Eastern Connecticut Corridor Rail and Transit Feasibility Study (ECRTS)

Appendix D: Thames River Corridor Assessment

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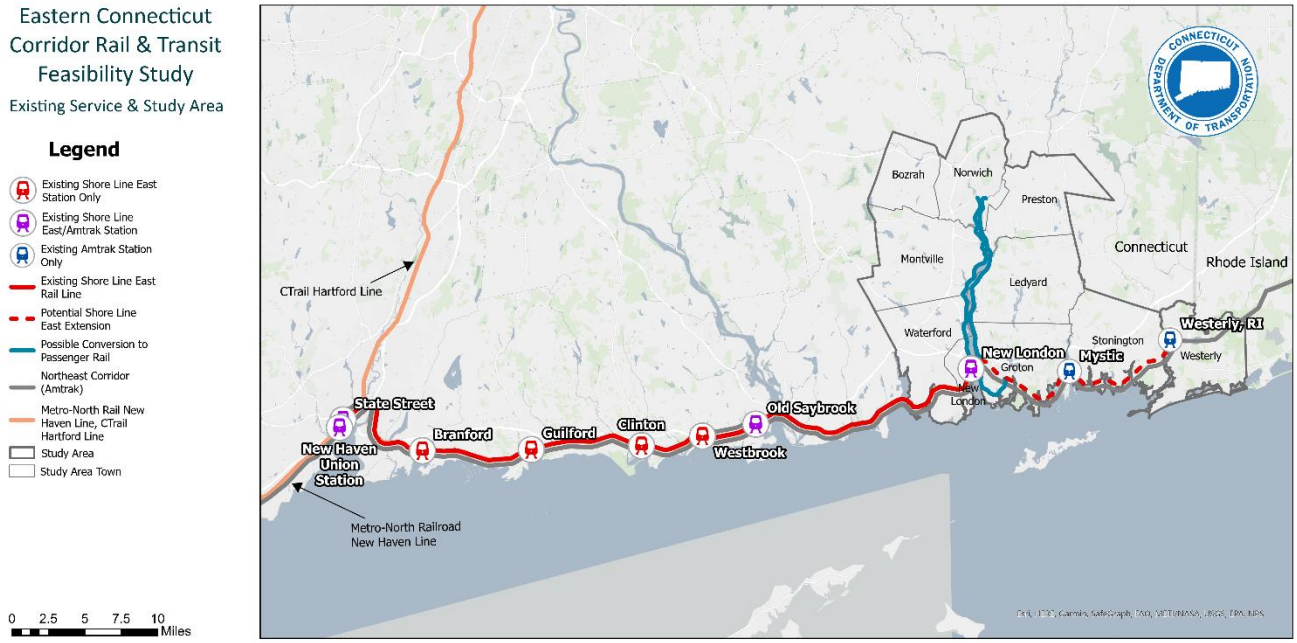
1. Introduction

The Connecticut Legislature has directed the Connecticut Department of Transportation (CTDOT) to conduct a feasibility study for expanding passenger rail service and ground transportation options in southeast Connecticut[1] via the Eastern Connecticut Corridor Rail and Transit Feasibility Study (ECRTS). ECRTS is investigating the feasibility of and market for the following transportation improvements (Figure 1):

- Extending the Shore Line East rail line to the State of Rhode Island
- Establishing a new passenger rail service from the City of New London to the City of Norwich
- Establishing a new passenger train station in the Town of Groton and the Borough of Stonington
- Extending other ground transportation systems in the eastern region of the state and providing improved connectivity between such systems and rail lines

Figure 1: Study Area Regional Context



A feasibility study is the first step in evaluating the viability of service in a corridor. This feasibility study will consider existing and future market and environmental conditions, equity and environmental justice issues, preliminary engineering considerations, ridership levels, service operations, equipment needs and system requirements, and preliminary costs and revenue forecasts within the ECRTS study area. As a result of the findings of these investigations, more detailed studies may follow.

This report covers the existing conditions of rail infrastructure within Thames River Corridor and makes a general recommendation on which of two existing rail alignments should be considered for potential future passenger rail service. The study consists of a visual inspection report that reviews costs, conditions, forecasted restrictions, and high-level overview of the type of service that can be anticipated if the Shore Line East service were to extend to Norwich along one of two rail corridors along the Thames River.

[1] Substitute House Bill No. 6484, Public Act 21-175, Section 20

This assessment can be broken down into three key sections. The first section (Chapters 2 and 3) includes the visual inspection, data collection, and inspection results of the existing conditions. The second section (Chapter 4) assesses the overall needs of each corridor and other considerations to support passenger rail based on the results of the existing conditions. The third section (Chapters 5 and 6) summarizes the first two sections and provides a recommendation for a rail corridor for further consideration.

1.1. Thames River Rail Corridor Alignments

The Thames River is a 15-mile tidal estuary that starts in downtown Norwich at a three-river junction alongside the Yantic and Shetucket River. The river proceeds south all the way through New London and drains into the Long Island Sound.

What is unique about the river from a rail perspective is that there are two existing freight rail corridors that run adjacent to the river on each side. The Palmer Line runs along the West Side and extends all the way through Connecticut into Palmer, MA and was formerly owned by New England Central Railroad. The Norwich Branch is a defined segment of the former Providence and Worcester rail company that ran service from New London all the way to Worcester, MA. Both rail corridors are now owned by Genesee and Wyoming Inc. In addition, there is a Spur east of the Thames River, hooking southwest off the Northeast Corridor, the Old Groton Industrial Spur, that was considered as part of this Alignment.

Each corridor has its own challenges as most of the infrastructure noted in this report will reveal each alignment is in fair/poor condition and would require substantial improvements to support Commuter Rail Service. Many of the recent capital improvements observed along the Thames River Corridor were a result of either TIGER grants from the federal government awarded in 2011 or the Rail Tie donation program through the State of Connecticut.

Each corridor has unique opportunity to support Commuter Rail Service. The Palmer Line along the West Corridor connects directly from New London Train Station where existing Shore Line East service currently terminates. The corridor passes several key areas including the US Coast Guard Academy (USGCA) and Connecticut College, Quaker Hill, Uncasville, and most notably Mohegan Sun Arena. Potential service could terminate adjacent to the Norwich Transportation Center. The Norwich Branch does not have any high-profile areas it passes through but does have substantial populations including the Naval Submarine Base in New London, Gales Ferry, Laurel Hill, and the old existing Norwich Train Station. The east corridor also consists of the Old Groton Industrial Spur, which connects to the Groton/New London Airport, UCONN Avery Point, Pfizer, and General Dynamics.

1.2. Ownership / Maintenance Requirements

As mentioned, both corridors are owned and operated by Genesee and Wyoming Inc. (G&W). The company owns or leases 116 freight railroads worldwide with over 13,000 track miles within North America. As owner of both the Palmer Line and Norwich Branch Line corridors, G&W is responsible for all capital improvements to ensure the system needs are met, as well as any maintenance required to keep the system functional. G&W is also required to adhere to standards and regulations set forth by the Federal Railroad Administration (FRA) to ensure compliance for rail safety and performance. This includes periodic logs of track conditions, field inspections, proper function and monitoring of grade crossing infrastructure and protection, and adhering to FRA's Rail Bridge Inspection Program Requirements, which requires rail owners to have their own formal bridge inspection program in place.

1.3. General Condition of Corridor

In summary, the visual inspection team concluded that the overall condition of each corridor is best characterized as fair/poor. Both corridors showed localized areas of poor drainage, and vegetation would likely need to be cut back/removed. Based on this inspection, it can be concluded that:

- Track infrastructure would likely need substantial upgrades
- Many undergrade structures would likely need to be replaced
- Numerous grade crossing surfaces and protection systems would need to be upgraded.

Because the inspection team was only able to perform spot checks, further in-depth inspection of the entire corridor would be required to confirm the extent of these issues throughout the corridor.

1.3.1. Track Condition Summary

Although the steel rail conditions appeared to be in good shape, the freight railroads currently utilize 100 or 115 RE steel rail which is insufficient for passenger rail service and would need to be upgraded. It appears that Continuous Welded Rail (CWR) was used in many locations.

Figure 2: Weld between 100 and 115 lb. Steel Rail

Figure 3: Severe Rotting of Wooden Ties - Lower Bartlett Road (MP 5.05)

Most ties are wooden ties that showed signs of longitudinal cracking and rotting, and it would be recommended they be replaced with concrete ties.

Figure 4: Ponding of Water Alongside Track Bed (MP 11.90)

Ballast / Sub-Ballast was generally in good / fair condition in most observed areas however some spot checks found areas of poor drainage, that would require further investigation of widespread drainge concerns.

1.3.2. Structures Summary

Figure 5: Timber Trestle Bridge

Bridges were only given a high-level visual inspection and would require an in-depth up-close inspection to determine true condition and load rating. Numerous bridges observed along the corridor were timber trestle, which is not recommended for passenger rail service, given its flammable properties and its tendency to rot from moisture or have potential termite damage.

Figure 6: Abandoned Bridge - Riverside Park (MP 1.07)

Overhead bridges did not appear to provide vertical clearance issues, however there were a few identified overhead structures that would need to either be removed or modified for safety purposes.

1.3.3. Grade Crossings Summary

Grade crossings were mostly in poor condition, with numerous crossing surfaces having severe issues. Asphalt crossing surfaces had severe heaving and cracks and should be replaced with either concrete or railway rubber. Other grade crossings either had wood that was severely cracked or unstable earth material as the crossing surface. Many grade crossings were passive crossings that did not have flashers, and most active grade crossings did not have crossing gates. Almost all grade crossings would likely have to be upgraded to include flashers and gate crossings. There were also several grade crossings that appeared to be private and/or unidentifiable that would require further inspection.

Figure 7: Grade Crossing with Severe Heaving (MP 5.05)

Figure 8: Thomas Griffin Road - Fenced Off Crossing with Private GC Sign

2. Available Resources

This section presents the methodologies and resources used by the team to develop this report. This covered in four subsections: Existing Documents, Field Inspection, Software, and Inventory.

2.1. Existing Documents

The team depended on information gathered from various agencies to ensure that the proper resources were used for this assignment. These documents include such items as Track Charts, Yard Configurations, At-Grade Crossing Locations, Bridge Inventories, and Limitations of current and future rolling stock. Key publications were also reviewed, including Southeastern Connecticut Council of Government (SECCOG) Master Transportation Plan (MTP), Regional Plan of Conservation and Development (C&D), and regional Freight Profile.

2.2. Field Inspection

The basis of this work was a visual field inspection performed along both corridors to assess the existing conditions of infrastructure along each corridor and to make recommendations based on these inspections to determine any necessary capital improvements. Further, these preliminary inspections can identify any additional challenges that may arise from the geometric profile or development that runs adjacent to each corridor.

2.3. Software

Field inspectors utilized photography to capture visual images that are provided throughout this report as well as supplied in **Exhibit A**. The photography was done using a camera application on iPhone 12. These photos were then uploaded to a windows explorer directory file and organized by Corridor and Mile-Point for review.

The team also relied on the use of ESRI ArcGIS, Google Earth, and Google Maps, to identify locations of interest, map out areas that could be visually inspected and to provide mapping services to organize these results. The team first used the Track Charts mentioned above to identify spatially on Google Earth where potential assets of concern were. The team also utilized FRA's GIS Safety Application to identify crossings and structures and their associated FRA ID's.

A master inventory using ArcMap 10.3 under ESRI's ArcGIS Suite of products was developed. This inventory captured all assets of interest including Undergrade (UG) Bridges, Overhead (OH) Bridges, Grade Crossings, and other identified assets of concern.

2.4. Inventory

Prior to going out into the field, the team utilized all the resources mentioned above to establish an initial inventory of infrastructure along each corridor. The inventory was useful to not only generate a list of assets under consideration for the analysis, but to assist in coordinating an itinerary for each field visit.

2.4.1. Track

Track is defined as the composition of all the components that support longitudinal movement of rail vehicles. The three main components of a track are the steel rails, the ties, and the ballast/subbase. The team utilized existing track charts to identify geometric alignments, age of rail/ties, and history of major maintenance such as surfacing of the track infrastructure. The length of track in this case is identified via use of mile points and can reference locations of other assets along the corridor via its mile point marker. These mile points are approximate based on track chart and may not represent an accurate track length.

Table 1: Track Inventory

Line Name	Corridor	Starting Mile Point	Ending Mile Point	Total Track Length
Palmer Line	West	0	13.6	13.60 Miles
Shore Line*	West	122.76	123.07	0.31 Miles
Norwich Branch	East	0	13.55	13.55 Miles
Old Groton Industrial Track	East (Spur)	0	2.86	2.86 Miles

*From New London Train Station to MP 0 of Palmer Line

West Corridor Total: 13.91 Miles
East Corridor Total: 16.41 Miles
Total Track: 30.32 Miles

2.4.2. Structures

Structures are classified into two main asset classes: Undergrade Structure (UG bridge), or Overhead Structure (OH bridge). A UG bridge is any feature the railroad bed crosses over, while an OH bridge is any structure that passes over the railroad right of way (ROW). All UG bridges must be identified regardless of size or feature as they must be able to support both dead and live loads of future passenger rail service and supporting infrastructure. OH bridges only need to support live and dead loads of the infrastructure they support, but for the purposes of this report, the larger concern is identifying structures that may pose a concern to vertical clearance of proposed train service, or any feature that is abandoned and should be removed. Only a handful of these structures were assigned an FRA Asset ID through the safety website, meaning assets had to be identified either through Google Maps or by discovering features while in the field.

West Corridor

Table 2: West Corridor Structures

FRA Asset ID	Asset Class	Corridor	Milepost	Location
None Assigned	UG Bridge	West	0.38	Winthrop Cove
None Assigned	OH Bridge	West	0.7	State Pier Road
500291X	OH Bridge	West	0.8	ID referenced along mainline
978004F	OH Bridge	West	0.85	I-95
247205D	OH Bridge	West	1.06	Abandoned
247206K	OH Bridge	West	1.28	USCGA
273188H	OH Bridge	West	1.45	USCGA
None Assigned	UG Bridge	West	2.95	Unnamed Cove
None Assigned	UG Bridge	West	3.25	Smith Cove (Timber Trestle)
None Assigned	UG Bridge	West	3.35	Smith Cove
None Assigned	UG Bridge	West	3.9	Unmarked Timber Culvert
None Assigned	UG Bridge	West	4.07	Unmarked I-Beam Culvert
None Assigned	UG Bridge	West	6.23	Horton Cove
None Assigned	UG Bridge	West	6.81	Unnamed Cove - (I-Beam)
None Assigned	UG Bridge	West	7.08	Unnamed Cove - (I-Beam)
None Assigned	UG Bridge	West	7.5	Unnamed Cove - (Thru Girder)

FRA Asset ID	Asset Class	Corridor	Milepost	Location
None Assigned	UG Bridge	West	7.68	Unnamed Cove - (Stringer)
None Assigned	UG Bridge	West	8.99	Indian Creek
None Assigned	UG Bridge	West	9.9	Shantok Brook
None Assigned	UG Bridge	West	10.32	Wood Stringer - Mohegan Sun Parking
None Assigned	UG Bridge	West	10.95	Trading Cove
None Assigned	UG Bridge	West	11.72	Timber Trestle
None Assigned	OH Bridge	West	13.15	Route 82 - No OH FRA Number
None Assigned	OH Bridge	West	13.18	Route 32 - No OH FRA Number

East Corridor

Table 3: East Corridor Structures

FRA Asset ID	Asset Class	Corridor	Milepost	Location
504363M	UG Bridge	East	0.01	Fairview Avenue
975817H	OH Bridge	East	0.03	I-95
975818P	OH Bridge	East	0.05	I-95
504364U	OH Bridge	East	1.00	Fairview Avenue
504366H	UG Bridge	East	2.40	Navy Base
504367P	UG Bridge	East	2.58	Navy Base
504368W	UG Bridge	East	3.10	Navy Base
None Assigned	UG Bridge	East	3.80	Mill Cove
504370X	OH Bridge	East	4.45	Private
504371E	OH Bridge	East	4.88	Hurlbutt Road
None Assigned	UG Bridge	East	5.11	Clarks Cove - Gales Ferry Marina
None Assigned	OH Bridge	East	6.08	DOW Chemical
None Assigned	UG Bridge	East	6.14	DOW Chemical
None Assigned	UG Bridge	East	6.44	Culvert
None Assigned	UG Bridge	East	6.79	Stoddard’s Wharf Road
None Assigned	UG Bridge	East	1.89	Navy Base
None Assigned	UG Bridge	East	7.09	Stoddard Cove
None Assigned	UG Bridge	East	7.83	Poquetanock Cove
975819W	OH Bridge	East	9.08	Route 2A
None Assigned	UG Bridge	East	9.83	Partridge
504375G	OH Bridge	East	12.08	Unknown
None Assigned	UG Bridge	East	12.14	Shetucket River
504377V	OH Bridge	East	12.36	Route 12 Viaduct
504378C	OH Bridge	East	12.41	Unknown

Table 4: Spur Structures

FRA Asset ID	Asset Class	Corridor	Milepost	Location
504358R	UG Bridge	Spur	1.35	Shennecossett Road

2.4.3. Grade Crossings

Grade Crossings are identified as at grade crossing locations that intersect the track bed to support movement of either vehicles or people across active tracks. A grade crossing has two primary components, the crossing surface itself, and the level of warning protection for those who are to cross if a train is oncoming. Most grade crossings are easily identifiable as they connect the existing road network and can be identified either through the FRA website or Google Maps. However, some private crossings are more difficult to spot as they do not carry vehicular traffic and may only exist to preserve crossing rights for private owners to assess their property. FRA IDs were obtained for every crossing identified.

West Corridor

Table 5: West Corridor Grade Crossings

FRA Asset ID	Asset Class	Corridor	Milepost	Location
247201B	Grade Crossing	West	0.50	Thomas Griffin Road - FRA Number not on website
247203P	Grade Crossing	West	0.91	F&F Distributors
247207S	Grade Crossing	West	1.39	USCGA
247208Y	Grade Crossing	West	1.70	USCGA Rowing Facility
247209F	Grade Crossing	West	1.80	Old Thames Shipyard Grade Crossing
273189P	Grade Crossing	West	1.96	Connecticut College
247210A	Grade Crossing	West	2.38	Benham Street
247212N	Grade Crossing	West	3.45	End of Scotch Cap Road (FRA references 273190J)
273191R	Grade Crossing	West	3.86	Unknown
273192X	Grade Crossing	West	4.85	Unknown
247213V	Grade Crossing	West	5.04	Lower Bartlett Road
247214C	Grade Crossing	West	5.34	NRG Montville
247215J	Grade Crossing	West	5.76	Dock Road
247217X	Grade Crossing	West	5.96	Depot Road
247226W	Grade Crossing	West	6.54	Point Breeze Road
273193E	Grade Crossing	West	6.91	Private
247227D	Grade Crossing	West	7.87	Massapeag Side Road / Derry Hill Road
974512G	Grade Crossing	West	9.24	Emergency Boat Launch
247228K	Grade Crossing	West	11.92	Terminal Way
247230L	Grade Crossing	West	12.06	Terminal Way
247231T	Grade Crossing	West	12.13	Terminal Way
273194L	Grade Crossing	West	12.77	South Thames Street

Table 6: New London Station Grade Crossings

FRA Asset ID	Asset Class	Corridor	Milepost	Location
500295A	Grade Crossing	New London	122.76	State Street
500294T	Grade Crossing	New London	123.07	Ferry Street

East Corridor

Table 7: East Corridor Grade Crossings

FRA Asset ID	Asset Class	Corridor	Milepost	Location
912618G	Grade Crossing	East	1.84	Nautilus
504365B	Grade Crossing	East	2.16	Navy Base
504369D	Grade Crossing	East	4.15	Private
504372L	Grade Crossing	East	6.08	DOW Chemical
504373T	Grade Crossing	East	9.37	Unknown
504374A	Grade Crossing	East	11.99	Shetucket Iron South
912617A	Grade Crossing	East	12.16	Pedestrian Crossing
504379J	Grade Crossing	East	12.67	Norwich Train Station
504380D	Grade Crossing	East	12.83	S Golden Street
504381K	Grade Crossing	East	12.90	Erin Street
504382S	Grade Crossing	East	13.28	2nd Street
504383Y	Grade Crossing	East	13.42	5th Street
504385M	Grade Crossing	East	13.55	8th Street
913657B	Grade Crossing	East	11.75	Private

Table 8: Spur Grade Crossings

FRA Asset ID	Asset Class	Corridor	Milepost	Location
504357J	Grade Crossing	Spur	1.18	Tower Avenue
504359X	Grade Crossing	Spur	1.78	Shenneccossett Golf Course
504360S	Grade Crossing	Spur	2.04	Shenneccossett Golf Course
504522S	Grade Crossing	Spur	2.18	Pfizer
504361Y	Grade Crossing	Spur	2.67	Eastern Point Road
504523Y	Grade Crossing	Spur	2.85	General Dynamics
504524F	Grade Crossing	Spur	2.86	General Dynamics

3. Visual Inspection Observations

This section presents a detailed synopsis of the field inspection results. The results are broken up by Asset Category and further summarized by corridor. The project team used reasonable means possible to obtain access to both corridors. In most cases access was limited to locations where each corridor intersected a roadway either At Grade, Above Grade, Or Below Grade. This essentially limited the scope of the visual inspection to spot checks to assess the entire condition of each corridor. In some cases, particularly with structures, the team was able to visually identify a structure but was not able to get a close up to provide a true visual assessment, thus referred to as a limited access visual inspection.

Figure 9 on the following page shows where the team was able to assess the track and provide a visual assessment. If further investigation is required, it is recommended by the inspection team that a follow up inspection be conducted via a geometry car to provide better data of the entire track.

Figure 9: Access Map - West Corridor

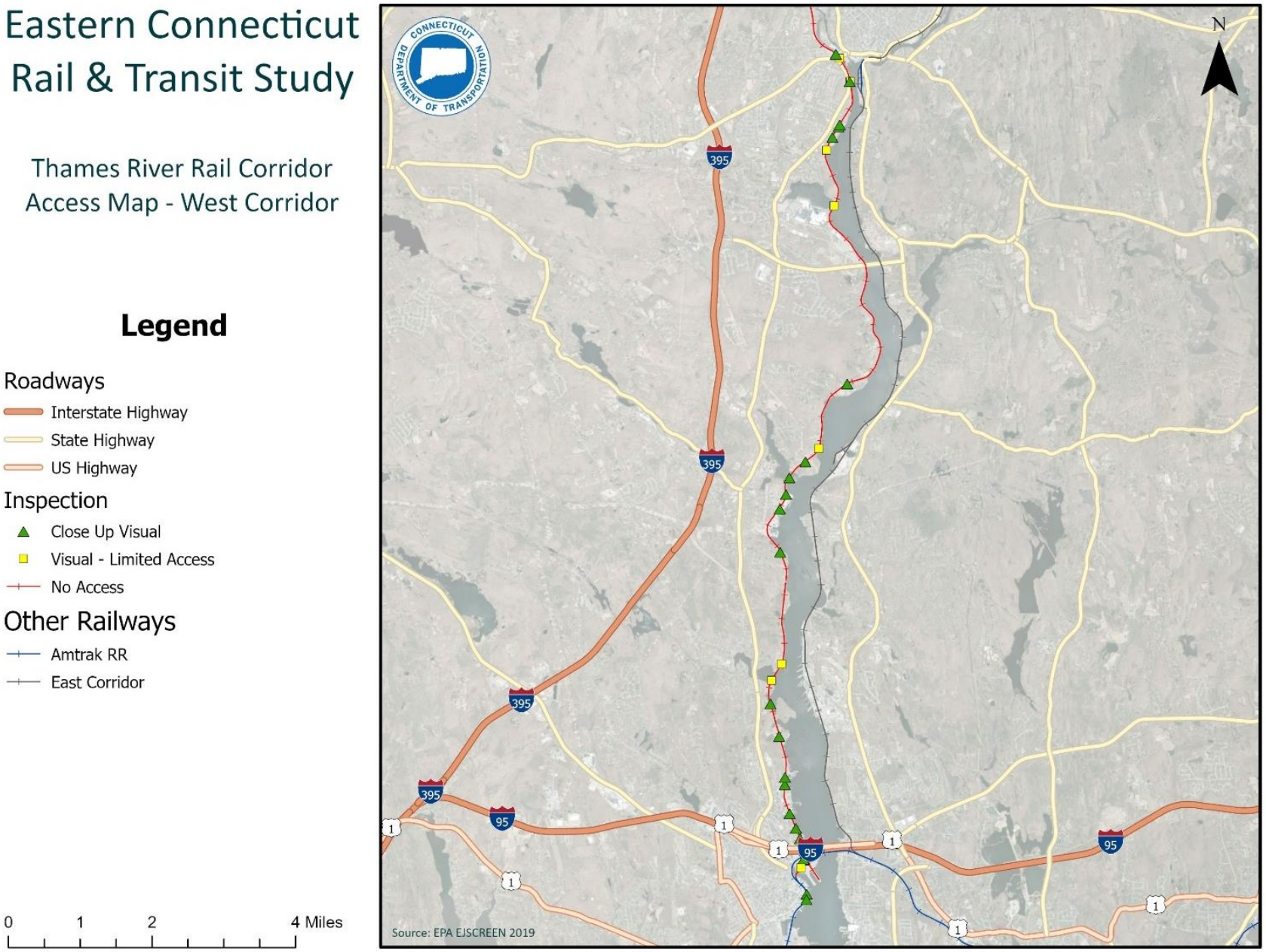
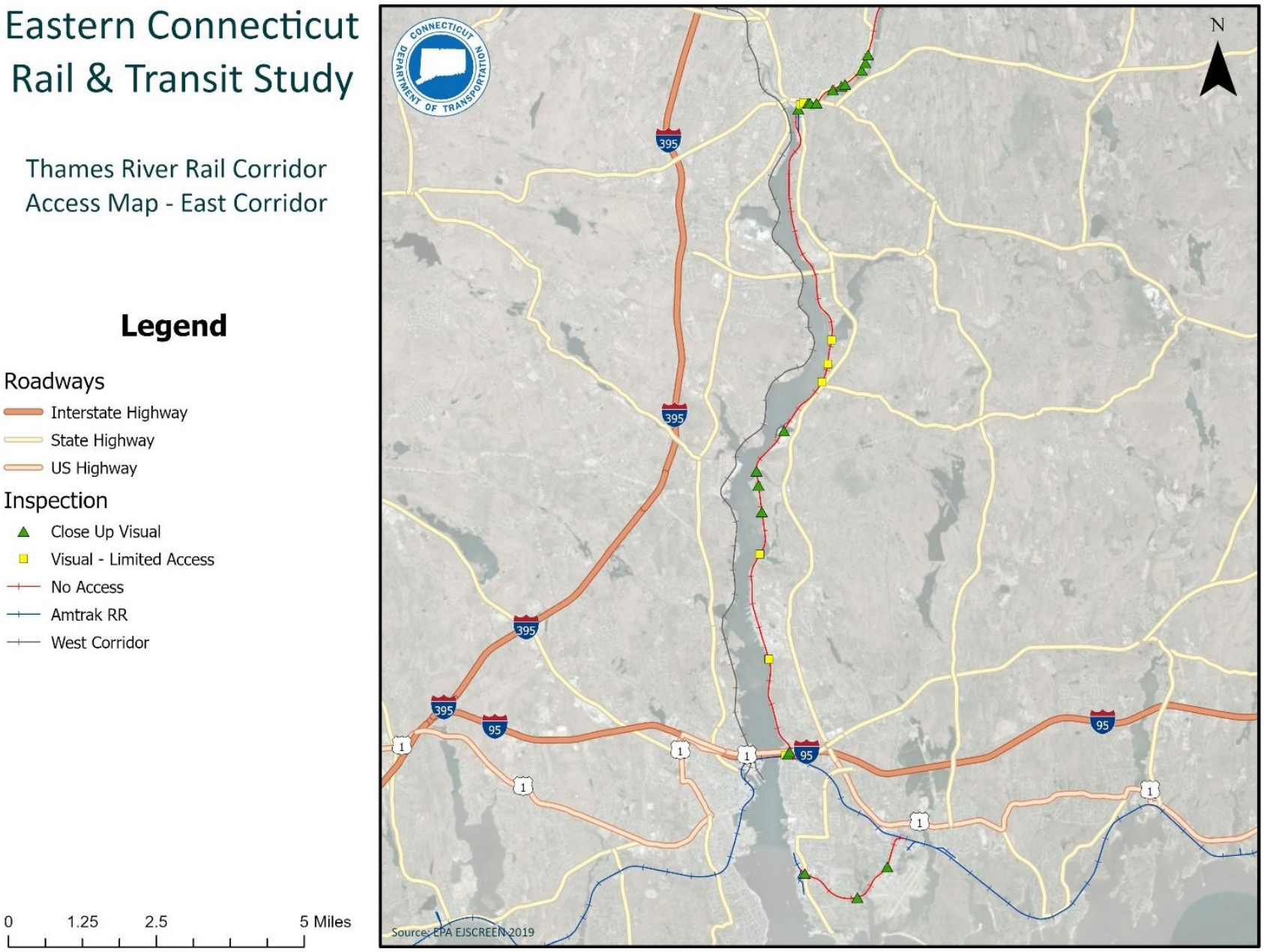


Figure 10: Access Map - East / Spur Corridor



3.1. Track

3.1.1. Steel Rail

The inspection team performed spot checks of the steel. In areas where the inspection team was able to assess the track, the team observed the steel rails to be in reasonable condition, with weights of 100 or 115RE steel. In the United States, it is recommended that main line steel rail for passenger services uses greater than 130 weight steel, most commonly manufactured 132/133 weight.

Figure 11: 115 RE Steel Rail

3.1.2. Ties

The inspection team performed spot checks of the ties. In areas where the inspection team was able to assess the track, the team observed only the existence of wood ties. Ties were in various conditions, but the team took photos of ties that were in poor condition. Signs of poor ties were either showing longitudinal cracking, severe rotting, or buried, which shows signs of poor drainage.

Figure 12: Wooden Ties with Severe Rotting

3.1.3. Ballast / Sub-Grade

The inspection team performed spot checks of the ballast. In areas where the inspection team was able to assess the track, the team observed the general condition of the ballast to be overall in good/fair condition, but in some spots, it was evident that the ballast condition was poor due to ponding water and excessive vegetation growth. This could signify unstable soil beneath that would require a thicker layer of ballast (>6 inches) or a need to replace the sub-ballast. The inspection team recommends that a follow up in-depth inspection occur along the entire corridor to provide a complete assessment of the ballast profile.

Figure 13: Lack of Visible Ballast/Ties and Vegetation Growth

3.1.4. Interlockings / Sidings

The inspection team was able to identify a few sidings, mainly on the west corridor, with manual switches. These switches were not able to be inspected for functionality and if necessary, it is recommended that further inspection be scheduled to test working condition. Additionally, the prospect of passenger rail service may recommend these sidings have automated switches for safety purposes.

Figure 14: Manual Track Switches and Interlockings

3.2. Structures

3.2.1. Undergrade Structures

The inspection team created an inventory of identified undergrade structures along both corridors, as shown in Table 9, Table 10, Figure 16, and Figure 16.

Table 9: Undergrade Structure - West Corridor - Visual Inspection

Mile Post	Inspection	Corridor	Bridge Type	FRA ID
11.72	Visual - Limited Access	West	Timber Trestle	None Assigned
10.90	Visual - Limited Access	West	Thru Girder	None Assigned
10.75	No Access	West	Culvert	None Assigned
10.32	No Access	West	Timber Trestle	None Assigned
9.78	No Access	West	Ballasted Deck	None Assigned
8.90	No Access	West	I-Beam	None Assigned
8.40	No Access	West	Open Deck	None Assigned
8.30	No Access	West	Open Deck	None Assigned
8.21	No Access	West	I-Beam	None Assigned
7.68	No Access	West	Timber Trestle	None Assigned
7.47	No Access	West	Thru Girder	None Assigned
7.08	No Access	West	I-Beam	None Assigned
6.81	Visual - Limited Access	West	I-Beam	None Assigned
6.23	Close Up Visual	West	I-Beam	None Assigned
5.21	No Access	West	Timber Trestle	None Assigned
4.67	No Access	West	Culvert	None Assigned
4.07	No Access	West	I-Beam	None Assigned
3.90	No Access	West	Timber Trestle	None Assigned
3.30	No Access	West	Open Deck	None Assigned
3.18	Visual - Limited Access	West	Timber Trestle	None Assigned
3.05	No Access	West	Open Deck	None Assigned
0.38	No Access	West	Timber Trestle	None Assigned

Table 10: Undergrade Structure - East/Spur Corridor - Visual Inspection

Mile Post	Inspection	Corridor	Bridge Type	FRA ID
12.14	Visual - Limited Access	East	Steel Truss	None Assigned
9.83	No Access	East	I-Beam	None Assigned
7.83	Visual - Limited Access	East	Multi-Span	None Assigned
7.09	Visual - Limited Access	East	I-Beam	None Assigned
6.79	Visual - Limited Access	East	I-Beam	None Assigned
6.44	No Access	East	Culvert	None Assigned
6.14	No Access	East	Unknown	None Assigned
5.11	Close Up Visual	East	I-Beam	None Assigned
3.80	Visual - Limited Access	East	Open Deck	None Assigned
3.10	No Access	East	Ballasted Deck	504368W
2.58	No Access	East	Open Deck	504367P
2.40	No Access	East	Open Deck	504366H
1.89	No Access	East	Culvert	None Assigned
0.01	Visual - Limited Access	East	Open Deck	504363M
1.35	Close Up Visual	Spur	Open Deck	504358R

Figure 15: Undergrade Structures West Corridor

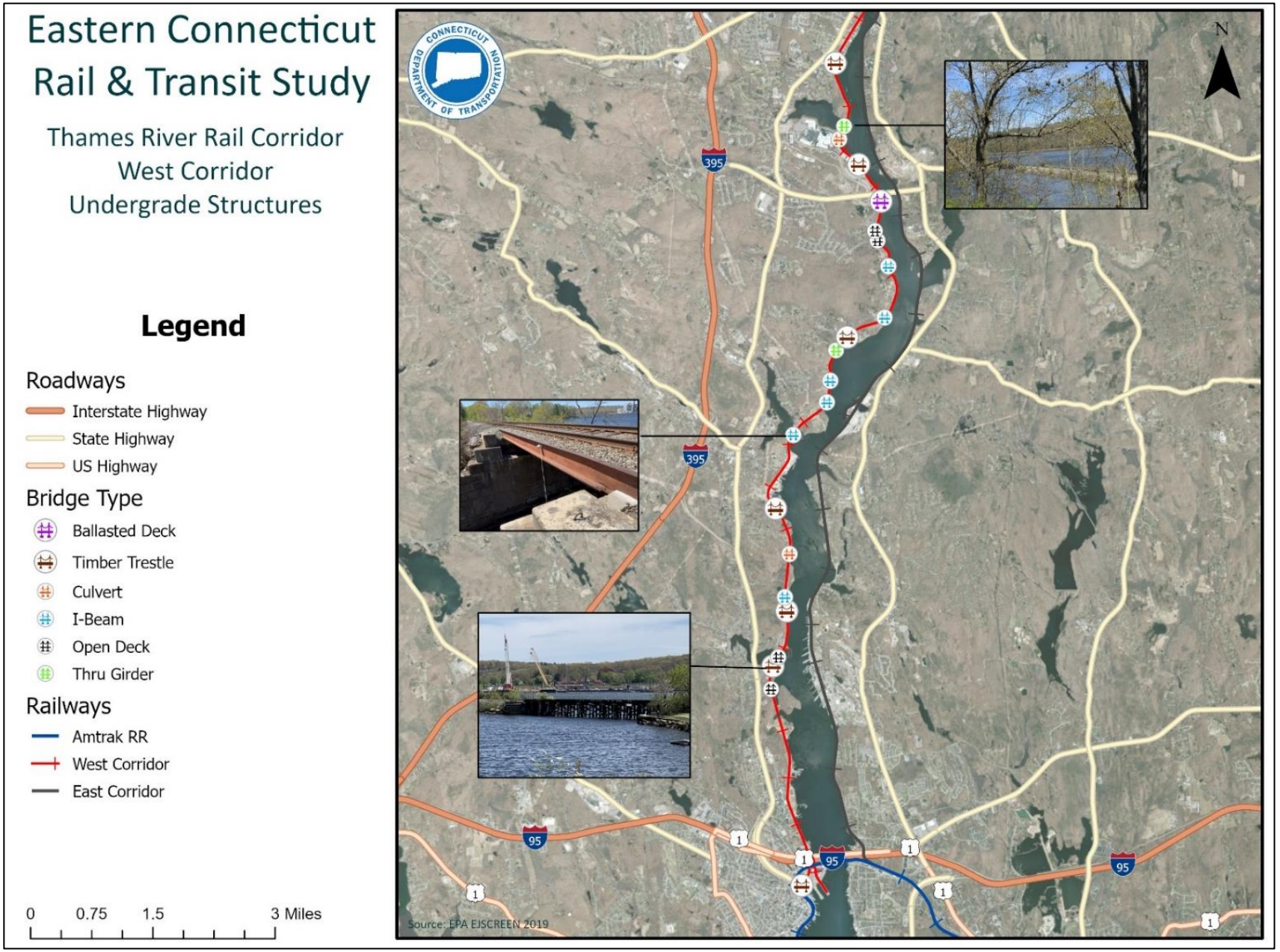
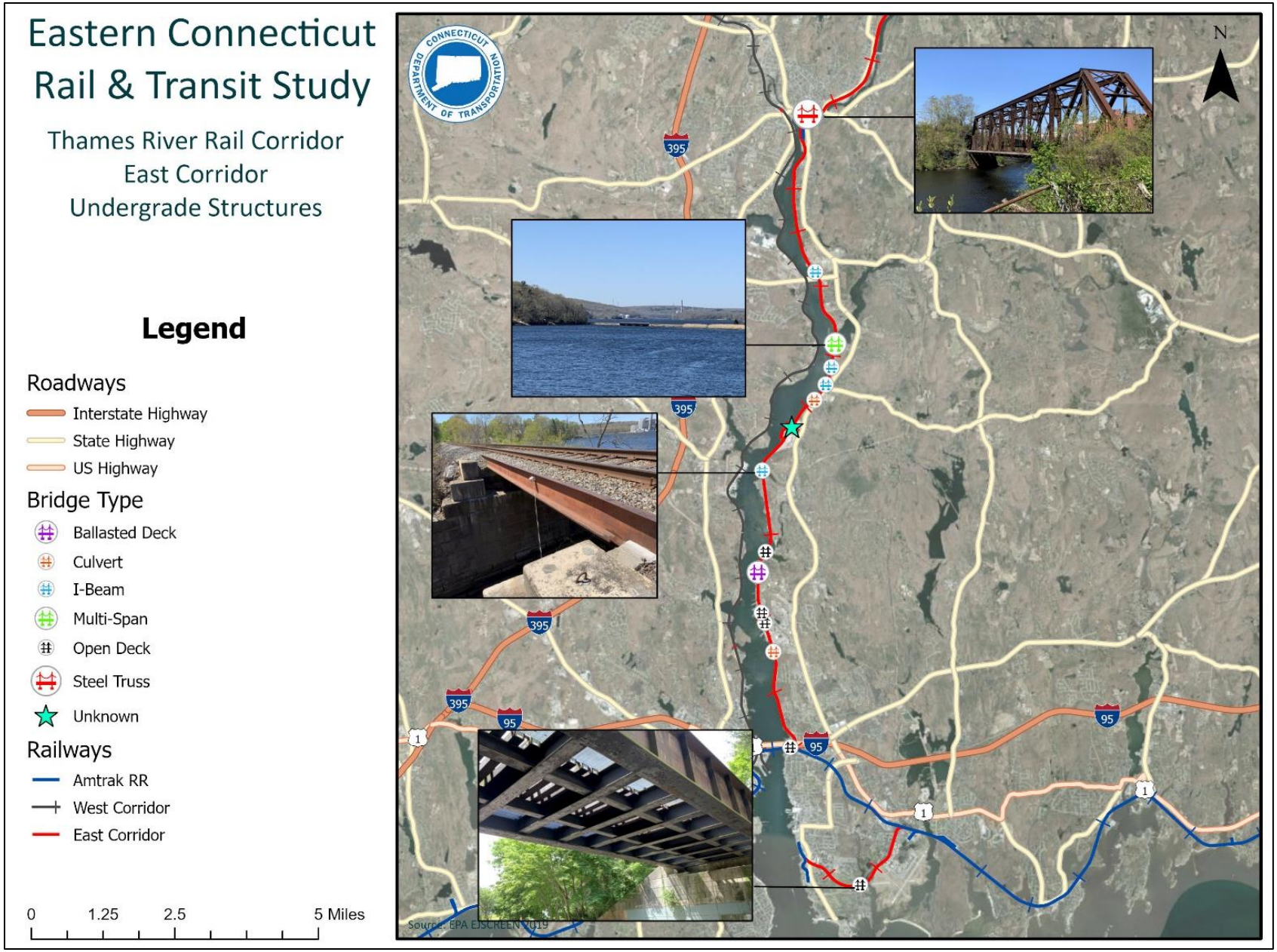


Figure 16: Undergrade Structures East/Spur Corridor



Undergrade structures can be characterized in many ways but for the purpose of this report, they were defined as follows:

Ballasted Deck

Two ballasted decks were identified using Google Map imagery, including structure 504368W along the East corridor (MP 3.10). Access was prohibited due to the structure residing on the US Navy Submarine Base in Groton. Further inspection would be require authorized access onto the base to obtain both visual and in-depth review of condition of these bridges.

Culvert

Three culverts (2 West Side and 1 East Side) were identified via Google Map Imagery (Asset ID's unknown). Access was prohibited due to inability to obtain visual inspection safely. Further inspection would be required that would authorize access to these locations to obtain both visual and in-depth review of condition of these bridges.

I-Beam

Ten (10) UG bridges combined along both corridors were defined as I-beam structures. Of the ten, two (2) received close visual inspections (MP 6.23 West Side and MP 5.11 East Side). Three (3) other structures received a limited visual inspection (MP 6.81 West Side / MP 6.79 and 7.09 East Side). The remaining five (5) were inaccessible due to inability to obtain visual inspection safely. Further inspection would be required that would authorize access to these locations to obtain an in-depth review of condition of these bridges.

Figure 17: I-Beam Bridge on Gales Ferry Marina (MP 5.11)

Multi-Span

The inspection team observed one (1) bridge along the east corridor that was identified as a multi-span bridge. This bridge received a limited visual inspection (MP 7.83) and would require boat access to complete a full in-depth inspection.

Figure 18: Multi-Span Bridge on Poquetanock Cove (MP 7.83)

Open Deck

Nine (9) UG bridges were identified as Open Deck structures. Of these nine, only three (3) had visual access and that access was limited for two of them (MP 0.01 and MP 3.80 East Side). Bridge 504358R along the Groton Spur received a visual close-up inspection of the substructure and underside of the superstructure, but there was no access to the top side of the structure (MP 1.35). The remaining six (6) were inaccessible due to the inability to obtain visual inspection safely. Further inspection would require authorized access to these locations to conduct an in-depth review of condition.

Figure 19: Open Deck Bridge on Shenneccossett Road (MP 1.35)

Steel Truss

The inspection team observed one (1) Steel Truss bridge along the east corridor that was adjacent to the old Norwich Train Station. The team was able to get close to the deck and superstructure from the northbound side but was not able to obtain a visual on the substructure. Therefore, this bridge received a limited visual inspection (MP 12.14) and would require boat access to complete a full in-depth inspection.

Figure 20: Steel Truss Bridge at MP 12.14

Thru Girder

The inspection team observed two (2) Thru-Girders along the west corridor. One bridge was able to receive a limited visual inspection (MP 10.90) while one bridge was inaccessible due to the inability to obtain visual inspection safely (MP 7.47). Further inspection would require authorized access to these locations to obtain an in-depth review of condition of these bridges.

Figure 21: Thru-Girder Bridge at Trading Cove (MP 10.90)

Timber Trestle

Along the west corridor, seven (7) UG structures were identified as Timber Trestles. Of these seven, only two (2) were able to obtain visual inspection and it was limited for both (MP 3.18 and 11.72). The other five (5) were inaccessible due to the inability to obtain visual inspection safely. Further inspection would require authorized access to these locations to obtain an in-depth review of condition of these bridges.

Figure 22: Timber Trestle (MP 3.18)

Unknown

A structure within the old DOW Chemical plant (MP 6.14) was unidentifiable due to lack of any kind of visual access and no imagery available on Google Maps. Access was unobtainable due to prohibition of trespassing on private property. Further inspection would be required to achieve both visual and in-depth review of condition of these bridges.

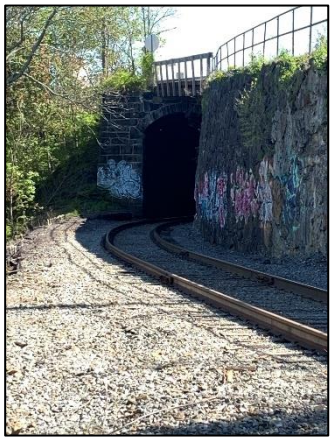
3.2.2. Overhead Structures

There were not many overhead structures observed in the field, but in most cases, OH bridges were existing roadways that crossed over the tracks. The main roadways were Route 2A and the Gold Star Bridge carrying I-95, which provided little to no concern of clearance or condition issues. Other structures, however, are called out below:

Figure 23: Riverside Park (MP 1.07)

Figure 25: DOW Chemical (MP 6.08)

Figure 24: Laurel Hill Avenue (MP 12.08)



3.3. Grade Crossings

Most spot checks performed along each corridor were at existing grade crossings. These were the locations that were easiest to access for the inspection team. The team observed both the condition of the crossing surface, as well as the presence of warning / control devices. They also observed other miscellaneous items, particularly the presence of fiber optic cables or notification of presence of utility piping. The inventory is shown below:

3.3.1. Crossing Surfaces

Crossing Surfaces are characterized as either being wood, rubber, pre-cast concrete, asphalt, or unpaved. Inventories are shown in the tables below as well as in Figures 26 and 27.

Table 11: Grade Crossing Surface Inventory - West Corridor

Mile Post	Inspection	Corridor	Crossing Surface	FRA ID
123.07	Close Up Visual	Main	Rubber Panels	500294T
122.76	Close Up Visual	Main	Rubber Panels	500295A
13.00	Visual - Limited Access	West	Asphalt	273194L
12.12	Close Up Visual	West	Asphalt	247231T
12.08	Close Up Visual	West	Rubber Panels	247230L
11.90	Close Up Visual	West	Asphalt	247228K
9.24	No Access	West	Unknown	974512G
7.87	Close Up Visual	West	Pre-Cast Concrete Panels	247227D
6.80	No Access	West	Unknown	273193E
6.50	Close Up Visual	West	Pre-Cast Concrete Panels	247226W

Mile Post	Inspection	Corridor	Crossing Surface	FRA ID
5.96	Close Up Visual	West	Unpaved	247217X
5.76	Close Up Visual	West	Asphalt	247215J
5.35	No Access	West	Unknown	247214C
5.05	Close Up Visual	West	Asphalt	247213V
4.90	No Access	West	Unknown	273192X
3.86	No Access	West	Unknown	273191R
3.55	Visual - Limited Access	West	Unpaved	273190J
2.37	Close Up Visual	West	Rubber Panels	247210A
1.90	No Access	West	Unknown	273189P
1.79	Close Up Visual	West	Asphalt	247209F
1.70	Close Up Visual	West	Asphalt	247208Y
1.39	No Access	West	Unknown	247207S
0.91	Close Up Visual	West	Asphalt	247203P
0.40	Visual - Limited Access	West	Unpaved	247208B

Table 12: Grade Crossing Surface Inventory - East/Spur Corridor

Mile Post	Inspection	Corridor	Crossing Surface	FRA ID
13.55	Close Up Visual	East	Wood	504385M
13.42	Close Up Visual	East	Unpaved	504383Y
13.28	Close Up Visual	East	Wood	504382S
12.90	Close Up Visual	East	Asphalt	504381K
12.83	Close Up Visual	East	Asphalt	504380D
12.67	Close Up Visual	East	Unpaved	504379J
12.16	Close Up Visual	East	Asphalt	912617A
11.99	Close Up Visual	East	Asphalt	504374A
11.75	No Access	East	Unpaved	913657B
9.50	No Access	East	Unknown	504373T
6.08	Close Up Visual	East	Asphalt	504372L
4.15	No Access	East	Unknown	504369D
2.16	No Access	East	Unknown	504365B
1.84	Visual - Limited Access	East	Asphalt	912618G
2.86	No Access	Spur	Unknown	504524F
2.85	No Access	Spur	Unknown	504523Y
2.67	Close Up Visual	Spur	Asphalt	504361Y
2.18	No Access	Spur	Unknown	504522S
2.04	No Access	Spur	Unknown	504360S
1.78	No Access	Spur	Unknown	504359X
1.18	Close Up Visual	Spur	Rubber Panels	504357J

Figure 26: Grade Crossing Surface Inventory - West Corridor

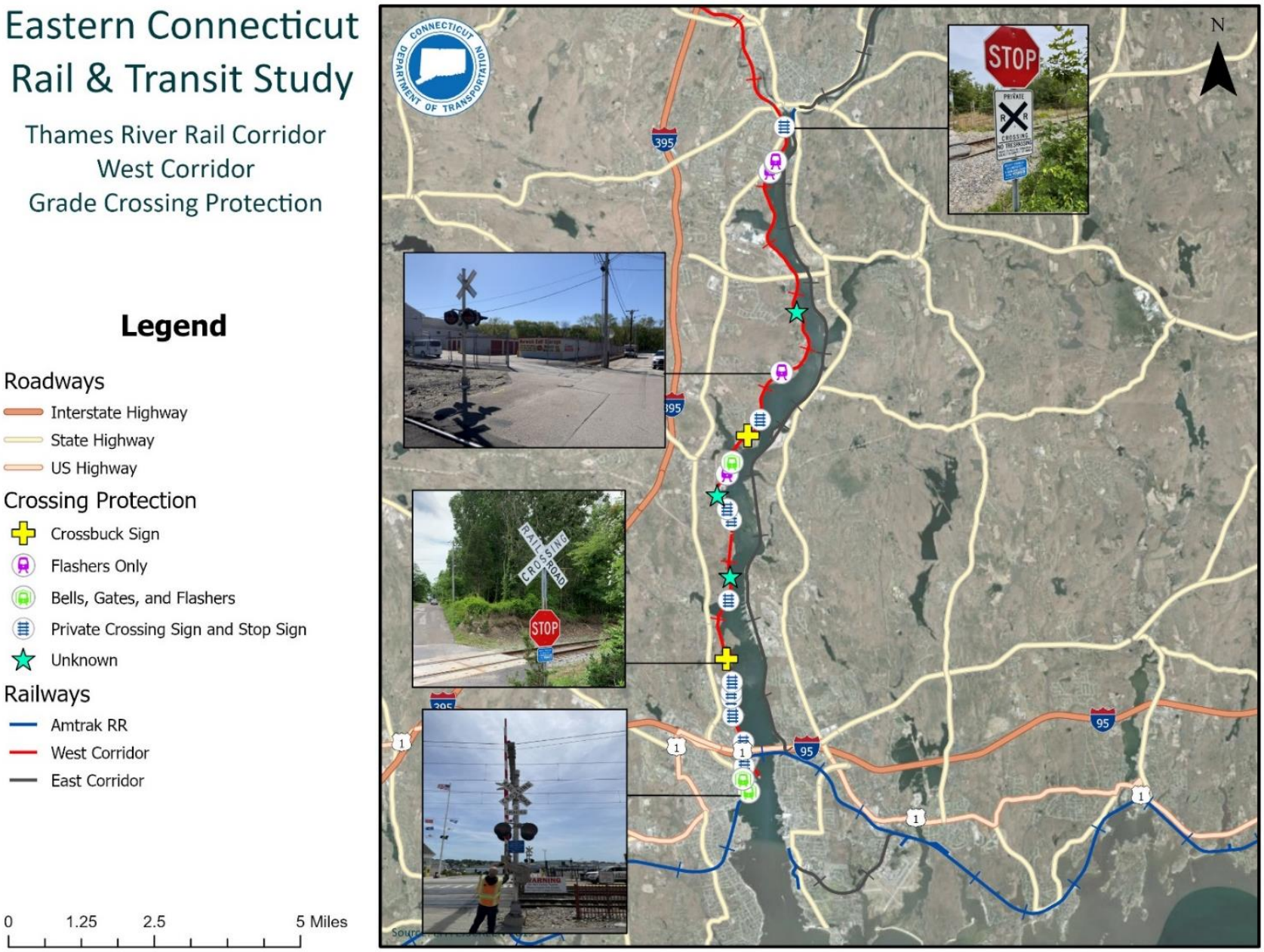
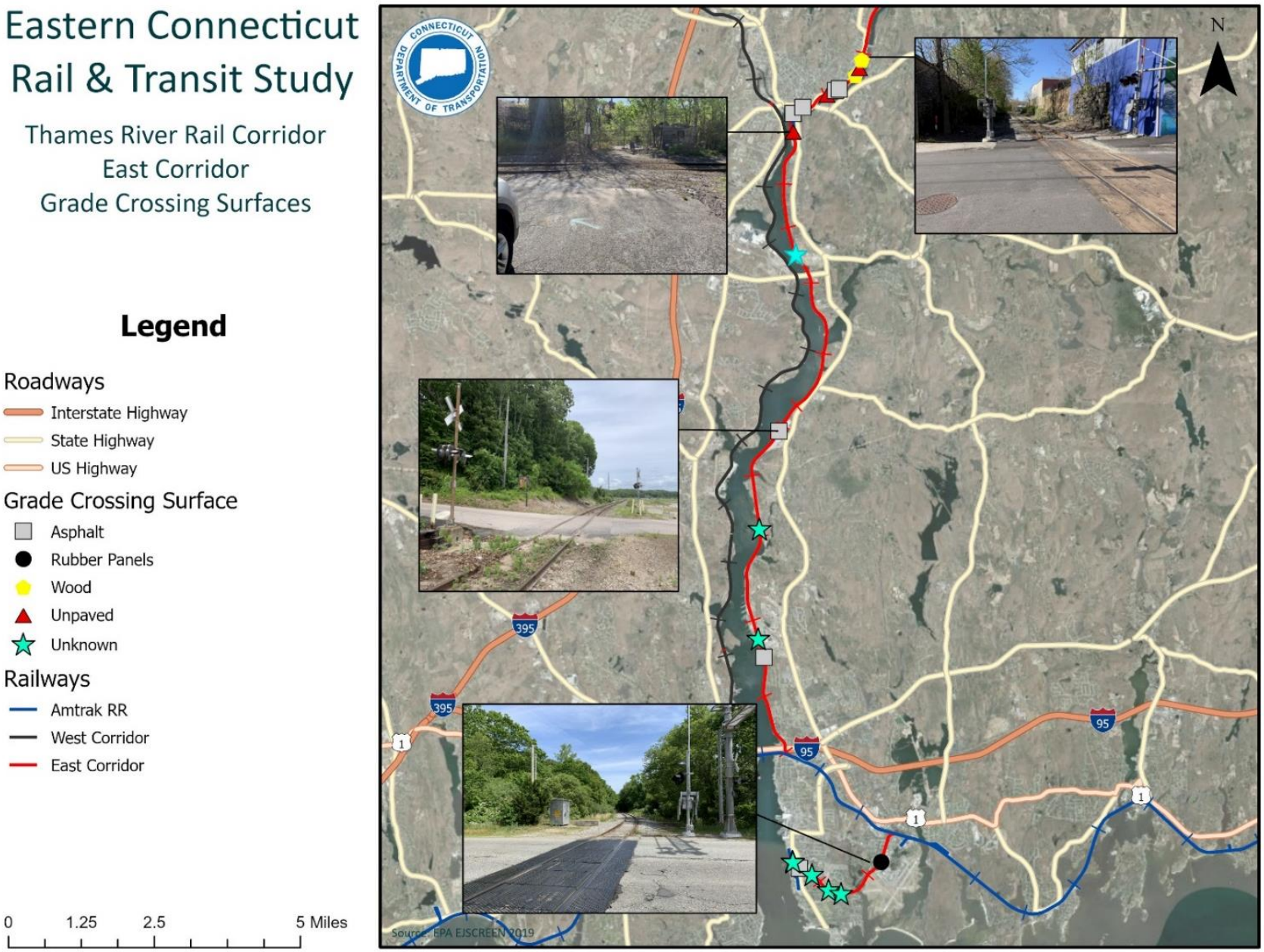


Figure 27: Grade Crossing Surface Inventory - East / Spur Corridor



Rubber

Rubber panels imbedded in the road were generally in good condition as they appeared to be installed recently and did not show any visual issues.

Figure 28: Benham Avenue Grade Crossing (MP 2.37)

Pre-Cast Concrete

Pre-cast concrete panels were generally in excellent condition as they appeared to be installed recently and did not show any visual issues.

Figure 29: Point Breeze Grade Crossing (MP 6.50)

Asphalt

Asphalt crossing surfaces had mixed condition assessments. While some surfaces appeared to show minimal cracking, others were in poor condition and showed signs of heaving, to some degree showing evidence of rubbing against the undercarriage of passing trains.

Figure 30: Elevation of Heaving from Rail Surface (Lower Bartlett Road)

Figure 34: Poor Condition - Lower Bartlett Road (MP 5.05)

Figure 33: Good Condition - Terminal Way (MP 12.08)

Figure 32: Fair Condition - DOW Chemical (MP 6.08)

Unpaved

Several unpaved surfaces exist for private crossings and were not all able to be visually inspected. Any identified crossings with unpaved surfaces would need to be upgraded preferably to a rubber or pre-cast concrete panel crossing surface.

Figure 31: Depot Road Grade Crossing (MP 5.96)

Figure 35: Old Thames River Shipyard (MP 1.79)

Unknown

Numerous passive grade crossings were unable to be accessed and therefore it could not be determined which type of crossing surface was available. In most cases access was limited to passive crossings that avoided trespassing on private property. The report identifies where these grade crossings are and their FRA asset ID's. Further inspection would be required that would have to include authorized access to these crossings.

3.3.2. Warning / Control Devices

Grade crossings for passenger rail should be fully signalized with bells, gates, and flashers. The inspection team identified varied levels of protection at all grade crossings, from active crossings with full gates and flashers, to passive crossings that only showed signage that were incompatible with FRA safety standards. Nearly all grade crossings both active and passive had an ID plate with a phone number for the public to call. There were five generalized categories to define protection at each identified grade crossing. Warning/control devices are summarized in Table 13, Table 14, Figure 36, and Figure 37.

Table 13: Grade Crossing Protection Inventory - West Corridor

Mile Post	Inspection	Corridor	Protection	FRA ID
123.07	Close Up Visual	Main	Bells, Gates, and Flashers	500294T
122.76	Close Up Visual	Main	Bells, Gates, and Flashers	500295A
13.00	Visual - Limited Access	West	Private Crossing Sign and Stop Sign	273194L
12.12	Close Up Visual	West	Flashers Only	247231T
12.08	Close Up Visual	West	Private Crossing Sign and Stop Sign	247230L
11.90	Close Up Visual	West	Flashers Only	247228K
9.24	No Access	West	Unknown	974512G
7.87	Close Up Visual	West	Flashers Only	247227D
6.80	No Access	West	Private Crossing Sign and Stop Sign	273193E
6.50	Close Up Visual	West	Crossbuck Sign	247226W
5.96	Close Up Visual	West	Bells, Gates, and Flashers	247217X
5.76	Close Up Visual	West	Flashers Only	247215J
5.35	No Access	West	Unknown	247214C
5.05	Close Up Visual	West	Private Crossing Sign and Stop Sign	247213V
4.90	No Access	West	Private Crossing Sign and Stop Sign	273192X
3.86	No Access	West	Unknown	273191R
3.55	Visual - Limited Access	West	Private Crossing Sign and Stop Sign	273190J
2.37	Close Up Visual	West	Crossbuck Sign	247210A
1.90	No Access	West	Private Crossing Sign and Stop Sign	273189P
1.79	Close Up Visual	West	Private Crossing Sign and Stop Sign	247209F
1.70	Close Up Visual	West	Private Crossing Sign and Stop Sign	247208Y
1.39	No Access	West	Private Crossing Sign and Stop Sign	247207S
0.91	Close Up Visual	West	Private Crossing Sign and Stop Sign	247203P
0.40	Visual - Limited Access	West	Private Crossing Sign and Stop Sign	247208B

Table 14: Grade Crossing Protection - East/Spur Corridor

Mile Post	Inspection	Corridor	Protection	FRA ID
13.55	Close Up Visual	East	Bells, Gates, and Flashers	504385M
13.42	Close Up Visual	East	Private Crossing Sign and Stop Sign	504383Y
13.28	Close Up Visual	East	Crossbuck Sign	504382S
12.90	Close Up Visual	East	Flashers Only	504381K
12.83	Close Up Visual	East	Flashers Only	504380D
12.67	Close Up Visual	East	Private Crossing Sign and Stop Sign	504379J
12.16	Close Up Visual	East	Bells, Gates, and Flashers	912617A
11.99	Close Up Visual	East	Flashers Only	504374A
11.75	No Access	East	Crossbuck Sign	913657B
9.50	No Access	East	Unknown	504373T
6.08	Close Up Visual	East	Flashers Only	504372L
4.15	No Access	East	Private Crossing Sign and Stop Sign	504369D
2.16	No Access	East	Flashers Only	504365B
1.84	Visual - Limited Access	East	Bells, Gates, and Flashers	912618G
2.86	No Access	Spur	Unknown	504524F
2.85	No Access	Spur	Unknown	504523Y
2.67	Close Up Visual	Spur	Crossbuck Sign	504361Y
2.18	No Access	Spur	Unknown	504522S
2.04	No Access	Spur	Unknown	504360S
1.78	No Access	Spur	Unknown	504359X
1.18	Close Up Visual	Spur	Bells, Gates, and Flashers	504357J

Figure 36: Grade Crossing Protection - West Corridor

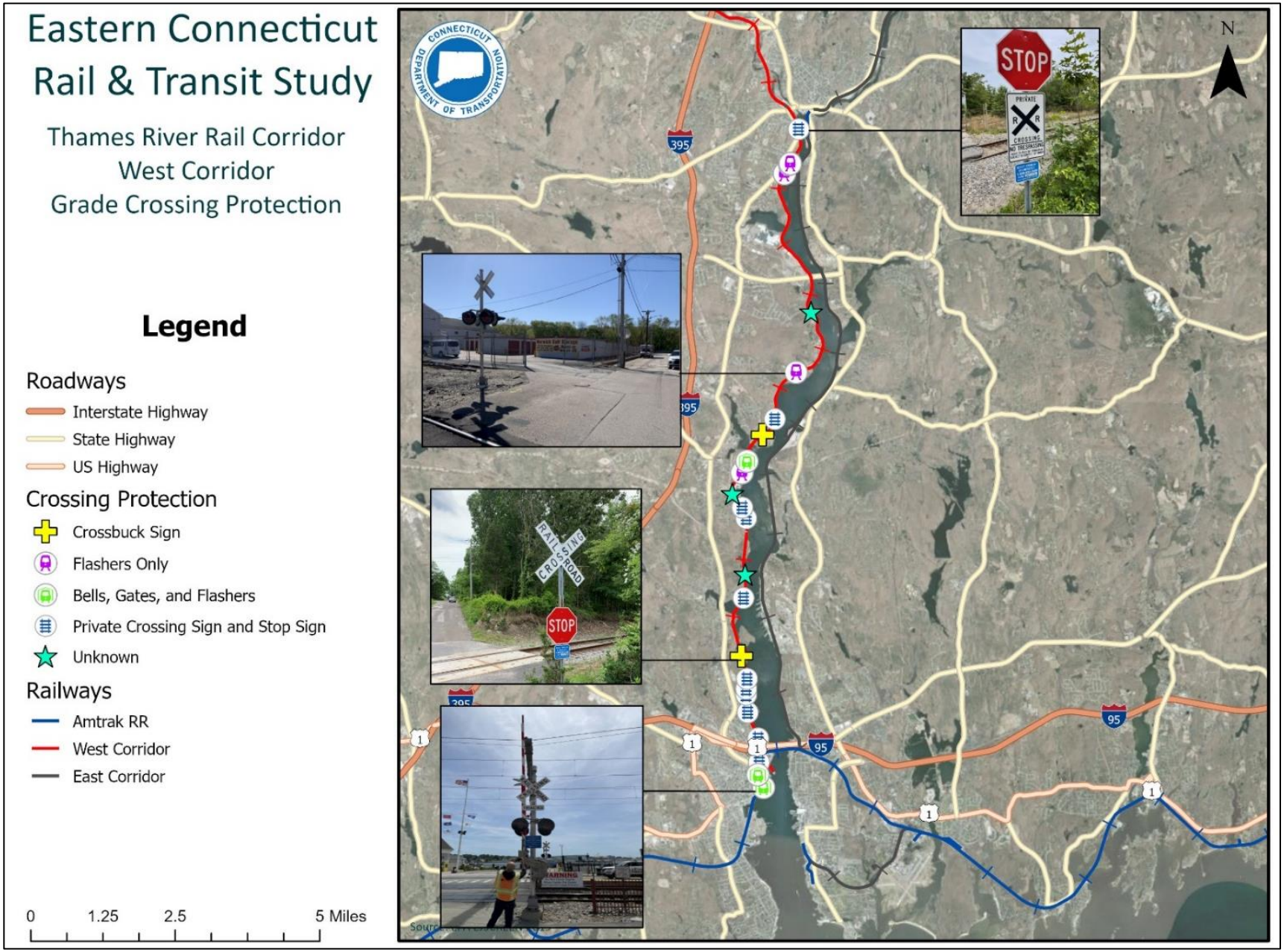
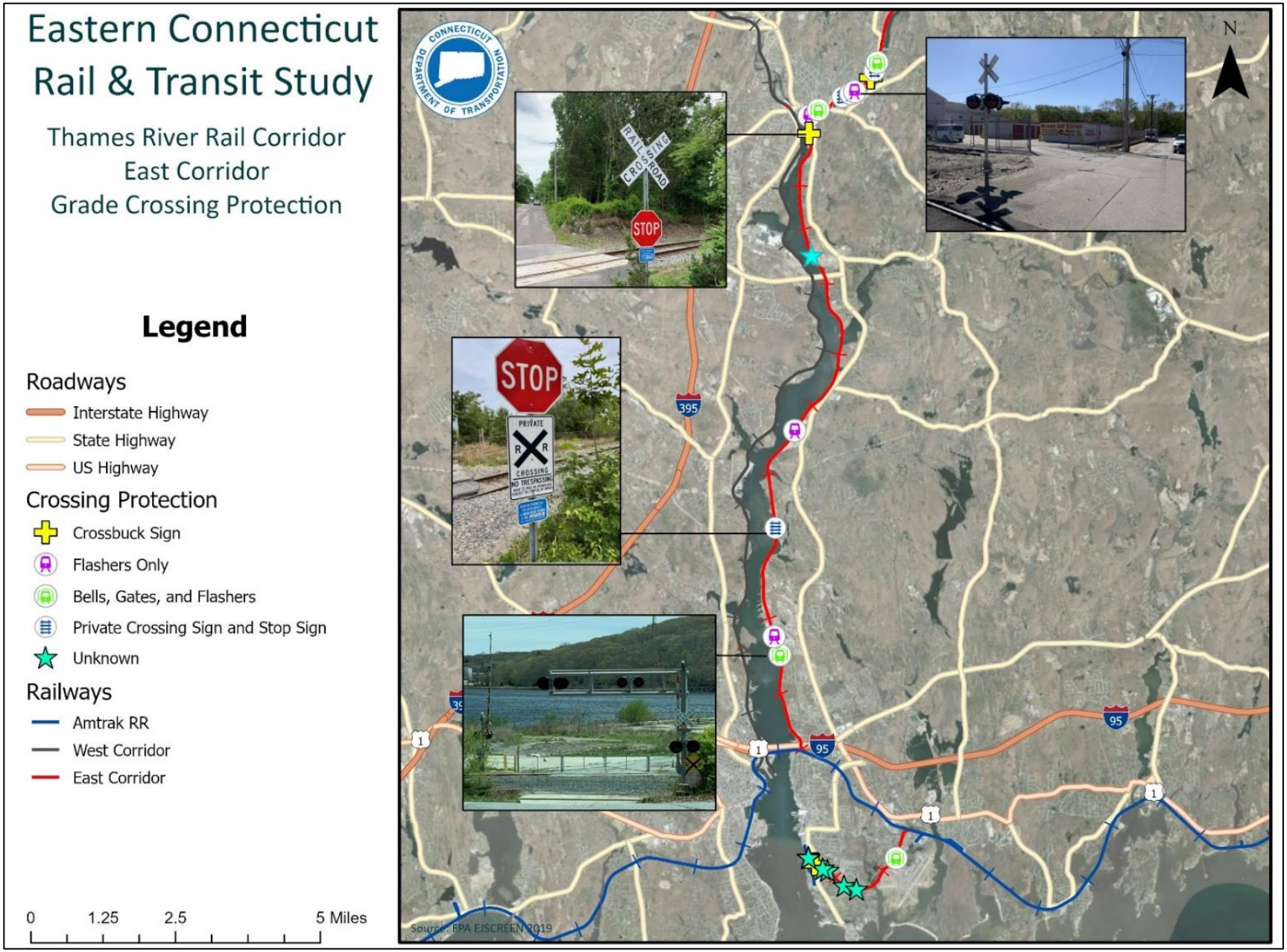


Figure 37: Grade Crossing Protection - East / Spur Corridor



Bells, Flashers, and Gates

Few active grade crossings were identified to have a complete combination of bells, flashers, and gates. In general, it was presumed these control devices were in working condition, but further inspection will need to test these devices to ensure they are in proper order.

Figure 38: New London Train Station Grade Crossing (MP 122.76)

Flashers Only

Most active grade crossings observed tended to show flashers only adhered to a crossbuck signpost. In general, it was presumed these were in working condition, but would likely need to be updated to include bells and gates to support passenger rail service.

Figure 39: South Golden Street (MP 12.83)

Figure 40: Terminal Way (MP 11.90)

Crossbucks Only

Passive grade crossings that crossed over public roads generally had a crossbuck only sign. Only a few grade crossings identified in the field fit this category. Proposed passenger rail service would likely justify classifying these crossings as active and require a full upgrade of communication equipment to support bells, gates, and flashers.

Figure 41: Point Breeze Road (MP 6.50)

Private Grade Crossing with Stop Sign

The most common occurrence observed in the field were private grade crossings that were either fenced or unfenced with a stop sign and private crossing sign.

Figure 42: Unfenced Private Grade Crossing - Lower Bartlett Road (MP 5.05)

Figure 43: Fenced Grade Crossing - South Thames Street (MP 13.00)

Unknown

Numerous passive grade crossings were unable to be accessed and therefore it could not be determined what existing crossing protection was available. In most cases access was limited to passive crossings to avoid trespassing on private property. The report identifies where these grade crossings are and their FRA asset ID's. Further inspection would be required that would have to include authorized access to these crossings.

3.4. Other Assets

3.4.1. Fiber Optic

While out in the field, the team identified fiber optic cable warning posts along numerous grade crossings along the western corridor. This indicates that a portion of the corridor already has fiber, which potentially could be utilized for upgrading the communications infrastructure along the western side of the corridor. Further coordination would need to be scheduled with AT&T to determine what the existing fiber is used for, what utility conflicts could arise if the corridor needed to be rehabbed, and whether the rail corridor could tap into the existing fiber network to support its communication equipment.

Figure 44: Existing Fiber Optic Cable Warning Post (AT&T)

3.4.2. Right of Way Protection

On various observed segments, there were existing chain link fencing that offered ROW protection. In many cases, the fencing was deficient and should be upgraded. A further inspection should identify other segments of the corridor that have either deficient fencing and/or require upgraded fencing for ROW protection.

Figure 45: Damaged Fencing at Old Norwich Train Station (MP 12.3)

3.4.3. Sewage Piping

On various segments, the inspection team identified both underground and/or exposed sewage piping. In New London, the team noticed a sign for pipe-sewage with a depth of about 6 feet. In Norwich, the team identified an exposed pipe of approximately 12" in diameter, that is believed to be a temporary outlet for treated water from the Norwich Wastewater Plant. Further inspection will need to confirm where these utilities exist throughout each corridor, where the inlets and outlets officially go, and whether exposed pipes are temporary/permanent and what impacts they would have on ROW construction.

Figure 46: Exposed Outlet Sewage Pipe (Norwich)

Figure 47: Signage for Buried Sewage Pipe (New London)

4. Needs Assessment

This section reviews the observed visual inspection considerations and provides a general analysis of the needs assessment for the corridor.

4.1. Capital Needs

For a full visual inspection photo index of each grade crossing and structure observed, refer to **Exhibit A**.

4.1.1. Track

Based on spot checks, the inspection team assumed that existing steel rail throughout the west corridor would need to be replaced. The inspection team observed steel rail of 100 or 115RE at all spots and assumed that the entire 13.6-mile corridor would need to be upgraded to support heavier axle load requirements at faster speeds, which generally requires at a minimum the use of 132/133 steel rail.

The inspection team found in all locations that the steel rail was supported by wooden ties. Although some ties appeared to be in good/fair condition, spot checks revealed many locations where existing wooden ties had severe longitudinal cracking. The inspection team recommends that the entire corridor should be upgraded with concrete ties, but further inspection might suggest that some segments of track ties may not need to be replaced.

Spot checks found that ballast appeared to be sufficient in many locations, but localized areas showed signs of poor drainage. This would suggest that ballast would need to be added in certain areas. However, a further full corridor inspection would be able to identify exactly how much of the corridor would need new ballast.

The project team identified several locations where there were manual throw switches for sidings. The team identified three (3) manual throw switches that would need to be upgraded to an automatic switch system. Because the team was only able to perform spot checks, there are likely additional switches that would need to be upgraded as well.

Table 15: Identified Capital Action Items for Track

Capital Item	Units	West	East
Replace 100/115 Steel Rail with 132/133	Track Miles	13.60	16.41
Replace Wooden Ties with Concrete Ties	Track Miles	13.60	16.41
Replace Ballast / Sub-Ballast	Track Miles	13.60	16.41
Replace Manual Throw Switches	Switches	2	1

4.1.2. Structures

Further in-depth inspection and load rating analysis would be required to determine to what extent repairs, rehabilitation, or replacement would be needed for undergrade structures. It is assumed, however, that any timber trestle identified would need to be replaced, as this study team recommends that passenger service does not run on any timber trestle bridges. There were seven (7) timber trestles identified along the west corridor.

The visual inspection identified two abandoned structures that would need to be removed, one on each corridor. The abandoned bridge at Riverside Park should be removed and a structure at the old DOW chemical site should be removed or at least further inspected to validate safety concerns. There is also a tunnel at Laurel Hill that would need to be inspected to ensure that vertical clearance is not an issue.

Table 16: Identified Capital Actions Items for Structures

Capital Item	Units	West	East
Timber Trestle (Replace)	# Of Structures	7	0
Thru Girder (Rehab/Repair/Replace)	# Of Structures	2	0
Culvert (Rehab/Repair/Replace)	# Of Structures	2	2
Ballasted Deck (Rehab/Repair/Replace)	# Of Structures	1	1
I-Beam (Rehab/Repair/Replace)	# Of Structures	6	4
Open Deck (Rehab/Repair/Replace)	# Of Structures	4	5
Steel Truss (Rehab/Repair/Replace)	# Of Structures	0	1
Multi-Span (Rehab/Repair/Replace)	# Of Structures	0	1
Unknown Bridge (Rehab/Repair/Replace)	# Of Structures	0	1
Remove Abandoned Overhead Structures	# Of Structures	1	1
Inspect/Repair Existing Overhead Structures	# Of Structures	0	1

4.1.3. Grade Crossings and Communications

As part of an upgrade to each corridor's grade crossing protection and condition, it is recommended that crossing surfaces at each grade crossing be in superior condition and safe to all vehicles and pedestrians. This means upgrading grade crossing surfaces that utilize dirt, stone, wood, or asphalt to either rubber or pre-cast concrete panels. For the purposes of recommendation calculations, the inspection team assumed each crossing would be upgraded to rubber.

Table 17: Identified Capital Action Items for Grade Crossing Surfaces

Capital Item	Units	West	East
Inspect/Repair Concrete Panel Surfaces	# Of Crossings	2	0
Inspect/Repair Rubber Panel Surfaces*	# Of Crossings	2	1
Replace Wood Xing Surfaces (Rubber)	# Of Crossings	0	2
Replace Asphalt Xing Surfaces (Rubber)	# Of Crossings	8	7
Replace Unpaved Xing Surfaces (Rubber)	# Of Crossings	3	3
Replace Unknown Xing Surfaces (Rubber)	# Of Crossings	7	8

*Excludes Crossings at New London Train Station on Main Line

To support passenger service, each corridor would see more frequent train service, which would likely require updating all passive grade crossings, both public and private, to active. It would also require active grade crossings that do not have gates to have them installed at all sites.

Table 18: Identified Capital Action Items for Grade Crossing Protection

Capital Item	Units	West	East
Inspect Crossings with Bells, Gates, and Flashers*	# Of Crossings	1	4
Upgrade Crossings with Flashers Only	# Of Crossings	4	4
Upgrade Crossings with Crossbuck Sign Only	# Of Crossings	2	3
Upgrade Private Crossings	# Of Crossings	8	2
Upgrade Unknown Crossings	# Of Crossings	7	8

*Excludes Crossings at New London Train Station on Main Line

4.1.4. Other Assets

Among other considerations, each corridor will likely need to install positive train control (PTC), as currently, each corridor appears to operate in dark territory. PTC generally requires the installation of wayside interface units and servers, as well as upgrades to existing cabinets at grade crossings and interlockings/control points.

There are various estimates for how much this infrastructure will cost, but general online research puts it anywhere from $192,000 per route mile to $1.9 million per route mile. Further studies will need to identify a reasonable cost estimate for installation of this technology.

In addition, there will be certain areas along each corridor that require ROW protection fencing. In some observed areas, there was existing fencing that was damaged and would need to be replaced. Further studies will need to identify which locations along the track require fencing.

Table 19: Identified Capital Action Items for Other Assets

Capital Item	Units	West	East
Install Positive Train Control	Track Miles	13.60	16.41
Replace and/or Install ROW Fencing	Track Miles	13.60	16.41

4.1.5. Facilities

This report does not take into consideration capital cost for any proposed passenger stations or administrative/maintenance facilities and is excluded from any derived costs.

4.1.6. Rolling Stock or other Non-Revenue Equipment

This report does not take into consideration procurement costs for additional rolling stock fleet or moveable equipment.

4.2. Operational Restrictions

As part of the overall assessment process, the team analyzed any potential operational restrictions for implementing passenger service on either of these corridors. The team identified five potential major restrictions but believes that others could be identified as the planning process progresses. The major restrictions identified are described in the follow subsections.

4.2.1. Existing Freight Volume within Corridor

Both corridors are active freight lines, and therefore coordination would be required to ensure that existing freight operations are unimpacted. Each corridor would require an assessment on existing daily train volumes and time of day that these trains operate. There would also need to be consideration about whether freight operators would cease operations or modify their schedules to support train service. The degree of this impact cannot be determined at this time and would require further coordination to quantify the restrictions of train service on either corridor.

4.2.2. Existing Freight and Passenger Rail Services on Main Line

Both corridors would also have to coordinate with existing freight and passenger rail services on the main line (Northeast Corridor). The west corridor potentially would have less impact, as the terminus of the west corridor is only approximately 3/10 of a mile from the New London train station. Meanwhile, the east corridor terminus

would require connection to the main line on the east side of the Thames River, and its terminus is approximately 1.59 miles away. If the Groton Spur corridor were to be considered, it appeared to the inspection team to be a less actively used track, however its terminus to the main line is 3.94 miles. The degree of this impact cannot be determined at this time and would require further coordination to quantify the restrictions of train service on either corridor.

4.2.3. Moveable Bridge along Thames River

A major limitation along the east corridor would be having to pass along the moveable bridge over the Thames River. This bridge is currently owned by Amtrak and would likely require special permission to access. Schedules would also be greatly impacted by any potential need to open the bridge. The bridge operates by default in an open state due to the USCGA and US Navy Submarine Base access requirements. There are also several other moveable bridges along the main line within southeastern Connecticut that provide similar constraints to Amtrak's existing service or any other additional proposed extension of Shore Line East service. The west corridor would likely have little to no impact as the track connects directly to New London Station.

4.2.4. Right of Way Constraints

Another major concern would be whether either corridor would require a second track or passing sidings to support passenger rail service. Any analysis that deems this a requirement may bring up additional challenges in securing adequate ROW. Certain portions of the corridor may require permanent takings that could substantially raise the cost of design and construction.

4.2.5. Environmental Restrictions

Although each corridor is owned by G&W, abutting private or non-state-owned governmental property may require operating restrictions based on time of day or frequency of service. The major concerns are federally owned properties such as the USCGA and the Navy Submarine Base. Additionally environmental reviews may determine noise limitations at grade crossings or at different times of day based on abutting sensitive land uses.

4.3. Travel Time Assessment

The general assumption for upgrades to each corridor is that each corridor would be upgraded to support FRA class 4. This class can support passenger rail service safely with speeds up to 80 MPH.

The inspection team assumes class 4 can be achieved throughout each corridor except for segments where the geometry could not support it. A further study would need to consider which segments of the track could not support class 4 due to geometrical restrictions, as well as how many proposed stations are to be considered to factor in acceleration / deceleration time in addition to dwell time at each station. This analysis also assumes use of diesel locomotives as the study team did not estimate the cost to install to traction power systems. *However, any extension on the Thames River Corridor would require a traction power system be installed in order to accommodate the M8 railcars used to operate Shore Line East Service.*

Using these assumptions, the inspection team determined the following preliminary travel times and speeds shown in Table 20, Table 21, and Table 22.

Table 20: Travel Time Assessment (West Corridor)

Segment Name (West Corridor)	Distance	Speed	Travel Time
Norwich (N Thames St) to Mohegan Sun (MP 13.3 – 10.4)	2.90 Miles	80 MPH	00:02:11
Mohegan Sun to USCGA (MP 10.4 - 1.45)	8.95 Miles	80 MPH	00:06:43

Segment Name (West Corridor)	Distance	Speed	Travel Time
USCGA to Main Line (MP 1.45 – 0.00/123.07)	1.45 Miles	80 MPH	00:01:06
Main Line to New London Station (MP 123.07 - 122.76)	0.31 Miles	60 MPH	00:00:19
Total Time:	**13.61 Miles**		**00:10:19**

Table 21: Travel Time Assessment (East Corridor)

Segment Name (West Corridor)	Distance	Speed	Travel Time
Old Norwich Station to Proposed Site (MP 12.14 – 9.4)	2.74 Miles	80 MPH	00:02:04
Proposed Site to Navy Base (Nautilus) (MP 9.4 - 1.84)	7.56 Miles	80 MPH	00:05:41
Navy Base (Nautilus) to Main Line (MP 1.84 – 0.0/124.35)	1.84 Miles	80 MPH	00:01:23
Main Line to New London Station (MP 124.35 - 122.76)	1.59 Miles	60 MPH	00:01:36
Total Time:	**13.73 Miles**		**00:10:44**

Table 22: Travel Time Assessment (Spur Corridor)

Segment Name (West Corridor)	Distance	Speed	Travel Time
General Dynamics to Main Line (MP 2.86 – 0/126.7)	2.86 Miles	80 MPH	00:02:09
Main Line to New London Station (MP 126.7 - 122.76)	3.94 Miles	60 MPH	00:03:57
Total Time:	**6.80 Miles**		**00:06:06**

4.4. NEC Connectivity Assessment

Connectivity is a broad term that assesses how well a transportation network connects people to goods and services to obtain a high quality of life. Connectivity has many key metrics but in general connectivity is best addressed by:

1) Integrating Transportation and Land Use Planning (Land Use and Density)

2) Reducing distances between Key Destinations (Activity Centers)

3) Improving Local, Pedestrian, and Bicycle Infrastructure and Parking (Target Populations)

4) Managing the Transportation System to reduce travel times (Regional Transportation System)

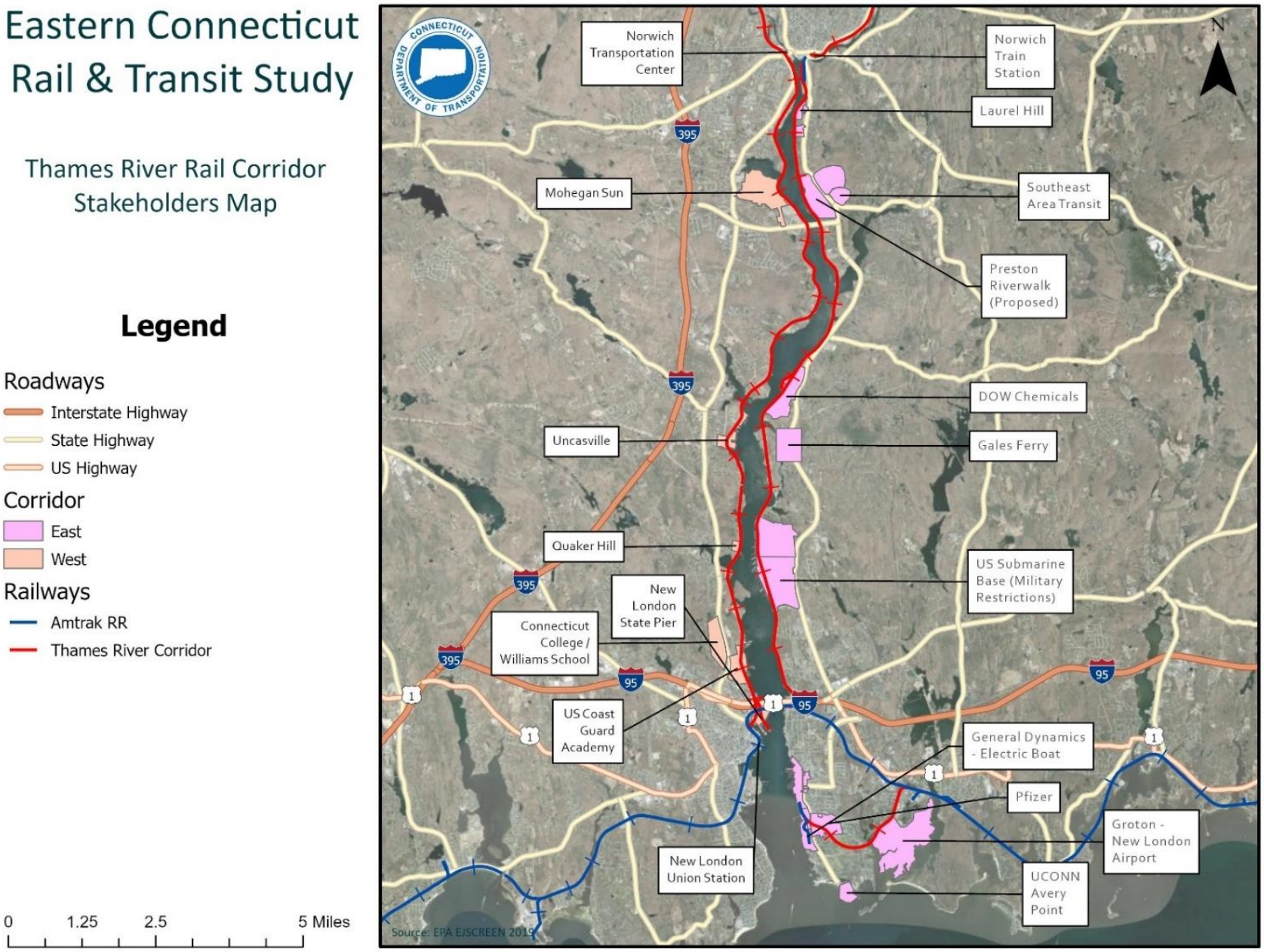
A connectivity assessment comparison between how two proposed alignments would address connectivity to the main line was conducted. Shore Line East is one of three core passenger rail services throughout the state that create an arterial transit network to access key markets throughout Connecticut. Therefore, it is important to focus on how each proposed line would open access to these statewide markets and which would have the most net positive impact.

The assessment will look at various elements of the regional profile, both present and projected, to estimate not only the quantity of people who would benefit, but the quality as well. Providing strong connectivity to a few select populations does not necessarily outweigh limited connectivity to a larger population group and so looking at different perspectives is key to performing this assessment. Most of these elements are addressed in the SECCOG Metropolitan Transportation Plan and Regional Plan of Conservation and Development.

4.5. Stakeholders Summary

To develop a connectivity assessment, the project team needed to determine key areas along the proposed corridors that contain dense pockets of existing or proposed activity. The study team identified eight major stakeholders along the west corridor and ten major stakeholders along the east corridor. Most notable are Mohegan Sun and the US Coast Guard Academy along the west corridor and the US Navy Submarine Base and the proposed Preston Riverwalk development along the east corridor. A brief description of each site is provided following the map of the stakeholders in Figure 48.

Figure 48: Stakeholder Map for the Thames River Rail Corridor



4.5.1. West Corridor Destinations

New London Union Station (MP 0.00)

New London Union Station is the current terminus for Shore Line East service and would act as a station for either proposed rail corridor.

New London State Pier (MP 0.41)

New London State Pier is owned by the Connecticut Port Authority (Formerly CTDOT). Although service would not exist at the pier, the west corridor passes through and would require coordination with the Port Authority for making improvements.

United States Coast Guard Academy, Connecticut College, and Williams School (MP 1.45)

The west corridor traverses through property owned by the United States Coast Guard Academy. This will require coordination with USCGA for capital improvements, however the USCGA could also be a potential stop along the west corridor for approximately 1,000 cadets and additional faculty and staff during the academic year. Additionally, across Route 32, this proposed stop could support students from both Connecticut College and Williams School.

Uncasville

Uncasville is a village in the town of Montville, at the mouth of the Oxoboxo River where it flows into the Thames River. The village has approximately 12,000 residents.

Mohegan Sun

Although part of Uncasville, Mohegan Sun by itself is one of the largest destination centers not only in southeastern Connecticut, but the state in general. It has over 350,000 square feet of activity space, and the State estimates that the casino and resort has over five million visitors annually, with about 8,000 employees. Mohegan Sun is the largest stakeholder on the western corridor.

Norwich Transportation Center

The west rail corridor would terminate in downtown Norwich across the river from the Norwich Transportation Center. This could serve as a potential park and ride station with connecting service to the Southeast Area Transit District (SEAT) bus service.

4.5.2. Groton Spur Destinations

General Dynamics Electric Boat (MP 2.86)

The Old Groton Industrial Spur terminates near the southern entrance to the General Dynamics Electric Boat plant.

Pfizer (MP 2.67)

Pfizer's research and development site also resides along the Old Groton Industrial Spur and would require coordination to upgrade track that passes through Pfizer's property, including under a building. The property sits on 160-acre site with approximately 2.8 million square feet of space.

UConn Avery Point

UConn Avery Point is a satellite campus for the University of Connecticut. Although the campus is not adjacent to the Old Groton Industrial Spur, the campus represents a substantial population that would likely utilize passenger rail service.

Groton New London Airport (MP 0.89)

Groton New London Airport is owned by the Connecticut Airport Authority (CAA). The airport is integrated into the Statewide Transportation Plan, as well as the National Airport System Plan, and could be a center for passenger rail service along the Spur if commercial air service were to be introduced at the airport.

4.5.3. East Corridor Destinations

US Navy Submarine Base (MP 1.84)

Naval Submarine Base New London is the primary United States Navy East Coast submarine base, occupying more than 687 acres plus over 530 acres of family housing. It also supports more than 70 tenant commands, including Naval Submarine School (NAVSUBSCOL), Naval Submarine Support Facility (NSSF), three Submarine Squadron staffs, and the housing and support facilities for more than 21,000 civilian workers, active-duty service members, and their families. All officer and enlisted submariners are stationed at Groton during their training, except for nuclear trained Electronics Technicians (ETs), Electrician's Mates (EMs), and Machinist's Mates (MMs). The US Navy has expressed willingness to discuss possible passenger rail service through the base and would have to coordinate with CTDOT for supporting capital upgrades of rail infrastructure as well as security measures on military property.

Gales Ferry

Gales Ferry is a village in the Town of Ledyard. It is located along the eastern bank of the Thames River. The population is approximately 1,100 residents.

DOW Chemicals (Allyn's Point) – (MP 6.08)

The former DOW chemical plant in Ledyard is considered a major stakeholder in that it is a former hazardous materials site that would require substantial environmental coordination for any capital improvements that occur through the facility on the rail corridor. The facility is currently operated by Styron and Americas Styrenics and is actively used as a materials manufacturing plant.

SEAT Administration and Maintenance Facility – (MP 9.50)

SEAT is a transit district, created by local towns in New London County as authorized by the General Statues of CT (Chapter 103A). Any addition of passenger rail service should involve substantial coordination with SEAT, to support transfer service at any or all proposed rail stations within either corridor. The Administration and Maintenance facility itself is located along the east corridor and is owned by the State of Connecticut. It is estimated that 70 employees work at the facility.

Preston Riverwalk (Proposed) – (MP 9.40)

A proposed development called Preston Riverwalk would be adjacent to the east corridor. Preston Riverwalk is marketed as a high-profile development campus consisting of six (6) unique parcels totaling approximately 393 acres. The development would be fully built out as a mixed-use complex.

Laurel Hill

Laurel Hill is a historic district south of downtown Norwich. The district was added to the National Register of Historic Places on October 26, 1987.

Norwich Train Station (MP 12.09)

The passenger service along the east corridor would terminate at the old Norwich Train Station in downtown Norwich. The existing building is currently occupied by the Norwich Bulletin and is privately owned. The canopy structure would likely need to be updated. The parking lot adjacent to the station is state-owned.

4.6. Cost Considerations

The inspection team was tasked with developing some cost considerations as part of the technical memorandum. Costs at this phase of the project development process are highly speculative and are subject to change if either corridor advances into design level activities.

The study team utilized estimated costs from its work on a previous rail project recorded in July 2020 and assumed a construction midpoint date of August 2030. Costs were escalated 3.5% per year compounded, resulting in an approximately 41% markup from 2020 costs.

The numbers shown below are strictly used for modeling comparison purposes and in no way reflect actual projected construction costs. Further planning and design engineering will be necessary to provide an engineering rated cost estimate of the below line items.

4.6.1. Track

As described in previous sections, it is assumed at this point that both corridors would need to fully upgrade the track infrastructure to support passenger rail. This includes everything from new steel rails to concrete ties, ballast, and a few track turnouts, switch heaters, and wayside signals. As mentioned, these unit costs were derived cost estimates from previous work.

Track replacement is defined as the aggregated process of removing old steel rail and old wooden ties and replacing them with upgraded steel rail and concrete ties. The engineering team estimated this process on a per track foot basis of $400 per track foot from the base year of 2020. In addition, as part of the construction process, there would need to be track realignment and surfacing treatment throughout the entire corridor as well, which would come out to $150 per track foot. The project team also recommends a placeholder for drainage improvements throughout either corridor, comprised of a six-foot drainage swale, 18-inch underdrain, and a sedimentation control system. These line items would cost $25, $100, and $5 per track foot respectively.

The volume of ballast assumes the whole corridor would need fresh ballast but would also require knowledge of the ballast profile. A ballast profile can only be calculated during the design phase at different stations throughout the alignment, however the study team utilized ballast profiles at several design station points from a different project to create a conceptual baseline ballast profile throughout the corridor. The team assumed a ballast profile of 19.87 square feet of ballast and 12.53 square feet of subballast. This would result in approximately 105,000 cubic feet (3886 cubic yards) of ballast per track mile and approximately 66,200 cubic feet (2452 cubic yards) of sub-ballast per track mile. The engineering team has calculated a 2020 estimate of $85 per cubic yard of ballast and $75 per cubic yard of subballast.

Other track items included the upgrade of interlocking for known passing sidings along the corridor, as well as switch heater/power supply, and wayside signals. These items are estimated as lump sum for now but could be easily higher as more infrastructure is identified or the design of the communication systems warrants more sidings or control points. Track turnouts using #20 switches have a 2020 baseline cost of $750,000, switch heaters and power supply are $150,000 each, and wayside signals are $400,000 each, and is assumed to be two installed per turnout.

Since many of these line items were derived as either a cubic yardage or a per track foot basis the following conversions are shown in Table 23 and Table 24.

Table 23: Capital Cost Quantities for Trackwork - (West Corridor)

Capital Item	Unit	West Corridor (Miles)	Conversion	Total Quantity
NEW TRACK CONSTRUCTION	Track Feet	13.60	5280 feet /mile	71,808 track feet
TRACK REALIGNMENT & SURFACING	Track Feet	13.60	5280 feet / mile	71,808 track feet
BALLAST	Cubic Yards	13.60	3886 cubic yards / mile	52,850 cubic yards
SUBBALLAST	Cubic Yards	13.60	2452 cubic yards / mile	33,347 cubic yards
6’ Drainage Swale	Track Feet	13.60	5280 feet / mile	71,808 track feet
18” Underdrain	Track Feet	13.60	5280 feet / mile	71,808 track feet
Sedimentation Control System	Track Feet	13.60	5280 feet / mile	71,808 track feet

Table 24: Capital Cost Quantities for Trackwork - (East Corridor)

Capital Item	Unit	West Corridor (Miles)	Conversion	Total Quantity
NEW TRACK CONSTRUCTION	Track Feet	16.41	5280 feet /mile	86,645 track feet
TRACK REALIGNMENT & SURFACING	Track Feet	16.41	5280 feet / mile	86,645 track feet
BALLAST	Cubic Yards	16.41	3886 cubic yards / mile	63,770 cubic yards
SUBBALLAST	Cubic Yards	16.41	2452 cubic yards / mile	40,238 cubic yards
6' Drainage Swale	Track Feet	13.60	5280 feet / mile	86,645 track feet
18" Underdrain	Track Feet	13.60	5280 feet / mile	86,645 track feet
Sedimentation Control System	Track Feet	13.60	5280 feet / mile	86,645 track feet

4.6.2. Structures

Bridges are difficult to estimate costs without knowing the true condition of the bridge and/or the actual deck area of the bridge. For the purposes of this report, certain bridge structure types were assumed to have a set value of track feet and bridges were assumed to need to be replaced. 2020 cost estimates assume most bridge structures come in at approximately $25,500 per linear track foot, and culverts at $10,000 per track foot. Most bridges were assumed to span 50 feet, with the exception of timber trestles at 100 feet per bridge, the steel truss bridge in Norwich at 250 feet, and a couple of thru girder bridges at 200 feet spans. Access to bridge inspection reports or further inspection will enable the team to develop a more accurate estimate of each bridge replacement/upgrade cost.

Table 25: Capital Cost Quantities for Structures - (West Corridor)

Capital Item	Unit	West Corridor (Miles)	Conversion	Total Quantity
Ballasted Deck (Replace)	Linear Feet	1.00	50 feet per bridge	50 Linear Feet
I-Beam (Replace)	Linear Feet	6.00	50 feet per bridge	300 Linear Feet
Open Deck (Replace)	Linear Feet	4.00	50 feet per bridge	200 Linear Feet
Timber Trestle (Replace)	Linear Feet	7.00	100 feet per bridge	700 Linear Feet
Thru Girder (Replace)	Linear Feet	2.00	200 feet per bridge	400 Linear Feet
Culvert - Box (Replace)	Linear Feet	2.00	4 feet per culvert	8 Linear Feet
Remove Abandoned OH Structures	Linear Feet	1.00	-	N/A
Inspect/Repair OH Structures	Linear Feet	0.00	-	N/A

Table 26: Capital Cost Quantities for Structures (East Corridor)

Capital Item	Unit	West Corridor (Miles)	Conversion	Total Quantity
Ballasted Deck (Replace)	Linear Feet	1	50 feet per bridge	50 Linear Feet
I-Beam (Replace)	Linear Feet	4	50 feet per bridge	200 Linear Feet
Open Deck (Replace)	Linear Feet	5	50 feet per bridge	250 Linear Feet
Steel Truss (Replace)	Linear Feet	1	250 feet per bridge	250 Linear Feet

Capital Item	Unit	West Corridor (Miles)	Conversion	Total Quantity
Multi-Span (Replace)	Linear Feet	1	250 feet per bridge	250 Linear Feet
Unknown Bridge (Replace)	Linear Feet	1	50 feet per bridge	50 Linear Feet
Culvert - Box (Replace)	Linear Feet	2	4 feet per culvert	8 Linear Feet
Remove Abandoned Overhead Structures	Linear Feet	1	-	N/A
Inspect/Repair Overhead Structures	Linear Feet	1	-	N/A

4.6.3. Grade Crossings

Grade crossing infrastructure from the 2020 figures was bundled and estimated on a per-crossing basis. As mentioned, the team recommends only updating crossings that are not currently concrete panel or rubber panel surfaces, and the lump sum cost is assumed to be $250,000 in 2020 dollars. Crossing protection systems were priced out to assume a full protection system of signs, flashers, bells, and gates, and were assumed as a lump sum cost of $750,000 per crossing in 2020 dollars.

4.6.4. Other Assets / Lump Sum Items

Other Assets

Positive Train Control (PTC) would likely need to be installed; however, a true cost assessment is not feasible at this time and would require a separate design scope to determine infrastructure needs and costs. Depending on factors like speed, frequency of service, geometry, and level of PTC software recommended, the cost range is highly variable and would only be a placeholder at this current moment. The study team recommended a preliminary estimated cost of PTC at $225,000 per track mile.

ROW fencing pricing was not available to the team and was excluded as part of the overall cost. The preliminary design phase would need to identify where fencing is needed or to be removed and be able to supply a reasonable price estimation.

Minor Item Allowance

As is standard with design development, cost estimation can include a minor item allowance. The minor item allowance for this conceptual estimate is 25% of all civil and site work.

Lump Sum Items

The study team identified several lump sum items to consider based on experience on previous rail projects. The lump sum items are calculated as a percentage of contract items. See the items below:

Table 27: Lump Sum Items

Lump Sum Item	Units	Conversion	Quantity
Clearing and Grubbing (Site Preparation)	Lump Sum	% of Contract Items	2.0%
Maintenance & Protection of Traffic	Lump Sum	% of Contract Items	3.0%
Mobilization and Project Close Out	Lump Sum	% of Contract Items	10.0%
Construction Staking	Lump Sum	% of Contract Items	2.0%
Environmental Health and Safety	Lump Sum	% of Contract Items	15.0%

Design Contingency

The study team included a design contingency line item to cover design costs for this project. The design contingency for this conceptual estimate is 20% of contract items.

Additional Items

The project team identified additional items to consider. Most of these items reflect capital needs identified in previous sections, but would likely be covered under railroad force account, including Amtrak Flag Protection, which for both corridors assumes 6 flaggers for 1.75 years at $1,400 per man shift. Other additional items include contingencies, utilities, and incidentals. The costs are summarized below:

Table 28: Additional Items (Contingencies, Utilities, Incidentals)

Lump Sum Item	Units	Conversion	Quantity
Contingencies	Lump Sum	% of Contract Items	15.0%
Utilities	Lump Sum	% of Contract Items	2.0%
Incidentals	Lump Sum	% of Contract Items	20.0%

Escalation

As mentioned, the project team developed these cost estimates based on prior work from other projects. These numbers were based on estimated costs as of August 2020. The assumption of the project team is an escalation of 10 years to the construction mid-point in August of 2030. Escalation is generally set at 3.5% per year compounded, which for a 10-year pushout requires a cumulative escalation of 41.06% from the base cost estimates.

4.6.5. Total Costs

The figures below show the total preliminary estimated costs for each corridor. The west corridor is shown to be more expensive to upgrade based on data currently available at approximately $359 Million ($26.4 million per track mile) vs. $321 million ($23.6 million per track mile) for the east corridor. Note that these estimates are preliminary in nature and likely underestimates, because they do not include things like traction power to be able to operate M8 railcars (the equipment used to operate Shore Line East service).

Summary Item	West Corridor	East/Spur Corridor
Subtotal Civil/Sitework (Ballast / Structures)	$58,500,000	$46,600,000
Subtotal Minor Item Allowance (25% of Civil/Sitework)	$14,600,000	$11,700,000
Subtotal Lump Sum Items	$34,400,000	$27,400,000
Design Contingency (20% Civil/Sitework, Minor Item, LS)	$21,500,000	$17,100,000
Subtotal Additional Items (Track / Grade Crossings / PTC)	$71,100,000	$75,900,000
Subtotal Contingencies/Utilities/Incidentals (37% Contract Items)	$74,000,000	$66,100,000
Subtotal Escalation (41.06% - 3.5% / year – 10 years compound)	$112,500,000	$100,500,000
Total Construction Cost	**$386,600,000**	**$345,300,000**
Total Track Miles	**13.6**	**16.41**
Total Cost per Track Mile	**$28,400,000**	**$21,000,000**

5. Summary and Recommendations

In summary, the inspection team found that both corridors would require significant investment to support passenger rail service. There is opportunity on both corridors with respect to economic development. While the west corridor appears to have fewer capital needs, better bus transit connectivity and more notable activity centers such as Mohegan Sun, the east corridor showed potential in a future build out scenario, particularly with the identification of the Preston Riverwalk future development.

The inspection team recommends the west corridor be considered for passenger rail service in future phases of the ECRTS. The attraction to Mohegan Sun is one of the largest in the state and was the only hub observed along the corridor that could support strong ridership levels from a regional perspective. Preliminary cost data shows a $350-$400 million dollar investment would be needed in either corridor. The inspection team also determined that use of the Old Groton Industrial Spur is not recommended because any proposed alignment utilizing the Spur in conjunction with either the west or east Thames River corridor that connects with New London Station would involve having to turn a train at New London Station, which is not ideal.

Table 29: Corridor Recommendation Summary Matrix

Category	Sub-Category	West	East/Spur	Advantage
Capital Needs (Cost)	Track	13.6 Miles	16.41 Miles	West
	Structures	23	17	East
	Grade Crossing Surfaces	18	20	West
	Grade Crossing Protection	21	17	East
	Positive Train Control	13.6 Miles	16.41 Miles	West
Operational Restrictions	Corridor Freight Volume	N/A	N/A	N/A
	Overlap of Track Miles with Other Rail Services	13.61	13.73 / 6.80 (Spur)	West
	Thames River Moveable Bridges	0	1	West
	Right of Way Constraints	N/A	N/A	N/A
	Environmental Restrictions	N/A	N/A	N/A
Travel Time Assessment	Travel Time (hh:mm:ss)	00:10:19	00:10:44 / 00:06:06 (Spur)	West
NEC Connectivity Assessment	Major Use Centers	8	7 / 4 (Spur)	West
	Population	105,450	136,729	East
	Compatible Land Use	32,570 Acres	40,681 Acres	East
	Transit Connectivity	21 Routes	17 Routes	West
Cost Considerations	Total Base Estimate	$386,600,000	$345,300,000	East
Corridor Recommendation				**West**

N/A – Data is not available

On the west corridor, the service would terminate in Downtown Norwich, across the Yantic River from the Norwich Transportation Center, which would operate as an effective park and ride lot for commuter rail service to Mohegan Sun and New London and provide transfers to all Norwich Routes on the SEAT bus system. Further analysis in later phases of this study will consider how to validate ridership forecasts and the full build out potential for this service.

This report identified numerous areas where additional studies, inspections, or coordination meetings would be recommended to further justify service in either corridor. The team has summarized these potential studies below:

Table 30: List of Further Recommended Studies / Inspections / Coordination

Study / Inspection / Coordination	Purpose
Geometry Car	Assess Existing Horizontal /Vertical Alignments, Track and Ballast Condition, Identify Additional Sidings, Fence Protection Needed
In-Depth Bridge Inspection	Identify Bridge Capital Needs
Bridge Load Rating Analysis	Identify Existing Bridge Condition / Capacity
Private Grade Crossing / Structure Inspection	Obtain Permission to Access Grade Crossings / Structures on Private Property (Includes Navy Base, USCGA, and DOW Chemical)
Grade Crossing Protection Testing	Test Active Protection Devices on Grade Crossings
Utility Coordination	Fiber Optic with AT&T, Norwich Wastewater, City of New London (Sewage Piping)
Positive Train Control Feasibility Study	Assess PTC Needs, Conceptual Design, and Preliminary Cost Estimate
Freight Coordination	Determine Existing Freight Volumes and Schedules
FRA Track Class Analysis	Determine Existing Track Class of segments of each corridor, and determine segments whose geometry does not support Class IV, Update Travel Time Assessment
In-Depth Land Use / Population Analysis (TOD Study)	Determine compatibility of population density and land use with proposed rail service
In-Depth Transit Connectivity Study	Further Assess Connection Opportunities to existing Transit Network. Explore modifications to Routes 1 and 2 based on proposed stations, and schedule adjustments.
Conceptual Engineering Design	Determine Preliminary Cost Estimates for Capital Upgrades

Eastern Connecticut Corridor Rail and Transit Feasibility Study (ECRTS)

Appendix D: Thames River Corridor Assessment, Exhibit A

November 2023

Prepared by

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Table of Contents

Figures

1. Introduction

This Exhibit A shows pictures of the observed rail infrastructure within Thames River Corridor. The project team went out to the corridor during two separate occasions with four inspectors, primarily capturing photographic records for the purposes of this report, and to assess the visual condition of capital infrastructure observed to make engineering judgement on perceived capital needs along the corridor.

The corridor is broken out into two sections along four total lines. The west section which is the Palmer Line along with the identified portion of the Shore Line between the Palmer Line terminus and the New London Union Station, and the East section which is comprised of both the Norwich Branch and the Old Groton Industrial Spur (Groton Secondary). The team took photos of the corridor where they could safely assess and were authorized to access the right of way along all four of these lines.

This exhibit is broken down into four chapters, one for each line.

- Chapter 2 – Main Line (Shore Line)
- Chapter 3 – West Corridor (Palmer Line)
- Chapter 4 – East Corridor (Norwich Branch)
- Chapter 5 – East Corridor (Groton Secondary)

Figure 1: New London Station with M8 Self Propelled Cars operating on Shore Line East

2. Main Line (Shore Line)

2.1. Union Station (New London)

2.1.1. MP 122.76 - Grade Crossing – State Street

FRA ID: 500295A

Figure 2: MP 122.76 - Grade Crossing – State Street - Identification Sign with Phone Number, MP and FRA ID

Figure 3: MP 122.76 - Grade Crossing – State Street – GC Protection System with Gates, Flashers, and Bells

2.1.2. MP 122.90 – Station Facility - New London Station

Overhead Contact System (OCS)

Figure 4: MP 122.90 – Power – New London Station - Shore Line is Equipped with Overhead Contact System

Platforms: New London Station

The station has two platforms and three sets of tracks used by CT Commuter Rail and Amtrak. There is a potential to share the existing eastern platform with proposed commuter rail. Parking garage is available across the street from the station (Water Street Garage). Also, this is a very convenient transfer point to the Cross-Sound, Block Island, and Fisher's Island Ferries.

Figure 5: MP 122.90 – Platforms - New London Station (Looking Southeast from West Platform)

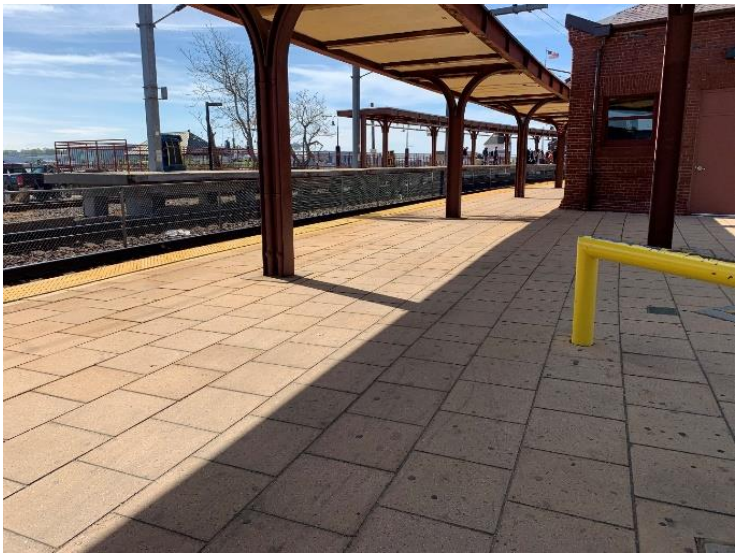


Figure 6: MP 122.90 – Platforms - New London Station (Looking Northeast from West Platform)

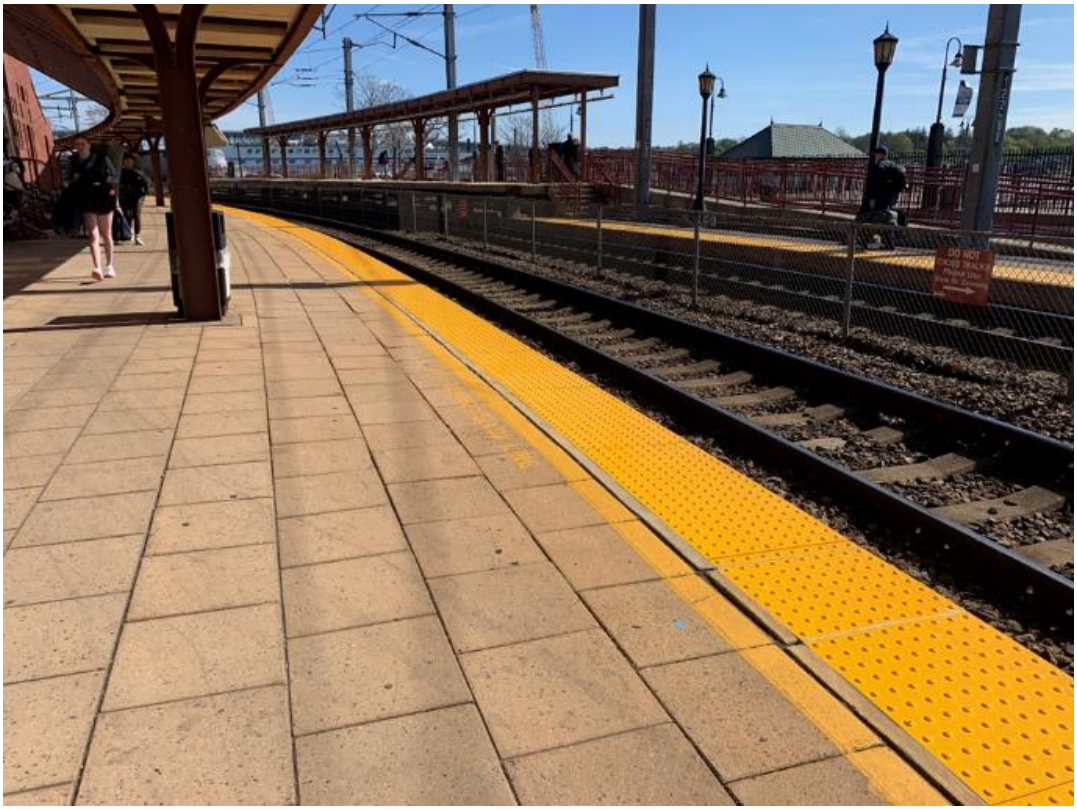


Figure 7: MP 122.90 – Platforms – New London Station (Looking Southwest) from S. Water Street Crossing

Passenger Facility: New London Union Station

Figure 8: MP 122.90 – Passenger Facility - New London Union Station - Passenger Facility

Figure 9: MP 122.90 - Passenger Facility - New London Station - Inside Building

Parking Garage: Ferry Street Parking Garage

Figure 10: MP 122.90 - Parking Garage – Ferry Street - Designated Parking for New London Union Station

2.1.3. MP 123.07 – Grade Crossing - Ferry Street (No Access)

FRA ID: 500294T

3. West Corridor (Palmer Line)

3.1. New London State Pier (New London)

3.1.1. MP 0.38 – UG Bridge - Timber Trestle Bridge – NO ACCESS

FRA ID: Unknown

Team identified via Google Imagery a Timber Trestle Structure at MP 00.38 over Winthrop Cove. However, team was not able to access this area.

3.1.2. MP 0.40 – Grade Crossing - Thomas Griffin Road

FRA ID: 247201B

Figure 11: MP 0.40 – Grade Crossing - Thomas Griffin Road - Private Grade Crossing

Grade crossing on Thomas Griffin Road, just north of Timber Trestle bridge. Single track splits into double tracks right after crossing the timber trestle bridge. The crossing is gated off and not signaled. Site of Connecticut Port Authority is across the tracks.

Figure 12: MP 0.40 – Grade Crossing – Thomas Griffin Road - Gated Private Crossing

3.1.3. MP 0.62 – OH Bridge - State Pier Road

Track

Figure 13: MP 0.62 – OH Bridge - State Pier Road (Looking South)

Two tracks approaching an overhead bridge. It is assumed that only the western track (viewer's right side of the photo) is in active use because the eastern track has a lot of vegetation present. It is a sign of poor drainage, and possibly rotten railroad ties which makes the track unsafe. Walking the right of way with flagmen would be necessary to perform a closer inspection.

FRA ID: 500291X

Figure 14: MP 0.62 – OH Bridge - State Pier Road (Looking North) - Amtrak Bridge and Two I-95 Bridges

3.1.4. MP 0.65 – OH Bridge - Aetna Bridge Company Yard

Track

Figure 15: MP 0.65 – Track - Aetna Bridge Company Yard

3.2. Riverside Park (New London)

3.2.1. MP 0.91 – Grade Crossing – Eastern Avenue - (F&F Distributors)

FRA ID: 247203P

Figure 16: MP 0.91 – Grade Crossing - Approach near Eastern Ave - Looking East

Crossing is in poor condition and is not signaled. Vegetation growing in the gauge – sign of very poor drainage. Most likely, only one track is in active use.

Figure 17: MP 0.91 - Grade Crossing - Eastern Avenue (Looking South)

Figure 18: MP 0.91 – Grade Crossing – Eastern Avenue (Looking East)

Figure 19: MP 0.91 – Grade Crossing – Eastern Avenue (Looking North)

3.2.2. MP 1.07 – OH Bridge – Riverside Park

Track

Figure 20: MP 1.07 – Track – Riverside Park (Looking North)

Figure 21: MP 1.07 – Track - Edge of Riverside Park and USCGA ROW

Figure 22: MP 1.07 – Track - Running Rail Weight Stamp - 90RA

Figure 23: MP 1.07 – Track - Typical Rail Joint and Tie Condition

Figure 24: MP 1.07 – Track - Riverside Park - Right of Way

FRA ID - 247205D

Figure 25: MP 1.07 - OH Bridge – Ped Bridge Riverside Park (Looking Northeast)

The bridge is closed due to its unsafe and unusable condition. Corrosion and missing timber boards. Some steel members have cross-sectional losses. The bridge would have to be removed to make the line safe for passenger service.

Figure 26: MP 1.07 – OH Bridge - Ped Bridge in Riverside Park (Looking East)

Figure 27: MP 1.07 – OH Bridge - Ped Bridge in Riverside Park (Looking North)

3.3. United States Coast Guard Academy (New London)

3.3.1. MP 1.28 – UG Bridge - USCGA Pier Bridge – NO ACCESS

FRA ID: 247206K

This Bridge was not able to be inspected due to lack of authorization to gain access to site

3.3.2. MP 1.39 – Grade Crossing – NO ACCESS

FRA ID: 247207S

This Grade Crossing was not able to be inspected due to lack of authorization to gain access to site

3.3.3. MP 1.46 – UG Bridge - Pedestrian Bridge – NO ACCESS

FRA ID: 273188H

This Bridge was not able to be inspected due to lack of authorization to gain access to site

3.3.4. MP 1.70 – Grade Crossing - USCGA Rowing Facility Grade Crossing

FRA ID: 247208Y

Figure 28: MP 1.70 - Grade Crossing - North of USCGA Rowing Center (Looking East)

Figure 29: MP 1.70 - Grade Crossing - Surface of USCGA (Looking East)

Figure 30: MP 1.70 - Grade Crossing - North of USCGA (Looking North)

3.3.5. MP 1.80 – Grade Crossing - Old Thames Shipyard

Track

Figure 31: MP 1.79 - Track - Farnsworth Street - North of Old Thames Shipyard (Looking North)

Figure 32: MP 1.79 - Track - Farnsworth Street - North of Old Thames Shipyard

FRA ID: 247209F

Figure 33: MP 1.79 - Grade Crossing - Farnsworth Street - Old Thames Shipyard (Looking South)

The vehicles crossing the tracks in and out of the shipyard carry a lot of fine material on their tires that gets spread over Farnsworth Street (marks are visible on the asphalt). The material gets washed back towards the tracks after every rainfall. The voids in the ballast get clogged, thus preventing the water from draining away from the tracks. Retaining moisture around the tracks, specifically around the railroad ties causes them to rot and breakdown thus compromising the required structural properties of the track.

Figure 34: MP 1.79 - Grade Crossing - Farnsworth Street - Old Thames Shipyard (Looking East)

The crossing is covered with a lot of fine material from passing vehicles in and out of the shipyard – will need to be rebuilt with drains to the west of the crossing.

Figure 35: MP 1.79 - Grade Crossing - Farnsworth Street - Old Thames Shipyard

Utility: Sewer Pipes

Figure 36: MP 1.79 - Sewer Pipe - Sign near Crossing

3.4. Quaker Hill (Waterford)

3.4.1. MP 2.37 – Grade Crossing – Bentham Avenue

Track Condition

Figure 37: MP 2.37 – Track - Bentham Avenue

Typical 100 lb/yd rail. However, some sections of this line have 115 lb/yd rail.

Figure 38: MP 2.37 – Track - Bentham Avenue – Measure of Track Gauge

Gauge dimension 4’- 8¾” (1/4” off from the standard 4’- 8½” gauge)

Figure 39: MP 2.37 - Track - Bentham Avenue – Measure of Vertical Height

FRA ID: 247212A

Figure 40: MP 2.37 - Grade Crossing - Bentham Avenue (Looking East)

Figure 41: MP 2.37 - Grade Crossing - Bentham Avenue (Looking South)

Some vegetation in the gage and near the crossing. Proper drainage is needed.

Figure 42: MP 2.37 - Grade Crossing - Bentham Avenue (Looking North)

3.4.2. MP 3.00 – Track - Riverhead Building Supply

Track: Mainline

Figure 43: MP 3.00 – Track - Riverhead Building Supply - Looking North

Track: Siding

Figure 44: MP 3.00 – Track - Riverhead Building Supply – Looking South

Siding Track on the Right and Mainline track on the left (Looking South)

3.4.3. MP 3.25 – UG Bridge – Richards Grove Road - Timber Trestle – LIMITED VISUAL

FRA ID: Unknown

Figure 45: MP 3.25 – UG Bridge - Richards Grove Road - Timber Bridge - (Looking North)

Walking the right of way would be necessary to perform a closer inspection.

Figure 46: MP 3.25 – UG Bridge – Richards Grove Road - Timber Bridge - Zoomed In

3.4.4. MP 3.45 – Grade Crossing - Scotch Cap Road

Track

Figure 47: MP 3.45 Grade Crossing – Scotch Cap Road

FRA ID: 247212N

Figure 48: MP 3.45 Grade Crossing – Scotch Cap Road

3.4.5. MP 3.86 – Grade Crossing – Unknown Location

FRA ID: 273191R

3.4.6. MP 3.90 – UG Bridge – Timber Trestle – NO ACCESS

FRA ID: Unknown

3.4.7. MP 4.07 – UG Bridge – I-Beam – NO ACCESS

FRA ID: Unknown

3.4.8. MP 4.85 – Grade Crossing – Unknown Location

FRA ID: 273192X

3.4.9. MP 5.05 – Grade Crossing – Lower Bartlett Road

FRA ID: 247213V

Figure 49: MP 5.05 - Grade Crossing - Lower Bartlett Road (Looking South)

Figure 50: MP 5.05 - Grade Crossing - Lower Bartlett Road (Looking East)

Figure 51: MP 5.05 - Grade Crossing - Lower Bartlett Road (Looking North)

3.5. Power Plant / Boat Launch / Horton Cove (Montville)

3.5.1. MP 5.21 –UG Bridge – Bartlett Cove - (Timber Trestle) – NO ACCESS

FRA ID: None Assigned

3.5.2. MP 5.35 - Grade Crossing – NRG Montville - NO ACCESS

FRA ID: 247214C

3.5.3. MP 5.76 – Grade Crossing - Dock Road

Track

Figure 52: MP 5.76 - Track - 100 lb/yd Running Rail

Figure 53: MP 5.76 – Track - 115RE lb/yd Running Rail

Figure 54: MP 5.76 - Track - Dock Road - CWR

Typical connection between 100 lb/yd rail and 115 lb/yd rail

FRA ID: 247215J

Figure 55: MP 5.76 - Grade Crossing - Dock Road (Looking West)

On Google Earth satellite view, this area is full of buildings and/or warehouses. On the date of the inspection this area was completely clear of buildings. There is potential for a train station and a parking lot, however, this area is not very densely populated and further research would be required to determine if it is feasible.

Figure 56: MP 5.76 - Grade Crossing - Dock Road – East of GC (Looking Southeast)

Figure 57: MP 5.76 - Grade Crossing - Dock Road – East of (Looking Northeast)

Figure 58: MP 5.76 - Grade Crossing - Dock Road - (Looking North)

Figure 59: MP 5.76 - Grade Crossing - Dock Road - (Looking South)

3.5.4. MP 5.96 – Grade Crossing - Depot Road

FRA ID: 247217X

Figure 60: MP 5.96 – Grade Crossing - Depot Road - Approach (Looking East)

This gate leads to the north end of the same property, shown just above in the previous set of photos. It increases the potential for a train station and a parking lot since there are two access points to the property.

Figure 61: MP 5.96 – Grade Crossing - Depot Road - (Looking South)

Figure 62: MP 5.96 – Grade Crossing - Depot Road - (Looking North)

Figure 63: MP 5.96 – Grade Crossing - Depot Road (Looking Southwest)

3.5.5. MP 6.23 – UG Bridge - Horton Cove

FRA ID: None Assigned

Figure 64: MP 6.23 - UG Bridge – Horton Cove - (I-Beam Pile Truss)

3.6. Uncasville (Montville)

3.6.1. MP 6.50 – Grade Crossing – Point Breeze Road

FRA ID: 247226W

Figure 65: MP 6.50 - Grade Crossing - Point Breeze Road (Looking East)

Figure 66: MP 6.50 - Grade Crossing - Point Breeze Road - Crossing Surface

Figure 67: MP 6.50 - Grade Crossing - Point Breeze Road (Looking South)

Figure 68: MP 6.50 - Grade Crossing - Point Breeze Road (Looking North)

3.6.2. MP 6.81 – UG Bridge – I-Beam – LIMITED ACCESS

FRA ID: Unknown

Figure 69: MP 6.81 - UG Bridge (I-Beam)

3.6.3. MP 7.08 – UG Bridge (I-Beam) – NO ACCESS

FRA ID: Unknown

3.6.4. MP 7.47 – UG Bridge (Thru Girder) – NO ACCESS

FRA ID: Unknown

3.6.5. MP 7.68 – UG Bridge (Wood Stringer) – NO ACCESS

FRA ID: Unknown

3.6.6. MP 7.87 – Grade Crossing – Derry Hill Road

FRA ID: 247227D

Figure 70: MP 7.87 – Grade Crossing - Derry Hill Road (Looking East)

Figure 71: MP 7.87 – Grade Crossing - Derry Hill Road (Looking South)

Figure 72: MP 7.87 – Grade Crossing - Derry Hill Road (Looking North) - Fiber Optic Cable Identified

Utility: Fiber Optic

Figure 73: MP 7.87 - Fiber Optic - Derry Hill Road

Track:

Figure 74: MP 7.87 - Track - Derry Hill Road

3.6.7. MP 8.21 – UG Bridge (I-Beam) – NO ACCESS

FRA ID: Unknown

3.6.8. MP 8.90 - UG Bridge (I-Beam) – NO ACCESS – Indian Creek

FRA ID: Unknown

3.6.9. MP 9.78 – UG Bridge (Concrete) – NO ACCESS – Shantok Brook

FRA ID: Unknown

3.7. Mohegan Sun (Montville)

3.7.1. MP 9.90 – OH Bridge (Route 2A) – NO ACCESS

FRA ID: Unknown

3.7.2. MP 10.32 – UG Bridge (Wood Stringer) – NO ACCESS – Mohegan Sun Parking

FRA ID: Unknown

3.7.3. MP 10.90 – UG Bridge (Unknown) – Trading Cove

FRA ID: Unknown

3.8. Terminal Way (Norwich)

3.8.1. MP 11.72 – UG Bridge (Timber Trestle)

FRA ID: Unknown

Figure 75: MP 11.72 - UG Bridge - Timber Trestle - from Coolidge Street (Looking North)

3.8.2. MP 11.90 – Grade Crossing - Terminal Way

FRA ID: 247228K

Figure 76: MP 11.90 – Grade Crossing - Terminal Way (Looking South)

Standing water and vegetation near the track – poor drainage.

Figure 77: MP 11.90 - Grade Crossing – Terminal Way - (Looking North)

Track

Figure 78: MP 11.90 – Track – Terminal Way - (Looking North)

Figure 79: MP 11.90 – Track – Terminal Way (Looking South)

3.8.3. MP 12.08 - Grade Crossing - Terminal Way

FRA ID: 247230L

Figure 80: MP 12.08 – Grade Crossing - Terminal Way - (Looking Northwest)

Track:

Figure 81: MP 12.08 – Grade Crossing – Terminal Way - (Looking North)

3.8.4. MP 12.12 – Grade Crossing - Terminal Way

FRA ID: 247231T

Figure 82: MP 12.12 - Grade Crossing – Terminal Way - (Looking North)

Figure 83: MP 12.12 - Grade Crossing – Terminal Way (Looking South)

Track: Manual Switch

Figure 84: MP 12.12 – Track – Terminal Way – Manual Switch (Looking North)

Track

Figure 85: MP 12.12 – Track – Terminal Way - (Looking North)

3.9. South Thames Street (Norwich)

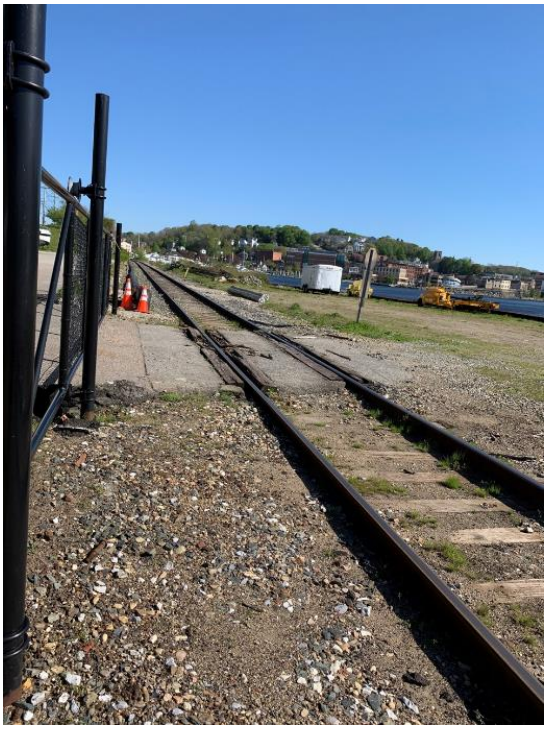
3.9.1. MP 13.00 – Grade Crossing – South Thames Street

FRA ID: 273194L

Figure 86: MP 13.00 – Grade Crossing - S Thames Street - (Looking North)

Track

Figure 87: MP 13.00 – Track - S Thames Street Track (Looking North)



Utility: Exposed Pipe

Figure 88: MP 13.00 – Utility - S Thames Street - Exposed Pipe running Alongside the Tracks (Looking North)

3.10. Norwich Intermodal Center (Norwich)

3.10.1. MP 13.14 – OH Bridge – West Main Street

Figure 89: MP 13.14 – OH Bridge - West Main Street (Looking Northeast)

3.10.2. MP 13.21 – OH Bridge - Route 82

FRA ID: Unknown

Passenger Facility: Norwich Intermodal Center

Figure 90: MP 13.21 – Passenger Facility - Norwich Intermodal Center

Figure 91: MP 13.21 – Passenger Facility - Norwich Intermodal Center Parking Garage

Figure 92: MP 13.21 – Passenger Facility - Norwich Intermodal Center - Main Entrance

3.10.3. MP 13.50 – Track - North Thames Street

Track

Figure 93: MP 13.50 – Track - N. Thames Street - West of the Track (Looking East)

Utility: Exposed Pipe

Figure 94: MP 13.50 – Track - North Thames Street (Looking North) - Exposed Piping

4. East Corridor (Norwich Branch)

4.1. Gold Star Memorial (Groton)

4.1.1. MP 123.90 – UG Bridge - Amtrak Moveable Bridge

FRA ID: 500290R

Figure 95: MP 123.90 – UG Bridge - Thames Moveable Bridge (Amtrak)

4.1.2. MP 0.09 – UG Bridge - Fairview Ave – NO ACCESS

FRA ID: 504363M

4.1.3. MP 0.82 – OH Bridge – I-95 Gold Star Memorial Bridge

FRA ID: 975817H

Figure 96: MP 0.82 – OH Bridge - Gold Star Memorial - I95 Northbound

FRA ID: 975818P

Figure 97: MP 0.82 – OH Bridge - Gold Star Memorial - I95 Southbound

Track

Figure 98: MP 0.82 – Track - Under I-95 Bridge (Looking East)

4.1.4. MP 1.00 – OH Bridge – Fairview Ave – NO ACCESS

FRA ID: 504364U

4.2. Naval Submarine Base New London (Groton)

4.2.1. MP 1.84 – Grade Crossing – USS Nautilus Museum

FRA ID: 912618G

Figure 99: MP 1.84 - Grade Crossing - USS Nautilus (Looking North from Nautilus Overlook Park)

The stretch of the railroad between MP 01.84 and MP 03.10 goes through a US NAVY Submarine Base which is inaccessible to the public. Afterwards, the railroad goes through a series of coves and enters the property of DOW Chemical plant, which in inaccessible to the public as well and exits the plant property at MP 06.15. Military Highway, followed by Route 12 go up along the bay, parallel to the railroad almost all the way up to Norwich, thus making potential locations for a station platform and a parking lot very limited.

Allowing the public to ride through the property on the train at a relatively slow speed will greatly increase the risk of espionage and other potential security threats.

The main priority in the initial stage of this study should be meeting with the representatives of the NAVY base to determine if running a commuter rail through their property would be something they will allow to begin with.

4.2.2. MP 1.89 – Culvert – NO ACCESS

FRA ID: Unknown

4.2.3. MP 2.16 – Grade Crossing - Navy Base – NO ACCESS

FRA ID: 504365B

4.2.4. MP 2.40 – UG Bridge - Navy Base – NO ACCESS

FRA ID: 504366H

4.2.5. MP 2.58 – UG Bridge – Navy Base – NO ACCESS

FRA ID: 504367P

4.2.6. MP 3.10 – UG Bridge – Navy Base – NO ACCESS

FRA ID: 504368W

4.3. Gales Ferry (Ledyard)

4.3.1. MP 3.80 – UG Bridge – Mill Cove

FRA ID: Unknown

Figure 100: MP 3.80 - UG Bridge - Mill Cove - from Erickson Park (Looking Southwest)

4.3.2. MP 4.15 – Grade Crossing – Private

FRA ID: 504369D

4.3.3. MP 4.45 – OH Bridge – Private

FRA ID: 504370X

Figure 101: MP 4.45 - OH Bridge -Browns Crossing Road - Timber Trestle (Looking West)

Private timber bridge on Browns Crossing Road. The bridge is in good condition.

4.3.4. MP 4.48 – OH Bridge – Hurlbutt Road

FRA ID: 504371E

Figure 102: MP 4.88 – OH Bridge - Hulrbutt Road Bridge – Limited Visual - From Sunset Road (Looking West)

4.3.5. MP 5.11 – UG Bridge – Clarks Cove – Gales Ferry Marina

FRA ID: Unknown

Figure 103: MP 5.11 - UG Bridge - Clark's Cove (Looking South, East of Bridge)

Figure 104: MP 5.11 - UG Bridge - Clark's Cove (Bridge Seat)

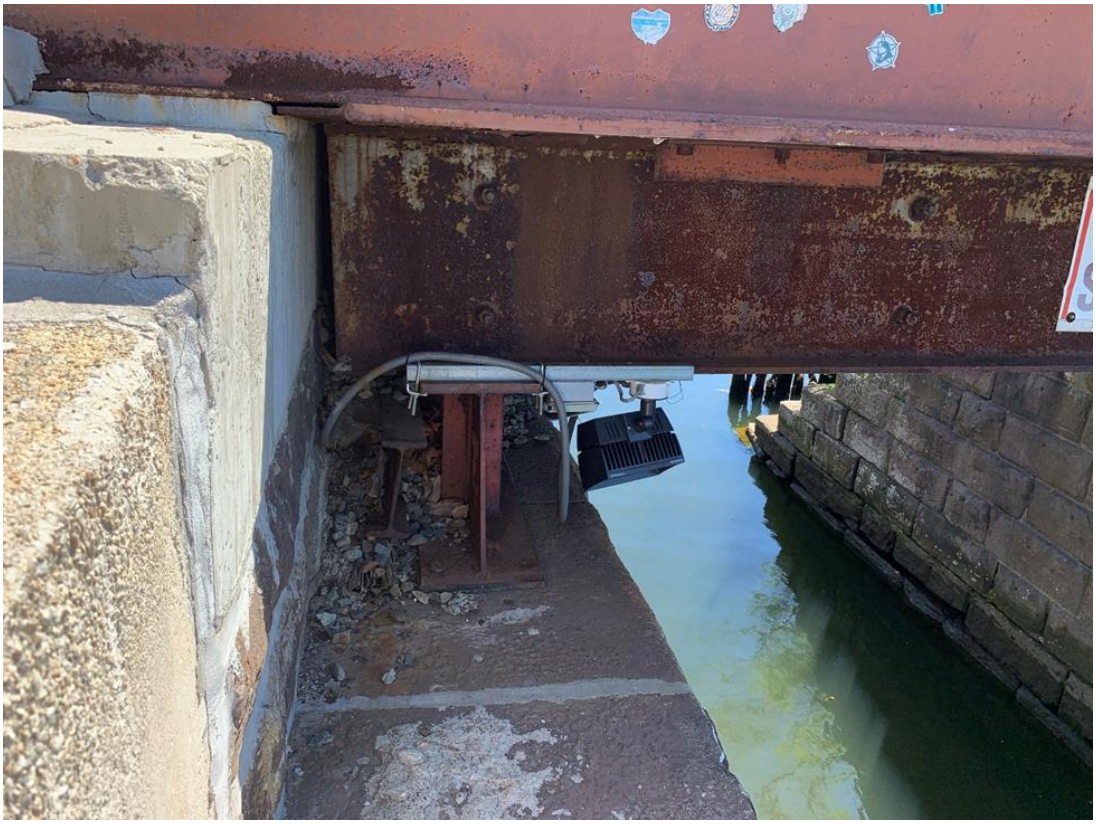


Figure 105: MP 5.11 - UG Bridge - Clark's Cove (Superstructure/Abutment)

Track

Figure 106: MP 5.11 - Track (Looking South)

Figure 107: MP 5.11 - Track (Looking West)

Figure 108: MP 5.11 - Track (Looking North)

4.4. Former DOW Chemical Site (Ledyard)

4.4.1. MP 6.08 – Grade Crossing – DOW Chemical

FRA ID: 504372L

Figure 109: MP 6.08 - Grade Crossing - DOW Chemical

On google earth satellite view this area has a few industrial buildings and large storage tanks. Most likely, they were a part of the DOW Chemical plant. Currently the area has no buildings. It is also under an environmental clean-up operation according to the sign next to the gate. This area could be a potential location for a train station with a parking lot. However, a meeting with DOW Chemical would be necessary to see if they plan to construct a new set of buildings after the environmental clean-up is completed.

Figure 110: MP 6.08 - Grade Crossing - DOW Chemical (Looking East)

Figure 111: MP 6.08 - Grade Crossing - DOW Chemical (Looking East)

Figure 112: MP 6.08 - Grade Crossing - DOW Chemical (Cabinet)

OH Bridge: None Assigned

Figure 113: MP 6.08 - OH Structure - Unidentified (Looking South)

Track

Figure 114: MP 6.08 – Track - DOW Chemical - (Looking North)

Figure 115: MP 6.08 – Track - DOW Chemical - (Looking South)

4.4.2. MP 6.14 – UG Bridge – DOW Chemical - NO ACCESS

FRA ID: Unknown

4.4.3. MP 6.44 – UG Bridge – Nova Lake – NO ACCESS

FRA ID: Unknown

4.4.4. MP 6.79 – UG Bridge – Stoddards Warf Road

FRA ID: Unknown

Figure 116: MP 6.79 - UG Bridge - Stoddards Warf Road

Track

Figure 117: MP 6.79 - Track - Stoddards Warf Road (Looking North)

Figure 118: MP 6.79 - Track - Stoddards Warf Road (Looking South)

4.5. Poquetanock / Stoddard Cove (Preston)

4.5.1. MP 7.09 – UG Bridge – Stoddard Cove

FRA ID: Unknown

Figure 119: MP 7.09 - UG Bridge - Stoddard Cove

Track outage and/or flagmen are needed to walk on the right of way and perform an inspection.

Figure 120: MP 7.09 - UG Bridge - Stoddard Cove (Looking South)

Track

Figure 121: MP 7.09 - Track - Stoddard Cove (Looking North)

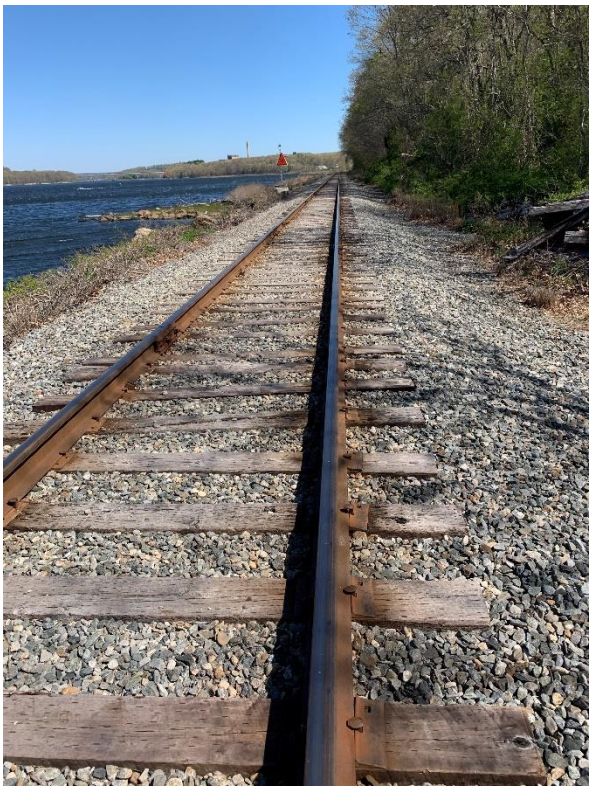


Figure 122: MP 7.09 - Track - Stoddard Cove (Looking South)

4.5.2. MP 7.83 – UG Bridge – Poquetanock Cove

FRA ID: Unknown

Figure 123: MP 7.83 - UG Bridge - Poquetanock Cove (No Access)

Track outage and/or flagmen are needed to walk on the right of way and perform an inspection.

4.6. Proposed Preston Riverfront (Preston)

4.6.1. MP 9.08 – OH Bridge – Route 2A – NO ACCESS

FRA ID: 975819W

4.6.2. MP 9.37 – Grade Crossing – Private – NO ACCESS

FRA ID: 504373T

4.6.3. MP 9.83 – UG Bridge – NO ACCESS

FRA ID: Unknown

4.7. Laurel Hill (Norwich)

4.7.1. MP 11.75 – Grade Crossing – Private – NO ACCESS

FRA ID: 913657B

4.7.2. MP 11.99 – Grade Crossing – Shetucket Iron South

FRA ID: 504374A

Figure 124: MP 11.99 - Grade Crossing - Shetucket Iron South (Looking North)

Figure 125: MP 11.99 - Grade Crossing - Shetucket Iron South - Surface

Figure 126: MP 11.99 - Grade Crossing - Shetucket Iron South (Looking South)

Track

Figure 127: MP 11.99 - Track - 115 Rail

Figure 128: MP 11.99 - Track - Shetucket Iron South

4.7.3. MP 12.08 – OH Bridge – Laurel Hill Avenue

FRA ID: 504375G

Figure 129: MP 12.08 - OH Bridge - Laurel Hill Avenue (Looking North)

Figure 130: MP 12.08 - OH Bridge - Laurel Hill Avenue - Retaining Wall

4.8. Norwich Train Station (Norwich)

4.8.1. MP 12.14 – UG Bridge – Shetucket River

FRA ID: Unknown

Figure 131: MP 12.14 - UG Bridge - Shetucket River (Looking South) – Truss Bridge

Figure 132: MP 12.14 - UG Bridge - Shetucket River (Looking South) - Truss Bridge

Track

Figure 133: MP 12.14 - Track – Shetucket River/Norwich Station

Figure 134: MP 12.14 - Track - Shetucket River/Norwich Station (Looking East)

Figure 135: MP 12.14 - Track - Shetucket River/Norwich Station - (Looking East)

Figure 136: MP 12.14 - Track - Shetucket River/Norwich Station - (Looking East) - 115 Rail

4.8.2. MP 12.16 - Grade Crossing – Norwich Station – Pedestrian Crossing

FRA ID: 504376N

Figure 137: MP 12.16 - Grade Crossing - Norwich Station (Looking North)

Figure 138: MP 12.16 - Grade Crossing - Norwich Station - GC ID

Figure 139: MP 12.16 - Grade Crossing - Norwich Station - Cabinet (Looking North)

Track

Figure 140: MP 12.16 - Track - Norwich Station (Looking East)

Figure 141: MP 12.16 - Track - Norwich Train Station (Looking Southwest)

4.8.3. MP 12.36 – OH Bridge – Route 12 Viaduct

FRA ID: 504377V

Figure 142: MP 12.36 - OH Bridge - Route 12 Viaduct (Looking East)

4.8.4. MP 12.41 – OH Bridge – Unknown – NO ACCESS

FRA ID: 504378C

5. East Corridor (Groton Secondary)

5.1. Tower Avenue (Groton)

5.1.1. MP 1.18 – Grade Crossing – Tower Avenue

FRA ID: 504357J

Figure 143: MP 1.18 - Grade Crossing - Tower Avenue (Looking East)

Figure 144: MP 1.18 - Grade Crossing - Tower Avenue (Looking North)

Track

Figure 145: MP 1.18 - Track - Tower Avenue (Looking South)

5.2. Shennecossett (Groton)

5.2.1. MP 1.35 – UG Bridge - Shennecossett Road

FRA ID: 504358R

Figure 146: MP 1.35 - UG Bridge - Shennecossett Road (Looking North)

Figure 147: MP 1.35 - UG Bridge - Shennecossett Road

5.2.2. MP 1.78 – Grade Crossing - Shennecossett Golf Course – NO ACCESS

FRA ID: 504359X

5.2.3. MP 2.04 – Grade Crossing – Shennecossett Golf Course – NO ACCESS

FRA ID: 504360S

5.3. Pfizer / General Dynamics (Groton)

5.3.1. MP 2.18 – Grade Crossing – Pfizer – NO ACCESS

FRA ID: 504522S

5.3.2. MP 2.43 – Grade Crossing – Pfizer – NO ACCESS

FRA ID: 917403A

5.3.3. MP 2.67 – Grade Crossing – Eastern Point Road

FRA ID: 504361Y

Figure 148: MP 2.67 - Grade Crossing - Eastern Point Road (Looking East)

Figure 149: MP 2.67 - Grade Crossing - Eastern Point Road (Looking East)

Track

Figure 150: MP 2.67 - Track - Pfizer (Looking East)

Figure 151: MP 2.67 - Track - Pfizer (Looking East)

5.3.4. MP 2.85 – Grade Crossing - General Dynamics

FRA ID: 504523Y

Figure 152: MP 2.85 - Grade Crossing - General Dynamics (Looking East)

Figure 153: MP 2.85 - Grade Crossing - General Dynamics (Looking West)

Track

Figure 154: MP 2.85 - Track - General Dynamics (Looking West)

FRA ID: 504524F (No Access)