



TIER 1 FINAL ENVIRONMENTAL IMPACT STATEMENT
VOLUME 2

7. Affected Environment, Environmental Consequences, and Mitigation Strategies

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TIER 1 FINAL ENVIRONMENTAL IMPACT STATEMENT
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7. Introduction

7 Affected Environment, Environmental Consequences, and Mitigation Strategies

INTRODUCTION AND GUIDE TO EFFECTS ASSESSMENT

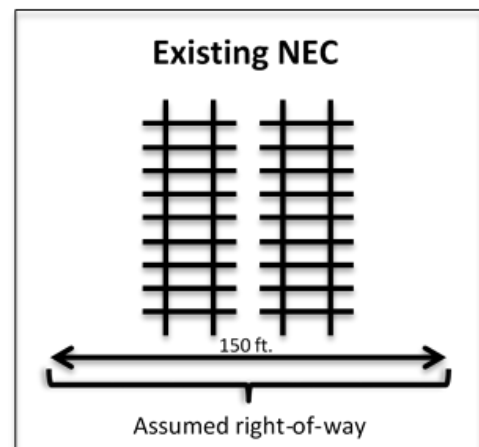
Chapter 7 presents the environmental and socioeconomic effects of the Action Alternatives considered in the NEC FUTURE Tier 1 Draft Environmental Impact Statement (Tier 1 Draft EIS). As described in Chapter 2, Readers' Guide, the Study Area includes a broad geographic area, extending 457 miles from Washington, D.C. (in the south) to Boston, MA (in the north), and covering over 50,000 square miles. The Federal Railroad Administration (FRA) developed an approach to defining Action Alternatives and their Representative Routes in a way that allows for a meaningful assessment of potential Environmental Consequences. For each resource, the Affected Environment discussion documents existing conditions and sets the geographic boundaries where effects would occur and the Representative Route establishes a physical footprint for conducting Environmental Consequences assessments. The Context Area is a wider buffer around the Affected Environment that identifies adjacent or nearby environmental features potentially affected by the Action Alternatives should the Representative Route shift. The FRA applies this approach throughout the environmental effects assessment presented in this chapter.

Analysis in this chapter also reflects input from a variety of resource and regulatory agencies at the federal and state level obtained during a series of agency coordination meetings. These efforts included meetings about specific resource topics, Technical Working Groups, webinars, and mailings. The various agencies have reviewed and commented on the effects-assessment methodologies, data, and preliminary Tier 1 Draft EIS findings as are relevant to their agencies jurisdiction or specialty. The FRA used this input to develop the Tier 1 Draft EIS.

Definition of Existing NEC, Representative Route, Affected Environment, and Context Area

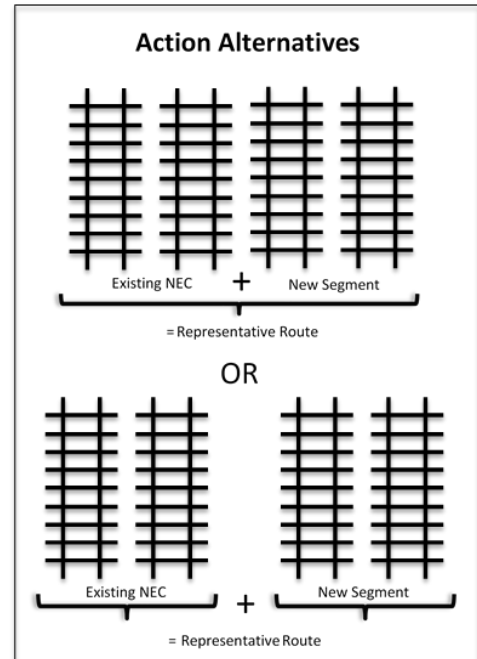
The FRA uses the following concepts and terminology (first defined in Chapter 2, Readers' Guide) in the effects assessment for each resource:

- ▶ **Existing NEC** refers to the assumed right-of-way of the NEC and is the footprint used in this Tier 1 Draft EIS to characterize environmental conditions of the existing NEC. The FRA standardized the width of the existing NEC to 150 feet, conservatively accounting for a four-track right-of-way between Washington, D.C., and Boston. The 150-foot width is inclusive of tracks, ballast, signals, etc.
- ▶ **Representative Route** is the route associated with an Action Alternative. The Representative Route includes the physical footprint of the improvements associated with the Action Alternatives. The dimensions of the footprint of the Representative Route are based on



cross sections identifying construction types (e.g., tunnel, viaduct, bridge, embankment, at-grade) that are applied to topography or land use type, stations, supporting facilities, and right-of-way requirements. The footprints associated with the Representative Routes range from 150 feet to 300 feet wide. Improvements associated with stations and supporting facilities (i.e., tracks, platforms, parking) could flare out beyond the dimensions of the Representative Route.¹

The width of the Representative Route for an Action Alternative includes the existing NEC and any new segment(s), where applicable. In some instances, a Representative Route consists of the existing NEC and new segment being adjacent and parallel to each other. In other instances, a Representative Route consists of the existing NEC and new segment being separated. An example would be a new segment proposed to create a bypass or an alternate route option to access a new geographic market. (See Section 4.2.4 for additional information.)



- ▶ **Affected Environment** is the geographic area for which the FRA identified existing conditions and Environmental Consequences for the existing NEC and Action Alternatives. The width of the Affected Environment varies based on the resource, but at a minimum is 2,000 feet wide, centered on the Representative Route. In some cases where appropriate to accurately characterize the resource, the Affected Environment encompasses the entire Study Area. Table 7-1 provides specific sizes of the Affected Environments by resource. The size of each Affected Environment reflects the nature of the resource itself and any relevant regulatory requirements that influence the area of effect the FRA considered in determining potential effects for each specific resource. Appendix E provides the effects-assessment methodologies for each resource, in which the FRA provides the rationale used to determine the Affected Environment width for each resource.

¹ The FRA did not evaluate other ancillary facilities, such as maintenance and storage yards, traction power substations, etc. in this Tier 1 Draft EIS. The FRA did not identify specific locations of these facilities as part of the development of alternatives (see Chapter 4, Alternatives Considered).

Table 7-1: Limits of Affected Environment by Resource

Resource	Description of Resource	Affected Environment
Land Cover	Land cover within the Affected Environment	½-mile-wide swath centered on the Representative Route for each Action Alternative
Agricultural Lands (Prime Farmlands and Timberlands)	Prime farmland and timberlands	2,000-foot-wide swath centered along Representative Route for each Action Alternative
Parklands and Wild and Scenic Rivers	Publicly owned parklands; parklands receiving funding from the Land and Water Conservation Fund Act; Rivers identified as Wild and Scenic by the National Rivers Inventory within the Affected Environment	2,000-foot-wide swath centered along Representative Route for each Action Alternative
Hydrologic/Water Resources	Coastal zones and saltwater wetlands, freshwater resources (including wetlands), and floodplains	2,000-foot-wide swath centered on the Representative Route
Ecological Resources	Critical habitats and federally listed Threatened & Endangered Species	3,000-foot-wide swath centered along Representative Route for each Action Alternative
Geologic Resources	Soil, geological, groundwater and topographic resources	3,000-foot-wide swath centered along Representative Route for each Action Alternative
Hazardous Waste and Contaminated Material Sites	Known sources and potential suspected sources of contaminated and hazardous materials	2-mile-wide swath centered along Representative Route for each Action Alternative
Cultural Resources and Historic Properties	Resources listed in or eligible for listing in the National Register of Historic Places within the Affected Environment or identified as significant by Indian Tribes	1-mile-wide swath centered along Representative Route for each Action Alternative
Visual and Aesthetic Resources	Prominent visual resources and aesthetic qualities within the Affected Environment	1-mile-wide swath centered along Representative Route for each Action Alternative
Environmental Justice	Minority and low-income populations within the Affected Environment	1-mile-wide swath centered along Representative Route for each Action Alternative
Noise and Vibration	Ambient noise and vibration conditions, and noise-sensitive land cover categories	5,000-foot-wide swath centered along Representative Route for each Action Alternative
Air Quality (including greenhouse gas emissions)	Current attainment status for criteria pollutants established by the U.S. Environmental Protection Agency for air-sheds within the Study Area	Determined by metropolitan planning organization by state within the Study Area
Energy	Energy consumed, particularly by the transportation sector	Entire Study Area
Climate Change and Adaptation (excluding greenhouse gas emissions)	Identification of areas susceptible to the impacts of climate change (sea-level rise, storm surge and/or extreme heat and cold events)	For flood hazards: 2,000-foot-wide swath
		For extreme heat and cold events: Entire Study Area

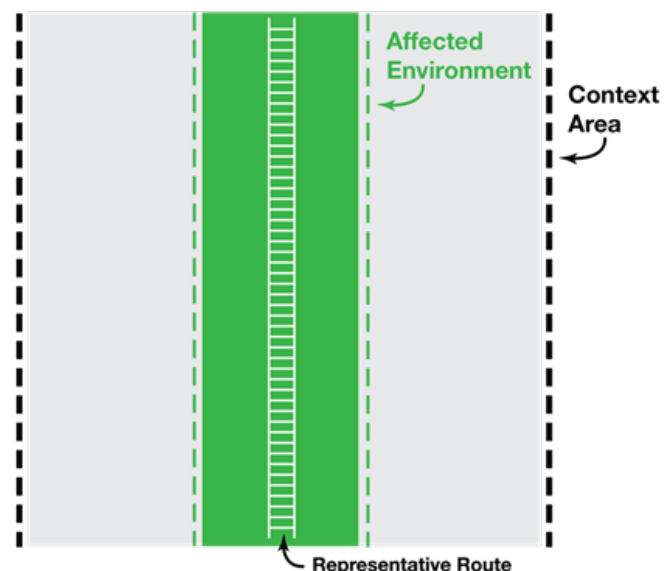
Table 7-1: Limits of Affected Environment by Resource (continued)

Resource	Description of Resource	Affected Environment
Section 4(f) and Section 6(f) Resources	Parklands converted to transportation use, including publicly owned public parks, recreation areas, and wildlife/waterfowl refuges	2,000-foot-wide swath centered along Representative Route for each Action Alternative
	Converted lands or facilities that were acquired with Land and Water Conservation Fund Act funds	
	Historic resources converted to transportation use, including historic sites of local, state or national significance (eligible or listed)	1-mile-wide swath centered along Representative Route for each Action Alternative
Electromagnetic Fields and Electromagnetic Interference	Electromagnetic Fields (EMF) associated with electric conventional or high-speed train operations and electromagnetic interference that occurs when EMFs are produced	2,000-foot-wide swath centered on Representative Route for each Action Alternatives
Safety	Operational, infrastructure and overall modal safety	Entire Study Area
Public Health	Potential public health-related effects for each of the relevant Tier 1 Draft EIS resource areas	As per the resource areas
Cumulative Effects	Combined result of the incremental direct and indirect effects of the Tier 1 Draft EIS Action Alternatives as well as the effects of other past, present, and reasonably foreseeable future actions, regardless of agency, on key resources	Study Area, expanded to include connecting corridors

¹ Chapter 5 addresses transportation effects and Chapter 6 addresses economic effects and growth.

- ▶ **Context Area** is a broader geographic area that extends beyond the Affected Environment. The FRA defines a standardized Context Area of uniform width as 5 miles wide, centered on the Representative Route, for all resources. For those resources for which the Affected Environment encompasses the entire Study Area, there is no Context Area analysis. The Context Area allows for qualitative evaluation of potential shifts in Representative Routes.

Figure 7-1 shows the relationship among the Representative Route, Affected Environment, and Context Area. These areas are all within the broader Study Area.

Figure 7-1: Representative Route, Affected Environment, and Context Area

Calculation of Environmental Consequences

The FRA describes the Environmental Consequences of Action Alternatives either quantitatively or qualitatively, depending on the resource. Quantitative analyses rely on geographic information system data and mapping to calculate the effects of the footprint of the Action Alternatives, or rely on service data to calculate the effects of the service proposed by the Action Alternatives. Qualitative analysis may consider information from other sources, such as existing reports and studies, to assess potential effects. The FRA attributes Environmental Consequences to one or both of the following:

- ▶ **Physical footprint of the Action Alternatives** – Environmental Consequences are based on either estimates of specific quantities of the resource (e.g., number of resources or resource-specific units of measurement such as acreage or linear feet) or the presence/absence of resources within the footprints of new or upgraded stations and within the Representative Route.

Chapter 7 provides information regarding the presence/absence of resources within the footprints of new or upgraded stations. Appendix E provides specific quantities of resources that have the potential to be affected within the footprints of new stations.

The calculation of footprint-related effects within the Representative Route for each resource in Chapter 7 assumes the use of six construction types: tunnel, trench, at-grade, embankment, aerial structure (viaduct), and major bridge. The analysis also uses these construction types to identify areas where impacts should be effectively mitigated. The construction types used in this analysis would be revisited during subsequent planning and environmental analysis at the (Tier 2) project level and changes to construction type may result in additional or different impacts. *With the exception of the following resources, every other resource in Chapter 7 assumes that potential impacts would occur under all six construction types:*

- Land Cover: The FRA excluded tunnels and major bridges in the analysis of potential land conversions because of the grade separation and resulting negligible conversion of land cover type at the surface. The FRA considered all construction types in the acquisitions and displacements analysis.
 - Hydrologic/Water Resources: The FRA excluded tunnels in the analysis of wetlands (both freshwater and saltwater) and floodplains because tunnels typically go beneath the resources and therefore avoid or greatly minimize the impact to a resource.
 - Noise and Vibration: The FRA excluded tunnels from the noise propagation effects analysis because tunnels would create a barrier between the noise source and a potentially sensitive receptor.
- ▶ **Service characteristics of the Action Alternatives** – Environmental Consequences are based on end-to-end estimates of service characteristics, including metropolitan areas and city-pairs served, type of service (e.g., Intercity or Regional, frequency, travel times), type of equipment (e.g., diesel or electric, speed profiles), user benefits (e.g., passenger trips, passenger miles, train miles, vehicle miles traveled), costs (i.e., capital, operation and maintenance), and revenues. These end-to-end statistics inform the environmental effects assessment for resource areas such as transportation, economic effects, environmental justice, noise and vibration, and air quality.

Each of the resource-specific sections presents direct effects. Direct effects include effects related to encroachment (even if separated by space or time) or specific impacts that result from an action affecting a particular resource. Chapter 6 presents indirect effects related to induced growth and development resulting from construction and operation of the Action Alternatives.

Effects Assessment for Alternative 3 Route Options

Alternative 3 includes improvements to the existing NEC plus the creation of a new two-track, high-speed route from Washington, D.C., to Boston. The FRA considered several possible routing options during the alternatives development process (Chapter 4, Alternatives Development). Based on this analysis, the FRA selected a single route between Washington, D.C., and New York City; however, the FRA identified two route options between New York City and Hartford, CT, and two route options between Hartford and Boston for further consideration in this Tier 1 Draft EIS. The route south of New York City and route options north of New York City include the following:

- ▶ Washington, D.C., to New York City (stops at the New Jersey/New York line at the Hudson County/New York County line bisecting the Hudson River)
- ▶ New York City to Hartford:
 - Via Central Connecticut (through Danbury)
 - Via Long Island (through Ronkonkoma and New Haven)
- ▶ Hartford to Boston:
 - Via Providence
 - Via Worcester

As a result, the FRA presents the findings for Alternative 3 as a range of values representative of the entire route between Washington, D.C., and New York City as well as the four route options north of New York City. The FRA usually presents the effects that would occur specifically under the portion of Alternative 3 between Washington, D.C., and New York City and the different route options in separate tables within the environmental resource sections of this chapter. In some sections of this Tier 1 Draft EIS, Alternative 3 is represented as Alternative 3.1 (Central CT/Providence), Alternative 3.2 (Long Island/Providence), Alternative 3.3 (Long Island/Worcester) and Alternative 3.4 (Central CT/Worcester). The FRA considers these as the representative end-to-end options for service-related analysis specific to Alternative 3. (Appendix B presents additional details about the Alternative 3 route options considered and their evaluation.)

Approach to the Analysis of the No Action Alternative

The No Action Alternative incorporates improvements such as track and signal upgrades within the existing NEC right-of-way. It also includes projects that may extend beyond the existing right-of-way, such as bridge and station rehabilitation or expansion projects, and other non-rail

Analysis of the No Action Alternative:

- Physical limits of the No Action Alternative are unknown; therefore, quantitative analysis for a footprint of the No Action Alternative is not presented.
 - Data for the existing NEC are presented as a proxy for the footprint of the majority of passenger rail investments included in the No Action Alternative.
-

transportation projects. Because some of the projects included within the No Action Alternative are still in the planning stages of development, the physical limits of the No Action Alternative are not well defined. As a result, calculating the footprint-related Environmental Consequences for the No Action Alternative was not possible. However, ***for the purposes of comparison against the Action Alternatives, the FRA used the existing NEC as a proxy for understanding potential footprint-related effects of the rail projects included in the No Action Alternative*** because the physical footprint of improvements associated with rail projects included in the No Action Alternative would occur primarily within the physical footprint of the existing NEC.² As stated earlier in this section, the FRA assumed the footprint associated with the existing NEC to be 150 feet wide, which conservatively covers the width of a four-track railroad. Each of the Action Alternatives also includes the improvements that the No Action Alternative will undertake.

Therefore, in Chapter 7 of this Tier 1 Draft EIS:

- ▶ The FRA considered resources within the existing NEC as a proxy for the resources that may be affected by the No Action Alternative. The existing NEC is referenced in both the Affected Environment and Environmental Consequences sections of this Draft Tier 1 EIS.
- ▶ The FRA developed an “Affected Environment of the existing NEC” for each resource. For each resource, the width of the Affected Environment of the existing NEC is the same as the width of the Affected Environment of each Action Alternative. Existing conditions within this Affected Environment of the existing NEC are shown for each resource in order for the FRA to make valid comparisons between the Affected Environment of the No Action Alternative (as represented by the existing NEC) and the Affected Environments of the Action Alternatives.
- ▶ There is a qualitative discussion of potential effects of the No Action Alternative for all resources. The FRA used this qualitative assessment to further understand and assess NEC FUTURE’s potential contributions to cumulative effects on identified resources.
- ▶ In presenting Environmental Consequences for each of the Action Alternatives, the numerical quantities for the Environmental Consequences include the quantities that occur within the existing NEC. This is because improvements on the existing NEC included in the No Action Alternative are also part of each Action Alternative.
- ▶ The FRA quantified service-related effects of the No Action Alternative. Service data for the No Action Alternative establish a baseline of service against which the FRA compared and evaluated the Action Alternatives. These service data include quantifiable timetable-related data such as scheduled trains by time of day, stopping patterns, and travel times, as well as equipment types.

This approach to the analysis of the No Action Alternative is consistent with the following:

- ▶ The programmatic level of detail across both the No Action and Action Alternatives, and inclusion of improvements to the existing NEC in the Action Alternatives
- ▶ National Environmental Policy Act (NEPA) practice, particularly where the projects included as part of the No Action Alternative are an integral component of proposed Action Alternatives

² Most rail improvement projects included in the No Action Alternative will take place within the existing NEC right-of-way, except for some projects underway such as East Side Access in New York City.

Level of Detail and Data Considerations

The interaction of resource-specific data (e.g., land cover, demographics, and ecological resources), service data, and information about the Action Alternatives drives the Affected Environment and Environmental Consequences analyses of resources evaluated in Chapter 7. As described in Chapter 2, Readers' Guide, the FRA analyzed readily available secondary source data (e.g., geographic information system [GIS]-based, published reports, technical analyses), and did not conduct fieldwork or subsurface testing of any kind as part of this Tier 1 Draft EIS. The FRA reviewed the data carefully to ensure a uniform level of detail since the data were collected from a variety of sources. For the Tier 1 Draft EIS resources assessed in Chapter 7, the FRA collected data for each resource in 2012 for the latest year in which a complete year of data was available, depending on the resource and availability of data. For a list of data sources used for each resource, refer to Appendix E for the individual resource methodologies. For the Tier 1 Final EIS, the FRA will update information for the Preferred Alternative as available and as appropriate to inform the decision to be made.

Chapter 7 presents data as totals for each of the affected states and Washington, D.C. Areas of interest and corresponding data are called out by county as needed in each resource section of Chapter 7. The highest level of detail collected and presented is at the county level; data were collected for each county for each resource and is presented in Appendix E.

Level of Detail:

- Broad environmental review
 - Analysis based on "readily available" data and information
 - No field work or subsurface testing
 - Detailed analysis will be carried out during Tier 2 actions
-

Data Considerations:

- Quantities associated with "footprint" calculations are based on GIS mapping overlays.
 - Data are tallied by state.
 - Highest level of detail is the county-level and is presented in Appendix E.
-

How to Read this Chapter

Impacts to the resources listed in Table 7-2 are analyzed in this chapter in accordance with NEPA and FRA’s Procedures for Considering Environmental Impacts (64 Fed. Reg. 28545). Other resources evaluated in this Tier 1 Draft EIS, including Transportation Effects, Economic Effects and Growth and Indirect Effects, and Construction Effects are addressed in Chapters 5, 6, and 8, respectively. Table 7-2 also identifies the key resources identified by the FRA.

Table 7-2: Chapter Number/Resource Area Considered

Chapter	Resource	Key Resource
7.2	Land Cover	X
7.3	Agricultural Lands (Prime Farmland and Timberlands)	
7.4	Parklands and Wild And Scenic Rivers	X
7.5	Hydrologic/Water Resources	X
7.6	Ecological Resources	X
7.7	Geologic Resources	
7.8	Hazardous Waste and Contaminated Material Sites	
7.9	Cultural Resources and Historic Properties	X
7.10	Visual and Aesthetic Resources	
7.11	Environmental Justice	X
7.12	Noise and Vibration	
7.13	Air Quality	
7.14	Energy	
7.15	Climate Change and Adaptation	X
7.16	Section 4(f) and Section 6(f) Resources	X
7.17	Electromagnetic Fields and Electromagnetic Interference	
7.18	Safety	
7.19	Public Health	
7.20	Cumulative Effects	
7.21	Irreversible and Irretrievable Commitment of Resources	

X = Key Resource. While all environmental factors are important, some have greater potential to influence the identification of a Preferred Alternative since they are tied to Executive Orders, environmental laws, regulations and regulatory requirements, including but not limited to Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations), Section 404 of the Clean Water Act, Section 106 of the National Historic Preservation Act, Section 7 of the Endangered Species, and Section 4(f) of the U.S. Department of Transportation Act. Some of these laws require avoidance of impacts or selection of an alternative that has the least environmental impact.

Organization of this Chapter

Table 7-3 summarizes the organization of this chapter. It also references appendices containing additional technical methodologies and analysis (Appendix E) and mapping (Appendix A). For each resource area, the FRA generally presents the Affected Environment and Environmental Consequences from south to north following the NEC or the Representative Route of each Action Alternative. This Tier 1 Draft EIS presents the findings by state; related appendices provide details for each state by county. Appendix A, Mapping Atlas, presents all resource mapping.

Table 7-3: Guide to Chapter 7 Resource Areas

	Effects-Assessment Methodology	Affected Environment and Environmental Consequences	Potential Mitigation and Subsequent Tier 2 Analyses
In Each Chapter 7 Resource Area:	A definition of the resource and summary of the methodology used to evaluate that particular resource	An overview of the character of the resource throughout the Study Area and within the Context Area, and identification of resources within the Affected Environment and effects on that resource by Action Alternative	A list of potential mitigation strategies and best practices appropriate to be identified at the Tier 1 level and acknowledgement of where additional and more detailed analyses would be needed at the project level (Tier 2) evaluation
Visit Appendix E, Technical Resource Documentation, for:	A complete effects-assessment methodology, defining the resource and data sources, and explaining how the Affected Environment was defined and established, and how the effects on each resource were evaluated and reported	Detailed data outputs, additional assumptions, and criteria used to focus presentation of environmental findings in each resource area of Chapter 7	
Visit Appendix A, Mapping Atlas, for:		<ul style="list-style-type: none"> ■ Resources mapped within the Affected Environments of each resource area and within the 5-mile Context Area for each Action Alternative (Part 1) ■ Representative Route for each Action Alternative showing construction types (Part 2) 	