reporting Instructions
Financial Plan and Supporting Information Supporting Final Design Requests and Financial Capacity Assessment		• 49 CFR 611.11 • Financial Capacity Policy Circular 7008.1A • Guidance for Transit Financial Plans June 2000 • Reporting Instructions • Guidelines and Standards for Assessing Local Financial Commitment
Project Development Requirements	-	• 23 CFR 771 • 49 CFR 622 • 2006 Guidance on New Starts Policies and Procedures - May 16, 2006 (Section 1) - Reference for New Starts Rating Information in ROD
Final NEPA Documentation (i.e., Categorical Exclusion, Finding of No Significant Impact, or Record of Decision) including description of required environmental permits and New Starts rating Information in ROD is the New Starts Rating is less than "medium"		

PRODUCTS	***FTA CONCURRENCE DATE***	***REFERENCE (Regulations, Guidance and Other Resources)***
Before and After Study Documentation of Methods and "Predicted" Results and Identification of Responsible Contractors		• Draft Before and After Guidance Available on Request • 2006 Guidance on New Starts Policies and Procedures - May 16, 2006
TIP and STIP Programming of Final Design and Construction (and update or amendment of long range plans, if needed)		• Capital Program Circular 9300.1A • Transportation Planning Final Rule
Travel Forecasts (If changed since approval to enter PE)	-	• Travel Forecasting for New Starts Proposals (From FTA Workshop) • Alternatives Analysis Technical Guidance (Part II.5-6) • Reporting Instructions
Documentation of Methodologies and Assumptions		
Summit Reports and Maps		
Travel Forecasts Template		
Annualization Factor Justification		
PROJECT MANAGEMENT PLAN (PMP) UPDATE	-	• 40 CFR 633 (Subpart C) • FTA P&CM Guidelines (Chapter 2-4) • Grant Management Circular 5010.1C (Chapter 1) • Full Funding Grant Agreements Guidance 5200.1A (Chapter 2) • QA/QC Guidelines
Basic Requirements Update	-	
Project Sponsor Staff Organization		
Project Budget & Schedule		
Procedures Update	-	
Document Control Procedures		
Change Order Procedures		
Material Testing Procedures		
Internal Reporting Procedures		
Operational Testing Procedures		
Quality Assurance/Quality Control (QA/QC)		
Plans Update	-	• FTA P&CM Guidelines (Chapter 2 & 3)
Contingency Management Plan (identifying significant areas of uncertainty in scope cost and schedule)		
Real Estate Acquisition Management Plan (RAMP)		• 49 CFR 24 • Uniform Act • Real Estate Page of FTA Website and FTA Real Estate Course
Rail Fleet Management Plan (RFMP)		• Grant Management Circular 5010.1C (Chapter 1) • FFGA Guidance 5200.1A (Chapter 2)
Bus Fleet Management Plan (BFMP)		
Safety and Security Management Plan (SSMP)		• SSMP Circular 5800.1 • Full Funding Grant Agreements Guidance 5200.1A (Chapter 2) • 49 CFR 659 • FTA P&CM Guidelines (Chapter 2)
Operating Plan		• FTA P&CM Guidelines (Chapter 3)
Configuration Management Plan		• FTA P&CM Guidelines (Chapter 5)

PRODUCTS	*FTA CONCURRENCE DATE*	*REFERENCE (Regulations, Guidance and Other Resources)*
Other Project Management Plans	-	• Capital Program Circular 9300.1A (Chapter V) • Grant Management Circular 5010.1C (Chapter 1) • FTA P&CM Guidelines (Chapter 4)
Value Engineering Analysis Report		
Procurement Contract Packages	-	• FTA P&CM Guidelines (Chapter 4) • Third Part Contracting Circular 4220.1E
Contracting Plan for Final Design Phase		
Contracting Plan for Construction/Procurement (draft policies and procedures for all proposed contracting) inclusive of profit strategies and proposed risk allocation measures)		
Claims Avoidance Plan for Final Design		• FTA P&CM Guidelines (Chapter 3)
Claims Avoidance Plan for Construction/ Procurement Phase		
General Conditions (preliminary drafted for design, construction and procurement contracts)		
Third Party Agreements	-	• Grant Management Circular 5010.1C (Chapter 1) • 23 CFR 645, Utilities • FTA P&CM Guidelines (Chapter 4) • FFG Guidance 5200.1A (Chapter 2)
Utility Agreements (negotiated and completed to the extent possible)		
Master, Interagency, Public/Private, Joint Development, Railroad and Right of Way Agreements (negotiated and completed to the extent possible)		
NEW STARTS TEMPLATES, CERTIFICATIONS, AND OTHER REPORTS	-	• Reporting Instructions
New Starts Criteria Templates and Certifications		
SCC Annualized Cost Worksheets		• Standard Cost Categories for Capital Projects
Land Use Supporting Information		• Reporting Instructions • Guidelines and Standards for Assessing Transit-Supportive Land Use
Making the Case Document		• Reporting Instructions • Examples on FTA Website
ADMINISTRATIVE REQUIREMENTS	-	• Capital Program Circular 9300.1A (Chapter 6)
Legal Capacity (Authority to undertake implementation of proposed transit mode)		
Authority to pursue and contract with project delivery method proposed (if not design-bid-build)		• FTA P&CM Guidelines (Chapter 4)
Grantee Letter of Request for FD Initiation		

Source: FTA

In addition to meeting FTA requirements for project evaluation, design, and construction, projects receiving FTA funding must also meet the Buy America requirements outlined in 49 CFR Part 661 and the final policy guidance for Buy America requirements issued by FTA on September 1, 2016[16]. According to the FTA in its final guidance, the domestic content requirement minimum for passenger rail equipment procurements for Fiscal Years 2016 and 2017 is more than 60 percent and by Fiscal Year 2020, the minimum will be more than 70 percent[17]. These requirements have had a significant impact on the range of rolling stock available for rail passenger services. DMU railcars are now available for commuter rail implementation that meet these requirements, including new FRA Compliant DMU vehicles, like those considered for potential implementation on the Iowa City-North Liberty Corridor.

16 *http://www.progressiverailroading.com/passenger_rail/news/FTA-issues-final-policy-guidance-for-Buy-America-requirements*
17 *Ibid*

It is possible that a proposed passenger rail project may fall within both FTA and FRA programs. A common example would be a commuter rail project sharing tracks with an active freight railroad and that is also seeking FTA New Starts or Small Starts funding. In this instance, the FRA safety regulations would apply, along with the FTA project evaluation and project management requirements. The two agencies have worked together in the past to apply complementary regulations when appropriate.

5.2 Surface Transportation Board

The STB is generally focused upon the economic regulation of the general railway system in the U.S., dealing with rail line construction; implementation of new freight or passenger common-carrier services that expand geographically beyond existing services; rate and service levels, adequacy, and disputes; acquisition, sale, or merger of private rail freight operators; and abandonments of common-carrier obligations. The STB generally does not have jurisdiction over mass transportation provided by a local government authority. The most common STB involvement related to urban passenger service results from abandonment of an existing freight common-carrier obligation associated with implementation of new rail passenger service. In addition, STB authority may be required for implementation of a new commuter rail service if it is jointly marketed or operated with an interstate passenger rail service. Because the CRANDIC segment proposed for the Corridor is currently a freight railroad with a common-carrier obligation, STB abandonment procedures may be required if the passenger rail mode selected, or the characteristics of the passenger service, preclude or substantially modify the CRANDIC's ability to provide for its common-carrier obligation.

Railroad abandonment requirements follow a process documented in 49 CFR 1152: Abandonment and Discontinuance of Rail Lines and Rail Transportation. The Iowa DOT actively participates in the railroad abandonment process within the state[18]. The key activities in the railroad abandonment process are summarized below:

- Filing of a Notice of Intent weekly for three consecutive weeks in a local newspaper in each county in which any part of the line is located.
- Filing the Abandonment Application with the STB and appropriate State offices. Application will describe physical condition of the line, financial aspects of the operation, and justification for the abandonment. Notice of intent to file and offer of financial assistance must be made within 30 days of the application filing.
- Public involvement for 45 days following the application filing for persons who oppose the application. An oral hearing may be requested. Notarized comments must be sent to the STB and the railroad/ representative filing the application.
- Applicant's reply or rebuttal to opposition within 60 days of application filing.
- Deadline for STB decision on merits of case within 110 days of filing.
- Offers of financial assistance to preserve service must be made within 10 days of STB decision.

A carrier may file for a Notice of Exemption if it can certify that:

- No local traffic has moved over the line for at least 2 years; and
- Any overhead traffic on the line can be rerouted over other lines;
- No formal complaint filed by the user of rail service on the line is pending or has been decided in favor or the complainant within two years.

The STB must find that the line is not necessary to carry out the rail transportation policy of the U.S. Government as established in Title 49 USC 10101, and the line is of limited scope and continued regulation is unnecessary to protect shippers from abuse of market power before the abandonment can be approved.

Parties seeking a public use condition in an abandonment proceeding must file a written request for public use condition with the STB no later than 45 days after the application is filed. If successful negotiations are not completed within 180 days, the railroad company is free to accept any other offer.

---

18 Railroad Abandonment, Iowa Department of Transportation, Revised March 25, 1997

The Study anticipates that the CRANDIC Corridor between Gilbert Street in Iowa City (approximately Milepost 25.8) and Forever Green Road in North Liberty (approximately Milepost 18.7) would be passenger rail only, and that CRANDIC would maintain physical connections to its existing contiguous freight only network at those locations. If in the future CRANDIC desires to reinstate its common-carrier obligation and provide freight rail service over the Iowa City-North Liberty segment, which would establish a shared-use passenger and freight rail corridor, it would be required to file with the STB.

5.3 Environmental Review

This section summarizes the general environmental requirements for construction and implementation of a passenger rail corridor and service between Iowa City and North Liberty.

5.3.1 Assumptions for Environmental Review

The process for environmental documentation review for a passenger rail project in the CRANDIC Corridor assumes the following:

- The document will analyze the environmental impact(s) of a passenger rail service in the Corridor between Iowa City and North Liberty.
- The Federal Transit Administration (FTA) is the Lead Agency for the National Environmental Policy Act (NEPA) with cooperation from the Surface Transportation Board (STB).
- The Iowa DOT or one or more local Iowa jurisdictions will be the Grantee, and if Iowa DOT is not the Grantee, it may be the Lead Agency.
- Based upon the characteristics of the Iowa City to North Liberty Corridor and the range of alternatives, the environmental class of action is anticipated to be either an Environmental Assessment (EA) or an Environmental Impact Statement (EIS).

5.3.2 Review Process

The Lead Agency and Grantee for the project will conduct scoping to determine major project issues and additional studies that may be needed in accordance with FTA requirements. The findings will be documented in memoranda and ultimately the NEPA document. Based on the conclusions of the scoping process, a class of action recommendation for FTA review and a Project Work Plan, which specifically includes a project schedule and detailed scope of work, will be submitted. The FTA will decide if the class of action for the project is an EA or an EIS. This step may be delayed until completion of additional environmental analysis.

If it is determined that the appropriate environmental class of action is an EIS, the Lead Agency will issue a Notice of Intent (NOI) to advise agencies and the public about the preparation of an EIS. The NOI will invite the public to comment on the scope of the document, purpose and need of the project, alternatives to be considered, impacts to be evaluated, and methodologies to be used in the evaluation.

The Lead Agency and Grantee will prepare technical studies and appropriate documentation in accordance with FTA's environmental procedures. The analysis will include typical impacts associated with passenger rail projects including noise, traffic, cultural and historical resources, wetlands and other waters of the U.S., threatened and endangered species, and other components. If the class of action was not determined prior to the technical studies, it would be determined using the results of the technical studies.

A Public Involvement Plan (PIP) will be developed which identifies various private and public stakeholders. These will include, but are not limited to agency partners, community groups, advocacy groups, business groups, potential riders of the passenger rail service, freight railroad hosting the service, and potential passenger rail service providers. The PIP typically includes strategies for the receiving and processing public input.

The Lead Agency and Grantee will complete an FTA-approved EA or EIS for construction of the project. For an EIS, a draft environmental document will be circulated and a public hearing for public input will be held. The FRA will complete a Final EIS document and a Record of Decision (ROD). For an EA, the environmental document will be circulated and a public meeting for public input will be held. If an EA is required, the FTA will complete a decision document, either a Finding of No Significant Impact (FONSI), or recommendation for completion of an EIS. The Grantee will identify all necessary mitigation and permits required for project construction and implementation.

The environmental process may potentially take between 12 months and 36 months to complete, depending upon the environmental class of action and the review process.

5.3.3 Contents of the Environmental Document

The EA or EIS will include, but is not limited to, the following:

- Project Description including a description of existing conditions in the Corridor.
- Purpose and Need for the project.
- Identification and environmental analysis of project build alternatives.
- Assessment of impacts of the proposed action and alternatives and necessary mitigation for impacts.

5.3.4 Impacts of MAP-21 on the Environmental Process

The U.S. Department of Transportation's (USDOT) Moving Ahead for Progress in the 21st Century Act (MAP-21) revised the process for preparing an EIS in Draft and Final formats. After the Draft EIS has been prepared by the Grantee and approved by the Lead Agency, MAP-21 provides for the preparation of the Final EIS during Project Development by attaching errata sheets to the Draft EIS if certain conditions are met. In addition, the USDOT allows Grantees to develop a single document that combines the Final EIS and the ROD.

Once the Lead Agency approves the Grantee's request to enter into Project Development (including project Environmental Analysis and Preliminary Engineering), MAP-21 requires that the Grantee submits the Final EIS within two years of entry.

5.3.5 Permitting and Mitigation Monitoring Plan

Environmental documentation will include identification of the permits required for the project. Permit applications will need to be developed and all mitigation and associated conditions incorporated into the construction plan. A Mitigation Monitoring Plan (MMP) will be developed that details mitigation monitoring measures to be implemented during construction of the project. The MMP provides the plan to maintain compliance, when to obtain permits, and identification of the agencies responsible for issuing permits. The MMP will identify and describe adverse and beneficial effects of the project, identify specific measures to mitigate the adverse impacts, and list parties that are responsible for ensuring compliance.

HDR