Chapter 2: Project Alternatives

2.1 Introduction

NEPA and its implementing regulations require consideration of reasonable alternatives to a proposed project. The Council on Environmental Quality's NEPA regulations (40 CFR Parts 1500-1508) state that Federal agencies should "Use the NEPA process to identify and assess the reasonable alternatives to proposed actions that will avoid or minimize adverse impacts of these actions upon the quality of the human environment" (§ 1502.2). This chapter discusses the potential alternatives for the Project. **Section 2.2** of this chapter describes the process FRA and NYSDOT used to evaluate alternatives and identify reasonable alternatives for further consideration in this EA. **Section 2.3** describes the alternatives that FRA and NYSDOT considered and eliminated from further study in the screening evaluation. The alternatives that were retained for evaluation in the EA are discussed in **Section 2.4**: the No Action Alternative (**Section 2.4.1**) and the Build Alternatives (**Section 2.4.2**), including Build Alternative 1, Replacement on an Adjacent North Alignment, and Build Alternative 2, Replacement on an Adjacent South Alignment. **Section 2.5** identifies the Preferred Alternative and **Section 2.6** discusses the potential permits required for the Project.

2.2 Alternatives Evaluation and Identification of Reasonable Alternatives

As discussed in **Chapter 1, "Project Purpose and Need,"** the purpose of the Project is to improve reliability and reduce passenger and freight train delays along this segment of the Empire Corridor; achieve (at a minimum) a long-term state-of-good-repair for the bridge; eliminate existing bridge and track deficiencies; and maintain or improve navigation near the bridge. FRA and NYSDOT considered a range of different alternatives for repairing, rehabilitating, or replacing the Livingston Avenue Bridge to identify alternatives that would meet that purpose and need and be feasible and reasonable.

In evaluating alternatives, FRA and NYSDOT first assessed whether they would meet the Project purpose and need. All alternatives that met the Project purpose and need were then evaluated to identify whether they were feasible and reasonable based on their ability to meet the established Project goals and, where relevant, preliminary information on the potential cost, engineering factors, and likely environmental and transportation impacts.

Using that approach, FRA and NYSDOT considered a number of alternatives, including elimination of a bridge at the current location, rehabilitation of the bridge, and replacement of the bridge on various alignments. FRA and NYSDOT also considered several bridge types in the evaluation. FRA and NYSDOT determined that discontinuation of a rail crossing between Albany and Rensselaer, repair and rehabilitation of the existing bridge, and replacement of the bridge within the existing bridge footprint would not be reasonable alternatives for the reasons described in **Exhibit 2-1**. FRA and NYSDOT concluded that two Build Alternatives that replace the existing bridge with a new lift bridge either just south or just north of the existing alignment would meet the purpose and need and be feasible and reasonable. The No Action Alternative was also retained for analysis in the EA to serve as a benchmark against which to compare the impacts of the Build Alternatives. **Exhibit 2-1** summarizes the conclusions of the alternatives evaluation, which is presented in more detail in the following sections of this chapter.

Exhibit 2-1
Summary of Alternatives Evaluation

Alternative	Evaluation
Permanent Detour: Use of Alternate Routes (see **Section 2.3.1**)*	Not reasonable because it would not meet the Project purpose and need.
Rehabilitation: Bridge Repairs (**Section 2.3.2.1**)*	Not reasonable because it would not meet the Project purpose and need. Also would not satisfy the Project goal of improving service reliability and operational flexibility (Goal 1), upgrading the load capacity of the bridge (Goal 2), or the Goal 2 objectives of improving the design life of the structure and eliminating the existing geometric deficiencies.
Rehabilitation of Existing Bridge (Substructure and Superstructure) to Accommodate Mixed Rail Traffic (**Section 2.3.2.2**)*	Not reasonable because it would not meet the Project goal of removing existing structural operational limitations (Goal 2) or the goal of minimizing conflicts with river traffic (Goal 3); would also not meet Goal 1 objective of eliminating track deficiencies and Goal 2 objective of providing a river crossing with a design life of a minimum of 100 years. Would have a cost ranging between 83 and 91 percent of the cost of replacing the structure.
Rehabilitation of Existing Bridge for Passenger Trains Only (**Section 2.3.2.3**)*	Not reasonable because it would not meet the Project purpose and need. Also would not meet Project objectives in Goal 2 of maintaining or improving freight movement across the bridge; improving the load rating of the structure to Cooper E-80 freight traffic; or supporting simultaneous two-track operation; and would not meet the goal of minimizing conflicts with river traffic (Goal 3).
Rehabilitation of Existing Bridge – Superstructure Replacement (**Section 2.3.2.4**)*	Not reasonable because it would not meet the Project goal of minimizing conflicts with marine traffic (Goal 3); would not meet Goal 1 objective of eliminating track deficiencies or Goal 2 objective of providing a 100-year design life. Other goals and objectives would not be met in a cost-effective manner.
Replacement Bridge on Existing Alignment (**Section 2.3.3.1**)*	Eliminated because it would have a higher cost and greater construction complexity than other replacement alternatives without providing any advantages.
Replacement Bridge on New Alignment (**Section 2.3.3.2**)*	Not reasonable because it would not meet Project objective of improving freight and passenger rail capacity in a cost-effective manner (part of Goal 1); or the goal of minimizing conflicts with river traffic through improved clearances (Goal 3). Would have much greater cost, need substantially more property acquisition, and would have greater environmental, social, and construction impacts.
Alternative Bridge Types (**Section 2.3.4**)*	A fixed span was eliminated because it would have construction complexities, much greater cost, need for substantially more property acquisition, and far greater environmental, social, and construction impacts for a lengthy new structure. A swing span was eliminated because it would have more complex mechanics that are more difficult to maintain and less reliable to operate than a lift span; a swing span also would not increase the width of the navigation channel. A bascule span was eliminated because it would not provide sufficient navigational clearance to meet Goal 3.
No Action Alternative (**Section 2.4.1**)**	Would not meet Project purpose and need or any goals or objectives but retained to serve as a comparative baseline for the environmental analyses as required by NEPA.
Build Alternative 1, Replacement on an Adjacent North Alignment (**Section 2.4.2**)**	Would meet the Project purpose and need and goals and objectives; evaluated in this EA.
Build Alternative 2, Replacement on an Adjacent South Alignment (**Section 2.4.2**)**	Would meet the Project purpose and need and goals and objectives; evaluated in this EA.

Notes:

* Alternative Eliminated from Further Consideration

** Alternative Retained for Further Analysis

2.3 Alternatives Eliminated from Further Consideration

In the alternatives evaluation, FRA and NYSDOT determined that discontinuation of a rail crossing between Albany and Rensselaer, rehabilitation of the existing bridge, and replacement in a new location or in the existing bridge footprint would not be reasonable alternatives. FRA and NYSDOT also reviewed bridge types and determined that a fixed bridge would not be reasonable and a lift bridge would be preferable to other types of movable bridges.

2.3.1 Permanent Detour: Use of Alternate Routes

There are no alternative passenger or freight routes that would be suitable as a permanent detour from the existing Livingston Avenue Bridge. The bridge is one of two rail crossings of the Hudson River near Albany. The second crossing is the Alfred H. Smith Memorial Bridge on the CSX Castleton Subdivision, which spans the river between Castleton-on-Hudson and Selkirk approximately 10 miles south of the Livingston Avenue Bridge. As an alternative to the Livingston Avenue Bridge, rail traffic could cross the Hudson River by way of the CSX route on the Alfred H. Smith Memorial Bridge, continuing northward using the CSX Selkirk Subdivision (see **Figure 2-1**). However, this routing would bypass Amtrak's Schenectady and Albany-Rensselaer Stations, which are important station stops for Amtrak (the Albany-Rensselaer Station is the ninth busiest Amtrak station in the country and serves the New York State capital at Albany). To route passenger trains in this manner would likely require new bypass track around the Selkirk Yard to avoid potential conflicts between passenger and freight train traffic. The diversion would increase travel times by roughly 2.5 hours for through passengers on the Empire Corridor due to restricted speeds through the yard and over the Alfred H. Smith Memorial Bridge, and would negatively affect ridership and Amtrak crew availability while requiring additional train sets. The cost of upgrading and placing new track within the existing rail right-of-way would be extensive. This routing would also make connections to CP's Canadian Mainline more difficult, thereby increasing travel times between New York City and points north of Albany, including Montreal and Vermont. For freight rail, this routing does not serve Schenectady, Rensselaer, and other communities currently served by CSX tracks crossing the Livingston Avenue Bridge.

Without a river crossing at Albany, another alternative would be to reroute freight trains as noted above and eliminate passenger rail service north of Albany. Travelers could instead travel by passenger car using the New York State Thruway (I-87 and I-90), which is generally parallel to the Empire Corridor, and the Northway (I-87), which is generally parallel to Adirondack rail routes. Intercity buses are also available to most locations, but not all buses provide for the same point-to-point service as Amtrak. Travelers could also use airlines, which provide direct service between New York City and Albany, Syracuse, Rochester, and Buffalo. However, there is no direct air service between the upstate cities and many communities along Amtrak's Adirondack and Ethan Allen Express routes do not have commercial air service.

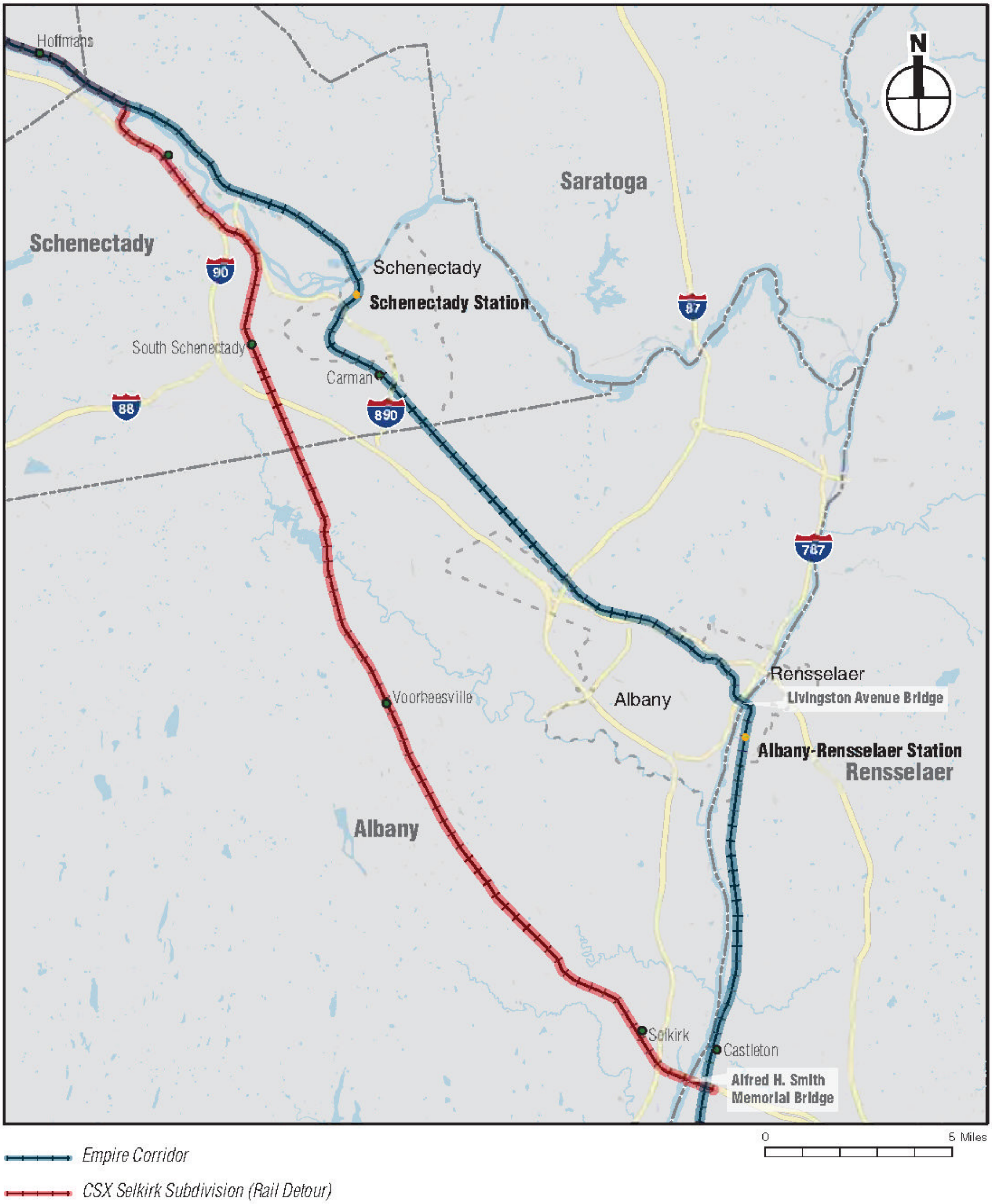
Overall, directing trains to a route that is 2.5 hours longer or eliminating rail service north of Albany does not meet, and is counter to, the Project purpose and need. Therefore, this alternative was eliminated from further consideration.

2.3.2 Rehabilitation Alternatives

The Rehabilitation Alternatives include improvements to the existing Livingston Avenue Bridge to address structural and seismic deficiencies. FRA and NYSDOT considered several levels of rehabilitation for the bridge, as discussed below.

2.3.2.1 Bridge Repairs

This alternative would repair worn and damaged components and restore the bridge to an as-built condition. The repair would include miscellaneous superstructure repairs, floor system repairs, bridge painting, pier repairs, new steel sheeting around piers for scour prevention, new fenders



Rail Detour if Livingston Avenue Bridge is Closed

Figure 2-1

for pier protection, upgrading electrical, mechanical, and track systems, and safety improvements. However, the bridge's live load capacity would not be improved, existing geometric deficiencies and vertical and horizontal clearance deficiencies would not be corrected, and the wye at the east approach to the bridge would not be realigned. With these substandard conditions, operations across the bridge would remain limited to single-track operation at 15 mph. In addition, the design life of this alternative would be only 15 years.

This alternative would not meet the purpose and need for the Project and would not satisfy the Project goal of improving service reliability and operational flexibility (Goal 1), upgrading the load capacity of the bridge (Goal 2), or the Goal 2 objectives of providing a river crossing with a design life of a minimum of 100 years and eliminating the existing geometric deficiencies. Therefore, this alternative was eliminated from further consideration.

2.3.2.2 Rehabilitation of Existing Bridge (Substructure and Superstructure) to Accommodate Mixed Rail Traffic

The most extensive form of rehabilitation, providing the greatest structural enhancement, would involve rehabilitation of both the existing bridge's substructure and its superstructure to increase the load capacity to allow double-track operation at 30 mph[6] and remove the existing structural and seismic deficiencies. However, the horizontal and vertical clearance deficiencies of the existing structure would remain. This extensive rehabilitation would likely extend the design life of the structure by 50 years.

The existing truss superstructure would be repaired and strengthened and the existing stringers (beams on which the track bed is laid), railroad ties, and track would be replaced. Existing truss gusset plates (the metal plates that connect the beams and girders to columns in the truss superstructure) may also need to be replaced to provide the strength needed for an increased load capacity. However, because of the design of the bridge's truss sections, strengthening the gusset plates may not be possible.

The existing mechanical and electrical equipment used to operate the bridge would be rehabilitated or replaced. The existing bridge piers supporting the truss spans, which consist of masonry block with timber piles below, would be encapsulated with concrete to address rotting and erosion in order to provide adequate structural and seismic capacity. Encapsulation of the piers would narrow an already limited navigation channel. The bridge abutments would also require reinforced concrete encapsulation or replacement.

To correct the existing substandard approach track geometry (i.e., sharp curve) and structural deficiencies, the bridge's four through girder spans on the east side of the structure near Rensselaer could be replaced on a new alignment instead of rehabilitated. In that case, the existing piers supporting the girder spans would be removed and replaced with new substructures as part of this realignment; otherwise, the existing piers would be encapsulated and new steel girders set on top. Retaining the existing deficient geometry would not meet the goal of achieving 30 mph service throughout the Project area.

This alternative would also include realigning the wye spur line on the east approach to connect to the realigned through girder spans. To correct the non-standard connection to the wye that begins on the bridge, this portion of the alignment would have to be widened, with the wye turnout on a separate bridge structure adjacent to the mainline structure.

Construction would occur overnight to minimize interruptions to rail and river traffic during rehabilitation of the truss spans and replacement of the girder spans, but short-term closures to traffic would nonetheless be required. Complex and lengthy staging would be required to rehabilitate the bridge while maintaining rail service across the bridge. This would not be required

[6] Rehabilitation to a load rating of double-track Cooper E-65.

for bridge replacement alternatives, since these could be constructed beside the existing bridge without disrupting train service. For the rehabilitation alternative, the truss superstructure repair would have to occur in sections, with the stringers, ties, and track replaced one panel at a time while single-track service continued across the bridge. The existing steel girder spans would be replaced with ballasted deck girder spans constructed off-line and floated or rolled into place as the existing spans are removed. In addition, staged construction of the through-girder spans would be required, with extensive temporary support installed under the existing girder spans to facilitate removal of one track and through girder while the second track and girder remain in service. Replacement of the west abutment would require installation of a temporary support structure, which would require relocation of Quay Street and temporary, or potentially permanent, closure of that street.

Construction of this rehabilitation alternative would have a longer duration than the construction period for the replacement alternative, largely due to the complication of maintaining an active railway while replacing and rehabilitating important structural members of the bridge. This alternative would require more overnight closures, which would have minimal effect on passenger rail service but would require greater coordination with and potential disruption to freight rail services. The cost of the rehabilitation of the existing structure would range between 83 percent and 91 percent of the cost of replacing the structure (depending which replacement alternative is selected).

While this alternative would allow the existing bridge to remain in place, the need to replace the girder spans, encapsulate the bridge piers, and replace truss components would compromise its historic integrity. This alternative would not meet the Project goal of removing existing structural operational limitations (Goal 2) or the goal of minimizing conflicts with river traffic (Goal 3), nor would it meet the Goal 1 objective of eliminating track deficiencies or the Goal 2 objective of providing a river crossing with a design life of a minimum of 100 years. Given its high cost, complex construction required to maintain rail and maritime operations during construction, and failure to meet two Project goals, this alternative is not reasonable and was eliminated from further consideration.

2.3.2.3 Rehabilitation of Existing Bridge for Passenger Trains Only

FRA and NYSDOT also evaluated a less extensive rehabilitation alternative that would reduce costs and construction duration in comparison to the rehabilitation, to accommodate mixed rail traffic discussed in **Section 2.3.2.2**. In this alternative, the bridge would be rehabilitated to increase the load rating of the structure to allow Amtrak service in single-track operation at 30 mph,[7] but the existing vertical and horizontal clearance deficiencies would remain. This rehabilitation would likely extend the design life of the structure by 50 years.

In this rehabilitation alternative, which would address the requirements for passenger trains but not the heavier freight trains, less steel rehabilitation would occur. In addition, this alternative would not replace the through girder spans on the east side of the structure near Rensselaer, but instead would rehabilitate them by encapsulating them and replacing the steel girders on top. While this would allow passenger trains to operate at 30 mph across the bridge, retaining the existing deficient geometry and structural deficiencies in the through girder portion of the bridge and rehabilitating other steel components to meet the demands of passenger trains would not remove the speed and weight limits for freight trains that cross the bridge.

This alternative would allow the existing bridge to remain in place, but the need to replace elements of the girder spans, encapsulate the bridge piers, and replace truss components would

[7] Rehabilitation to a load rating of single-track Cooper E-65.

compromise its historic integrity. Encapsulation of the piers would also narrow an already limited navigation channel.

In addition, the bridge would no longer support heavy freight rail traffic or simultaneous two track operation. As a result, freight traffic would need to be rerouted, potentially affecting freight routes, affecting established cargo distribution operations, and requiring upgrades to other rail lines and bridges (see **Section 2.3.1**).

The cost to rehabilitate the bridge for passenger trains would be about 95 percent of the cost of rehabilitating the bridge for mixed rail traffic, thereby resulting in minimal cost savings. This would be close to the cost of replacing the structure (79 to 86 percent, depending on which replacement alternative is selected).

This alternative would not meet the Project purpose and need, because it would not improve reliability and reduce freight train delays along this segment of the Empire Corridor or eliminate existing track deficiencies. It also would not meet the Project objectives in Goal 2 of maintaining or improving freight movement across the bridge, improving the load rating of the structure to Cooper E-80 freight traffic, supporting simultaneous two-track operation, or providing a river crossing with a design life of a minimum of 100 years. This alternative would also not meet the goal of minimizing conflicts with river traffic (Goal 3). Therefore, this alternative was eliminated from further consideration.

2.3.2.4 Rehabilitation of Existing Bridge – Superstructure Replacement

The bridge superstructure replacement alternative would completely replace the existing deficient superstructure, rather than rehabilitating it, and retain the existing substructure. This alternative would correct existing non-standard vertical and horizontal clearances. However, this alternative would require certain substructure retrofits rather than their replacement, which, in combination with the feasible superstructure replacements, would cost more than one and a half times greater than the alternative to rehabilitate the bridge completely. Similar to all the rehabilitation alternatives, this alternative would narrow the navigation channel as it passes by the bridge, since the existing bridge piers would be encapsulated with concrete to address rotting and erosion in order to provide adequate structural and seismic capacity. This alternative would also completely alter the appearance of the superstructure. Superstructure replacement would likely extend the design life of the structure by 50 years.

Similar to the full rehabilitation alternative described in **Section 2.3.2.2**, to maintain single-track service, the replacement of the through-girder spans on the east side of the bridge would have to be carefully staged and would require extensive temporary support installed using the same float in/roll in procedure as the replacement on existing alignment option (described in **Section 2.3.3.1**).

The superstructure replacement would substantially alter the appearance of the superstructure, which would compromise the historic integrity of the bridge. NYSDOT evaluated this alternative in accordance with the Bridge Rehabilitation or Replacement Selection Guidelines in the agency's *Bridge Manual*[8] and eliminated it primarily because of cost and impractical design elements. This alternative would not meet the goal of minimizing conflicts with river traffic (Goal 3) and does not meet the Goal 1 objective of eliminating track deficiencies or the Goal 2 objective of providing a 100-year design life. Although this alternative would accomplish some of the goals and objectives of the Project, they would not be met in a cost-effective manner. Therefore, this alternative was eliminated from further consideration.

---

8 NYSDOT, *Bridge Manual*, 4th Edition, April 2006, revised January 2008, pg. 19-7.

2.3.3 Alignment Alternatives

2.3.3.1 Replacement Bridge on Existing Alignment

This alternative would replace the existing bridge with a new bridge, including a lift span, on the existing bridge alignment. This would involve complex construction staging to allow rail traffic to continue to use the existing bridge while the new bridge is being constructed.

The new bridge substructures would be constructed between the existing bridge substructures with minimal impacts to rail or river traffic. Once the new piers are in place, the existing bridge superstructure would be modified to be temporarily supported by the new substructures and then be replaced span by span with the new superstructure.

The new, wider bridge cross section (36'-0" compared to 24'-0" today) would accommodate 14-foot track centers and horizontal clearance requirements and would provide a vertical clearance from top of rail of 23'-6." The new bridge would be designed to accommodate two tracks operating at 30 mph.[9] The bridge would have a lift span with a navigational opening approximately 190 feet wide, east of the existing swing span. (See the discussion of movable bridge types in **Section 2.3.4** for the reasons this alternative would have a lift span.)

The new superstructure spans would be erected on barges and floated into position as the existing span sections are floated out. The existing truss spans would require modification prior to float in/float out to allow them to be removed in pieces. The span-by-span replacement construction method would require a series of 8- to 12-hour rail and boating closures. The steel girder spans on the east end of the bridge would require temporary falsework to be erected in the shallow water where float-in and float-out are not possible, similar to the replacement alternatives described later in this chapter.

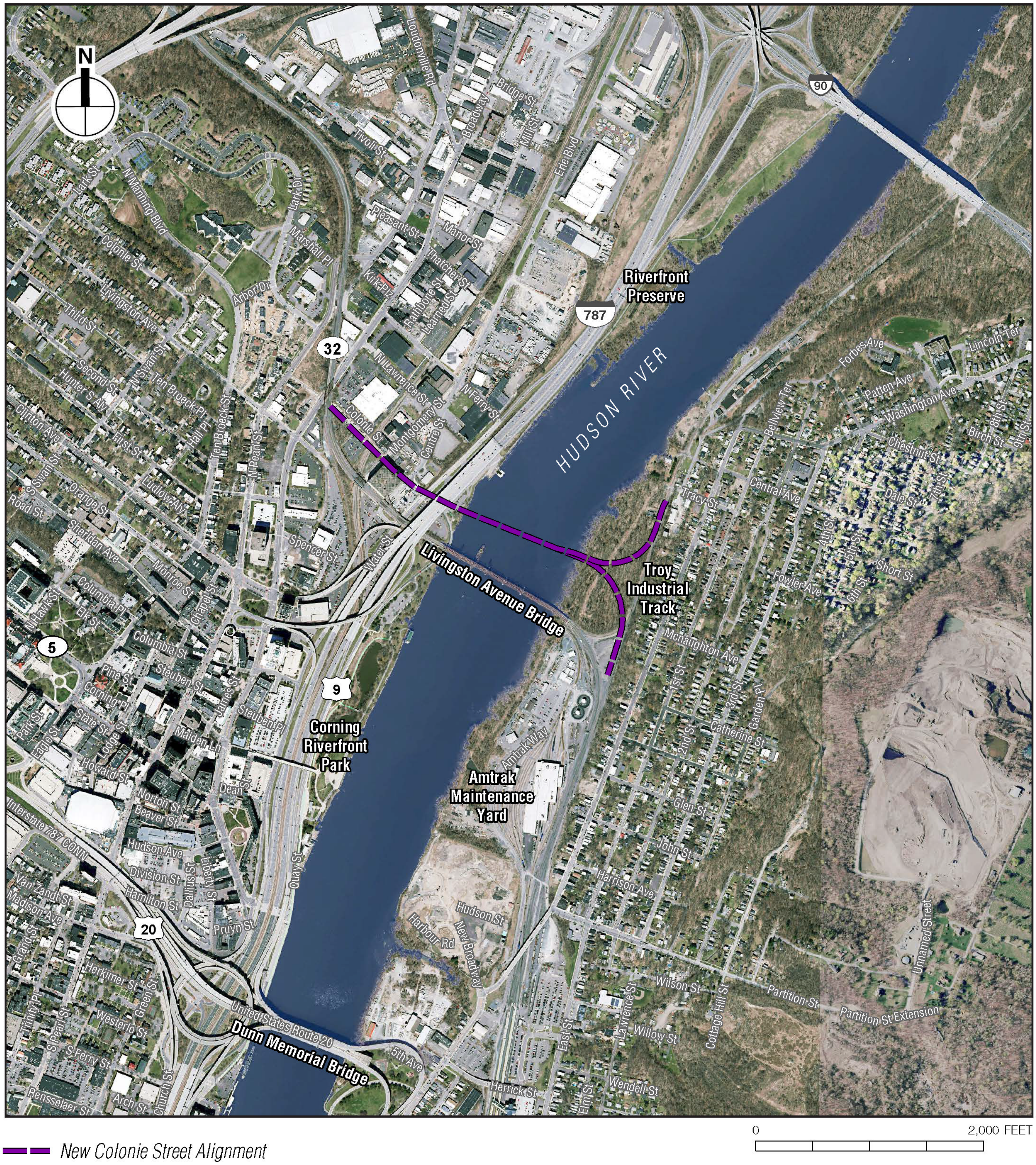
This alternative would also include realignment of the wye track east of the bridge, which would require additional and separate superstructure from the bridge itself.

Because of the construction complexities, this alternative would have a higher cost than replacing the bridge on a parallel alignment to the north or south of the existing bridge. The estimated construction cost for this alternative is $392 million, which is 9 percent higher than a replacement bridge using a northern alignment (Build Alternative 1) and 18 percent higher than a replacement bridge using a southern alignment (Build Alternative 2). This alternative would also be complex and difficult to construct due to the new substructures needed under the existing bridge and the need to replace the existing spans in sections while maintaining rail traffic across the bridge during construction. Other than requiring less property acquisition, because the new bridge would be predominately within its existing right-of-way, the replacement on the existing alignment does not provide an advantage over the replacement alternatives on other alignments. Therefore, this alternative was eliminated from further consideration.

2.3.3.2 Replacement Bridge on New Alignment

Another alternative is to construct a new river crossing on a new alignment and leave the existing Livingston Avenue Bridge in place. Any replacement alternative that would tie into the existing bridge approaches (i.e., Build Alternatives 1 and 2) would not allow the existing bridge to remain in place, as the existing swing span would not have enough clearance to remain open for river traffic; therefore, FRA and NYSDOT evaluated a replacement alternative farther away on an alignment with Colonie Street (see **Figure 2-2**). With this alternative, a new river crossing and bridge approaches would be constructed approximately 500 feet north of the existing Livingston Avenue Bridge, aligned with Colonie Street in Albany. West of the Hudson River in Albany, the rail line would continue along present-day Colonie Street and tie in with the existing rail line between

9 The load rating would be Cooper E-80.



Build at a New Location Alternative

Figure 2-2

Montgomery Street and Broadway. On the east side of the Hudson River in Rensselaer, a new wye would be developed about 500 feet north of the existing wye to tie in with the existing north-south rail tracks.

In Albany, this alternative would require acquisition of new rail right-of-way through a developed urban area, displacing the existing Colonie Street right-of-way, requiring realignment of surrounding streets, and affecting access to properties. The existing street right-of-way would need to be widened to accommodate the dual-track rail right-of-way and adequate safety standards, thereby requiring extensive property acquisition. This alternative would also affect access to publicly accessible recreational facilities such as the existing Mohawk-Hudson Bike-Hike Trail and the existing boat ramp at the Riverfront Preserve (described below in **Section 4.2**). The Broadway–Colonie Street Railroad Bridge, which is a historic structure, would be affected, likely resulting in an adverse effect to this historic property. In Rensselaer, the new alignment would require acquisition of vacant forested land, similar to the Build Alternatives.

An alignment south of the existing bridge with sufficient clearance for the swing span of the existing bridge would have comparable challenges. West of the Hudson River, such an alignment would have to pass over or through Corning Riverfront Park, potentially affecting features of, and access to, this park. Similar to the Colonie Street alignment discussed above, this alignment would require displacement of multiple residential and commercial properties within a densely developed urban environment and would be further constrained by piers of the existing I-787–U.S. Route 9 interchange, which limit the ability to tie the new rail alignment to existing rail tracks. East of the Hudson River, this alignment would require realignment of numerous rail tracks in the Amtrak Maintenance Facility and would complicate tie-in with existing north-south rail tracks and the Albany-Rensselaer Station.

Realignment of the bridge further north or south of the existing alignment would have potentially extensive environmental impacts. These alignments would not be practical as they would not take advantage of the already established rail right-of-way that serves this heavily traveled freight and passenger rail corridor, thereby requiring extensive property acquisition and substantial additional expenditures. In addition, maintaining the existing bridge would perpetuate existing horizontal and vertical clearance limitations.

In addition, while this alternative would allow the historic Livingston Avenue Bridge to remain in place, it would not necessarily avoid adverse effects to the historic property. The bridge could remain in place for a future non-rail use, such as recreation or tourism, but the deteriorated components would need to be replaced or rehabilitated to meet safety requirements. As such, the historic integrity of the bridge could be compromised. Further, the bridge would need to be transferred to a new owner who would be responsible for maintaining the structure. USCG would likely require the swing span to remain in the open position to accommodate river vessels. This would also limit the practicality of maintaining the bridge for some alternative functional use.

This alternative would fail to meet the Project objective of improving freight and passenger rail capacity in a cost-effective manner (part of Goal 1); or the goal of minimizing conflicts with river traffic through improved clearances (Goal 3). It would have greater cost, require substantially more property acquisition, and would have greater environmental, social, and construction impacts. Other structure replacement alignments that use the existing rail right-of–way would achieve the benefits of this alternative without the environmental impacts. Therefore, this alternative was eliminated from further consideration.

2.3.4 Alternative Replacement Bridge Types

2.3.4.1 Fixed Bridge

A fixed, rather than movable, rail bridge across the Hudson River on the Empire Corridor would eliminate the need to have a movable span that opens to allow boat traffic to pass. The bridge would need to provide a vertical clearance of 60 feet above Mean High Water to provide the same navigational clearance as the bridges to the immediate north and south of the existing Livingston Avenue Bridge—the Patroon Island Bridge about a mile to the north, which carries I-90 over the Hudson River; and the Dunn Memorial Bridge close to a mile to the south, which carries U.S. Routes 9 and 20 across the river. This would mean that the trackbed of a new fixed bridge would be approximately 35 feet higher than the existing bridge's tracks.

Because of the need to provide a shallow grade of no more than 1.5 percent to accommodate freight trains, the fixed bridge alternative would require new landside approach tracks extending almost a mile from the bridge abutments on a new alignment. In Rensselaer, the bridge approach would need to begin climbing above existing grade immediately north of Albany-Rensselaer Station, then turn east to continue gaining elevation before turning 180 degrees to come back west and cross the Hudson River. With this alternative, the wye track could not connect to the new bridge because the grade would be too steep to allow this connection. Amtrak might choose to retain the wye for the purpose of turning trains for return trips to New York City. Freight trains traveling between Albany and the Troy Industrial Track would need to pull south to the point where the new fixed bridge alignment ties back into the existing grade, then reverse to continue onward to their destination. In Albany, the bridge approach would be along a new right-of-way, so that the Albany Railroad Viaduct would no longer serve the mainline track. This could result in an adverse effect to the historic viaduct by eliminating its function. The lengthy landside approach would require extensive property acquisition in a densely developed area through several neighborhoods near downtown Albany and would likely require realignment of surrounding streets.

Given the construction complexities, much greater cost, need for substantially more property acquisition, and far greater construction impacts for a lengthy new structure, FRA and NYSDOT eliminated a fixed bridge alternative from further consideration.

2.3.4.2 Movable Bridge Types

Moveable bridge types include swing, bascule, and vertical lift. A brief description of each is provided in this section.

Swing bridges, like the existing Livingston Avenue Bridge, have a structural pier on which the movable span can pivot out of the navigation channel. Swing bridges can pivot on a central support, as with the Livingston Avenue Bridge, creating two parallel navigational channels on either side of the support. They can also pivot on one end of the span, opening as a gate. This type of swing bridge typically has a narrower opening than swing bridges with a central support, because of the increased counterweight size and mechanical requirements of not being able to balance the weight of the movable span. In either case, the support pier occupies some of the navigation channel.

Bascule bridges have a span (called a leaf) that lifts from one side. Bascule bridges can have one leaf or two, in which case the leaves rest on a center pier and open from both sides of the navigational opening. As a replacement to the Livingston Avenue Bridge, a bascule bridge would provide a navigational opening that is less than a lift bridge, and would cost more to construct than a lift bridge.

Vertical lift bridges operate by moving a center span vertically to allow the passage of vessels underneath. The center span operates along two towers that house the counterweights required to raise and lower the movable span. A vertical lift bridge offers a longer span than other movable bridge types, which will allow for a wider navigation channel. In addition, lift bridges generally have less complex mechanical devices than swing bridges, and are easier to maintain and more reliable to operate.

Because lift bridges provide a wider navigation span than swing or bascule bridges, with greater reliability and ease of maintenance than swing bridges and lower cost than bascule bridges, FRA and NYSDOT have selected a lift bridge for the Livingston Avenue Bridge replacement.

2.4 Alternatives Retained for Further Analysis

Based on the alternatives evaluation, FRA and NYSDOT advanced three alternatives for analysis in this EA: the No Action Alternative, which is required by NEPA; and two replacement bridge alternatives, one to the south and one to the north of the existing Livingston Avenue Bridge. Both replacement bridge alternatives would create a new lift bridge close to the existing bridge, and once the new bridge is in operation, the old bridge would be removed. Both Build Alternatives meet the Project purpose and need and the Project goals and objectives and are reasonable alternatives for evaluation in the EA.

2.4.1 No Action Alternative

The NEPA regulations require examination of a No Action Alternative, which is an alternative to examine the conditions that would exist if the proposed action were not implemented. The No Action Alternative serves as a baseline against which the potential benefits and impacts of the Build Alternatives can be compared. NYSDOT's regulations for implementing SEQRA also require consideration of a No Action Alternative.

In the No Action Alternative, the Livingston Avenue Bridge would remain in service as is, with continued routine maintenance and repairs. No major improvements to, or replacement of, the Livingston Avenue Bridge would be undertaken with the No Action Alternative. The bridge's live load capacity would not be improved, existing geometric deficiencies and vertical and horizontal clearance deficiencies would not be corrected, and the wye at the east approach to the bridge would not be realigned. Operations across the bridge would remain limited to single-track operation at 15 mph.

The No Action Alternative would result in the continued deterioration of the structure, resulting in increased maintenance, and eventually could require the bridge to be closed to rail traffic. If the bridge were to close in the future, trains would have to cross the Hudson River via an inefficient, longer route. In that situation, passenger trains could be diverted to lower class track and across another Hudson River crossing, the Alfred H. Smith Memorial Bridge, on the CSX Castleton Subdivision, which spans the river between Castleton-on-Hudson and Selkirk. Routes would be longer and trains would either have to bypass the Albany-Rensselaer and Schenectady Stations completely or make circuitous routes to reach them that would add to the required detour (see the discussion of the permanent detour alternative in **Section 2.3.1**).

In addition to operational limitations, the No Action Alternative would adversely affect river traffic. Existing horizontal clearance limitations would not be improved. The mechanical features of the swing span would continue to be subject to failure due to age and deterioration, limiting the reliability of the navigation channel.

This alternative would not meet the purpose and need for the Project or satisfy any of the Project goals and objectives or the programming goals of improving service reliability and operational flexibility, improving the load capacity and reducing the operational limitations, and minimizing conflicts with navigational traffic. The No Action Alternative was retained as a baseline for environmental analyses as required by NEPA and SEQRA.

With the No Action Alternative, other rail improvements that are planned or programmed separately from the Project would occur. In addition, other improvements to the regional transportation system and development projects that are proposed by others in the vicinity of the Livingston Avenue Bridge would occur. Transportation improvements are discussed in **Chapter 3, "Transportation Impacts," Section 3.3,** and proposed development projects and new park spaces are discussed in **Section 4.2, "Land Use and Community Character."**

2.4.2 Build Alternatives: Replacement on an Adjacent North Alignment (Build Alternative 1) or Adjacent South Alignment (Build Alternative 2)

In both Build Alternatives, a new movable bridge would be constructed adjacent to the existing Livingston Avenue Bridge and the existing bridge would be removed once the new bridge is put into service. The new bridge would have two tracks and could accommodate two trains operating across the bridge at the same time, with speeds up to 30 mph.[10] The new tracks would be continuous welded rail on wood ties, with a grade of close to 0 percent (i.e., flat).

Both Build Alternatives would realign the wye tracks on the east side of the Hudson River and reconfigure the approach tracks on the west side of the Hudson River. Both Build Alternatives would also have a shared use path for pedestrians and bicyclists.

Key characteristics of the Build Alternatives are described below and summarized in **Exhibit 2-2**. More detailed information about the Build Alternatives is included in **Appendix A, "Design Information."**

2.4.2.1 Alignment

2.4.2.1.1 Build Alternative 1 – Replacement on an Adjacent North Alignment

In Build Alternative 1, the new bridge would be on a skewed alignment north of the existing bridge (see **Figure 2-3**). The skewed alignment is necessary for a bridge north of the existing bridge so that the tracks could connect back into the existing alignment on the west side of the Hudson River before it passes under the eight-lane I-787 viaduct, while also providing a straight alignment for the movable span. The alignment would be approximately 200 feet north of the existing bridge on the east side of the river and would abut the existing bridge on the west side.

2.4.2.1.2 Build Alternative 2 – Replacement on an Adjacent South Alignment

In Build Alternative 2, the new bridge would be on an alignment parallel to and approximately 50 feet south of the existing bridge (see **Figure 2-4**). Like Build Alternative 1, the tracks would connect with the existing alignment on the west side of the Hudson River before it passes under the I-787 viaduct.

2.4.2.2 Superstructure

With both Build Alternatives the new bridge would be a truss bridge with deck girder approach spans, the same type of superstructure as the existing bridge. The specific truss design would be different from the existing bridge, and therefore the new bridge would have a different appearance than the existing bridge. The top of rail elevation would be 2 feet higher than with the existing bridge, to accommodate a deeper floor system while maintaining the same clearance above the water when the bridge is closed.[11] The new bridge would need a deeper floor system to provide proper lateral support for the widened structure.[12] The two towers supporting the lift span would be approximately 145 feet tall above Mean High Water, slightly less than the towers on the existing bridge that carry power cables and catenary wires at a height of 151.5 feet.

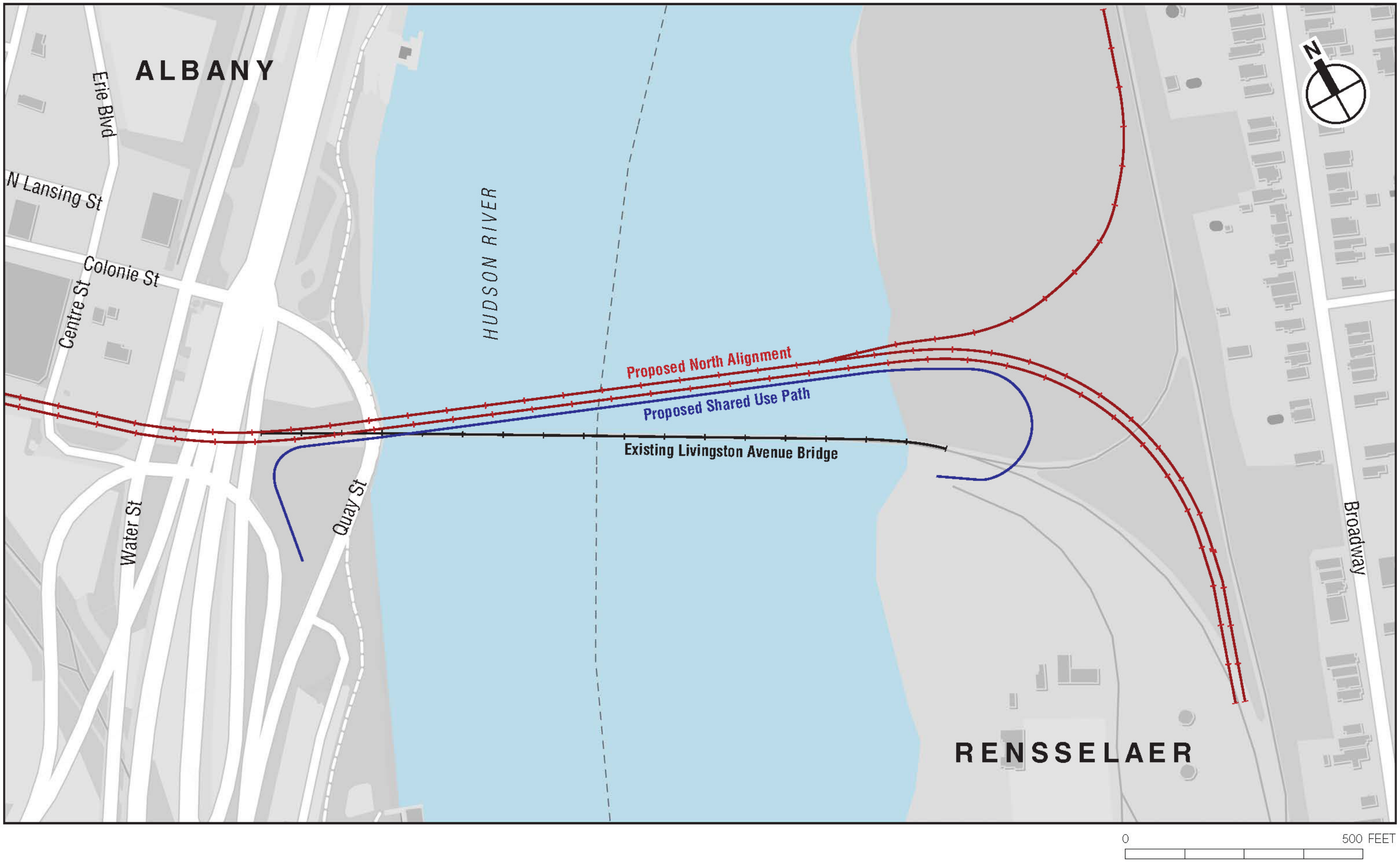
---

[10] The load rating for both tracks would be Cooper E-80.

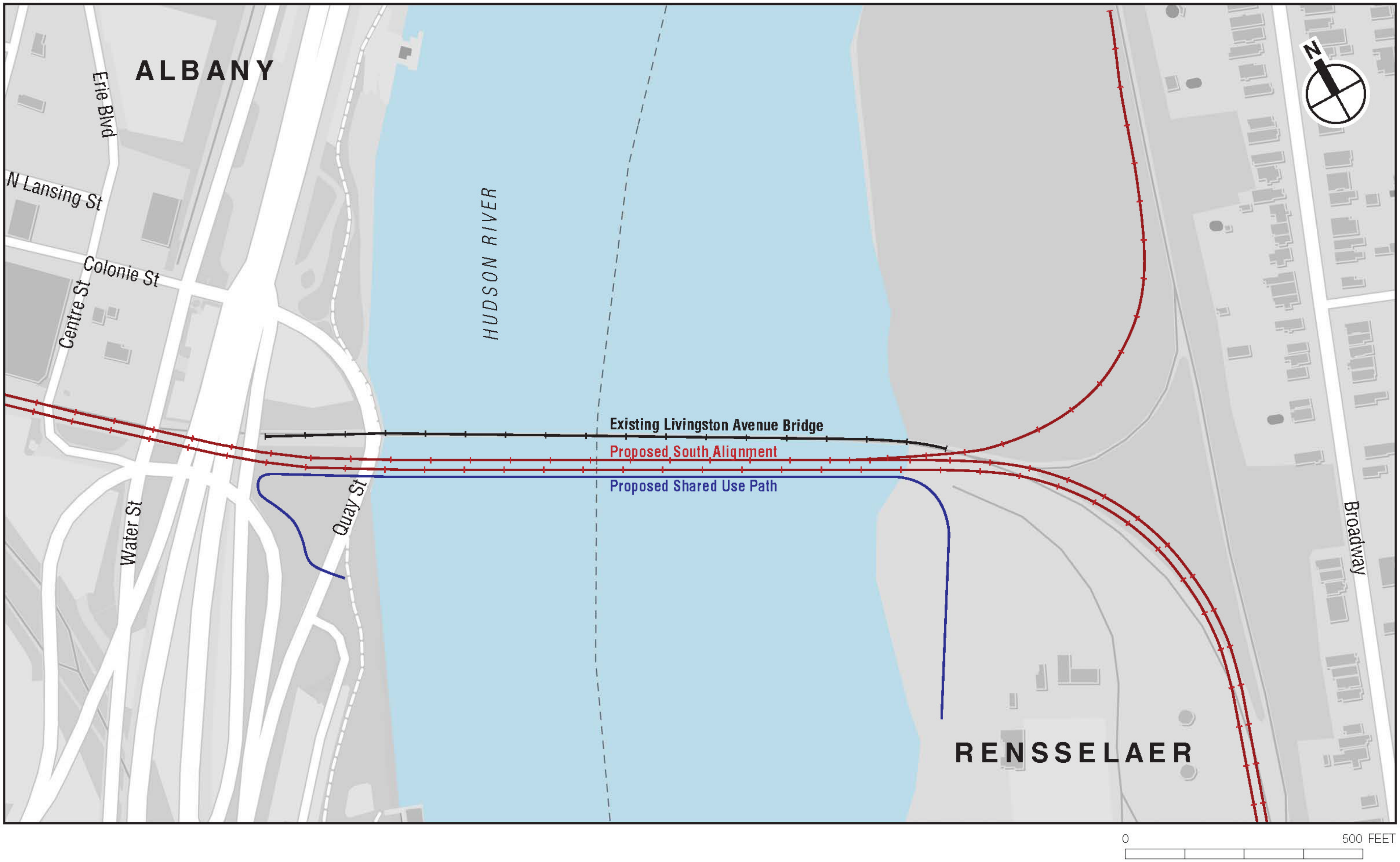
[11] The bridge would have a multi-beam girder approach spans arrangement, rather than a through girder arrangement. The use of a through girder system would have further increased the required change in profile due to the increased depth of the through girders and floor beams to accommodate the increased track spacing and ballasted deck.

[12] The bridge would be seven feet wider to meet AREMA standards.

8.27.17



Build Alternative 1 – Replacement on an Adjacent North Alignment
Figure 2-3



Build Alternative 2 – Replacement on an Adjacent South Alignment
Figure 2-4

Exhibit 2-2
Key Characteristics of the Build Alternatives

Bridge Feature	Build Alternative 1, North Alignment	Build Alternative 2, South Alignment
Geometry	• Would improve mainline and wye track geometry in comparison to No Action Alternative. • Mainline and wye track geometry would meet current design standards with two exceptions: the track centers would be narrower than the CSX standard of 15 feet, and the curve on the north leg of the wye would be sharper than the Amtrak standard. • Would remove all the existing deficiencies. • Track centerline spacing of 14 feet across the Livingston Avenue Bridge, which would match the existing track spacing at the Project limits that was recently installed by two other rail improvement projects. • 10 spans, with the following span arrangement from east to west: o Three 100-foot double-track deck girder spans for the mainline tracks; three adjacent 100-foot single-track deck girder spans for the wye track; a fourth 100-foot double-track deck girder span that is wider to allow for the wye track to merge with the north mainline track; and a fifth 100-foot double-track deck girder span for the mainline tracks west of the merge with the wye track o One 235-foot through-truss lift span with 30-foot tower spans on either side o One 235-foot through-truss fixed span o Three 75-foot double-track deck girder spans • To accommodate the new 14-foot track spacing, track on the rail bridges over Water and Centre Streets (which has a track spacing of 12 feet) would be realigned and the bridge substructures and superstructures would be retrofitted.	• Would improve mainline and wye track geometry in comparison to No Action Alternative. • Mainline and wye track geometry would meet current design standards with two exceptions: the track centers would be narrower than the CSX standard of 15 feet, and the curve on the north leg of the wye would be sharper than the Amtrak standard. • Would remove all the existing deficiencies. • Track centerline spacing of 14 feet across the Livingston Avenue Bridge, which would match the existing track spacing at the Project limits that was recently installed by two other rail improvement projects. • 9 spans, with the following span arrangement from east to west: o One 100-foot double-track deck girder span for the mainline; an adjacent 100-foot single-track deck girder span for the wye track o Two 80-foot double-track deck girder spans for the mainline tracks; one adjacent 80-foot single-track deck girder span for the wye track; the second 80-foot deck girder span would merge the wye track with the north mainline track o One 235-foot through-truss fixed span o One 235-foot through-truss lift span with 30-foot tower spans on either side o One 235-foot through-truss fixed span o Two 75-foot double-track deck girder spans o One 100-foot double-track deck girder span • To accommodate the new 14-foot track spacing, track on the rail bridges over Water and Centre Streets (which has a track spacing of 12 feet) would be realigned and the bridge substructures and superstructures would be retrofitted.
Navigation	• 190-foot-wide navigational opening with 60-foot-high vertical clearance when the bridge is in the open position, the same as adjacent upstream and downstream structures. • Would maintain the existing vertical clearance of 25 feet within the navigation channel under the fixed spans.	• 190-foot-wide navigational opening with 60-foot-high vertical clearance when the bridge is in the open position, the same as adjacent upstream and downstream structures. • Would maintain the existing vertical clearance of 25 feet within the navigation channel under the fixed spans.
Design Life	• 100-year design life	• 100-year design life

Exhibit 2-2 (Cont'd)
Key Characteristics of the Build Alternatives

Bridge Feature	Build Alternative 1, North Alignment	Build Alternative 2, South Alignment
Right-of-Way	• In addition to lands owned by New York State and Amtrak, acquisition (either fee acquisition or easements) of approximately 2.2 acres of vacant parcels (including 1.8 acres of the Kiliaen's Landing development site). • Temporary construction easements required to provide access for construction near both riverbanks.	• In addition to lands owned by New York State and Amtrak, acquisition (either fee acquisition or easements) of approximately 2.1 acres of vacant parcels (including 1.4 acres of the Kiliaen's Landing development site). • Temporary construction easements required to provide access for construction near both riverbanks.
Construction Considerations	• Would require a 2-day navigational closure to reverse the operation of the existing swing span. • Would require two weekend closures of the wye track (32-36 hours) to rail traffic (both access to the Troy Industrial Track and turning train movements from Albany-Rensselaer Station). • Would require a 2-day closure to river traffic to install the final new bridge span and remove one of the existing spans adjacent to the new lift span.	• Would require three overnight closures (8-16 hours) to rail traffic, the first to the wye track and north mainline track and the others to the south mainline track. • Would require two weekend closures of the wye track (32-36 hours) to rail traffic (both access to the Troy Industrial Track and turning train movements from Albany-Rensselaer Station). • Would require a 2-day closure to river traffic to install the final new bridge span and remove one of the existing spans adjacent to the new lift span.
Cost	• $356.90 Million (2023 dollars)	• $330.78 Million (2023 dollars)

On the east and west, the bridge's approach girder spans would be ballasted deck girders. This would accommodate the additional width for the increased track spacing.

On the east, the approach spans would also accommodate the turnout for the wye track on the bridge. East of the turnout, the wye spur line would be on a separate superstructure from the mainline replacement superstructure.

On the Albany side of the river, both alternatives would shift the western abutment of the rail bridge west from its current location, which would improve sightlines along Quay Street, which passes beneath the bridge adjacent to the abutment.

2.4.2.3 Substructure

The substructure of the new bridge would consist of piles installed in the river bottom. The piers would be solid reinforced concrete plinths with a steel reinforced pointed edge upstream and downstream to protect the pier against ice and debris. The new piers could be faced with granite similar to the existing stone masonry blocks, to maintain a similar appearance to the existing bridge.

2.4.2.3.1 Build Alternative 1–Replacement on an Adjacent North Alignment

With Build Alternative 1, the alignment of the bridge deck would be skewed relative to the flow of the Hudson River, but the piers supporting the superstructure would align with the flow of the river to avoid hydraulic issues. This would require larger pier widths than the existing piers or those of Build Alternative 2 to accommodate the skew of the superstructure relative to the piers. With this alternative, the total footprint of the piers would be approximately 0.74 acres, compared to 0.42 acres for the existing bridge. This alternative would have nine piers, the same number as the existing bridge.

2.4.2.3.2 Build Alternative 2–Replacement on an Adjacent South Alignment

Build Alternative 2 would have piers that would be larger than those of the existing bridge, but would have eight piers, one fewer than the existing bridge. The total pier footprint would be approximately 0.5 acres for this alternative, compared to 0.42 acres for the existing bridge.

2.4.2.4 Lift Span

With both Build Alternatives, the new bridge would have a lift span instead of a swing span like the existing bridge. This would increase the width of the navigation channel from the current width of 100 feet to approximately 190 feet wide. The vertical clearance of the lift span when open would be 60 feet above Mean High Water, which is the same clearance as the nearest bridges upstream and downstream of the Livingston Avenue Bridge. When the bridge is closed, the vertical clearance above the water would be the same as with the existing bridge, 25 feet above Mean High Water.

The regulated navigation channel in this portion of the Hudson River is approximately 600 feet wide, most of the width of the river. With both Build Alternatives the lift span would be east of the existing swing span. The existing swing span is at the west side of the channel and the new lift span would be at the east side.

At the lift span, a fender system would protect the bridge piers from vessel and debris strikes. The fenders would consist of filled sheet pile structures[13] (dolphins) in front of the lift span tower piers on either side of the bridge and connected by pile-supported horizontal beams (walers) to redirect wayward vessels back into the navigation channel.

2.4.2.5 Geometry

The new bridge cross section would provide 14-foot track centers and meet both horizontal and vertical clearance standards. The 14-foot track centers across the bridge would also extend west of the new bridge over the Water and Centre Street rail bridges, and would match the track centers on either end of the bridge, where recent rail improvement projects have updated track spacing. The new bridge would correct the existing substandard conditions and meet the standards established by AREMA and Amtrak, CSX, and NYSDOT, with limited exceptions.[14]

2.4.2.6 Approaches

2.4.2.6.1 Approach Bridges (Albany)

With either Build Alternative, the rail bridges over Water and Centre Streets would be rehabilitated and reconfigured to accommodate the shift in the track alignment. At each of those bridges, the beam sets of the bridge abutments that support the bridge girders (i.e., the beam seats and girder bearings) would be modified or replaced and several pairs of deck girders (i.e., bridge beams) would be repositioned to support the new alignment. At the Water Street bridge, a set of existing deck girders would be removed to accommodate this shift.

The Water and Centre Street rail bridges have four trackbeds, each supported by a separate pair of girders that spans the street. The two center trackbeds are in use and the two outer trackbeds are not. In addition, a separate viaduct spur just to the north of the Centre Street bridge once

[13] Sheet piles are steel sheet sections with interlocking edges that are driven in place similar to piles.

[14] While the Build Alternatives would improve substandard conditions over the existing conditions and No Action Alternative, two substandard conditions would remain: track centers would be narrower than the CSX standard of 15 feet, so as to meet the track centers of the adjacent track, and the curve on the north leg of the wye would be sharper than the Amtrak standard, to optimize the geometry on the bridge.

provided access into a nearby warehouse building, the Central Warehouse. Under either Build Alternative, the beam seats and girder bearings of the bridges would be modified or replaced by building a temporary support frame in front of the bridge abutments and then replacing the beam seat concrete. Once that is complete, modifications to deck girders would be made, including removing one girder pair from the Water Street bridge and shifting girder pairs on both bridges to shift the track locations. **Figures 2-5 and 2-6** illustrate existing conditions at the bridges and **Figures 2-7 and 2-8** illustrate the proposed changes with Build Alternative 1 (**Figure 2-7**) and Build Alternative 2 (**Figure 2-8**). The proposed changes to the deck girders would differ for the two Build Alternatives, since the new track alignment would be different. **Exhibit 2-3** provides information on the changes at each bridge.

Exhibit 2-3
Modifications to Water and Centre Street Bridges, Build Alternatives 1 and 2

Location (From North to South)	Description	Modification: Build Alternative 1 (North Alignment)	Modification: Build Alternative 2 (South Alignment)
Water Street Bridge			
Northern trackbed (exterior)	Not in use – formerly led to Centre Street spur to Central Warehouse (adjacent to Centre Street bridge)	Shift southward approximately 7 feet to serve main line westbound track	No change
Second trackbed (interior)	Main line westbound track	Remove	Move southward approximately 4 feet
Third trackbed (interior)	Main line eastbound track	Shift tracks slightly on existing structure to serve as main line eastbound track	Remove
Southern trackbed (exterior)	Not in use	No change	Move northward approximately 11 feet to serve main line eastbound track
Centre Street Bridge			
Northern trackbed (exterior)	Not in use – two tracks (spur diverging at this point)	No change	No change
Second trackbed (interior)	Main line westbound track	Shift northward approximately 2 feet	Shift northward approximately 2 feet
Third trackbed (interior)	Main line eastbound track	Shift tracks slightly on existing structure	Shift tracks slightly on existing structure
Southern trackbed (exterior)	Not in use	No change	No change

The proposed modifications to the Water and Centre Street rail bridges are designed to minimize the change in appearance of the bridges because they are components of the Albany Railroad Viaduct, which is eligible for listing on the National Register of Historic Places (NR). At the Water Street bridge, an interior pair of girders would be removed and an exterior pair would be shifted inward so that the appearance from the street would be maintained. This would leave an exposed portion of the bridge seats on the outside of the bridge abutments but would not otherwise change the appearance of the structure. At the Centre Street bridge, an interior pair of girders would be shifted and the exterior girders would remain unchanged. No alterations to the other three bridges on the west approach would be required. These changes would not permanently change vehicular operations on the streets below the rail bridges.

Centre Street Bridge South Elevation (View North) **1**

Centre Street Bridge West Abutment, Beam Seat, and Deck Girders **2**

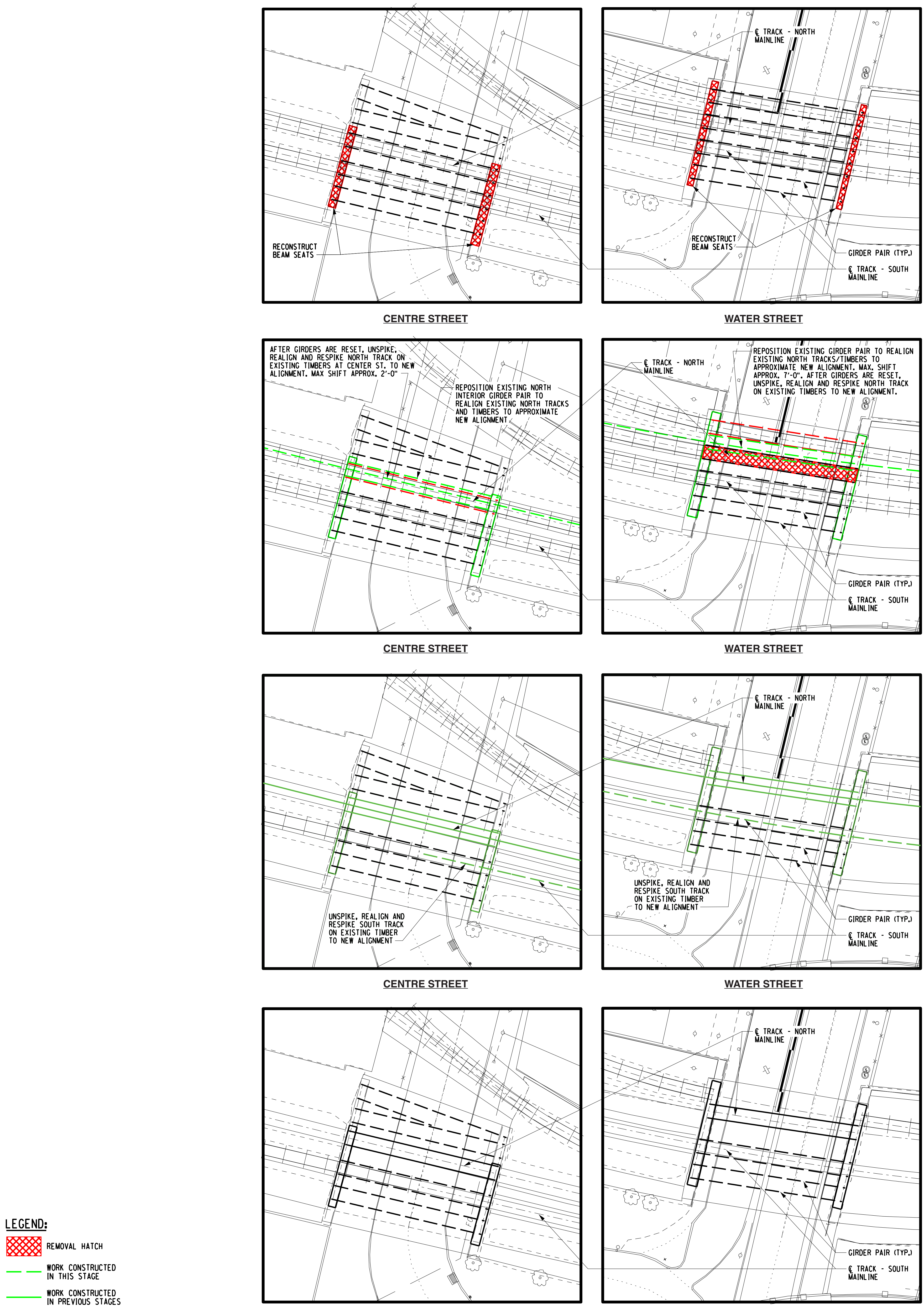
Centre Street Bridge Existing Conditions
Figure 2-5

Water Street Bridge South Elevation (View North) **3**

Water Street Bridge – East Abutment, Beam Seat, and Deck Girders **4**

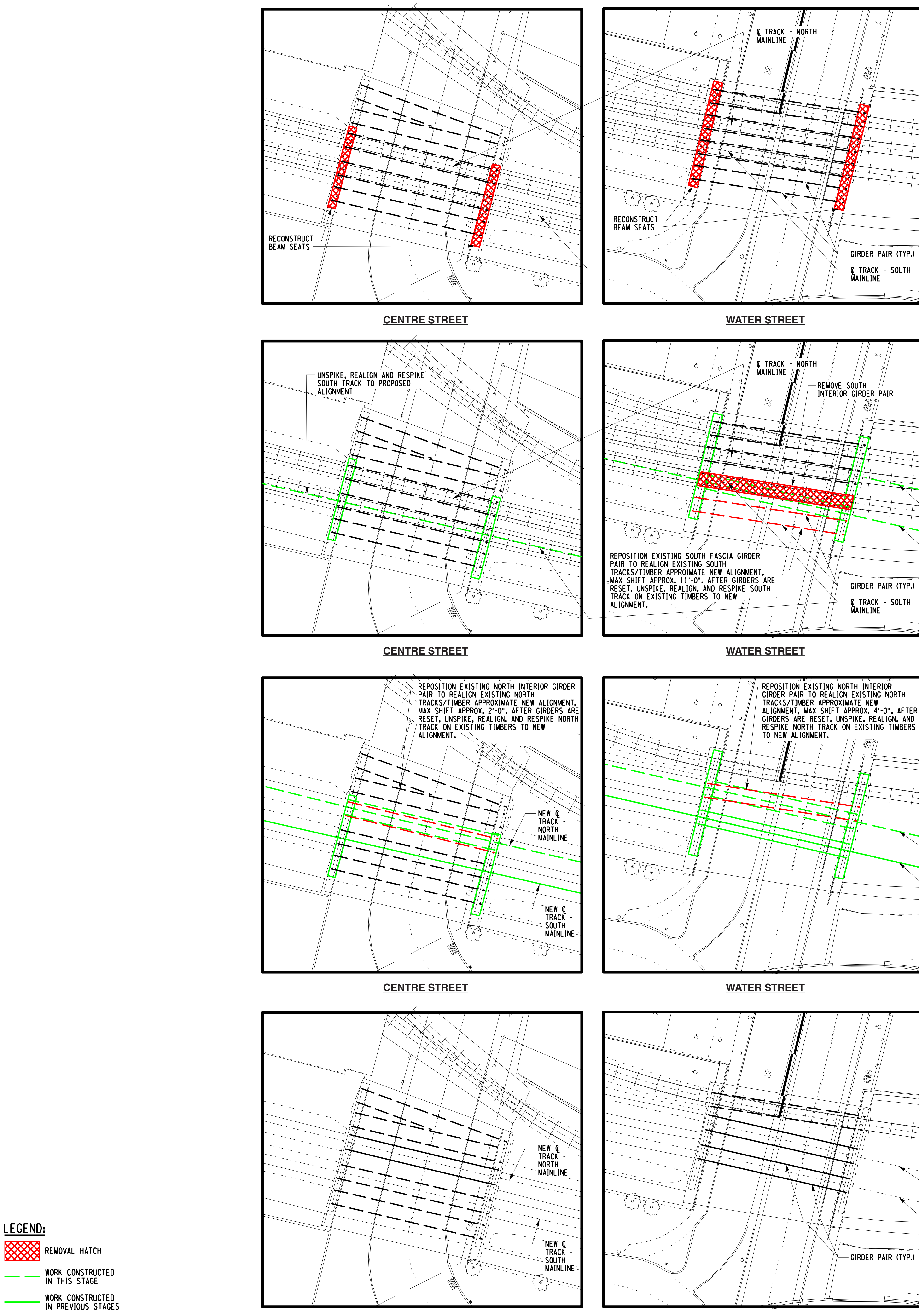
Water Street Bridge Existing Conditions

Figure 2-6



Build Alternative 1 (North Alignment)
Proposed Modifications to
Centre and Water Street Bridges

Figure 2-7



Build Alternative 2 (South Alignment)
Proposed Modifications to
Centre and Water Street Bridges
Figure 2-8

2.4.2.6.2 Wye Track (Rensselaer)

Both Build Alternatives would realign the wye track to reduce the sharpness of the curve for the northern leg of the wye. The curve would still be sharper than the Amtrak standard,[15] but further changes to flatten the curve would affect the track geometry on the bridge. With both Build Alternatives, the wye would be reconfigured so that the movement from the bridge south toward Albany-Rensselaer Station becomes the primary move, an improvement over the existing condition in which the primary move from the bridge on the north mainline track is the straight-ahead move to the Troy Industrial Track.

2.4.2.7 Speeds

With the new bridge and reconfigured wye, the maximum authorized speed would increase from 15 mph on the bridge, 25 mph on track west of the bridge, and 20 mph on track east of the wye, to the following:

- For trains on the bridge: 35 mph for freight trains and 40 mph for passenger trains.
- For trains on tracks west of the bridge: 35 mph for freight trains and 40 mph for passenger trains (these speed limits are due to the curved alignment).
- For trains on tracks east of the bridge, between the Albany-Rensselaer Station and the wye: 25 mph for freight trains and 30 mph for passenger trains. On the mainline Empire Corridor, eastbound trains would be decelerating as they cross the bridge to enter the station, and westbound trains would be accelerating out of the station.
- For trains on the wye track: 10 mph for freight trains, 15 mph for passenger trains. This speed limit would be partially controlled by the unsignalized track and grade crossings located up the spur line to the north. Trains using the wye track would be either Amtrak trains turning to head back into New York City or freight trains headed up the speed-limited north spur track, which requires deceleration across the bridge regardless of the Project speed limit.

2.4.2.8 Signal System Improvements

The new bridge would have a new signal system integrated with the bridge operating system that would tie into the existing signal systems on the east and west approaches to the bridge, which were recently upgraded as part of the Albany-Rensselaer Station 4th Track project and the Albany to Schenectady Double Track project. This signal system is remotely controlled by the Amtrak dispatch center in New York City; the bridge is operated manually from an operator’s house on the bridge above the center of the swing span.

As part of the proposed reconfiguration of the wye on the east side of the bridge, signals would be installed for the wye tracks governing movements across the bridge span and through the turnout at the north end of the wye.

Similar to the existing condition, the bridge operating system would allow the bridge to open only upon a signal from the Amtrak train dispatcher in New York City confirming that there are no trains approaching. The bridge opening for river traffic would either be initiated by a local bridge operator or be remotely opened when coupled with sufficient video displays that allow for the detection of river traffic and pedestrian traffic. The local operator would only control the opening and closing of the bridge under the authority of the Amtrak train dispatcher.

---

[15] Amtrak trains turning to head back south into New York City use the wye track for this movement.

2.4.2.9 Shared Use Path

Both Build Alternatives would include a new shared use path for pedestrians and bicyclists. FRA and NYSDOT evaluated a range of different configurations for the shared use path for each Build Alternative and selected the design options described below.

For both Build Alternatives, the shared use path would run along the south side of the new bridge on a cantilever extending from the bridge trusses and supported on an independent girder superstructure parallel to the rail girder spans that shares piers and abutments with the deck girder approach spans of the rail bridge. The shared use path would be 12 feet wide on the bridge to allow two-way pedestrian and bicycle traffic, and would widen to 14 feet at the base of its approaches. The approach ramps would have a grade of no more than 5 percent and the shared use path and its approach ramps would comply with the Americans with Disabilities Act (ADA).

The approach ramps for the shared use path would touch down south of the new bridge and connect to existing and planned waterfront pathways on each side of the river. On the east side of the river, the shared use path would connect to the planned Rensselaer Riverfront Multi-Use Trail, a linear park that will run along the waterfront. On the west side of the river, it would connect to the Mohawk-Hudson Bike-Hike Trail, which runs along the waterfront, and the Albany Skyway (see the discussion in **Section 3.3.3**).[16]

Both Build Alternatives would have a retaining wall along the south side of the railroad embankment in Albany between the river and Water Street to support the sloping shared use path. The retaining wall would be designed to be visually compatible with the existing landscape.

The shared use path would have a bicycle height railing on the outboard side and a pedestrian security fence and bicycle height railing on the inboard side to prevent unauthorized access from the walkway onto the railroad tracks. The walkway would include scenic overlooks at each end of the movable span to provide an area for pedestrians to collect and bicyclists to dismount when the bridge is opening/closing and the walkway gates are closed. Lighting, cameras, and other security devices would ensure safe operation of the movable bridge span.

NYSDOT will coordinate details related to operation and maintenance of the shared use path on the bridge during final design. NYSDOT has ongoing coordination with the Cities of Rensselaer and Albany as well as CSX and Amtrak regarding ownership and maintenance of the shared use path.

2.4.2.9.1 Build Alternative 1 – Replacement on an Adjacent North Alignment

With Build Alternative 1, the east approach for the shared use path in Rensselaer would begin close to the water's edge south of the new bridge (close to the location of the existing bridge). The path would start at the northern end of the planned Rensselaer Riverfront Multi-Use Trail that will run north-south along the river. It would curve up and around 180 degrees to meet the bridge. One track in the Amtrak Maintenance Facility to the south of the existing bridge would have to be shifted to accommodate the shared use path's approach ramp.

On the Albany side of the river, the shared use path approach would begin at Quay Street, where there would be an at-grade crossing to connect to the Mohawk-Hudson Bike-Hike Trail. From Quay Street, the approach ramp would curve around to meet the new rail bridge. The ramp would also provide a connection to the Albany Skyway, which is close to the location of the shared use path's Albany ramp.

---

[16] At the time of publication of this EA, construction for the Albany Skyway project is nearing completion. The project involves the creation of a new walkway and bikeway from an existing highway ramp near the Livingston Avenue Bridge.

NYSDOT also considered a design option for the shared use path on the north side of the new rail bridge with Build Alternative 1 rather than the south side but determined that a shared use path on the south side was preferable. For the north side option, the approaches would be north of the new bridge, to avoid the need for pedestrians and bicyclists to cross the railroad tracks. On the east side of the river in Rensselaer, the shared use path approach would begin at a future riverside pedestrian trail and curve around to meet the new bridge. On the west side of the river in Albany, the shared use path approach would begin on Water Street at an existing parking lot. However, unlike a shared use path on the south side of the bridge, a north side alignment would not provide direct connections to existing or planned walkways or bikeways, such as the Rensselaer Riverfront Multi-Use Trail on the east side of the river or the Mohawk-Hudson Bike-Hike Trail or Albany Skyway on the west side. A shared use path on the north side of the new bridge in Build Alternative 1 would also require right-of-way acquisitions for the approach ramps that would not be required for a shared use path on the south side of the bridge. For these reasons, NYSDOT selected the shared use path on the south side of the bridge with Build Alternative 1 and eliminated a shared use path on the north side of the bridge from further consideration.

2.4.2.9.2 Build Alternative 2 – Replacement on an Adjacent South Alignment

With Build Alternative 2, the east approach to the shared use path in Rensselaer would begin close to the water's edge south of the new bridge, at the northern end of the planned Rensselaer Riverfront Multi-Use Trail that will run north-south along the river. The path would bend westward to connect into the new railroad bridge west of its abutment to avoid a conflict with the nearby Amtrak Maintenance Facility. To make this connection, the shared use path ramp would ascend on a fill embankment from the Rensselaer Riverfront Multi-Use Trail to its own superstructure independent of the bridge, with a separate pier and abutment to extend the ramp structure over the northern extent of the planned Rensselaer Riverfront Multi-Use Trail.

On the Albany side of the river, the shared use path approach would begin at Quay Street, where there would be an at-grade crossing to connect to the Mohawk-Hudson Bike-Hike trail. From Quay Street, the approach ramp would curve around to meet the new rail bridge. The ramp would provide a connection to the Albany Skyway, which is close to the location of the shared use path's Albany ramp.

NYSDOT also considered several other design options for a shared use path with Build Alternative 2. This included a different ramp configuration for the shared use path in Rensselaer and two different options for shared use paths on the north side of the new bridge rather than the south side.

For a shared use path on the south side of the new bridge in Build Alternative 2, NYSDOT evaluated an approach ramp configuration in Rensselaer in lieu of the proposed independent superstructure for the ramp. To avoid a conflict with the nearby Amtrak Maintenance Facility, the access path would rise higher than the new bridge's track level, using retaining walls and a flyover structure, so that it could pass above the rail yard. However, this configuration would be more expensive and more complex to construct than the proposed approach ramp; therefore, NYSDOT eliminated this option from further consideration.

In addition, NYSDOT considered design options for a shared use path on the north side of the new railroad bridge with Build Alternative 2 rather than the south side. These options would have approaches north of the new bridge to avoid the need for pedestrians and bicyclists to cross the railroad tracks. On the east side of the river in Rensselaer, the east approach would begin at a future riverside pedestrian trail and curve around to meet the new bridge. On the west side of the river in Albany, the approach could either begin at Water Street at the connection to the existing Mohawk-Hudson Bike-Hike Trail, with a tunnel under the railroad berm and then a ramp up to the bridge, or it could begin in an existing parking lot north of the bridge, without a direct connection to a waterfront walkway. The tunnel option would have safety, security, and cost issues not present in other alternatives, and the parking lot option would require additional right-of-way acquisition and would not provide direct connections to a walkway or path. Therefore, NYSDOT eliminated the option of a shared use path on the north side of the bridge with Build Alternative 2 from further consideration.

2.4.2.10 Construction Considerations

The new bridge's substructures would be supported on deep piles. NYSDOT will require the use of pile installation that limits vibration near the existing bridge, to avoid potential damage to that structure. The specific pile installation measure will be determined during final design after a detailed geotechnical study is performed to determine the susceptibility of the existing structure to vibration. Trains would operate at slow speeds (e.g., 5 mph with protection by flaggers) past any construction work occurring within 25 feet of an operational track.

Build Alternative 1 would require a two-day closure to river traffic (and potentially rail traffic as well) to reverse the operation of the existing swing span, which currently rotates in a clockwise direction that would put it in the path of the new bridge construction. Before the new bridge can be constructed adjacent to the swing span for Build Alternative 1, the swing span would have to be modified to swing in the opposite direction.

With either Build Alternative, the new bridge would be constructed span by span to allow the existing bridge to remain in operation until the new bridge is complete. The float-in of the final new span adjacent to the existing swing span and float-out of the existing span(s) adjacent to the new lift span would take place during a closure to both rail and river traffic. Both alternatives would require some short-term closures to rail traffic and a two-day closure of the navigation channel at the bridge to install the final new bridge span and remove one of the existing spans adjacent to the new lift span. Once in place, the lift would be left in the open position as construction continues and the existing bridge would continue to open and close as needed to accommodate river traffic.

The steel girder spans on the east end of the bridge would require temporary falsework, such as a pile-supported work platform in the river, to be erected in the shallow water near the shoreline, which is not deep enough for float in and out.

Both Build Alternatives would require short-term temporary detours to surface streets in Albany to facilitate construction of the west abutment and the modifications to the Water and Centre Street rail bridges.

More information on the construction activities for the Build Alternatives is provided in **Section 4.16, "Construction Impacts."**

2.4.2.11 Cost

With a longer span, larger piers, and more complex construction staging, Build Alternative 1 would cost more than Build Alternative 2—$356.90 million versus $330.78 million. **Exhibit 2-4** provides a summary of the capital costs for the two Build Alternatives.

Exhibit 2-4
Estimated Capital Costs for Build Alternatives ($ Millions)

Activities	Build Alternative 1: North Alignment	Build Alternative 2: South Alignment
Final Design (10%)	$18.20	$16.90
Construction	$182.00	$168.30
Wetland Mitigation	$0.00	$0.00
SPDES Mitigation	$5.00	$5.00
Incidentals (25%)	$45.50	$42.10
Subtotal ($)	**$250.70**	**$232.30**
Contingency (15%)	$37.61	$34.90
Subtotal ($)	**$288.31**	**$267.20**
Mobilization (4%)	$11.54	$10.74
Subtotal ($)	**$299.85**	**$277.94**
Inflation (present costs inflated 4% per year to midpoint of construction, 2023)	$24.50	$22.70
Subtotal ($)	**$324.35**	**$300.64**
Construction Inspection (10%)	$32.50	$30.10
Right-of-Way Costs	$0.05	$0.04
Total Project Cost (2023 dollars)	**$356.90**	**$330.78**

Note: Costs for the shared use path are included in the bridge costs; cost for the shared use path approach ramps are not included but can be covered by the contingency factor.

2.5 Identification of Preferred Alternative

Based on the environmental analysis in this EA as well as operational and engineering considerations, FRA and NYSDOT have identified Build Alternative 2, Replacement on an Adjacent South Alignment, as the Preferred Alternative. The following factors differentiate the Build Alternatives:

- Build Alternative 2 requires slightly less right-of-way acquisition than Build Alternative 1 (2.1 acres versus 2.2 acres, not including land already owned by New York State).
- Build Alternative 2 would have a smaller impact on the Kiliaen's Landing development area, a proposed development project on the Rensselaer waterfront just north of the existing Livingston Avenue Bridge (requiring acquisition of 1.4 acres from that site versus 1.8 acres with Build Alternative 1).
- The pier footings for Build Alternative 2 would impact a smaller area of river bottom than those for Build Alternative 1 (net increase of 0.05 acre versus 0.32 acre), which would in turn reduce adverse impacts to Hudson River benthic habitat.
- Build Alternative 2 would require less tree clearing than Build Alternative 1 (2 acres versus 3 acres), which would in turn reduce adverse impacts to upland habitat.
- Build Alternative 2 would have a lesser impact to navigation during construction by avoiding the need to reverse the operation of the existing swing span, which would require a two-day navigational closure under Build Alternative 1.
- The construction cost of Build Alternative 2 would be lower than that of Build Alternative 1 ($330.78 million versus $356.90 million).
- The construction staging for Build Alternative 2 would be marginally more complex than that of Build Alternative 1 due to its proximity to the existing structure, but this would be offset by the savings in construction materials and a final alignment that is simpler and preferable to the bridge owner (CSX).

2.6 Potential Permits Required

NYSDOT will obtain a number of permits and certifications for the Project. Additionally, substantial coordination with Federal, New York State, and local agencies will be required. Potential permits and approvals include the following:

- U.S. Coast Guard (USCG)
  - USCG Section 9 Permit
- U.S. Army Corps of Engineers (USACE)
  - USACE Section 404 and Section 10 Permit
  - USACE Section 408 Permit
- New York State Department of Environmental Conservation (NYSDEC)
  - State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (GP-0-20-001)
  - Floodplain Variance
  - Water Quality Certification (Section 401) of the Federal Water Pollution Control Act
- New York State Department of State (NYSDOS)
  - Coastal Zone Consistency Certification Statement
  - Coastal Zone Local Waterfront Revitalization Certification
- New York State Office of General Services (NYSOGS)
  - Grants or License of Land Underwater (New York State Public Lands Law § 6-75.7b)
- Other Agency Coordination
  - Coordination with NYSDEC pursuant to the NYSDEC/NYSDOT Memorandum of Understanding Regarding ECL Article 15 and 24
  - Coordination with Advisory Council on Historic Preservation (ACHP) and New York State Historic Preservation Office (SHPO) regarding Section 106 of the National Historic Preservation Act
  - Coordination with the U.S. Fish and Wildlife Service (USFWS)
  - Coordination with the New York Natural Heritage Program (NYNHP)
  - Coordination with National Marine Fisheries Service (NMFS)
  - Coordination with various entities as required for compliance with Section 4(f) and Section 106
  - Coordination with CSX, CP, and Amtrak