



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



7.7 Geologic Resources

7.7 GEOLOGIC RESOURCES

7.7.1 Introduction

Understanding geologic features can influence design and construction practices because certain geologic features are considered resources while others are considered potential hazards. This chapter identifies geologic resources that are intersected by the Representative Route of the Preferred Alternative.

Volume 2, Section 7.7, defines and discusses geologic resources and geologic hazards. Geologic resources include sole source aquifers, naturally occurring minerals, and active/inactive mines. Geologic hazards include seismic hazards (active geologic faults or fractures), karst terrain (characterized by sinkholes and caves), unstable soils (landslide susceptibility), naturally occurring asbestos, and acid producing soils. With regard to Environmental Consequences, the Preferred Alternative may affect geologic resources, but geologic hazards may also affect decisions about the location, design, and construction methods for the Preferred Alternative. Effects would depend on the type of geologic resource or hazard present and construction method proposed. Depending on construction type, effects on geologic resources or hazards would be generally associated with earth-moving construction activities such as drilling, boring, and earth removal. For example, tunneling would have a higher likelihood of affecting a geologic feature (such as sole source aquifers) than at-grade construction activities. However, given the level of detail regarding construction activities and alignments being analyzed for this Tier 1 Final Environmental Impact State (Tier 1 Final EIS) and generalized locations of the geologic resources and hazards, the Federal Railroad Administration (FRA) did not identify site-specific effects. Refer to Volume 2, Appendix E.07, for the detailed methodology describing how geologic resource effects were analyzed.

During the Tier 1 Draft EIS comment period, the U.S. Environmental Protection Agency requested more information and analysis with regard to effects on public and private drinking water supplies. Section 7.7.4 includes effects on sole source aquifers, which supply drinking water to many areas within the Affected Environment. Section 7.7.9 provides recommendations on understanding effects on public and private drinking water supplies during Tier 2 project studies. In addition, Chapter 7.5, Hydrologic/Water Resources, provides a list of water bodies, some of which may serve as drinking water supplies based on their water quality designation. Chapter 7.19, Summary of Public Health Effects, also addresses potential effects on drinking water supplies.

7.7.2 Resource Overview

Within the Affected Environment, the following geologic resources and hazards occur (see Volume 2, Appendix E.07, for a description of these geologic resources and hazards):

- ▶ Sole source aquifers in Delaware, Pennsylvania, New Jersey, New York, Connecticut, Rhode Island, and Massachusetts
- ▶ Naturally occurring asbestos in Maryland and New Jersey
- ▶ Karst terrain in Maryland
- ▶ Landslide susceptibility in Maryland, Delaware, Pennsylvania, Connecticut, and Massachusetts

These occurrences are generally consistent with what occurs within both the Existing NEC + Hartford/Springfield Line and Preferred Alternative; the exception is that karst terrain does not occur within the Existing NEC + Hartford/Springfield Line.

7.7.3 Affected Environment

The FRA analyzed the Affected Environments for the Existing NEC + Hartford/Springfield Line and the Preferred Alternative for the existence and/or occurrence of geologic resources and geologic hazards. Appendix EE.07 notes these geologic features by state and county.

Notable resources within the Affected Environments include sole source aquifers, naturally occurring asbestos, karst terrain, and soils associated with moderate or high landslide susceptibility. The former two resources are notable to highlight within the Affected Environments because they may represent significant regulatory challenges. The latter two resources are notable to highlight within the Affected Environments due to potential associated safety issues and engineering costs related to construction.

Sole source aquifers supply drinking water to many areas within the Affected Environment and occur in the following locations within the No Action Alternative and Preferred Alternative:

- ▶ New Castle County, DE
- ▶ Delaware, Philadelphia, and Bucks Counties, PA
- ▶ Mercer and Middlesex Counties, NJ
- ▶ New York, Queens and Kings Counties, NY
- ▶ New London County, CT
- ▶ Washington and Kent Counties, RI
- ▶ Bristol and Norfolk Counties, MA

Naturally occurring asbestos exists in soils within the Affected Environments of the No Action Alternative and the Preferred Alternative in Baltimore City, MD, and Hudson County, NJ.

Karst terrain occurs within the Affected Environment in Baltimore and Harford Counties, MD, for the Preferred Alternative.

Soils associated with moderate or high landslide susceptibility occur within the Affected Environments of the Existing NEC + Hartford/Springfield Line and the Preferred Alternative in Baltimore, Baltimore City, Harford, and Cecil Counties, MD; New Castle County, DE; Delaware, Philadelphia and Bucks Counties, PA; Hartford County, CT; and Hampden and Suffolk Counties, MA.

7.7.4 Environmental Consequences

As discussed in the previous section, this analysis highlights where the Existing NEC + Hartford/Springfield Line and Preferred Alternative intersect with certain geologic resources and hazards—including sole source aquifers, soils associated with moderate and high landslide susceptibility, naturally occurring asbestos, and karst terrain. These four geologic resources and hazards may present significant regulatory challenges or potential associated safety issues and engineering costs related to construction. Appendix EE.07 includes an inventory of a larger set of

geologic features (listed by state and county) that the Existing NEC + Hartford/Springfield Line and Preferred Alternative would intersect.

The Existing NEC + Hartford/Springfield Line and the Preferred Alternative would intersect sole source aquifers in the following locations, including all states except Maryland and the District of Columbia:

- ▶ New Castle County, DE
- ▶ Delaware, Philadelphia, and Bucks Counties, PA
- ▶ Mercer and Middlesex Counties, NJ
- ▶ Queens County, NY
- ▶ New London County, CT
- ▶ Washington and Kent Counties, RI
- ▶ Norfolk County, MA

The Preferred Alternative would also intersect sole source aquifers in New York and Kings Counties, NY.

The Existing NEC + Hartford/Springfield Line and the Preferred Alternative would intersect soils associated with moderate or high landslide susceptibility in the following areas:

- ▶ Baltimore City, and Baltimore, Harford, and Cecil Counties, MD
- ▶ New Castle County, DE
- ▶ Bucks Counties, PA
- ▶ Hartford County, CT
- ▶ Hampden and Suffolk Counties, MA

The Preferred Alternative would also intersect soils associated with moderate or high landslide susceptibility in Delaware and Philadelphia Counties, PA.

Karst terrain occurs only within Harford County, MD, within the Preferred Alternative. In addition, naturally occurring asbestos does not exist within the Existing NEC + Hartford/Springfield Line or the Preferred Alternative.

Since the Existing NEC + Hartford/Springfield Line is incorporated in whole within the Preferred Alternative, the following describes the effects of new or upgraded segments proposed under the Preferred Alternative on geologic resources.

Elements South of New York City

- ▶ **Maryland/Delaware – Bayview to Newport (new segment)** – The Preferred Alternative would not encounter sole source aquifers in the segment between the Bayview and Newport nodes, which spans Baltimore City, Baltimore, Harford, and Cecil Counties, MD, and part of New Castle County, DE. In the same segment, the Preferred Alternative would intersect soils associated with moderate landslide susceptibility in Baltimore, Baltimore City, Harford, and Cecil Counties, MD, and New Castle County, DE. The Preferred Alternative would encounter karst terrain in Harford County, MD.

- ▶ **Delaware – Wilmington Segment (bypasses Wilmington Station)** – The Preferred Alternative would encounter the Delaware River Streamflow/New Jersey Coastal Plains Aquifer sole source aquifer in New Castle County, DE. The Preferred Alternative would not encounter karst terrain or landslide susceptibility within the Wilmington Segment.
- ▶ **Pennsylvania – Philadelphia Segments (new segments)** – The Preferred Alternative would encounter the Delaware River Streamflow/New Jersey Coastal Plains Aquifer sole source aquifer in Delaware and Philadelphia Counties, PA. The Preferred Alternative would not encounter landslide susceptibility or karst terrain within the Philadelphia Segments.
- ▶ **New Jersey – New Brunswick to Secaucus (new segment)** – The new segment between New Brunswick and Secaucus for the Preferred Alternative would not encounter any of the geologic resources or hazards called out in this section.
- ▶ **New Jersey – Secaucus/Bergen loop (new segment)** – The new Secaucus/Bergen loop segment for the Preferred Alternative would not encounter any of the geologic resources or hazards called out in this section.

Elements North of New York City

- ▶ **New York/Connecticut – New Rochelle to Greens Farms (new segment)** – The Preferred Alternative would not encounter sole source aquifers in the segment between the New Rochelle and Greens Farms nodes, which begins in Westchester County, NY, and runs through Fairfield County, CT. This segment of the Preferred Alternative would not intersect soils associated with landslide susceptibility or karst terrain.
- ▶ **Connecticut/Rhode Island – Old Saybrook-Kenyon (new segment)** – The Preferred Alternative would encounter the Pawcatuk River Aquifer sole source aquifer in the Old Saybrook-Kenyon segment. The segment begins in Middlesex County, CT, and runs through New London County, CT, and into Washington County, RI. This segment of the Preferred Alternative would not intersect soils associated with landslide susceptibility or karst terrain.
- ▶ **Connecticut/Massachusetts – Hartford/Springfield Line (upgraded track/electrification)** – The Preferred Alternative would not encounter sole source aquifers in the Hartford/Springfield Line, which begins in New Haven County, CT, and spans Hartford County, CT, and Hampden County, MA. This segment of the Preferred Alternative would intersect soils associated with high landslide susceptibility in Hartford County, CT, and Hampden County, MA. This segment of the Preferred Alternative would not encounter karst terrain.

7.7.5 Stations

As described in Volume 2, new stations would likely affect geologic resources or encounter geologic hazards more than modified stations. Table 7.7-1 presents proposed new stations or modified existing stations that geographically coincide with resources and hazards that may present significant regulatory challenges, potential associated safety issues, and engineering costs related to construction, or other potential geographic conflicts that would need to be assessed. The resources include sole source aquifers and mineral resources. The hazards include soils associated with moderate or high incidences of landslide occurrences, naturally occurring asbestos, and karst

terrain. As shown in Table 7.7-1, no effects associated with naturally occurring asbestos or karst terrain would occur as a result of new stations or modifications to existing stations.

Table 7.7-1: Environmental Consequences: Preferred Alternative – Modified or New Stations – Geologic Resources

State	County	Station ID	Station Type	Station Name	Geologic Resource/Hazard	Presence
MD	Baltimore City	13	New	Bayview	Landslide Susceptibility	X
	Cecil	23	New	Elkton		X
DE	New Castle	26	New	Newport	Landslide Susceptibility	X
		28		Edgemoor	Landslide Susceptibility Sole Source Aquifer	X
PA	Delaware	34	New	Baldwin	Sole Source Aquifer	X
		44		Philadelphia Airport	Sole Source Aquifer Landslide Susceptibility	X
NJ	Mercer	61	Modified	Princeton Junction	Sole Source Aquifer	X
Hartford/Springfield Line						
CT	Hartford	186	New	West Hartford	Landslide Susceptibility	X
		163	Modified	Hartford	Landslide Susceptibility	X
		187	New	Enfield	Landslide Susceptibility	X

Source: NEC FUTURE team, 2016

X = Presence of resource and potential effects within the station footprint; potential effects subject to Tier 2 project analysis.

7.7.6 Context Area

Conditions within the Context Area are similar to those described for the Affected Environment. In addition to the geologic resources and hazards described in Section 7.7.3, soils potentially containing naturally occurring asbestos also exist within the Context Area in Delaware, Philadelphia, and Bucks Counties, PA.

7.7.7 Comparison to the Action Alternatives

The Preferred Alternative shares some similarities with the three Action Alternatives (which are described in Volume 2, Section 7.7) but also differs in some locations. Some notable similarities and differences include the following:

- ▶ The Preferred Alternative would intersect karst terrain in Harford County, MD, which differs from Alternatives 1 and 2 but similar to Alternative 3.
- ▶ The Preferred Alternative would avoid all geological resources and hazards within Nassau and Suffolk Counties, NY, which is similar and consistent with Alternatives 1 and 2. Alternative 3 is the only alternative that runs through Nassau and Suffolk Counties, NY.
- ▶ The Preferred Alternative would intersect soils associated with moderate or high landslide susceptibility in Massachusetts on the Hartford/Springfield Line. The Action Alternatives would avoid landslide susceptibility in Massachusetts.

7.7.8 Potential Mitigation Strategies

Programmatic mitigation measures could include design considerations, alternative construction methods, and slope/soil stabilization measures. Depending on the affected geologic resource, specific mitigation measures could include the following:

- ▶ **Sole Source Aquifers** – Develop Stormwater Pollution Prevention Plan and/or Spill Pollution Prevention Plan.
- ▶ **Landslide Susceptibility** – Use engineered slopes and fill material.
- ▶ **Seismic hazards** – Mitigate seismic motion through design consideration and enforcement of seismic building codes during construction.
- ▶ **Acid Producing Soils** – Use engineered fill material, add soil amendments to correct acidity of soil.
- ▶ **Naturally Occurring Asbestos** – Follow OSHA regulations to minimize exposure to workers; engineering controls, site worker training and awareness, site monitoring, and regulatory interaction and reporting.
- ▶ **Karst terrain** – Karst terrain assessment, design consideration, construction engineering.
- ▶ **Mineral resources** – Provide/construct alternative access to physically avoid the mineral resource.

7.7.9 Subsequent Tier 2 Analysis

More-detailed analysis and subsurface test will be required during Tier 2 analyses to confirm geologic conditions that may affect engineering, design, and costs. During the public comment period, the U.S. Environmental Protection Agency requested that more information and analysis be included in regards to effects on public and private drinking water supplies for the Tier 2 project studies. Detailed groundwater and surface water source studies and more-specific construction methodology mitigation measures will be included as part of Tier 2 project analysis. Additional analysis will include potential impacts on public and private drinking water supplies, including where the Preferred Alternative may cross surface water and groundwater drinking water sources or potential sources of drinking water. Any state or federally defined Source Water Protection Areas (for both surface water and groundwater)—including sanitary protective areas for any public water supply located within the Preferred Alternative—will be defined. The Tier 2 project analysis will include coordination with the EPA, appropriate state resource representatives, and the U.S. Geological Survey.