



TIER 1 FINAL ENVIRONMENTAL IMPACT STATEMENT
VOLUME 1 (PREFERRED ALTERNATIVE)

7.5 Hydrologic/Water Resources

7.5 HYDROLOGIC/WATER RESOURCES

7.5.1 Introduction

This chapter assesses the effects from the Preferred Alternative on hydrologic/water resources including wetlands, floodplains, water quality and coastal resources. Chapter 7.7, Geologic Resources, and Chapter 7.19, Summary of Public Health Effects, discuss effects on drinking water supplies.

Water resources are protected and regulated under various federal, state, and local laws such as the Clean Water Act of 1972 (33 USC §1344). Implementation of the Preferred Alternative can result in degradation of water quality, dredge and fill of wetlands, encroachment of floodplains, development in coastal zone management areas, and crossing of Navigable Waterways. These effects would result from construction and operations associated with the modification of existing rail infrastructure (such as expansion of rail rights-of-way) and/or construction of new rail infrastructure (such as railroad tracks or stations). Adverse effects on these resources require mitigation and permitting by regulating agencies such as the U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), state environmental agencies, and localities.

The Federal Railroad Administration (FRA) grouped the definition of resources, as used in this Tier 1 Final Environmental Impact Statement (Tier 1 Final EIS), into four main categories:

► **Freshwater Resources**

- **Surface Waters** include freshwater creeks, streams, rivers, lakes, and ponds that are above ground.
- **Water Quality** is the physical, chemical, and biological characteristics of a water body
- **Freshwater Wetlands**, as defined by the USACE, means those areas that are inundated or saturated by surface- or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The U.S. Fish and Wildlife Service categorizes wetlands by eight wetland types as part of the National Wetlands Inventory (NWI). The wetland types that were considered *freshwater* wetlands for the purposes of this assessment include Freshwater Forested and Shrub; Freshwater Emergent; Freshwater Pond; Riverine; Lake; and Other Freshwater.

- **Navigable Waters** refers to large waterways as defined under Section 10 of the Rivers and Harbors Act of 1899 that have been used in the past, are now used, or are susceptible to use as a means to transport interstate or foreign commerce to the head of navigation.

Hydrologic/Water Resources

- Regulated by numerous federal, state, and local laws, regulations and Executive Orders.
 - Adverse impacts may be difficult to permit or unallowable and may influence implementation of the Preferred Alternative.
 - Types of effects include dredge or fill of wetlands; encroachment of floodplains; development within designated coastal zones; crossing Navigable Waterways.
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- ▶ **Floodplains** are those areas adjacent to a stream or river that are susceptible to flooding. This study focuses on areas designated by the Federal Emergency Management Agency as special flood hazard areas (SFHA), also known as the area that would be inundated by the 1-percent annual chance flood, also known as the 100-year flood.
- ▶ **Coastal Resources**
 - **Coastal Zones** are defined by Section 304 of the Coastal Zone Management Act as coastal waters (including the lands therein and thereunder) and the adjacent shorelines, strongly influenced by each other and in proximity to the shorelines of the coastal states. Designated coastal zones include islands, transitional and intertidal areas, coastal/salt marshes (saltwater wetlands), and beaches. The zone extends inland from the shorelines only to the extent necessary as determined by each individual state that has a designated coastal zone.
 - **Saltwater Wetlands**, as defined by the USACE, means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The U.S. Fish and Wildlife Service categorizes wetlands by eight wetland types as part of the NWI. The wetland types that were considered *saltwater* wetlands for the purposes of this assessment include Estuarine and Marine, and Estuarine and Marine Deepwater.

Numerous water resources exist within the Study Area, including within the Affected Environments and Representative Routes for the Existing NEC + Hartford/Springfield Line and Preferred Alternative. The FRA collected, catalogued, and analyzed data pertaining to waterbodies and corresponding hydrologic systems such as floodplains and wetlands, and identified potential impacts to water resources of interest. Appendix EE.06 contains a complete list of the hundreds of streams, rivers, lakes, ponds, estuaries, and bays that occur within the Affected Environment of the Preferred Alternative.

Volume 2, Appendix E.05, provides a description of the methodology used for analyzing existing conditions and Environmental Consequences of each of these hydrologic/water resources.

7.5.2 Resource Overview

Understanding the locations of water resources is important since it can influence decisions on infrastructure needs and design considerations. The analysis presented in this section identifies concentrations of known water resources that the FRA considered when identifying the Preferred Alternative and that future project proponents should evaluate further during Tier 2 project planning and development. Key findings of this water resources analysis follow:

- ▶ **Benefits**
 - The Preferred Alternative incorporates the use of elevated structures and tunnels for new segments and modifications to the Existing NEC, which would minimize effects on water resources.

► **Impacts**

- The Preferred Alternative would affect SFHA, wetlands, Navigable Waterways, waterbodies with special water quality considerations, and coastal zones.
 - The majority of the impacts to water resources would occur in Connecticut.
 - The Preferred Alternative incorporates service improvements to the Existing NEC and therefore continues to run, via the NEC, through the John Heinz Wildlife Refuge in Delaware and Philadelphia Counties, PA; the Patuxent Research Refuge in Anne Arundel and Prince George’s Counties, MD; and Stewart B. McKinney National Wildlife Refuge in Middlesex County, CT. These refuges have associated wetlands, SFHA, coastal zones, and are ecologically sensitive.
- New crossings of Navigable Waterways would occur as part of the Preferred Alternative.

7.5.3 Affected Environment

The FRA identified numerous water resources within the Affected Environment. Table 7.5-1 summarizes the quantities and types of resources identified for the Existing NEC + Hartford/Springfield Line and Preferred Alternative; these tables list totals by state, but Appendix EE.05 provides a full listing of resources.

Table 7.5-1: Summary of Water Resources within the Affected Environment

Geography	Existing NEC + Hartford/Springfield Line					Preferred Alternative				
	SFHA (acres)	Wetlands (acres)	Coastal Zone (route miles)	Navigable Waters Crossed	WQ	SFHA (acres)	Wetlands (acres)	Coastal Zone (route miles)	Navigable Waters Crossed	WQ
D.C.	120	60	NA	0	3*	120	60	NA	0	3*
MD	3,310	1,840	1	2	29*	4,465	2,430	1	2	37*
DE	1,645	915	25	1	7	2,365	1,310	40	2	6
PA	1,305	690	30	1*	18	2,405	915	40	1*	13
NJ	3,145	2,490	1	4*	31*	3,425	2,675	2	4*	31*
NY	1,165	490	15	2*	7*	1,365	630	20	3*	7*
CT	10,755	6,905	125	12*	135*	11,480	7,770	175	12*	150*
RI	2,185	2,025	0	1*	28*	2,420	2,270	0	1*	29*
MA	1,955	2,150	1	0	24*	1,955	2,155	1	0	23*
TOTAL	25,585	17,565	198	20	280	28,000	20,215	279	22	297

Source: NEC FUTURE team, 2016

WQ = Waterbodies with special water quality designations.

SFHA = special flood hazard areas

*One or more waterbodies are located within the geographical boundaries of two states and are included in the totals for both states.

Table 7.5-1 lists the total acres of SFHA and wetlands, and route miles of coastal zones, within the Affected Environments of the Existing NEC + Hartford/Springfield Line and the Preferred Alternative. Values for route miles of coastal zones are the same for each state within the Affected Environments and the Representative Routes since it is a linear rather than areal calculation. The FRA’s assessment of the effects on coastal zones included identifying areas within the Affected

Environment where the Preferred Alternative intersects coastal zones boundaries, as well as describing the coastal zone boundaries for each state. Because the coastal zone extends inland from the shoreline only to the extent necessary to control the shoreline as defined by each state, coastal zones boundaries differ between jurisdictions. Jurisdictional coastal zones have been established for each affected state with the exception of Washington, D.C. The entire state of Delaware is a designated coastal zone. Volume 2, Chapter 7.5, Table 7.5-7, provides a description of each state's coastal zones.

Also listed is the number of Navigable Waterways crossed by the Representative Routes. Additional Navigable Waterways are present within the Affected Environments but are not crossed; Appendix EE.05 notes those. The FRA also calculated the total number of waterbodies with special water quality designations within the Affected Environments by state. Some of these waterbodies may serve as drinking water supplies based on their water quality designation. (See Appendix EE.05, for a complete list of all surface waters and corresponding water quality designations.) For more discussion on the effects of drinking water, refer to Chapter 7.7, Geologic Resources, and Chapter 7.19, Summary of Public Health Effects.

Connecticut has the largest number of acres of SFHA and wetlands within the Affected Environments followed by Maryland and New Jersey. Connecticut also has the largest number of acres of wetlands (freshwater and saltwater), route miles of coastal zones, Navigable Waters crossed, and waterbodies with special water quality designations within the Affected Environments.

7.5.4 Environmental Consequences

7.5.4.1 No Action Alternative

Improvements anticipated under the No Action Alternative could affect water resources occurring within and adjacent to the Existing NEC + Hartford/Springfield Line right-of-way. Mitigation and permitting of water resources affected under the No Action Alternative will be the responsibility of project sponsors undertaking those actions.

7.5.4.2 Preferred Alternative

Table 7.5-2 provides the total number of acres, route miles, or sums of water resources that would be affected by the Preferred Alternative compared to the Existing NEC + Hartford/Springfield Line. Since the Existing NEC + Hartford/Springfield Line is included in its entirety within the Preferred Alternative, a discussion of the data and impacts of just the new or upgraded segments included in the Preferred Alternative follows the table.

Table 7.5-2: Environmental Consequences: Representative Route – Quantitative Impacts to Water Resources

Geography	Existing NEC + Hartford/Springfield Line					Preferred Alternative				
	SFHA (acres)	Wetlands (acres)	Coastal Zone (route miles)	Navigable Waters Crossed	WQ	SFHA (acres)	Wetlands (acres)	Coastal Zone (route miles)	Navigable Waters Crossed	WQ
D.C.	10	1	NA	0	1	7	1	NA	0	1
MD	200	65	1	2	26	440	155	1	2	32
DE	50	10	25	1	5	135	75	40	2	5
PA	50	10	30	1*	17	150	20	40	1*	12
NJ	140	65	1	4*	19*	210	105	2	4*	19*
NY	65	25	15	2*	6*	75	50	20	3*	6*
CT	645	200	125	12*	107*	690	265	175	12*	119*
RI	80	60	0	1*	12*	100	85	0	1*	13*
MA	105	70	1	0	16	110	80	1	0	16
TOTAL	1,345	506	198	20	207	1,920	836	279	22	221

Source: NEC FUTURE team, 2016

WQ = Waterbodies with special water quality designations.

SFHA = special flood hazard areas

*One or more waterbodies are located within the geographical boundaries of two states and are included in the totals for both states.

Elements South of New York City

- ▶ **Maryland/Delaware – Bayview to Newport (new segment)** – A new segment, approximately 60 miles in length, extends from Bayview in Baltimore City, MD, to Newport, DE. This two-track segment runs farther inland than the Existing NEC, adjacent to CSX-owned right-of-way and U.S. Route 40. This new segment would affect 268 acres of SFHA and 126 acres of wetlands in Maryland and Delaware. The new segment would cross no additional Navigable Waterways or waterbodies with special water quality considerations compared to the Existing NEC.
- ▶ **Delaware – Wilmington Segment (bypasses Wilmington Station)** – In Delaware, a new segment, approximately 8 miles in length, extends from Newport to Holly. The new segment bypasses the Wilmington Station and runs closer to the Delaware River than the Existing NEC, crossing the Christina River in two locations. This new segment would affect 56 acres of SFHA and 32 acres of wetlands, and would run through coastal zones. This segment would also result in an additional Navigable Waterway crossing at the Christina River via tunnel.
- ▶ **Pennsylvania – Philadelphia Segments (new segments)** – In Pennsylvania, a new segment, approximately 10 miles in length, runs from Baldwin Station to Philadelphia 30th Street Station.

Gunpowder River

The Gunpowder River in Baltimore and Harford Counties, MD, drains to the Chesapeake Bay. Where the Preferred Alternative crosses the Gunpowder River, it is considered a Navigable Waterway in addition to having associated saltwater wetlands, special flood hazard areas, and coastal zones. The state of Maryland has designated the Gunpowder River a Class II waterbody, which supports shellfish harvesting. The FRA recognizes the importance of avoiding and/or minimizing impacts to the Gunpowder River estuary in order to preserve the special designated use classification and to uphold overall water quality. Additional stormwater and water quality requirements resulting from the comprehensive Chesapeake Bay Total Maximum Daily Load apply to the Gunpowder River watershed.

This segment diverges from the Existing NEC at Route 291/Industrial Highway, providing direct access to the Philadelphia International Airport, then converging with the Existing NEC prior to 30th Street Station. The new segment is in proximity to the CSX Chester Secondary right-of-way, which would minimize the impact to the John Heinz Wildlife Refuge, affecting 25 acres of SFHA and 1 acre of wetlands. The segment would use the existing right-of-way and would not include additional footprint impacts to the refuge. This segment is within the designated coastal zone; however, it would affect five fewer waterbodies with special water quality considerations than the Existing NEC. Appendix EE.05 provides a list of waterbodies intersected by the Representative Route of the Preferred Alternative and associated water quality designations.

- ▶ **New Jersey – New Brunswick to Secaucus (new segment)** – A new segment, approximately 24 miles in length, extends from North Brunswick Station to the Passaic River at Newark Penn Station. The new two-track segment spans Middlesex, Union, Essex, and Hudson Counties, NJ, running mostly parallel to the Existing NEC, with small bump-outs (where the new segment diverges and then converges with the Existing NEC) in multiple areas along a 24-mile span. This segment would affect 30 acres of SFHA and 11 acres of wetlands primarily occurring in Union County, NJ, associated with the Rahway River.
- ▶ **New Jersey – Secaucus/Bergen Loop (new segment)** – This segment extends from Secaucus Station running parallel to the NJ TRANSIT Main Line until just prior to US Route 1, in Hudson County, NJ. The new loop would affect an additional 35 acres of SFHA and 10 acres of wetlands.

Passaic River

The Passaic River flows through New Jersey, draining much of the northern portion of the state through its tributaries. The Preferred Alternative crosses a section of the Passaic River that flows through a highly urbanized and industrialized area and that drains to Newark Bay. The segment of the Passaic River likely to be crossed by the ultimate alignment of the Preferred Alternative, should it be implemented, is highly polluted and is listed on the Section 303(d) list of impaired waters. Additionally, there are saltwater wetlands, special flood hazard areas, and coastal zones associated with the Passaic River within the Affected Environment. The U.S. Environmental Protection Agency has released a \$1.4 billion plan to clean up the lower 8 miles of the Passaic River over 11 years.

Elements North of New York City

- ▶ **New York/Connecticut – New Rochelle to Greens Farms (new segment)** – This new two-track segment spans from New Rochelle Station in Westchester County, NY, to Greens Farms Station in Fairfield County, CT. This segment runs parallel to I-95, diverging from the Existing NEC and passing existing local stations, then converging with the Existing NEC again after crossing the Saugatuck River, just south west of the Greens Farms Station. This new segment would affect 10 acres of wetlands as well as 20 acres of SFHA while traversing the coastal zones for the entire length of the segment. This segment includes a new Cos Cob Harbor crossing at I-95.
- ▶ **Connecticut/Rhode Island – Old Saybrook-Kenyon (new segment)** – This new segment, spanning approximately 50 miles from Old Saybrook Station in Middlesex County to New London, CT, to Kenyon in Washington County, RI, runs inland through Connecticut parallel to I-95, diverging from the coastal Existing NEC, then rejoining the Existing NEC prior to Kingston Station in Rhode Island. This new segment crosses two additional Navigable Waterways: the Connecticut and Thames Rivers. The entire segment is located within the coastal zone boundaries and would increase coastal zone route miles and would affect 50 acres of SFHA and

80 acres of wetlands. The Old Saybrook-Kenyon new segment intersects waterbodies with special water quality considerations. This segment also crosses the Niantic, Mystic, and Pawcatuck Rivers, and Groton and Mystic Reservoirs.

- ▶ **Connecticut/Massachusetts – Hartford/Springfield Line (upgraded track/electrification)** – This corridor runs somewhat parallel to I-91 between New Haven, CT, and Springfield, MA. The FRA proposes track upgrades (electrification) on the existing connecting corridor. This upgrade would affect water resources, including 10 route miles of coastal zone (in New Haven County, CT), 280 acres of SFHA, and 70 acres of wetlands in New Haven and Hartford Counties, CT, and Hampden County, MA. This segment would cross two Navigable Waterways at the Connecticut and Quinnipiac Rivers, and intersect waterbodies with special water quality considerations.

The Preferred Alternative could affect water resources along the Northeast coastline. The FRA identified 20 waterbodies as experiencing the greatest combined impact to water resources. Combined impact refers to instances where Environmental Consequences may be aggravated by impacts to multiple hydrologic systems (e.g., wetlands and floodplains). Table 7.5-3 lists each resource that has potentially affected associated wetlands and designated SFHA, and is navigable and in a regulated coastal zone. The table also denotes the counties identified as being at significant risk from climate change–related flooding, including sea level rise, storm surge, and riverine flooding. Chapter 7.15, Climate Change and Adaptation, provides a more detailed discussion and analysis on climate change. Appendix EE.05 provides quantifiable effects to water resources, organized by state and county, for the Preferred Alternative.

Connecticut River

Flowing from the Canadian border to Long Island Sound, the Connecticut River is the longest river in New England. The Preferred Alternative crosses the Connecticut River in two places: the Hartford/Springfield Line in Hartford, CT, and the Old Saybrook-Kenyon new segment in Middlesex and New London Counties, CT. The Connecticut River is a designated American Heritage River, and the estuary and tidal wetlands complex of the Lower Connecticut River are recognized as Ramsar Wetlands of International Importance. The 7.2-million-acre Connecticut River Watershed is also home to Silvio O. Conte National Fish and Wildlife Refuge and an extensive network of high-quality fresh, brackish, and salt marshes. These marshes provide habitat for marine fish and migratory pathways for salmon, shad, and herring. The State of Connecticut has assigned a Class B water quality classification to the Connecticut River at the Preferred Alternative Old Saybrook-Kenyon segment, which includes recreational use, and fish and wildlife habitat. The Connecticut River is listed on the Section 303(d) list of impaired waters at both areas where the Preferred Alternative crosses the river, and associated wetlands, special flood hazard areas, and coastal zones are present.

Table 7.5-3: Environmental Consequences: Water Resources with Greatest Combined Impact within the Preferred Alternative

State	County	Resource
MD	Baltimore County / Harford*	Gunpowder River
	Harford*	Bush River
DE	New Castle	Christina River
		Brandywine Creek
NJ	Essex / Hudson*	Passaic River
	Hudson*	Hackensack River
NJ / NY	Hudson* / Manhattan*	Hudson River
NY	Manhattan* / Queens / Kings	East River
CT	Fairfield	Pequonnock River
	New Haven*	West River
		Mill River
		Quinnipiac River
	Middlesex / New London*	Connecticut River
	New London*	Niantic River
		Thames River
		Mystic River
Stonington Harbor		
CT / RI	New London* / Washington	Pawcatuck River
MA	Boston	Fort Point Channel
Hartford/Springfield Line		
CT	Hartford	Connecticut River

Source: NEC FUTURE team, 2016

*County has been identified as having significant risk of climate change–related flooding.

7.5.5 Stations

Table 7.5-4 summarizes the potential Environmental Consequences to water resources from stations that are part of the Preferred Alternative. Five of the stations (44, 76, 81, 101, and 157) would potentially affect SFHA, wetlands, and coastal zones. Secaucus Station in Hudson County, NJ, would affect the largest number of acres of SFHA and acres of wetlands.

Table 7.5-4: Environmental Consequences: Preferred Alternative – Modified or New Stations – Hydrologic/Water Resources

State	County	Station ID	Station Type	Station Name	Preferred Alternative		
					SFHA (acres)	Wetlands (acres)	Within Coastal Zones
DE	New Castle	26	New	Newport	1	0	Yes
		28		Edgemoor	0	1	Yes
PA	Delaware	34	New	Baldwin	3	0	Yes
		44		Philadelphia Airport	10	1	Yes
NJ	Mercer	61	Modified	Princeton Junction	0	1	No
	Middlesex	62	New	North Brunswick	0	5	No
		68		Metropark H.S.	2	0	No
	Hudson	76	Modified	Secaucus	20	15	Yes
NY	Bronx	78	New	Hunts Point	2	0	No
		80		Morris Park	3	0	Yes
		81		Co-op City	15	4	Yes
CT	Fairfield	94	New	Stamford H.S.	0	0	Yes
		101	Modified	Greens Farms	10	4	Yes
		107	New	Barnum	0	0	Yes
	New Haven	189	New	Orange	0	2	Yes
	New London	124	New	Mystic/New London H.S.	0	1	Yes
Hartford/Springfield Line							
CT	New Haven	157	New	North Haven	2	3	Yes
	Hartford	161	New	Newington	3	0	No
		187		Enfield	2	0	No

Source: NEC FUTURE team, 2016

SFHA = special flood hazard areas

7.5.6 Context Area

The Context Area contains numerous water resources. Some of the larger water resources for each state include the Chesapeake Bay, Patuxent River, and Susquehanna River in Maryland; Delaware River in Delaware and Pennsylvania; Assunpink Creek and lower Hudson River in New Jersey; Mamaroneck and Cross Rivers in New York; major tributaries to the Long Island Sound, Connecticut River, Connecticut Coastal (Atlantic Ocean) in Connecticut; Pawcatuck River, Chapman Pond and Scituate Reservoir in Rhode Island; and the Charles River and Neponset River in Massachusetts. Many of these water resources have associated wetlands, floodplains, coastal zones, and Navigable Waterways.

7.5.7 Comparison to the Action Alternatives

The FRA identified a Preferred Alternative based on numerous comments and feedback obtained as part of the public comment period from the public and agency stakeholders. A general description of some of the notable changes to or differences between the Preferred Alternative and the Action Alternatives is provided below. The Preferred Alternative includes the Existing Hartford/Springfield Line, which was not part of the Action Alternatives. This segment would have potential impacts to water resources including SFHA, wetlands, coastal zones, and additional Navigable Waterways and waterbodies with special water quality designations crossings. Table 7.5-5 provides a comparison of impacts to water resources between the Preferred Alternative and the Action Alternatives.

Table 7.5-5: Quantitative Comparison of Water Resources between Alternatives

Resource	Alternative 1	Alternative 2	Alternative 3	Preferred Alternative
Special Flood Hazard Areas (acres)	1,135	1,520	2,225–2,270	1,920
Wetlands (acres)	540	745	1,140–1,725	836
Coastal Zone (route miles)	225	235	270–300	279

Source: NEC FUTURE team, 2016

Alternative 1 Comparison

The Preferred Alternative proposes tunnel construction for the Old Saybrook-Kenyon new segment, which crosses the Connecticut River in Old Lyme, CT. Alternative 1 proposes this new segment, as well as an aerial structure for the area in and around Old Lyme, CT. The Preferred Alternative avoids the use of an aerial structure in the historic district of Old Lyme, which would avoid or minimize many impacts to water resources, including floodplains, wetlands, and coastal zones, as well as sensitive ecological resources within the Connecticut River area.

However, on a corridor-wide basis, the Preferred Alternative would have more total impacts to SFHA, wetlands, and coastal zones than Alternative 1.

Alternative 2 Comparison

The Preferred Alternative will use the existing railroad within the John Heinz National Wildlife Refuge rather than constructing a new bridge to cross the refuge as Alternative 2 proposes. This change in the location of the Representative Route would reduce potential impacts to water resources within the John Heinz National Wildlife Refuge, including SFHA, wetlands, and coastal zones as well as ecological resources.

The Preferred Alternative does not include the segment connecting Hartford, CT, to Providence, RI, which Alternative 2 proposes; however, the Preferred Alternative includes a shorter segment as part of the Hartford/Springfield Line that connects Hartford, CT, to Springfield, MA. This segment avoids constructing a new Connecticut River crossing in Hartford. The Preferred Alternative would avoid some potential impacts to water resources, specifically SFHA and wetlands impacts.

The Preferred Alternative would have more total impacts (acres and route miles) to SFHA, wetlands, and coastal zones than Alternative 2.

Alternative 3 Comparison

In Delaware, the Preferred Alternative uses the existing right-of-way when crossing Brandywine Creek and the Christina River, rather than constructing a new aerial structure that would have required two new Christina River crossings and a new Brandywine Creek crossing as Alternative 3 proposes. The Preferred Alternative would affect fewer water resources, including SFHA, wetlands, and coastal zones with fewer major waterbody crossings.

The Preferred Alternative travels farther inland than Alternative 3, in Delaware County, PA, just north of the Philadelphia International Airport and away from the Delaware River. While it does intersect the John Heinz National Wildlife Refuge, it minimizes impacts to water resources within the refuge, including the Schuylkill River crossing that Alternative 3 proposes. The Preferred Alternative does not include the at-grade track proposed north of the Philadelphia International Airport from Ridley Creek in Delaware County, PA, to 30th Street Station, avoiding Darby and Cobbs Creek crossings. The Preferred Alternative does not include the proposed tunnel through Center City Philadelphia.

In New York and Connecticut, the Preferred Alternative does not include the Long Island tunnel that Alternative 3 proposes, which would avoid substantial impacts to water resources, including SFHA, wetlands, and coastal zones.

The Preferred Alternative follows the Existing NEC from New York City to New Haven, which would affect fewer water resources than the Central Connecticut segment that Alternative 3 proposes. Likewise, the Preferred Alternative follows the Existing NEC for much of the connection between New Haven, CT, and Boston, MA, with the exception of the Old Saybrook-Kenyon new segment. The Preferred Alternative would also avoid potential impacts to water resources proposed as part of the Hartford-Boston line via Providence, RI, and Worcester, MA.

The FRA incorporated the Old Saybrook-Kenyon new segment into the Preferred Alternative. Due to the sensitive hydrological and ecological resources in and around the Connecticut River watershed, the FRA changed the representative construction type at the Connecticut River crossing from aerial to tunnel, which would avoid some potential impacts to water resources.

In Connecticut, the Preferred Alternative includes the New Rochelle-Greens Farms segment in Westchester and Fairfield Counties, CT. There would be increased impacts to SFHA, wetlands and coastal zones; however, the proposed aerial construction may serve to avoid some impacts.

The FRA converted the proposed tunnel running nearly entirely through Suffolk County, MA, to Boston South Station, to at-grade, running north along Hyde Park Avenue to Forest Hill Station. At-grade construction could have more potential impacts to water resources in Massachusetts, although the Preferred Alternative follows the Existing NEC at this location.

The Preferred Alternative would affect fewer acres of SFHA and wetlands than Alternative 3 and roughly the same number of route miles of coastal zones.

7.5.8 Potential Mitigation Strategies

Potential mitigation strategies to address adverse effects on hydrologic resources are presented below by specific topic. Many of the strategies are most appropriate during the design and construction phases of a project.

7.5.8.1 Water Quality/Stormwater Management

- ▶ Prepare site-specific Stormwater Pollution Prevention Plan.
- ▶ Infiltrate stormwater on-site when possible.
- ▶ Minimize length of waterbody crossing.
- ▶ Incorporate pervious materials in design.
- ▶ Implement soil erosion and sediment control features where applicable.
- ▶ Minimize segments of railway that closely parallel streams and waterbodies.
- ▶ Incorporate vegetative buffers to intercept runoff.

7.5.8.2 Wetlands

Temporary construction access into the wetlands should be limited to the maximum extent practicable. Implementing appropriate soil erosion and sediment control measures—using timber mats, and minimizing compression of the soil—will lessen the severity of the temporary impact. All areas temporarily disturbed should be restored to pre-construction elevations using appropriate soil types and will be replanted with native wetland vegetation. Where permanent impacts are unavoidable, the Tier 2 project sponsors should apply the following compensatory mitigation concepts:

- ▶ Elevate tracks using piers.
- ▶ Avoid wetland crossing where feasible.
- ▶ Minimize width of disturbance within wetlands.
- ▶ Utilize wetland protection features while performing activities in wetlands.
- ▶ Implement soil erosion and sediment control features where applicable.
- ▶ Limit removal of vegetation within wetlands.
- ▶ Limit activity in wetlands and re-vegetate immediately following completion of grading.
- ▶ Restore, enhance, and preserve wetland as deemed appropriate.
- ▶ Provide in-lieu fees and wetland mitigation banking.

7.5.8.3 Floodplains

- ▶ Use construction best management practices to reduce or prevent sedimentation from construction site.
- ▶ Construct at-grade sections on embankments with culverts.
- ▶ Construct tracks above the Base Flood Elevation using piers.

7.5.8.4 Coastal Resources

- ▶ Elevate tracks using piers.
- ▶ Prepare site-specific Stormwater Pollution Prevention Plan.
- ▶ Infiltrate stormwater on-site when possible.
- ▶ Incorporate pervious materials in design.
- ▶ Minimize length of waterbody crossing.

7.5.9 Subsequent Tier 2 Analysis

The FRA has assessed environmental impacts based on conceptual and representative information as part of this programmatic Tier 1 EIS. The FRA has used the Environmental Consequences analysis to develop the Preferred Alternative and identify water resources to be considered and assessed more thoroughly during Tier 2 project studies. Volume 2, Chapter 7.5, provides considerations including regulations, permitting requirements, and coordinating authorities for subsequent Tier 2 studies. Additional considerations for Tier 2 water resource analysis identified during the official comment period are summarized below.

Table 7.5-6 lists U.S. Interstate Compacts and State Commissions that provide advisory, and in many cases regulatory oversight, pertaining to water resources, watershed management, conservation, and ecological resources, and should be, or may require to be, involved and included in project-level coordination and review.

Table 7.5-6: Interstate and State Commission Authorities Associated with Water Resources

Commission	Geographic Oversight
Susquehanna River Basin Commission	Maryland, Pennsylvania, New York
Delaware River Basin Commission	Delaware, Pennsylvania, New Jersey, New York
Interstate Environmental Commission	New Jersey, New York, Connecticut
Delaware and Raritan Canal Commission	New Jersey
Connecticut River Gateway Commission	Connecticut

Source: NEC FUTURE team, 2016

In issuing permits, the USACE must comply with the Section 404(b)(1) Guidelines (40 CFR Part 230), which generally require selection of the practicable alternative that causes the least harm to the aquatic ecosystem. The USACE may only permit discharges of dredged or fill material into Waters of the United States that represent the least damaging practicable alternative. In New Jersey, the New Jersey Department of Environmental Protection (NJDEP) has assumed the USACE’s responsibility for administering the Section 404 permitting program. Therefore, NJDEP rather than the USACE issues Section 404 permits in New Jersey, pursuant to the same legal standards that apply to the USACE. A Freshwater Wetland Individual Permit requires a rebuttal of the presumption that an activity has an alternative that does not involve disturbances to freshwater wetlands or state open waters.