DOCKET NO. 474 - The Connecticut Light & Power Company d/b/a Eversource Energy application for a Certificate of Environmental Compatibility and Public Need for the Greater Hartford-Central Connecticut Reliability Project that traverses the municipalities of Hartford, West Hartford, and Newington, which consists of (a) construction, maintenance and operation of a new 115-kilovolt (kV) electric transmission line within existing Eversource, Amtrak and public road rights-of-way and associated facilities extending overhead approximately 2.4 miles and underground approximately 1.3 miles between Eversource's existing Newington Substation in the Town of Newington and existing Southwest Hartford Substation in the City of Hartford; (b) modifications to a .01 mile section within existing Eversource right-of-way of the existing overhead 115-kV electric transmission line connection to the Newington Substation (Newington Tap); and (c) related modifications to Newington Substation and Southwest Hartford Substation.	}	Connecticut Siting Council February 1, 2018

Findings of Fact

Introduction

1. Pursuant to Connecticut General Statutes (C.G.S.) §16-50g et seq., on June 7, 2017, The Connecticut Light and Power Company doing business as Eversource Energy (Eversource), applied to the Connecticut Siting Council (Council) for a Certificate of Environmental Compatibility and Public Need for a 115-kilovolt (kV) electric transmission line project that traverses the municipalities of Newington, Hartford and West Hartford and consists of (a) construction, maintenance and operation of a new approximately 3.7 miles long 115-kV electric transmission line within existing Eversource, Amtrak and public road rights-of-way and associated facilities extending overhead approximately 2.4 miles and underground approximately 1.3 miles between Eversource's existing Newington Substation in the Town of Newington and existing Southwest Hartford Substation in the City of Hartford; (b) modifications to a 0.01 mile section within existing Eversource right-of-way of the existing overhead 115-kV electric transmission line connection to the Newington Substation (Newington Tap); and (c) related modifications to Newington Substation and Southwest Hartford Substation. Collectively, the proposed project is referred to as the Greater Hartford-Central Connecticut Reliability Project (GHCCRP or Project). (Eversource 1, Vol. 1, p. ES-1)

2. The purpose of the Project is to bring the electric supply system in the Greater Hartford Sub-area into compliance with applicable national and regional reliability standards and criteria and to improve the ability of the transmission system to move power across Connecticut when the system is under stress. The need for the proposed Project facilities was identified as a result of electric system planning studies and alternatives analyses performed by the Independent System Operator in New England (ISO-NE). (Eversource 1, Vol. 1, p. ES-3)

3. For the purposes of electric system planning, the Greater Hartford Sub-area includes the following 17 municipalities: Hartford, West Hartford, Newington, Berlin, Cromwell, Rocky Hill, Wethersfield, Plainville, New Britain, Farmington, Burlington, Avon, East Hartford, Bloomfield, Windsor, East Granby, and Granby. (Eversource 1, Vol, 1, p. ES-3)

4. The only party in this proceeding is Eversource. (Transcript, August 22, 2017, 3:22 p.m. [Tr. 1], p. 4; Transcript, August 22, 2017, 6:31 p.m. [Tr. 2], pp. 73-74)

5. Pursuant to C.G.S. §16-50*l*(b), Eversource provided service and legal notice of the application. This included notice to municipalities traversed by the proposed Project, federal, state, local and regional agencies, elected officials, and abutters of both substations. Eversource published notice of the application filing in the Hartford Courant on May 4 and 11, 2017 and West Hartford News on May 4 and 11, 2017. Eversource included a project information insert in one or more of its monthly bills to customers within Newington, West Hartford and Hartford within 60 days before submission of the application to the Council. (Eversource 1, Vol. 1, p. FR-11 and FR-12, Affidavit of Service of Application; Affidavit Regarding Publication of Legal Notice; Affidavit Regarding Notice Provided to Customers of CL&P d/b/a Eversource; Affidavit Regarding Notice to Community Groups; Affidavit of Service of Notice Upon Owners of Property Abutting Substations)

6. On or before June 5, 2017, Eversource notified property owners abutting both substations through certified mailings. Eversource received certified mailing return receipts from all but four abutters. Eversource mailed the notice First Class Mail to each of those four abutters. (Eversource 7, response 1; Eversource 1, Vol, 1, Affidavit of Service of Notice Upon Owners of Property Abutting Substations)

7. In accordance with the Council's Application Guide for an Electric and Fuel Transmission Line Facility dated February 2016, Eversource provided notice to a number of community groups including applicable economic development commissions, land trusts, environmental groups, river protection organizations, historic preservation groups, and water companies with watersheds within the Project area. (Eversource 1, Vol. 1, pp. FR-9 through FR-11, Affidavit Regarding Notice to Community Groups, and Affidavit Regarding Notice to Water Companies)

8. Pursuant to C.G.S. §16-50*l*(b), Eversource served a copy of the application for the proposed Project on federal, state, regional and local officials listed therein. (Eversource 1, Vol. 1, pp. FR-10 and FR-11; Affidavit of Service of Application)

Procedural Matters

9. On June 9, 2017, the Council sent a letter to the State Treasurer, with copies to the Chief Elected Officials of Hartford, West Hartford, and Newington, stating that $25,000 was received from Eversource as payment to the Municipal Participation Fund (Fund) and deposited in the office of the State Treasurer's department account. The Fund is available for any or all of the municipalities to apply for as reimbursement to defray expenses incurred by the municipalities if they participated as a party in the proceeding, pursuant to C.G.S. §16-50bb. None of the subject municipalities applied for party status in the proceeding. (Record)

10. During a regular Council meeting on July 20, 2017, the application was deemed complete pursuant to Regulations of Connecticut State Agencies (R.C.S.A.) §16-50*l*-1a and the public hearing schedule was approved by the Council. (Record)

11. Pursuant to C.G.S. § 16-50m, on July 21, 2017, the Council sent a letter to the Towns of Newington and West Hartford and the City of Hartford to provide notification of the scheduled public hearing and to invite each municipality to participate in the proceeding. (Record)

12. Pursuant to C.G.S. §16-50m, the Council published legal notice of the date and time of the public hearing in the Hartford Courant on July 25, 2017. (Record)

13. On August 2, 2017, the Council held a pre-hearing conference on procedural matters for parties and intervenors to discuss the requirements for pre-filed testimony, exhibit lists, administrative notice lists, expected witness lists, filing of pre-hearing interrogatories and the logistics of the public inspection of the Project. (Council pre-hearing conference memoranda dated July 27, 2017 and August 3, 2017)

14. In compliance with R.C.S.A. §16-50j-21, on August 3 and 4, 2017 Eversource installed six four-foot by six-foot signs throughout the Project area that presented the type of facility proposed, the public hearing date, and contact information for the Council. (Eversource 2; Eversource 4, p. 53)

15. The Council and its staff conducted a field review of the proposed Project on August 22, 2017 beginning at 1:30 p.m. Eversource provided bus transportation to both substations and various locations along the proposed electric transmission line route. (Council Hearing Notice dated July 21, 2017; Council Field Review Notice dated August 15, 2017; Eversource 10)

16. Pursuant to C.G.S. §16-50m, the Council, after giving due notice thereof, held a public hearing on August 22, 2017, beginning with the evidentiary session of the hearing at 3:00 p.m. and continuing with the public comment session at 6:30 p.m. at the Newington Town Hall, Auditorium, 131 Cedar Street, Newington, Connecticut. (Council Hearing Notice dated July 21, 2017; Tr. 1, p. 1)

Municipal Consultation and Community Outreach

17. Eversource began its outreach efforts to the Towns of Newington and West Hartford and the City of Hartford in March 2015 by informing municipal officials of the proposed Project and soliciting input concerning the scope of work, especially the routing of the new transmission line. (Eversource 1, Vol. 1, pp. ES-17 and 9-2)

18. Pursuant to C.G.S. §16-50*l*(e), Eversource provided a Municipal Consultation Filing (MCF) to the Towns of Newington and West Hartford and the City of Hartford in December 2015 to begin the 60-day municipal consultation process. (Eversource 1, Vol. 1, pp. FR-10 and ES-17)

19. A link to the MCF was posted on Eversource's website and was made available in the respective municipal libraries. (Eversource 1, Vol. 1, pp. FR-1 and ES-18)

20. Eversource held an open house event on January 20, 2016 at the Elmwood Community Center in West Hartford, and it was based on an all-underground transmission route through public streets. (Eversource 7, response 3; Eversource 1, Vol. p. 9-4)

21. On or about the time of the first open house, West Hartford and Newington officials expressed concerns about the all-underground route with respect to impacts to traffic, businesses and residents, as well as excavation in recently paved streets. West Hartford and Newington municipal officials suggested route variations to mitigate some of these impacts, which Eversource was prepared to implement. (Eversource 1, Vol. 1, p. 9-4)

22. In March 2017, Eversource briefed the municipalities on the proposed hybrid (overhead/underground) Project that includes the use of the Amtrak railroad right-of-way (ROW). Representatives from both Newington and West Hartford indicated support for the new proposed Project and found it preferable to the original all-underground route. Hartford did not comment on the hybrid Project. Representatives from Newington also inquired about the feasibility of using Spring Street, rather than Shepard Drive for a portion of the underground route. (Eversource 1, Vol. 1, p. 9-4; Tr. 1, pp. 17-18)

23. While the new 115-kV line could be installed along Spring Street, Eversource contends that this route variation presents constructability challenges and results in potential impacts to residents that would make it less preferable. Eversource would continue discussions with Newington regarding this alternative to mitigate concerns with traffic impacts to Willard Avenue and Shepard Drive. (Eversource 1, Vol. 1, p. 9-4)

24. Eversource held a second open house event on April 27, 2017 at the John Wallace Middle School in Newington, and it was based on the hybrid proposed Project. (Eversource 1, Vol. 1, pp. 9-4 and 9-5; Eversource 7, response 3)

25. Eversource did not receive any written comments on the proposed Project as part of the municipal consultation process at the two open house presentations. (Eversource 1, Vol. 1, p. 9-5)

26. The Council did not receive any written correspondence from any of the Project municipalities. (Record)

State Agency Comment

27. Pursuant to C.G.S. § 16-50j (g), on July 21, 2017, the following State agencies were solicited by the Council to submit written comments regarding the proposed facility: Department of Energy and Environmental Protection (DEEP); Department of Public Health (DPH); Council on Environmental Quality (CEQ); Public Utilities Regulatory Authority (PURA); Office of Policy and Management (OPM); Department of Economic and Community Development (DECD); Department of Agriculture (DOAg); Department of Transportation (DOT); Connecticut Airport Authority (CAA); Department of Emergency Services and Public Protection (DESPP); and State Historic Preservation Office (SHPO). (Record)

28. On August 14, 2017, the Council received comments from DOT's Bureau of Engineering and Construction, including, but not limited to, the following:
    a) Eversource's preferred route uses the Amtrak rail corridor for a portion of the Project. As part of the New Haven-Hartford-Springfield (NHHS) Rail program, DOT will be adding commuter rail service to the same Amtrak corridor, which will increase the number of trains passing through the route area. DOT requests that Eversource perform construction during overnight hours so as not to interrupt the newly established commuter rail service. With this qualification and other noted comments, DOT generally endorses the preferred route as proposed;
    b) As part of the NHHS Rail Program, DOT plans to construct a new railroad station (RR Station) at Flatbush Avenue in the Town of West Hartford in 2020. The proposed transmission route in the area of the RR Station has proposed steel monopole Structure Nos. 47 and 48 to be installed at either end of the RR Station with the overhead transmission line spanning directly over the overpass and east side pedestrian platform. DOT requests that Eversource consider safety concerns related to a transmission located above occupied portions of the RR Station. DOT also requests that the location of the two structures be coordinated with the final RR Station design to avoid conflict. DOT also requests that the overhead configuration have sufficient clearance. DOT does not recommend a route variation that has the overhead line located to the east through the RR Station parking lot because a parking garage is planned for such location;
    c) No splice vaults are proposed within the Route 173 right-of-way, and DOT finds this acceptable. However, should the plans change, every effort must be made to locate splice vaults outside of the state highway right-of-way;

d) Eversource's Application refers to a minimum of 30-inch bury depth to the top of the concrete encasement for a duct bank. Per DOT's Utility Accommodation Manual, underground utility facilities shall be installed at a minimum depth of 36 inches;
e) DOT requests that Eversource be required to develop standard means/methods to accurately locate the facility when installed in a public highway;
f) Eversource would need to coordinate with DOT District 1 Maintenance for allowable work hours within DOT right-of-way;
g) DOT plans to paint the Amtrak Bridge over New Britain Avenue (Route 529) in West Hartford. The painting project will include lane closures, and Eversource should coordinate as necessary;
h) DOT enclosed signal plans for two signalized intersections in proximity to the proposed overhead crossing of New Britain Avenue (Route 529) in West Hartford. These signals have a hard wire interconnect between them. Eversource should ensure that the interconnect facility is protected from damage during construction;
i) Eversource should ensure that proposed Structure No. 40 and associated overhead crossing would not conflict with existing railroad equipment at an existing railroad crossing located at Oakwood Avenue No. 1 in West Hartford; and
j) An encroachment permit would be required for work within DOT ROWs.

(DEEP Comments dated August 14, 2017)

29. On August 18, 2017, Eversource responded to DOT's comments as noted below and as corresponds to the finding of fact above.
    a) Eversource would work with DOT and Amtrak to coordinate a construction schedule that would not interrupt the new commuter rail service;
    b) Eversource would maintain proper overhead line clearance for Structure Nos. 47 and 48 by increasing the height from the originally proposed 107 feet tall to a maximum worst-case height of 140 feet. While Eversource could initially install these two structures with lower heights and design them with flange joints to accommodate extensions later, Eversource would prefer to construct the taller poles initially to avoid the necessity of having to increase the heights later. Furthermore, while the initial costs would be comparable, it would cost an additional approximately $285,000 to extend the structures later. Since the exact final heights of Structure Nos. 47 and 48 are not yet known, Eversource would consult with DOT and provide the final heights of Structure No. 46 through 49 in the D&M Plan. As for the parking garage, Eversource notes that a specific route variation through the parking garage area could not be proposed until the final design of the parking garage is provided. However, Eversource contends that a route modification in the vicinity of the garage would not be necessary if Eversource's preferred option of constructing overhead above the proposed RR Station is approved;
    c) Eversource has designed the Project with no splice vaults within the State ROW and would make every effort to maintain such design to avoid vaults within State ROW;
    d) Eversource would revise the burial depth to a 36-inch minimum for the 0.14-mile segment of underground cable system planned for location with the State highway ROW;
    e) At its meeting with DOT, Eversource committed to work with DOT to develop a mutually agreeable method to address these concerns. The final method chosen would be described in the D&M Plan;
    f) Eversource would coordinate with DOT District 1 Maintenance for allowable work hours with DOT ROW;
    g) Eversource would coordinate as necessary;
    h) Eversource would ensure that the interconnect facility is protected from damage during construction;

i) Eversource would ensure that proposed Structure No. 40 and associated overhead crossing would not conflict with the existing railroad devices; and
j) Eversource would coordinate with DOT District 1 Maintenance Office when restoration requirements are determined by that office in connection with the encroachment permit.

(Eversource 8, pp. 1-8; Tr. 1, pp. 11-14)

30. The Council received a response from SHPO dated August 17, 2017 indicating that the proposed Project would have no adverse effect on historic resources. (SHPO Comment dated August 17, 2017)

31. The Council received a response from DEEP on August 21, 2017 that contained a field description of the Project route; presented comments regarding expected dewatering and possible soil and groundwater contamination issues; noted a transition structure relocation on the Shepard Steel Property; and included applicable DEEP permit requirements. A Natural Diversity Database letter was attached to the DEEP comments including protection strategies for two State-listed species occurring along the southwestern portion of the Project area. (DEEP Comments received August 21, 2017)

32. DEEP notes that, generally, the route chosen for the proposed transmission line represents a low impact route to provide the desired connection of the two substations. The use of existing utility and transportation corridors minimizes environmental and land use impacts compared to alternatives routes which could involve longer transmission lines or which could traverse more sensitive areas. (DEEP Comments received August 21, 2017)

33. The following agencies did not respond with comment on the application: DPH, CEQ, PURA, OPM, DECD, DOAg, CAA, and DESPP. (Record)

System Planning and Mandatory Reliability Standards

34. The Federal Energy Policy Act of 2005 required the Federal Energy Regulatory Commission (FERC) to designate an Electric Reliability Organization (ERO) to develop and enforce a system of mandatory reliability standards for planning and operations of the bulk power electric system. Compliance with the standards is mandatory under federal law and violations are punished by fines. (Eversource 1, Vol. 1, p. 2-2 and 2-3)

35. FERC designated the North American Electric Reliability Corporation Inc. (NERC) to be the ERO. As the ERO, NERC is charged with improving the reliability of the bulk-power electric system by developing mandatory reliability standards for planning and operations. (Eversource 1, Vol. 1, p. 2-2 and 2-3)

36. The Northeast Power Coordinating Council (NPCC) is a regional reliability council that was established to improve the reliability of the interconnected bulk power system in New York, the six New England states, and eastern Canadian provinces. The US systems of the NPCC formed two regional reliability councils to ensure the reliability of their portions of the interconnected bulk-power electric system - ISO-NE, and New York Independent System Operator (NYISO). (Eversource 1, Vol. 1, p 2-2)

37. ISO-NE is responsible for power system planning, as well as grid operation and market administration in the six New England States. ISO-NE uses a ten-year planning horizon. It has adopted planning standards, criteria and procedures consistent with the standards and criteria established by NERC and the NPCC, designed to ensure that New England's electric system will provide adequate and reliable electric power. (Eversource 1, Vol. 1, pp. 2-2 through 2-6)

38. ISO-NE is responsible for the reliable and economical operation of New England's electric power system, which includes managing the comprehensive, long-term planning of the regional power system to identify the region's electricity needs and plans for meeting those needs. The planning process involves the preparation of an annual Regional System Plan (RSP) that provides forecasts of annual energy use and peak loads for a ten-year planning horizon; information about amounts, locations, and characteristics of market responses; and descriptions of transmission projects for the region that could meet the identified needs, as summarized in the RSP Project List. (Council Administrative Notice Item No. 17)

39. The RSP Project List is a summary of needed transmission projects for the region and includes the status of reliability transmission upgrades, market efficiency transmission upgrades, elective transmission upgrades and generator interconnection upgrades. The Project is identified on the RSP Project List as a planned reliability transmission upgrade that received Proposed Plan Application/I.3.9 Approval* from ISO-NE on April 16, 2015 with a projected in service date of December 2018.

    *This is based on the original all-underground line proposal. (Council Administrative Notice Item No. 18; Eversource 4, pp. 13-14)

40. As a transmission owner in New England, Eversource must comply with the reliability standards and criteria adopted by NERC, NPCC, and ISO-NE. These standards and criteria establish a set of performance tests or contingency simulations under which Eversource's electric transmission system must perform without experiencing overloads or voltage problems. (Eversource 1, Vol. 1, pp. 2-2 to 2-5)

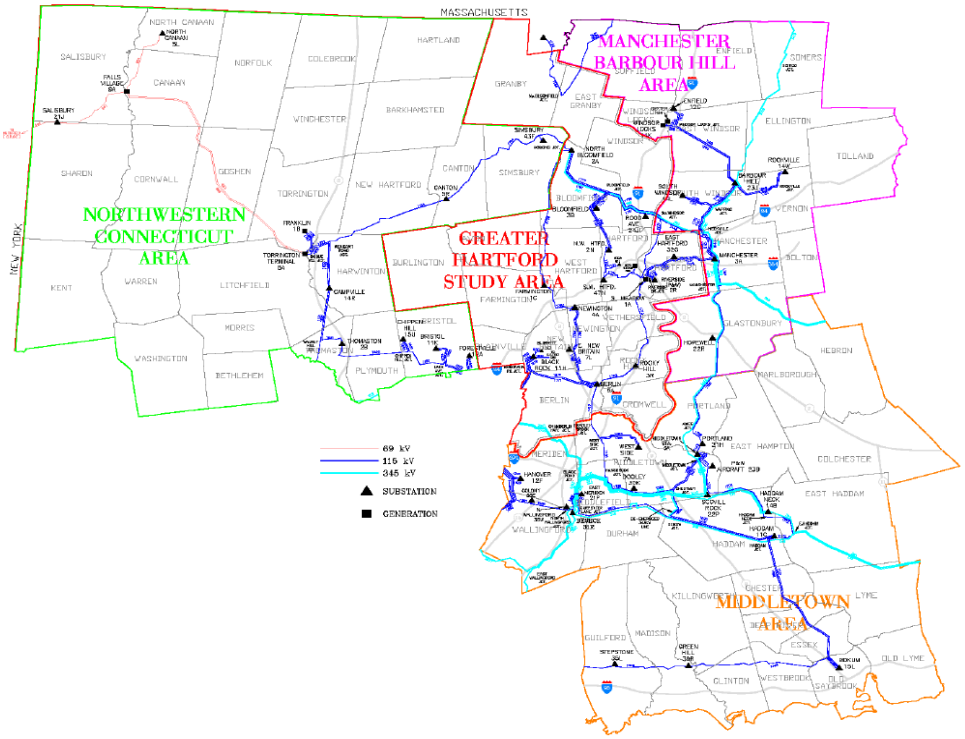
Project Need

41. In 2005, ISO-NE identified potential future criteria violations on the 115-kV system in the Greater Hartford area in the course of early studies that ultimately resulted in the New England East-West Solution (NEEWS) Plan, a comprehensive set of 345-kV improvements to the Southern New England transmission system in Connecticut, Rhode Island, and Massachusetts. Accordingly, potential solutions initially considered for the regional problems addressed by NEEWS and presented to the ISO-NE's Planning Advisory Committee in 2006 included improvements to the Greater Hartford 115-kV system, principally a new 115-kV line between Eversource's East Hartford Substation and Manchester Substation. (Eversource 1, Vol. 1, pp. 2-7 and 2-8)

42. By 2009, further analyses showed that there were additional "load serving" issues in the Greater Hartford area that would not be resolved by a new 115-kV line. Therefore, in early 2010, ISO-NE removed the 115-kV system-related issues from the scope of the NEEWS studies and initiated a new separate study supplementary to the NEEWS studies. This new study was known as the Greater Hartford Area Reliability Study. (Eversource 1, Vol. 1, p. 2-8)

43. In early 2011, ISO-NE combined the Greater Hartford Area Reliability Study, along with other ongoing studies of reliability issues in subareas adjacent to Greater Hartford, in an assessment of load serving problems in four contiguous electrical sub-areas of Connecticut: Greater Hartford; Manchester – Barbour Hill; Middletown; and Northwestern Connecticut. These combined studies became known as the Greater Hartford/Central Connecticut (GHCC) study. To conduct this study, ISO-NE formed a working group of transmission planners from ISO-NE, Northeast Utilities Service Company (now Eversource Energy Service Company), and The United Illuminating Company. (Eversource 1, Vol. 1, p. 2-8)

44. The figure below depicts the GHCC study area.



(Eversource 1 Vol. 1, p. 2-9)

45. An ongoing reassessment of the need for the Central Connecticut Reliability Project (CCRP), one of the four original NEEWS 345-kV projects, was folded into the GHCC study. At the time of the reassessment of the need for the CCRP, that project was planned to consist primarily of a new 345-kV transmission line from North Bloomfield Substation (in Bloomfield) to Frost Bridge Substation (in Watertown) and was designed to greatly increase the capability of the transmission system to transfer power from east to west along the Western Connecticut Import Interface. (Eversource 1, Vol. 1, pp. 2-9 and 2-10)

46. The preliminary results of the CCRP reassessment indicated that the need for such increased transfer capability had been substantially reduced by changes in system conditions and forecasted load, but not eliminated. Accordingly, the GHCC analysis was expanded to identify the needs for both local reliability issues and western Connecticut import requirements, with the expectation that both sets of needs could be addressed by a single, integrated 115-kV solution, which would replace CCRP and meet local load serving needs. (Eversource 1, Vol. 1, p. 2-10)

47. The planning studies showed that the Greater Hartford Sub-area had four transmission elements with N-1 thermal violations and four 115-kV buses with N-1 low-voltage violations. Under N-1-1 conditions, there were 27 elements with thermal violations and ten 115-kV Pool Transmission Facilities (PTF) buses with low voltage violations. Two 115-kV non-PTF buses also had low voltages. There were no N-0 violations. Violations occurred with all of the one-unit-out and two-unit-out dispatches. A significant number of violations were dispatch-independent; the violation occurred with all dispatches. (Eversource 1, Vol. 1, p. 2-16; Eversource 1, Vol. 2, ISO-NE GHCC 2022 Redacted Needs Assessment)

48. The 2012 Needs Assessment Report found that the year of need for the Greater Hartford improvements was 2013 because the Connecticut peak load forecast for 2013 was 7,776 MW. Thermal violations began to occur at 4,756 MW net load, and low voltage violations began to occur at a 4,319 MW net load. Furthermore, the majority of the worst-case violations in the Greater Hartford Sub-area occurred at the 2013 net load level. (Eversource 1, Vol. 1, p. 2-16; Eversource 4, p. 9)

49. The table listed below includes the actual historical (not weather-normalized) peak loads in Connecticut versus the critical load levels for thermal and voltage violations.

Actual CT Peak Loads Year	CT Peak (MW)	Thermal CLL (MW)	Voltage CLL (MW)
2013	7,128	4,756	4,319
2014	6,183		
2015	6,342		
2016	5,522		

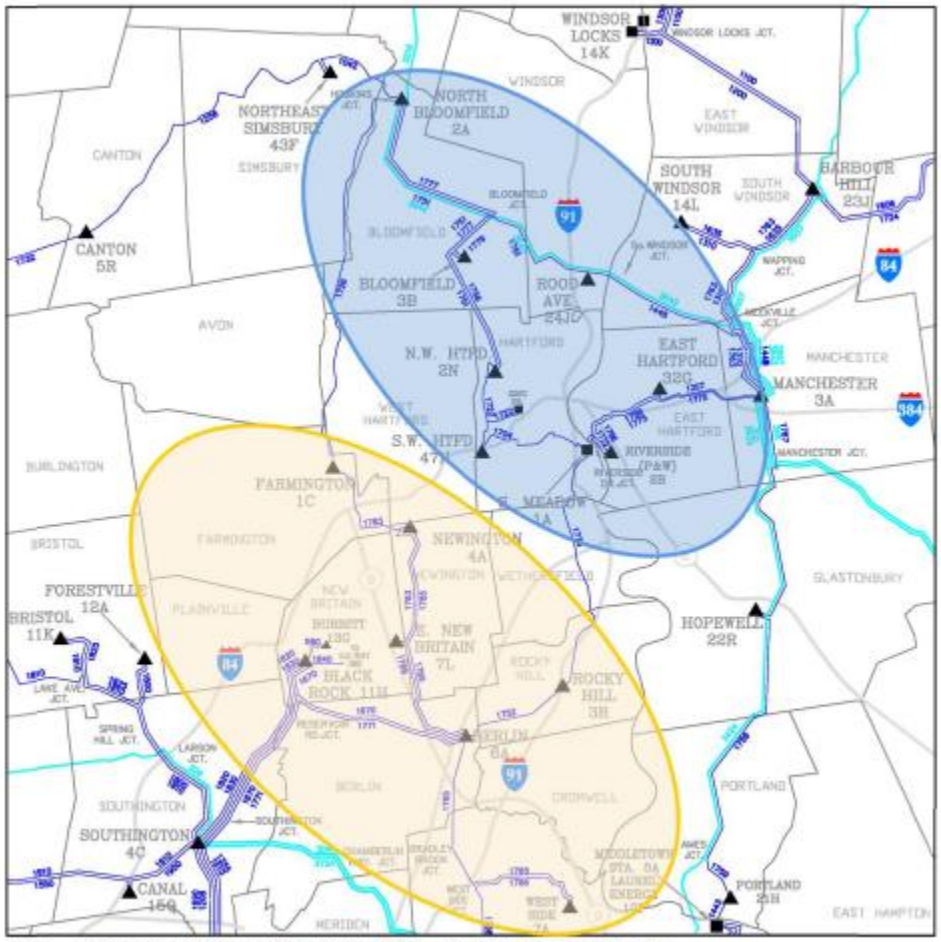
(Eversource 4, p. 10; Tr. 1, p. 66)

50. The actual 2013 summer peak was close to the ISO-NE 90/10 forecast. While subsequent peaks have been lower, they have consistently exceeded the critical load levels at which violations begin to occur. Accordingly, ISO-NE has not seen fit to reassess the need for the Project and has continued to list it in its Regional System Plans. (Eversource 1, Vol. 1, p. 2-16; Eversource 4, pp. 9-10)

51. Even taking into account the most up to date 2017 ISO-NE Capacity, Energy, Loads, and Transmission (CELT) Forecast data, Connecticut's peak loads would still be well above the thermal and voltage critical load levels of 4,756 MW and 4,319 MW, respectively. (Tr. 1, pp. 19-20; Eversource 4, p. 10; Council Administrative Notice Item No. 19 – 2017-2026 CELT)

52. The Greater Hartford sub-area is a net importer of electrical energy and relies on surrounding areas to serve local load. (Eversource 1, Vol. 1, p. 2-11)

53. The GHCC studies also showed that there were criteria violations in two distinct "load pockets" within the Greater Hartford Sub-area. Load pockets are areas that have insufficient generation and/or transmission to serve their load. These two load pockets are the South Meadow-Berlin-Southington Area and the North Bloomfield-Manchester Area. These load pockets are depicted in the figure below.



(Eversource 1, Vol. 1, pp. 2-11 and 2-13)

54. The conceptual solution to resolve the criteria violations in the targeted load pockets was to connect them with a new transmission line so that the transmission system in each load pocket would be able to serve the other when needed. The Working Group identified two sets of logical terminal points for such a new line. One set consisted of Newington Substation and Southwest Hartford Substation, which are not currently interconnected and were ultimately selected as the terminal points of the preferred solution. The other set of terminal points considered was Farmington Substation in Farmington and North Bloomfield Substation in Bloomfield. (Eversource 4, pp. 31-32)

55. In early 2015, ISO-NE published a report identifying the preferred solutions for the needs of the entire GHCC study area, including the improvements in the Greater Hartford Sub-area proposed in this Project (the GHCC Solutions Report). After a positive recommendation by its Reliability Committee, on April 16, 2015, ISO-NE issued a technical approval of a set of preferred GHCC solutions, including a new 115-kV underground transmission circuit between Newington Substation and Southwest Hartford Substation, together with associated equipment additions to those substations. (Eversource 1, Vol. 1, p. 2-10)

56. The preferred new transmission circuit identified in the GHCC Solutions Report was an approximately 4-mile 115-kV underground cable between Newington Substation and Southwest Hartford Substation. Installation of this new circuit also would have required the installation of associated terminal equipment, including a 1.2 percent series reactor in series with the new cable. This all-underground solution was developed on the assumption that, because of the dense urban and suburban development in the area between Newington Substation and Southwest Hartford Substation and the lack of existing utility rights-of-way connecting these two substations, the installation of a new 115-kV line in an overhead configuration between these points would be impractical. (Eversource 1, Vol. 1, p. 2-17)

57. After extensive technical studies and negotiations with Amtrak, Eversource reconfigured the proposed 115-kV line to an approximately 3.7-mile hybrid overhead/underground circuit with approximately 1.3 miles of the circuit to be constructed underground and approximately 2.4 miles overhead along the Amtrak/CT *fastrak* transportation corridor (Amtrak ROW). Also as part of the Project, modifications to both Newington Substation and Southwest Hartford Substation would be required to connect the new 115-kV line to the transmission system. (Eversource 1, Vol. 1, p. 2-17)

58. The proposed hybrid Project would meet the need identified by the Working Group because upon completion of the Project, the transmission system in each of the load pockets in the Greater Hartford Sub-area would be able to serve the other when needed. In the event of contingencies in either area, there would be an additional high voltage transmission element to share the load that would be automatically redistributed from the failed system element, and each area would have a new high capacity path by which generation from outside both load pockets may reach the load within each. (Eversource 1, Vol. 1, p. 2-19)

59. The new 115-kV line and its associated improvements would also provide incremental transfer capability across the Western Connecticut Import Interface. As the 345-kV CCRP would have done, the proposed 115-kV line would add another transmission element to the interface; therefore, it would increase transfer capability across the interface. The increment in transfer capability provided by this improvement to the 115-kV system is less than would have been provided by the 345-kV CCRP solution; however, the GHCC studies determined it to be adequate because less capability was needed under the modeled updated system conditions to eliminate criteria violations. (Eversource 1, Vol. 1, p. 2-20)

60. The GHCC Solutions Report specified a project with an all-underground transmission line, and the I.3.9 technical approval that ISO-NE issued on April 16, 2015 was based on an analysis of a project that included an all underground transmission line. Accordingly, Eversource would need to seek a supplemental I.3.9 approval from ISO-NE before it can construct the Project. However, Eversource's planners have determined that the electrical characteristics of the proposed Project are sufficiently close to that for which the original I.3.9 was issued such that there should be no issue with the issuance of a supplemental I.3.9 approval from ISO-NE. (Eversource 4, pp. 13-14)

61. The Project was included in the DEEP 2014 Integrated Resources Plan (IRP) as a planned new transmission project with an in-service date of 2017. (Council Administrative Notice Item No. 37, Appendix F, p. F-28)

62. The proposed Project was listed in the Council's *2014/2015 Review of the Ten Year Forecast of Connecticut Electric Loads and Resources* as a proposed 4.0 mile 115-kV transmission line from Newington Substation to Southwest Hartford Substation with an in service date of 2017. (Council Administrative Notice Item No. 26, Appendix B)

63. The proposed Project was listed in Eversource's *2016 Forecast of Loads and Resources for the Period 2016-2025* as a planned 4.0 mile 115-kV transmission line from Newington Substation to Southwest Hartford Substation with an in-service date of 2018. (Eversource Administrative Notice Item No. 67)

64. The Project is consistent with the *Conservation and Development Policies Plan for Connecticut 2013-2018*. It would serve a public need for the reliable transmission of electricity to support development in Connecticut. (Council Administrative Notice Item 47; Eversource 1, Vol. 1, p. 5-33)

65. Connecticut's 2013 Comprehensive Energy Strategy (CES) proposes further investments in grid reliability and identifies three important components to grid reliability: resource adequacy, transmission security and distribution resiliency. (Council Administrative Notice Item No. 38, pp. 71, 97)

Project Cost

66. The estimated capital cost of the Project is approximately $61.1 million, with the transmission line accounting for $44.4 million (including $1.2 million for Newington Tap) and the substation modifications accounting for $16.7 million. (Eversource 4, p. 22)

67. The cost of the Project is anticipated to be regionalized with Connecticut ratepayers paying approximately 25 percent of the Project cost. Any additional cost incurred for local requirements would be expected to be paid by Connecticut ratepayers. (Eversource 4, p. 22-23)

68. The life-cycle cost for the transmission line portion of the Project would be approximately $80.5 million. This total would include annual carrying charges of the capital cost, annual operation and maintenance costs, cost of energy losses, and cost of capacity. (Eversource 3; Eversource 1, Vol. 1, p. 3-25)

69. Project construction is anticipated to begin in mid-2018. The tentative in-service date is the fourth quarter of 2019. (Eversource 4, response 23)

Project Alternatives

70. A "no-action" alternative would not improve the reliability of the electric system in the Greater Hartford sub-area, subjecting the area to continued risk of electric outages as well as undermining ISO-NE long range reliable transmission planning for Connecticut and New England. Eversource could be fined by FERC for failure to correct the identified criteria violations. (Eversource 1, Vol. 1, p. 10-1; Eversource 4, p. 31)

71. On June 6, 2014, the state statutory requirement under C.G.S. §16a-7c for initiation by the Connecticut Energy Advisory Board of a reactive request for proposal process to seek non-transmission alternatives to the need addressed by an application for a proposed facility that is submitted to the Council was repealed. (State of Connecticut Public Act 14-94)

72. In the 2014 IRP, DEEP outlines criteria used for illustrating reliability projects that may be viable candidates for the consideration of non-transmission alternatives - Category A consists of new substations; Category B consists of infrastructure upgrades; and Category C consists of new transmission lines and new infrastructure considered in reliability studies. Categories A and B are identified as unlikely to have viable non-transmission alternatives. (Council Administrative Notice Item No. 37, Appendix F, p. F-22)

73. In addition to the proposed Project, two other alternative 115-kV solutions were studied. Specifically, the Working Group considered a second all-overhead 115-kV line from Farmington Substation in Farmington to North Bloomfield Substation in Bloomfield (Farmington-North Bloomfield Alternative). Eversource also considered a 115-kV underground transmission line from Newington Substation to Southwest Hartford Substation (All-Underground Alternative). (Eversource 4, pp. 31-32)

74. Farmington Substation and North Bloomfield Substation are presently connected by an existing 11.7-mile long 115-kV Eversource overhead transmission line. A second 115-kV line could be built within the same ROW in an overhead configuration adjacent to the existing 115-kV line. (Eversource 1, Vol. 1, p. 10-2)

75. A partially overhead 115-kV line from Newington Substation to Southwest Hartford Substation was initially considered impractical because of the dense urban and suburban development in the area. Thus, a new line from Newington Substation to Southwest Hartford Substation was initially considered the All-Underground Alternative. (Eversource 4, pp. 31-32)

76. Both alternatives would have reliability improvements that would be nearly equal. (Eversource 1, p. 10-11)

77. The Farmington-North Bloomfield Alternative has a total estimated project cost of $95.9 million, including both transmission and substation improvements versus about $99.8 million for the All-Underground Alternative. However, the Farmington-North Bloomfield Alternative would potentially result in permanent wetland impacts for structures and/or access drives. (Eversource 1, Vol. 1, pp. 10-10 and 10-17; Eversource 4, pp. 22, 32-33)

78. After the ISO-NE analysis was completed, Eversource determined that it would be possible, by employing non-standard construction methods and line design and by obtaining the cooperation of Amtrak, to align a 115-kV circuit between Newington Substation and Southwest Hartford Substations overhead for the majority of its length, by co-locating with the Amtrak ROW. The southern and northern portions of the circuit (i.e. near Newington Substation and Southwest Hartford Substation) would be configured underground. This hybrid configuration is proposed as Eversource's proposed solution or proposed Project. (Eversource 1, Vol. 1, p. 10-2)

79. The All-Underground Alternative and the Farmington-North Bloomfield Alternative were both rejected in favor of the proposed Project because the cost of the proposed Project (including Newington Tap and substation improvements) would be approximately $61.1 million or about $38.7 million less than the All-Underground Alternative and $34.8 million less than the Farmington-North Bloomfield Alternative. (Eversource 1, Vol. 1, p. 10-17; Eversource 4, p. 22)

80. Non-transmission alternatives (NTAs) were examined including the addition of gas-fired turbines (both simple cycle and combined-cycle), energy storage, solar, wind, fuel cells and energy efficiency measures. The least cost (and technically feasible) non-transmission alternative solution to meet the identified needs is the construction of a 182 MW combined-cycle natural gas fueled turbine generator at Northwest Hartford Substation, 24 MW peaking plant of aeroderivative technology at Southington Substation, 23 MW of incremental demand response at Northwest Hartford Substation, and 3 MW of incremental demand response at Southington Substation. This potential solution was rejected due to its high cost to Connecticut ratepayers, estimated to be at as much as 13 times greater than the cost of the proposed Project. (Eversource 1, Vol. 2, NTA Analysis Report, p. 10, 45; Eversource 1, Vol. 1, pp. 10-21 to 10-23; Eversource 4, pp. 34-35; Eversource 1, Vol. 2, LEI Report, p. 2)

Project Description

81. The proposed Project entails the installation of a new 115-kV electric transmission line, designated as the #1346 Line, and related improvements as listed below:
    a) modifications of the Newington Substation in Newington;
    b) modifications to Newington Tap in Newington;
    c) installation of a 1.16-mile 115-kV underground transmission cable from Newington Substation to the Amtrak ROW in Newington;
    d) installation of a 2.37-mile long 115-kV overhead transmission line along the east side of the Amtrak ROW from Newington to West Hartford to Hartford;
    e) installation of a 0.17-mile long 115-kV underground transmission cable from the transition structure at the north end of the overhead line to Southwest Hartford Substation; and
    f) modifications to the Southwest Hartford Substation.

    Detail of each portion of the Project is described in the following subsections. (Eversource 1, Vol. 1, p. ES-1, ES-6, ES-7, and 1-6)

Newington Substation Modifications

82. The existing Newington Substation is located on an 11.4-acre parcel owned by Eversource in northwestern Newington at 185 Cherry Hill Drive. The existing developed substation area is 1.7 acres. (Eversource 1, Vol. 1, p. 5-50; Eversource 4, p. 19)

83. Eversource proposes to modify the substation by expanding the substation fenceline by approximately 30 feet to the south and 20 feet to the west, increasing the fenced substation area by approximately 0.3 acre. (Eversource 1, Vol. 1, pp. 1-10, 3-18 and 3-19; Eversource 4, p. 2)

84. Major Project related work at the substation involves the following:
    a) Modify the substation 115-kV yard into a ring bus, with two new circuit breakers;
    b) Construct a new 32-foot by 14-foot control house for protection and control equipment, primarily battery components;
    c) Connect the proposed 115-kV underground #1346 Line to the substation at the existing #1783 Line terminal position;
    d) To allow the installation of the new #1346 Line, the #1783 Line terminal would be relocated to the existing 2X bus position between the 1T and 2T breakers;
    e) The final configuration for each line terminal position would include one lightning arrestor, one disconnect switch, and one capacitance coupling voltage transformer (CCVT) per phase;
    f) Transition the new underground #1346 Line to the rigid substation bus, using one pothead per phase. The height of this terminal would be 16.5 feet, which is approximately the same as that of the existing bus;
    g) Install a new dead-end structure within the substation in order to relocate the #1783 Line interconnect in the substation to the south. This structure would be approximately 65 feet high*;
    h) Extend the existing substation ground grid to accommodate the expanded substation footprint;
    i) Perform grading and evaluate drainage and stormwater improvements to accommodate the substation modifications; and
    j) Install a concrete retaining wall on the south and west sides of the substation to maintain the grade for the expanded portion of the substation. The retaining wall would have a total length of approximately 490 feet with a maximum retained height of 7.8 feet.

    *This proposed structure would be the tallest structure within the substation and approximately 1 foot shorter than the tallest existing structure.

    (Eversource 1, Vol. 1, pp. 1-10 and 1-11; Eversource 7, response 17)

85. The expanded area for the substation would consist of a 4-inch layer of crushed traprock over compacted fill or subgrade. The crushed traprock surfacing would extend four feet beyond the fence line. (Eversource 7, response 16)

86. The expanded fence would be 7 feet tall chain link with 1-foot of barbed wire on top. (Eversource 7, response 15)

Newington Tap Modifications

87. Eversource's existing overhead 115-kV #1783 Line extends from Farmington Substation to East New Britain Substation and passes adjacent to Newington Substation. Newington Tap is an approximately 0.01-mile overhead 115-kV transmission line segment that currently connects the #1783 Line to Newington Substation. (Eversource 4, pp. 21-22; Eversource 1, Vol. 1, p. 5-50)

88. In the proposed Project, the existing 0.01-mile long transmission line tap would be relocated and rebuilt with larger conductors. These modifications would also provide space within Newington Substation to accommodate the new #1346 Line termination and would avoid overloads on the Newington Tap line under certain contingencies. (Eversource 4, pp. 21-22)

89. For the relocated line tap, Eversource would install one new approximately 95-foot tall galvanized steel vertical monopole structure to support the new 1590-kcmil aluminum conductor with steel support (ACSS) on the existing ROW south of Newington Substation. The new tap line would connect to the substation from the south. (Eversource 1, Vol. 1, pp. 1-11 and 13-1; Eversource 7, response 20)

90. Eversource would remove an existing 67-foot tall wood H-frame structure and a 57-foot tall wood single-pole structure, conductors, and related equipment that comprise the tap. (Eversource 1, Vol. 1, p. 1-11; Eversource 7, response 20)

91. Eversource would reconfigure the guying arrangement on two existing transmission line structures within the ROW. (Eversource 1, Vol. 1, p. 1-11)

Proposed 115-kV Underground Transmission Cables

92. The first proposed 115-kV underground cable segment (located in Newington) would exit the west side of Newington Substation, loop around the north side of the substation, and proceed along Eversource's property and existing Eversource distribution line ROW between Newington Substation and Willard Avenue (Route 173) for a distance of 0.8 miles. From the intersection of the Eversource ROW with Route 173, the cable route would be aligned north along Route 173 before turning east along a local road (Shepard Drive), then traversing a short distance across a privately-owned paved parking lot in an industrial area to a transition structure where the line would change to overhead before crossing the Amtrak ROW. See next section titled Proposed Overhead 115-kV Transmission Line. (Eversource 1, Vol. 1, p. ES-6; Eversource 3, Proposed Route – Sheets 1 and 2)

93. The second proposed 115-kV underground cable segment (located in Hartford) would extend from a transition structure at the north end of the overhead line segment (west of the Amtrak ROW) into Southwest Hartford Substation. From the transition structure, the underground cable would traverse west for approximately 0.1 mile near the paved parking lot of the Bow-Tie Cinema and then would turn north for approximately 0.1 miles, traversing along New Park Avenue, and crossing beneath Interstate 84 to extend a short distance within Eversource property to Southwest Hartford Substation. (Eversource 1, Vol. 1, pp. 1-6 and ES-6; Eversource 3, Proposed Route – Sheet 4)

94. The proposed single-circuit underground 115-kV transmission line would consist of three cables (phases). Each phase would consist of one 5000-kcmil copper conductor cable surrounded by cross-linked polyethylene (XLPE) insulation. (Eversource 1, Vol. 1, p. 3-13)

95. The cables would be installed within polyvinyl chloride (PVC) ducts encased in concrete. A fourth duct would be installed to allow for future use by a replacement cable if the need arises. (Eversource 1, Vol. 1, p. 3-14)

96. Three fiber optic cables would be installed within the duct bank for transmission cable protection, control and temperature monitoring. (Eversource 1, Vol. 1, p. ES-7)

97. The proposed underground cable segment in Newington would be installed in four sections and joined at a total of three underground splice vaults. The first splice vault would be installed on Eversource property between Newington Substation and Avery Road. The second splice vault would be installed on Eversource property east of West Hartford Road. The third splice vault would be installed along Shepard Drive, just east of the intersection with Newington Road. These splice vaults would allow the cable to be joined together and allow cable segments to be pulled through the conduit. (Eversource 1, Vol. 1, pp. ES-7 and 3-15; Eversource 3, Proposed Route, Sheets 1 and 2)

98. The proposed underground cable segment in Hartford would not have a splice vault. It would be continuous cable from the transition structure located west of the Amtrak ROW to Southwest Hartford Substation. (Eversource 3, Proposed Route, Sheet 4)

99. Both proposed transition structures (to be located west of the Amtrak ROW) would be galvanized steel and between 95 and 105 feet in height. (Tr. 1, p. 22; Eversource 1, Vol. 1, pp. ES-7 and ES-8)

100. The southern transition structure, to be located on the property of Shepard Steel, would be relocated approximately 125 feet to the south of its originally proposed location in order to move it away from the Shepard Steel building, and the underground cable route on this property would be modified accordingly. Eversource would obtain an easement from Shepard Steel for use of this property for the transition structure and underground cable. The final locations of the transition structure and underground cable on this property would be included in the D&M Plan. (Eversource 1, Vol. 1, p. ES-8; Tr. 1, pp. 10-11)

Proposed Overhead 115-kV Transmission Line

101. The proposed 115-kV overhead transmission line would consist of three 1,272-kcmil ACSS phase conductors to be installed on galvanized steel monopoles. (Eversource 1, Vol. 1, pp. 3-6 and 13-1)

102. All of the new monopoles would support conductors arranged in a vertical configuration (refer to Attachment 3). (Eversource 1, Vol. 1, p. 3-4)

103. The new overhead line would be protected by one overhead lightning shield wire. The lightning shield wire would contain optical fibers (i.e. OPGW) for communication purposes. (Eversource 1, Vol. 1, p. 3-6)

104. In general, the 49 new monopoles would be 95 feet to 110 feet in height, except for in the vicinity of DOT's future railroad station at Flatbush Avenue in West Hartford where two of the structures may reach a maximum height of 140 feet. See FOF # 212. (Eversource 1, Vol. 1, pp. 3-5 and 3-6; Eversource 8, pp. 2-4)

105. The final location of the new poles may be modified in coordination with Amtrak and/or as the result of subsurface investigations, final engineering design, etc. However, the final structure locations are generally expected to be within 20 feet (longitudinally along the line) of the proposed locations in the Application. (Eversource 1, Vol. 1, p. 3-7)

106. The proposed transmission line would be generally located within existing Amtrak ROW through the municipalities of Newington (0.17 miles), West Hartford (1.64 miles) and Hartford (0.56 miles) for a total distance of about 2.37 miles. (Eversource 3, Introduction)

107. The existing Amtrak ROW varies in width from 86 feet to 155 feet, but is typically 93 to 115 feet. (Eversource 1, Vol. 1, p. 3-7; Eversource 4, p. 16)

108. All but one (Structure No. 46) of the proposed overhead transmission structures would be located within the Amtrak ROW. Eversource would acquire an easement for the installation of proposed Structure No. 46 adjacent to the railroad corridor. (Eversource 1, Vol. 1, p. 10-13)

109. Land use adjacent to the Amtrak ROW includes transportation corridors such as State and local roadways, railroad corridor, and the CT *fastrak* busway, as well as commercial/industrial developments. (Eversource 1, Vol. 1, pp. 5-27 and 5-28)

Southwest Hartford Substation Modifications

110. The existing Southwest Hartford Substation is located on a 7.1-acre parcel owned by Eversource in the southwestern section of Hartford at 219 New Park Avenue. The existing developed substation area is approximately 2.1 acres and is accessed off New Park Avenue. (Eversource 1, Vol. 1, p. 1-11; Eversource 4, p. 20)

111. Eversource proposes to modify the substation by expanding the substation fenceline by 65 feet to the east, increasing the fenced substation area by approximately 0.3 acres. (Eversource 1, Vol. 1, pp. 1-11 and 1-12)

112. Major Project related work at the substation involves the following:
    a) Modify the substation 115-kV yard into a ring bus, with two new circuit breakers;
    b) Add one line terminal position and relocate the existing line terminal;
    c) Relocate a portion of the #1722 Line to accommodate the new #1346 Line entering the substation underground;
    d) Install the equipment for each line such as one series reactor, circuit switcher, disconnect switch, arrestor, CCVT and pothead per phase;
    e) Install two 70-foot tall dead-end structures* per line (or a total of four new structures) to provide a bypass for the operation of the reactors;
    f) Extend the existing substation ground grid to accommodate the expanded substation footprint;
    g) Perform grading and evaluate drainage and stormwater improvements to accommodate the substation modifications; and
    h) Relocate or remove existing high-pressure fluid filled (HPFF) interconnection piping and associated valve cabinet.

    *These proposed structures would be the tallest structures within the substation and approximately 10 feet taller than the tallest existing structure.
    (Eversource 1, Vol. 1, pp. 1-12; Eversource 7, response 18)

113. The existing access road and gate located off of New Park Avenue would be modified. (Eversource 4, p. 21)

114. The expanded area for the substation would consist of a 4-inch layer of crushed traprock over compacted fill or subgrade. The crushed traprock surfacing would extend four feet beyond the fence line. (Eversource 7, response 16)

115. The expanded fence would be 7 feet tall chain link with 1-foot of barbed wire on top. (Eversource 7, response 15)

General Project Construction Procedures

116. The following subsections describe the general construction procedures for each portion of the Project. If the Project is approved, Eversource may submit separate Development and Management (D&M) Plans for the Project: one for the new 115-kV transmission line and one for the modifications to the substations (including Newington Tap). (Eversource 5, p. 28)

Newington Substation, Newington Tap and Southwest Hartford Substation Modifications

117. The construction of these substation improvements would involve similar sequences of activities. (Eversource 1, Vol. 1, p. 4-31)

118. Site preparation activities would include vegetation removal within substation expansion areas. (Eversource 1, Vol. 1, pp. 4-32 to 4-35)

119. Temporary erosion and sedimentation controls (E&S Controls) would be installed in accordance with Eversource's Best Management Practices Manual (Eversource BMPs) and the *2007 Connecticut Guidelines for Soil Erosion and Sediment Control*, followed by grading and filling as necessary to create a level area to accommodate new substation equipment. (Eversource 1, Vol. 1, p. 4-32 and 4-35)

120. Foundation construction would commence after the completion of rough grading. After foundations are installed, construction activities would shift to the installation of steel support structures for electrical equipment. (Eversource 1, Vol. 1, p. 4-32)

121. Protection and control conduits, as well as ground-grid conductors would be installed below grade as necessary. (Eversource 1, Vol. pp. 4-33 and 4-35)

122. All of the new substation equipment would be tested prior to connection to the transmission grid. (Eversource 1, Vol. 1, pp. 4-33 and 4-36)

123. After construction is complete, any remaining construction debris would be removed. (Eversource 1, Vol. 1, pp. 4-33 and 4-36)

124. Areas of disturbed soils within the substation fence would be stabilized with crushed traprock or gravel. Areas of disturbed soils located outside of a substation fence would be seeded, mulched, and allowed to re-vegetate in low-growing shrub or grass species. Temporary E&S Controls would be maintained in disturbed areas until such areas are stabilized. (Eversource 1, Vol. 1, pp. 4-33 to 4-36)

Proposed 115-kV Underground Transmission Cables

125. Eversource would perform pre-construction planning (e.g. locate underground utilities, perform soil and groundwater testing as necessary) to finalized the underground cable design and location. (Eversource 4, p. 37)

126. Eversource would establish traffic control procedures to minimize traffic disruption and provide a safe working environment for construction. (Eversource 4, p. 37)

127. Eversource would remove vegetation where necessary. Vegetation removal (e.g. tree and brush clearing, mowing and side tree trimming) would be required particularly along the Eversource ROW, but may be performed as necessary along paved areas to provide clearance for equipment. (Eversource 4, p. 37)

128. Eversource would establish a construction access road, as needed, along the Eversource ROW. Eversource would also temporarily relocate the existing distribution lines within the Eversource ROW. (Eversource 4, p. 37)

129. Eversource would excavate for the splice vaults. For the vault to be located along Shepard Drive, pavement saw cutting and removal would be performed as needed. (Eversource 4, p. 37)

130. The splice vaults would be approximately 24 feet long by eight feet wide by eight feet high. Each vault would be installed approximately 30-inches below grade* and once constructed, would be accessible via two access manholes.

*This would increase to 36 inches within state ROW areas per DOT requirements. (Eversource 1, Vol. 1, pp. 3-17)

131. Eversource would install the pre-cast splice vaults and then backfill over the top of the splice vaults with excavated spoils and/or other approved material. Eversource would re-pave or restore disturbed areas. (Eversource, 4, p. 37)

132. Eversource would excavate a trench approximately 6 to 10 feet deep and 5 feet wide to install the duct bank system by saw cutting and removing the pavement in any roads or other paved areas. (Eversource 1, Vol. 1, p. 4-17; Eversource 4, p. 37)

133. Any groundwater that is encountered would be dewatered as necessary in accordance with applicable regulations. (Eversource 1, Vol. 1, p. 4-17)

134. Any open portions of trench would be covered with plywood or steel plates after work hours to prevent fall hazards. (Eversource 1, Vol. 1, p. 4-19)

135. Eversource would install the conduits in the trench and encase the conduits in concrete. Eversource would backfill the trench with excavated spoils and/or other approved material. Other approved material may include a concrete-like substance known as fluidized thermal backfill (FTB). (Eversource 4, p. 37)

136. After conduits have been installed, they would be tested with a mandrelling procedure, in which a "pig" (a cylindrical object slightly smaller in diameter than the conduit) is pulled through the conduit to verify that the conduit has not been crushed, damaged, or installed improperly. (Eversource 1, Vol. 1, p. 4-20)

137. Eversource would re-pave or restore disturbed areas. (Eversource 4, p. 38)

138. Eversource would pull the cables through the conduits and splice the cables within the splice vaults or terminate the cables at the substations. (Eversource 4, p. 38)

139. Eversource would return the temporarily-relocated Eversource distribution lines to a permanent configuration along the Eversource ROW. (Eversource 4, p. 38)

140. Eversource would remove any temporary access roads and complete any remaining site restoration work such as pave affected road ROWs and parking lots, re-vegetate non-paved or graveled areas such as those along the Eversource ROW. (Eversource 4, p. 38)

Proposed Overhead 115-kV Transmission Line

141. Eversource would conduct pre-construction surveys and stake the proposed structure locations, ROW boundaries, monument line (where necessary), and the limited areas of clearing (as necessary). Eversource would also mark the boundaries of Trout Brook and any other areas to be avoided or where mitigation measures would be implemented. (Eversource 4, p. 35)

142. Eversource would install E&S controls, as necessary, in accordance with Amtrak specifications and Eversource BMPs, as applicable. (Eversource 4, p. 36)

143. Eversource would establish a construction yard/field office, typically including space for office trailer(s), equipment storage and maintenance, sanitary facilities, and parking. (Eversource 4, p. 35)

144. Eversource would prepare material staging sites (e.g. storage, staging, and laydown areas) to support the construction effort. The preferred locations for such areas would typically be, but would not be limited to, the general vicinity of the Amtrak ROW. (Eversource 4, p. 35)

145. Eversource would perform vegetation clearing or mowing as necessary. (Eversource 4, p. 35)

146. Eversource would identify and improve or construct (as necessary) access to work sites along the ROW. With Amtrak's approval, existing railroad access road may be upgraded (using gravel or timber mats) for Project construction. In addition, various public roads and private driveways and parking lots abut the Amtrak ROW, and Eversource would investigate the use of such areas to provide access if necessary. (Eversource 4, p. 36)

147. Eversource would prepare level work (crane) pads as necessary at each proposed 115-kV structure site, as well as conductor pulling sites, and, if necessary, at guard structure/boom truck sites. Work pad installation may involve grading and require the installation of a stable base consisting of gravel, timber mats, or equivalent. (Eversource 4, p. 36)

148. Tangent structures would be directly embedded into the ground. Strain and dead-end structures would have a drilled shaft (concrete) foundation. (Eversource 1, Vol. 1, p. 3-4)

149. Eversource would construct structure foundations and erect/assemble the new structures. Flat-bed trucks would be used for hauling new structure components, new hardware and augers. Other trucks would haul reinforcing rods, drill rigs, and cranes. Concrete trucks would provide the concrete for the foundations. Dump trucks would be used to remove excavated material from the ROW. (Eversource 4, p. 36)

150. Eversource would install counterpoise, where needed. Depending on site-specific soil conductivity, supplemental grounding would be installed. (Eversource 4, p. 36)

151. Eversource would install shield wires, OPGW and conductors. The equipment required for these activities would include conductor reels, conductor pulling and tensioner rigs, and bucket trucks. Helicopters may also be used to install the initial pulling lines for the conductors or shield wires. (Eversource 4, p. 36)

152. Eversource would restore construction sites upon completion. Construction materials and debris would be removed from temporary access roads, work pads and staging areas. Such sites would then be re-graded or otherwise restored and stabilized. In the urban Project area, gravel or paving would typically be used for site restoration/stabilization. Construction debris would also be removed from any remaining areas. (Eversource 4, p. 36)

153. Eversource would maintain temporary E&S Controls in accordance with Eversource BMPs until vegetation is re-established or disturbed areas are otherwise stabilized with gravel or paved. After site stabilization is achieved, all temporary E&S Controls would be removed from construction sites and properly disposed of. (Eversource 4, pp. 36-37; Eversource 1, Vol. 1, p. 4-4)

154. Eversource proposes to utilize invasive species control best management practices during construction, as required by the U.S. Army Corps of Engineers (ACOE). Notwithstanding, wetland areas such as Wetland N-1A, Wetland N-1, Wetland N-2, and Wetland N-3 may already contain invasive species in some areas including, but not limited to, phragmites and reed canary grass, and long term control is not possible. (Tr. 1, pp. 51-53; Eversource 1, Vol. 1, p. 5-12)

Environmental Resources

155. The proposed Project is located within the Central Valley (or Newark Terrane), which is located within the Connecticut River Valley. This region is characterized by relatively flat areas bordered by variably hilly terrain. (Eversource 1, Vol. 1, p. 5-2)

156. Land uses in the Project area are characterized by a variety of uses and types, including transportation and utility corridors and residential, commercial and industrial developments. (Eversource 1, Vol. 1, p. 5-27)

157. Elevations along the proposed Project route range from approximately 50 feet to 200 feet above mean sea level. (Eversource 1, Vol. 1, p. 5-2)

158. The Project is consistent with the Federal Energy Regulatory Commission (FERC) Guidelines for the Protection of Natural, Historic, Scenic and Recreational Values in the Design and Location of Rights-of-Way and Transmission Facilities as this proposed route jointly utilizes existing rights-of-way that are occupied by different kinds of utility services. (Council Administrative Notice Item No. 9)

Watercourses

159. The proposed Project is located within the Connecticut River Major Drainage Basin and the Park River Regional Drainage Basin. (Eversource 1, Vol. 1, p. 5-6)

160. The proposed Project crosses a total of two watercourses/waterbodies. Of these, both are perennial streams. (Eversource 5, p. 11)

161. The proposed route extends across 100-year and 500-year flood zones associated with Trout Brook. Though overhead line spans are proposed over such areas, no proposed structures would be located within the designated 100-year or 500-year flood zones. (Eversource 1, Vol. 1, p. 5-12)

162. None of the rivers or streams along the route are designated as or considered for designation as a National Wild and Scenic River. (Eversource 1, Vol. 1, p. 5-9)

163. Trout Brook is the only perennial watercourse along the Project route that is known to support fish habitat, and it would be spanned by the overhead portion of the transmission line. Thus, the proposed Project would not significantly impact any fisheries. (Eversource 1, Vol. 1, p. 6-13)

164. The unnamed tributary to Piper Brook is a perennial stream that would be crossed by the underground cable segment in Newington, and it is not known to support any fish. Impacts to this watercourse, beneath which Eversource proposes to install the underground transmission cable using an open cut method*, would be minimal and short-term. The installation of the cable system beneath this stream would be performed in accordance with Eversource BMPs and in compliance with the conditions of Project-specific water resource permits from DEEP and ACOE.

*While a horizontal directional drill or horizontal bore method would be feasible, Eversource contends that either method would be significantly more costly and time-consuming than the proposed open cut method.

(Eversource 1, Vol. 1, pp. 4-26 to 4-28, 6-13, 6-14; Eversource 5, p. 11)

Wetlands

165. The Inland Wetlands and Watercourses Act (IWWA), CGS §22a-36, *et seq.*, contains a specific legislative finding that the inland wetlands and watercourses of the state are an indispensable and irreplaceable but fragile natural resource with which the citizens of the state have been endowed, and the preservation and protection of the wetlands and watercourses from random, unnecessary, undesirable and unregulated uses, disturbance or destruction is in the public interest and is essential to the health, welfare and safety of the citizens of the state. (CGS §22a-36, et seq.)

166. The IWWA grants regulatory agencies with the authority to regulate upland review areas in its discretion if it finds such regulations necessary to protect wetlands or watercourses from activity that will likely affect those areas. (CGS §22a-42a)

167. The IWWA forbids regulatory agencies from issuing a permit for a regulated activity unless it finds on the basis of the record that a feasible and prudent alternative does not exist. (CGS §22a-41)

168. Four delineated wetland areas are either crossed by or located immediately adjacent to the proposed Project Route. These are designated as Wetlands N-2, N-3, N-4, and N-5. (Eversource 1, Vol. 1, p. 5-11)

169. Wetlands N-2, N-3, and N-4 along the proposed Route are located within Eversource's existing ROW between Newington Substation and Route 173. Wetlands N-2, N-3, and N-4 are characterized as palustrine emergent marsh and/or palustrine shrub-scrub. (Eversource 1, Vol. 1, pp. 5-10 and 5-11)

170. Wetland N-5 is a fringing wetland located south of Shepard Drive and adjacent to the banks of the unnamed tributary to Piper Brook (PS-1). Wetland N-5 is classified as a palustrine forested wetland. (Eversource 1, Vol. 1, pp. 5-11 and 5-12)

171. Wetlands on the Newington Substation property are designated as Wetlands N-1 and N-1A and classified as palustrine scrub-shrub wetlands. Wetland H-1 is located on the property of Southwest Hartford Substation. (Eversource 1, Vol. 1, p. 5-11; Eversource 3, Proposed Route – Sheets 1 and 4)

172. Development of the Project would convert approximately 0.24 acres of forested wetlands to scrub-shrub or emergent marsh wetlands. In forested wetlands, stumps would be left in place where practical. (Eversource 1, Vol. 1, pp. 6-7 and 6-8; Eversource 5, p. 20; Evesource 7, response 28)

173. The estimated areas of wetland impacts associated with the proposed underground cable in Newington are indicated in the table below*.

Project Activity	Wetland Number and Approximate Potential Impacts (Estimated Acres)			
	N-2	N-3	N-4	TOTAL
Total Permanent Impacts	0 acre	0 acre	0 acre	0 acre
Temporary Impact: Access/Work Space	0.44 acre	0.71 acre	0.11 acre	1.26 acres
Temporary Impact: Duct Bank Trench	0.12 acre	0.16 acre	0.01 acre	0.29 acre
Total Temporary Impacts	0.56 acre	0.87 acre	0.12 acre	1.55 acres
Secondary Wetland Effects (Tree Removal in PFO Wetlands)	0.05 acre	0.19 acre	N/A	0.24 acre

*Based on further study, the actual duct bank trench width in wetlands would be less than 10 feet, thereby reducing the temporary impact of the duct bank trench in Wetland N-2 and Wetland N-3 from 0.12 acre and 0.16 acre, respectively, to 0.11 acre for each. Updated acreages associated with the final trench design would be provided in the D&M Plan. (Eversource 1, Vol. 1, p. 6-8; Eversource 3, Proposed Route – Sheets 1 and 2; Eversource 4, pp. 2-3)

174. The construction of Newington Tap modifications would temporarily affect approximately 0.51 acre of Wetland N-1. (Eversource 5, p. 20; Eversource 3, Proposed Route – Sheet 1)

175. The proposed expansion area of Newington Substation would not be located in wetlands. (Eversource 3, Proposed Route – Sheet 4)

176. No proposed overhead transmission structures or transition structures would be located in wetlands. (Eversource 3, Proposed Route – Sheets 2 through 4)

177. The proposed expansion area of Southwest Hartford Substation would not be located in wetlands. (Eversource 1, Vol. 1, p. 3-24; Eversource 3, Proposed Route – Sheet 4)

178. The proposed underground cable in Hartford (that would connect to Southwest Hartford Substation) would not be located in wetlands. (Eversource 3, Proposed Route – Sheet 4)

179. Eversource would implement measures to avoid and/or minimize impacts to wetlands during construction. Such measures include, but are not limited to, petroleum product management (e.g. re-fueling plan), E&S Controls, and use of timber mats in wetland areas. (Eversource 1, Vol. 1, p. 6-8)

180. Compensatory wetland mitigation may be required depending on permit requirements from DEEP and the ACOE and would likely consist of an in-lieu fee payment. (Eversource 1, Vol. 1, p. 6-13)

181. Two potential vernal pools were initially identified in August 2016 along the portion of the proposed route within Eversource's distribution line ROW in the Town of Newington. Because these potential vernal pools were identified outside of the typical spring to early summer amphibian breeding and migration seasons, additional field investigations were performed in 2017. Specifically, in the spring of 2017, vernal pool surveys were performed in these previously-identified potential vernal pool locations. No evidence of vernal pool usage by obligate vernal pool species were observed during these surveys. Thus, no vernal pools were confirmed within the Project area. (Eversource 1, p. 5-15; Eversource 5, p. 5-6)

182. The Project route does not traverse any DEEP-designated Aquifer Protection Areas (APAs). There are no known APAs within the municipalities of Hartford, West Hartford or Newington. (Eversource 1, Vol. 1, p. 5-14; Council Administrative Notice Item No. 67)

183. In the vicinity of the proposed Project route, potable water service is provided by the Metropolitan District (MDC). The primary water supply source for MDC is a series of drinking water reservoirs, the closest of which is located approximately 2.5 miles northwest of Newington Substation. (Eversource 1, Vol. 1, p. 5-14)

184. Groundwater along the southwest portion of the Project area is designated as Class GA*, and groundwater along the majority of the proposed Project route is identified as Class GB**. The proposed Project would not be expected to adversely impact groundwater.

*Class GA is considered existing private water supply and potential public water supply suitable for drinking without treatment.
**Class GB is considered industrial water supply and miscellaneous non-drinking supply.
(Eversource 7, response 30)

185. Groundwater ranges from six inches depth to greater than six feet in depth in the vicinity of the proposed Project route. If groundwater is encountered during any Project excavations, dewatering would be performed in accordance with authorizations from applicable regulatory agencies. (Eversource 1, Vol. 1, p. 5-13 and 4-17)

Vegetative Clearing

186. Approximately 1.9 acres of forested vegetation (of which approximately 0.24 acre would be forested wetland) would be removed within the Eversource ROW for the installation of the underground segment between Newington Substation and Willard Avenue. (Eversource 1, Vol. 1, p. 6-11; Eversource 5, p. 20)

187. Vegetation removal for the overhead portion of the proposed transmission line is expected to be minimal as the entire Amtrak ROW is already cleared of tall-growing vegetation. (Eversource 1, Vol. 1, p. 4-4)

188. The proposed expansion of Newington Substation would result in the loss of approximately 0.3 acre of shrubland. (Evesource 5, p. 23)

189. The proposed expansion of Southwest Hartford Substation would result in the loss of approximately six trees. (Eversource 5, p. 23)

190. For the Newington Tap modifications, vegetation removal would typically be limited to construction work space within Eversource's managed #1783 Line ROW. However, some trees along the edge of this ROW would have to be removed or trimmed to achieve the required clearances from the relocated overhead line. (Eversource 5, p. 22)

191. Shrubland and edge habitats support a high biodiversity. Due to land use patterns, shrubland and old field areas are in rapid decline and managed ROW is now an important source of this habitat. (Eversource 1, Vol. 1, p. 6-12 and 6-13)

192. Connecticut Audubon Society's 2009 *State of Birds* report notes that shrubland birds are benefiting from maintenance of powerline corridors by utility companies which remove tall-growing trees from the vicinity of wires, creating a habitat dominated by shrubs, grass and herbs. (Eversource 5, p. 23)

193. Once the Project is complete, cleared areas would revert to scrub-shrub habitat benefiting many species that depend on this type of habitat, including species of high-conservation priority, including the prairie warbler, blue-winged warbler, and American kestrel. (Eversource 1, Vol. 1, pp. 6-13 and 6-14)

Wildlife

194. Based on review of Natural Diversity Database for state endangered, threatened or special concern species and ongoing consultations with DEEP, two State-listed species were identified as potentially occurring in the Project area. (Eversource 7, response 33)

195. DEEP has provided Eversource with protection strategies for each of two State-listed species. Eversource expects that these protection strategies would be further refined in consultation with DEEP and incorporated in the D&M Plan. (Eversource 7, response 33)

196. Although the NDDB has no record of State-listed bird species in the Project area, seven State-listed bird species were identified as potentially breeding in the Project vicinity. However, the proposed Project is not expected to have any significant, long-term adverse impact on State-listed birds. In addition, there would be the conversion of approximately 1.9 acres of forest lands into low growth vegetation along the Eversource ROW, and three of the seven listed species prefer open field/agricultural habitats. (Eversource 7, response 31)

197. The northern long-eared bat (NLEB), a Federally-listed Threatened Species, may occur within the Project area. The preferred habitat for the NLEB includes caves or mines (where bats hibernate in the winter) and within cavities or crevices of both live and dead trees (where bats roost in the summer). No critical habitat (e.g. roosting sites, caves) are known or designated for this species in the Project area. The proposed Project area does not support large stands of mature trees. (Eversource 1, Vol. 1, p. 5-26; Council Administrative Notice Item No. 39, pp. 1 and 3

198. Eversource would continue to coordinate with the U.S. Fish & Wildlife Service regarding the NLEB and potential habitat in the Project area. (Eversource 1, Vol. 1, p. 5-26; Eversource 7, response 32)

Scenic, Historic and Recreational Areas

199. Eversource's consultant, Heritage Consultants, LLC (Heritage), performed a Cultural Resources Review in 2015 (2015 CRR Report) for an all-underground route along existing road ROWs from Newington Substation to Southwest Hartford Substation. Heritage determined that paved portions of the route have been assessed as no/low sensitivity areas, and no archaeological testing of these areas is recommended. However, if the proposed transmission line were to be aligned along Eversource ROW, then a Phase 1B review should be performed as these areas retain moderate/high archaeological sensitivity. (Eversource 1, Vol. 1, pp. 5-35 to 5-38; Eversource 1, Vol. 2, 2015 CRR Report)

200. After determining that the proposed 115-kV line could be co-located along existing Eversource ROW in Newington and along the Amtrak ROW, Eversource commissioned Heritage to conduct additional cultural resources investigations and further consultations with SHPO. (Eversource 1, Vol. 1, p. 5-38)

201. The Newington Junction District in Newington, the Parkville Historic District in Hartford, the former Royal Typewriter Company Building (now demolished), and the St. Paul's Methodist Episcopal Church in Hartford are all listed on the National Register of Historic Places (NRHP) and located at least 300 feet from the proposed Project. The Newington Junction North Historic District is an NRHP resource that would be crossed by the proposed Project Route. Heritage performed a visibility study using a balloon and concluded that no significant visual effects were anticipated to historic property viewsheds as a result of proposed transmission line structures. (Eversource 5, p. 15; Eversource 1, Vol. 1, pp. 5-36 and 5-37)

202. In December 2016, Heritage performed a Phase 1B Cultural Resources Reconnaissance Survey and issued its Phase 1B Report in 2017. In the Phase 1B Report, Heritage determined that there would be no adverse effect on cultural resources from the Proposed Project. The Phase 1B Report was then provided to SHPO. (Eversource 1, Vol. 1, pp. 5-39 and 5-40)

203. Also as part of the Project planning process, on December 7, 2016, Eversource submitted requests for consultation to the Tribal Historic Preservation Officers (THPOs) of the Mashpee Wampanoag Tribe, the Mohegan Tribe and the Mashantucket Pequot Tribe. The Mashpee Wampanoag Tribe requested a copy of the archaeological field investigations results report and subsequently concurred with the results and recommendations of the report on July 26, 2017. As of August 15, 2017, no response had been received from the Mohegan Tribe or the Mashantucket Pequot Tribe. However, Eversource and Heritage will continue to coordinate with such THPOs regarding the Project. (Eversource 5, p. 16; Eversource 7, response 35)

204. By letter dated August 17, 2017, SHPO indicated that it had reviewed the Phase 1B Report and determined that the proposed Project would have no adverse effect on historic resources. (SHPO Comments dated August 17, 2017)

205. The Project would not be located near any State-designated heritage areas. (Eversource 5, p. 11)

206. The Project would not be located near any DOT designated Scenic Land Strips. (Eversource 5, p. 11)

207. The proposed Project route does not cross the Trout Brook Greenway and Trail (Trout Brook Trail), but it spans Trout Brook approximately 265 feet to the east of Trout Brook Trail's terminus at New Park Avenue. (Eversource 1, Vol. 1, p. 5-29)

208. The Project would not be located near any state parks or state forests. (Eversource 5, p. 11)

209. The Project would not be located near any state or federally-designated scenic roads. (Eversource 5, p. 11)

Visibility

210. While the proposed 115-kV structures for the overhead portion of the transmission line would represent a long-term modification to the visual environment, the Amtrak ROW has long been dedicated to transportation uses such as a railroad and more recently, the CT *fastrak* busway. Furthermore, the Amtrak ROW extends through industrial and commercial areas where the overall impact of this visual change would be limited. (Eversource 1, Vol. 1, p. 6-17)

211. Existing industrial/commercial buildings and vegetation generally would screen long-distance views of the proposed transmission line structures. (Eversource 1, Vol. 1, p. 6-17)

212. The maximum worst-case structure height would be approximately 140 feet for Structure Nos. 47 and 48 to be located at the new railroad station at Flatbush Avenue in West Hartford to be constructed. Eversource's final structure design would depend on DOT's final design of the railroad station. Depending on such design, the two structures might be shorter and in the range of 125 to 130 feet. (Eversource 8, pp. 2-4)

Noise

213. Eversource expects only short-term and highly localized construction-related noise effects from the Project. Most construction related noise would occur during normal work hours of 7 AM to 7 PM Monday through Saturday. Notwithstanding, some nighttime hours may be necessary for the underground cable segment construction to minimize potential inconvenience to businesses and traffic disruption. Eversource also expects that some overhead transmission construction would need to occur during nighttime hours based on its consultations with Amtrak. Sunday or evening hours may also be necessary due to unforeseen conditions such as inclement weather, outage constraints and/or critical path activities. (Eversource 1, Vol. 1, pp. 6-20 to 6-22; Eversource 7, response 22)

214. If approved, Eversource would coordinate its work hours with Amtrak, DOT, and the municipalities and include further information on work hours in the D&M Plan. (Eversource 1, Vol. 1, p. 6-22)

215. During the installation of the transmission line, rock may be encountered. Whereas mechanical methods are the primary method for removing rock, in some areas, controlled blasting may be required. If blasting is required, Eversource would develop a Blasting Control Plan in compliance with state, industry, and Eversource standards. Potential impacts from rock removal may include dust, vibration, and noise. (Eversource 1, Vol. 1, p. 6-4)

216. Construction noise is exempt from DEEP Noise Control Standards. (R.C.S.A. §22a-69-108(g))

217. At the limits of the ROW for the overhead transmission line, there would be no discernible post-construction noise from the overhead transmission line (i.e. less than 10 dB at ground level). (Eversource 7, response 36)

218. The proposed Project would comply with DEEP Noise Control Standards at the property boundaries of Newington Substation and Southwest Hartford Substation. (Eversource 7, response 36)

Electric and Magnetic Fields

219. Electric fields (EF) and magnetic fields (MF) are two forms of energy that surround an electrically charged device. Transmission lines are a source of both EF and MF. In North America, electric utilities provide power at 60 Hertz (i.e. oscillate 60 times per second). (Eversource 1, Vol. 1, p. 7-1)

220. EF result from voltages applied to electrical conductors and equipment. Appliances within homes and the workplace are the major sources of electric fields indoors, and power lines are the major sources of electric fields outdoors. EF levels decrease rapidly with distance from the source, diminishing even faster when interrupted by materials such as buildings and vegetation. The scientific community does not regard EF levels to be a concern to the general public, and thus, studies of health effects from electrical transmission lines and equipment has focused on MF. (Council Administrative Notice Item No. 25; Eversource 1, Vol. 1, p. 7-1)

221. MF are produced by the flow of electric currents. The level of a MF is commonly expressed as magnetic flux density in units called gauss (G), or in milliGauss (mG). The magnetic field level at any point depends on characteristics of the source, which can include the arrangement of conductors, the amount of current flow through the source, and its distance from the point of measurement. MF levels decrease rapidly with distance from the source but are not easily interrupted as they pass through most materials. (Council Administrative Notice Item No. 25; Eversource 1, Vol. 1, p. 7-1)

222. In the United States, no state or federal exposure standards for 60-hertz MF based on demonstrated health effects have been established. Nor are there any such standards established world-wide. However, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) has established a level of 2,000 mG, based on extrapolation from scientific experimentation, and the International Committee on Electromagnetic Safety (ICES) has calculated a guideline of 9,040 mG for exposure to workers and the general public. (Council Administrative Notice Item 29; Eversource 1, Vol. 1, p. 7-18 and 7-19)

223. In accordance to the Council's *Electric and Magnetic Fields Best Management Practices for the Construction of Electric Transmission Lines in Connecticut* guidelines (EMF BMP), Eversource is required to provide an analysis of recent scientific literature regarding MF exposure, an analysis of pre and post construction MF levels, and investigate 'no cost" and "low cost" transmission line design alternatives to reduce MF levels at the edge of a right-of-way and in areas of particular interest, as long as such designs do not compromise system reliability or worker safety, or environmental and aesthetic project goals. (Council Administrative Notice Item No. 25)

224. As required by the Council's EMF BMP, Eversource provided an analysis of recent scientific literature regarding MF exposure and determined there were no relevant changes in current research conclusions or the recommended exposure standards established by ICES and ICNIRP. (Eversource 1, Vol. 1, pp. 7-17 and 7-18)

225. As required by the Council's EMF BMP, Eversource examined the Project route to determine the location of any schools, daycare facilities, playgrounds, hospitals, and residential areas, as defined under C.G.S. § 16-50p(a)(3)(D), for specific MF analysis. There are no schools, hospitals, or playgrounds within 500 feet of the proposed transmission route. One licensed child care facility, the Family Tree Childcare and Learning Center, is located approximately 350 feet north of the proposed route at 41 West Hartford Road in Newington. The nearest residence to the proposed underground line segment is located at 79 Willard Avenue, approximately 28 feet away. The nearest residence to the proposed overhead line segment is located at 100 Day Street, Newington, approximately 155 feet away. (Eversource 1, p. 6-18; Eversource 4, p. 42; Eversource 7, response 4)

226. Field measurements of existing, pre-construction MF were taken on April 5, 2017. These field measurements represent only the MF at the time of measurement. MF levels vary constantly depending on the amount of power flowing through the line. (Eversource 1, p. 7-6)

227. Field measurements of existing MF around the perimeter of Newington Substation had a high reading of approximately 88 mG near existing distribution circuits near the northwest corner of the substation. (Eversource 1, Vol. 1, p. 7-7)

228. Field measurements of existing MF measured longitudinally along Avery Road under existing distribution circuits had a high reading of approximately 11 mG. (Eversource 1, Vol. 1, p. 7-8)

229. Field measurements of existing MF measured longitudinally along the Flatbush Avenue Bridge in West Hartford had a high reading of less than 1 mG. (Eversource 1, Vol. 1, p. 7-9)

230. Field measurements of existing MF around the perimeter of Southwest Hartford Substation had a high reading of approximately 17 mG. (Eversource 1, Vol. 1, p. 7-10)

231. The table below reflects the calculated magnetic field levels for the underground* portion of the proposed transmission line under average annual load (AAL) conditions.

Calculated Magnetic Field (mG)		
Left Edge of ROW	Max in ROW	Right Edge of ROW
0.3	63.0	3.3

*The All-underground Alternative would have magnetic field levels approximately the same as noted on this table.
(Eversource 1, Vol. 1, p. 7-11; Eversource 7, response 10; Eversource 4, pp. 43-45)

232. The table below reflects the calculated magnetic field levels near a splice vault under AAL conditions.

Calculated Magnetic Field (mG)		
Left Edge of ROW	Max in ROW	Right Edge of ROW
2.6	433.0	2.6

(Eversource 1, Vol. 1, p. 7-13; Eversource 4, pp. 43-45)

233. The table below reflects the calculated magnetic field levels for the overhead portion of the proposed transmission line under AAL conditions.

Calculated Fields near OH Line			
Field	Left Edge of ROW	Max in ROW	Right Edge of ROW
Magnetic Field (mG)	3.7	13.6	12.8
Electric Field (kV/m)	0.03	0.44	0.38

(Eversouce 1, Vol. 1, p. 7-14; Eversource 4, pp. 43-45)

234. The EMF BMP directs an Applicant to initially develop a baseline Field Management Design Plan that incorporates "no-cost" MF mitigation design features. The Applicant shall then study potential design alternatives by adding "low-cost" MF mitigation design features specifically where portions of the project are adjacent to residential areas, public or private schools, licensed child day-care facilities, licensed youth camps, or public playgrounds. The overall cost of "low-cost" design features are to be calculated at four percent of the initial Field Management Design Plan. The four percent guideline for "low-cost" mitigation should aim at a magnetic field reduction of 15 percent or more at the edge of the utility's ROW. This 15 percent reduction should relate specifically to those portions of the project where the expenditures would be made. (Council Administrative Notice Item No. 25)

235. Eversource's base Field Management Design Plan incorporates "no cost" magnetic field reduction measures, consistent with the Council's EMF BMP, through the use of taller structures. Eversource would utilize structures that are higher than would be typical because the design of the overhead segment of the transmission line accounts for Amtrak's plans for future electrification of its rail lines. This "no cost" design was used to develop the post-Project MF calculations. (Eversource 1, Vol. 1, pp. 7-14 and 7-16)

236. Although the post construction MF levels at the edge of the right-of-way are small compared with the guidelines from ICNIRP and ICES, Eversource examined the feasibility of "low cost" modification to the Field Management Design Plan. The MF associated with the overhead lines drop off sharply to background levels. Consequently, no further mitigation measures are recommended for the overhead segment of the proposed transmission line. With respect to the underground portions of the proposed transmission line, these underground segments would not provide sources of persistent exposure of MFs above background levels to people or inhabited structures. Thus, further mitigation measures for the underground portion of the line are not proposed. (Eversource 4, p. 46; Eversource 1, Vol. 1, pp. 7-11, 7-13, 7-14 and 7-19)

237. For underground line segments, the use of cancellation loops (as an engineering control to mitigation MF) would decrease MF above splice vaults, but it would increase MF at nearby residences. (Eversource 4, p. 46; Council Administrative Notice Item No. 25)

238. For the overhead line segment, the use of a delta configuration for the phase conductors (as an engineering control to mitigate MF) would actually result in slightly higher magnetic field levels than the proposed vertical configuration. A horizontal configuration would not fit within the Amtrak ROW. (Eversource 7, response 9; Eversource 4, p. 44; Council Administrative Notice Item No. 25)

239. The cost differential (of nearly $39 million) between the more expensive All-underground Alternative versus the proposed Project would exceed the recommend four percent cost allocation to achieve MF reduction. (Eversource 1, Vol. 1, p. 10-11; Council Administrative Notice Item No. 25; Tr. 1, p. 55)

240. At Newington Substation and Southwest Hartford Substation, EF would be unchanged as a result of the proposed Project modifications. MF would be unchanged except for those associated with the new underground transmission line entries into the substations. (Eversource 4, p. 45)

241. The reconfiguration of Newington Tap would not cause a measurable change in the EF or MF beyond the substation property. (Eversource 4, p. 45)

Public Safety

242. The proposed Project would be constructed in full compliance with the National Electric Safety Code, standards of the Institute of Electrical and Electronic Engineers, and the American National Standards Institute, good utility practice and applicable PURA regulations regarding the methods and manner of transmission line construction. (Eversource 1, Vol. 1, p. 4-1)

243. Protective relaying equipment would be incorporated into the new transmission line and substation designs to automatically detect abnormal operational conditions. Circuit breakers would automatically be triggered to isolate the faulted section of the transmission system. (Eversource 1, Vol. 1, p. 4-37)

244. Protective relay mechanisms include redundant primary and back up equipment to ensure continuous operational monitoring if some of the monitoring equipment was out of service. (Eversource 1, Vol. 1, p. 4-38)

245. The new transmission line design includes fiber optic cable that would be installed within the proposed underground transmission duct bank and at shield wire positions on the proposed overhead transmission line to allow for protective relay system communication. (Eversource 1, Vol. 1, p. 4-37)

246. Protection would also be provided by a Supervisory Control and Data Acquisition (SCADA) system. The SCADA system allows for remote control and equipment monitoring by the Connecticut Valley Electric Exchange (CONVEX) system operator. (Eversource 4, p. 48)

247. Smoke detection systems are already in place at both Newington Substation and Southwest Hartford Substation. If triggered, these detection systems would automatically activate an alarm at the CONVEX, where appropriate action would be taken. (Eversource 1, Vol. 1, p. 4-37 to p. 4-38)

248. To deter unauthorized entry to the substations, the existing substations are enclosed by a seven-foot high chain link fence topped with barbed wire. The new fence around the expansion areas at both substations would match existing fencing. Access to the substation compounds is through locked gates. Appropriate signage is in place around each substation indicating the presence of high-voltage equipment. (Eversource 1, Vol. 1, pp. ES-8, 4-38, 4-39 and 4-41)

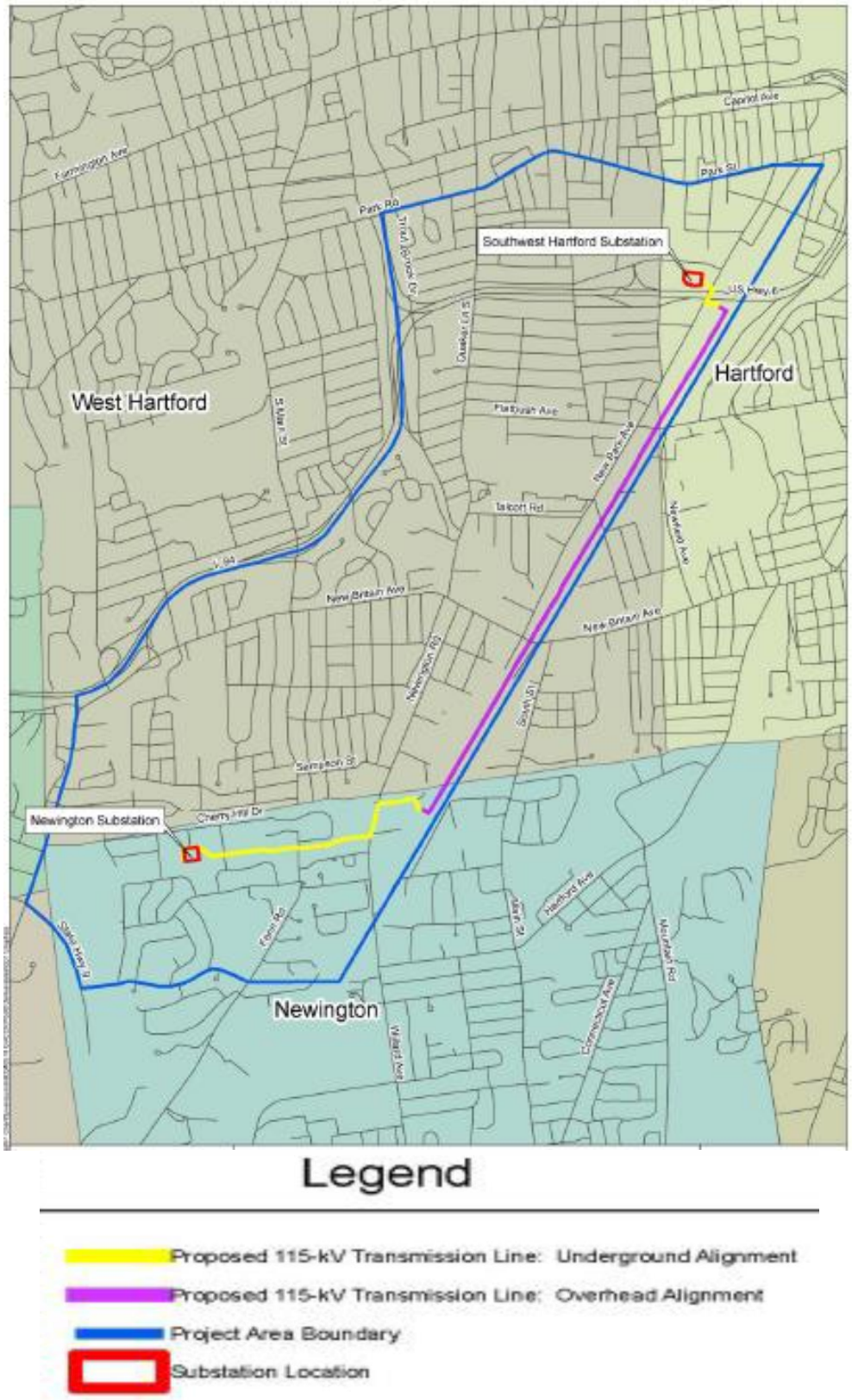
249. Physical security at Newington Substation and Southwest Hartford Substation is consistent with the Council's *White Paper on the Security of Siting Energy Facilities*. The white paper guidelines focused on security issues related to intentional physical destruction of substation equipment. (Council Administrative Notice Item No. 27; Eversource 1, Vol. 1, p. 4-38)

250. Low-level lighting is already installed within Newington Substation and Southwest Hartford Substation yards for safety and security purposes. Additional lighting to facilitate work at night under emergency conditions and during inclement weather is also already installed at both substations. (Eversource 1, Vol. 1, p. 4-38)

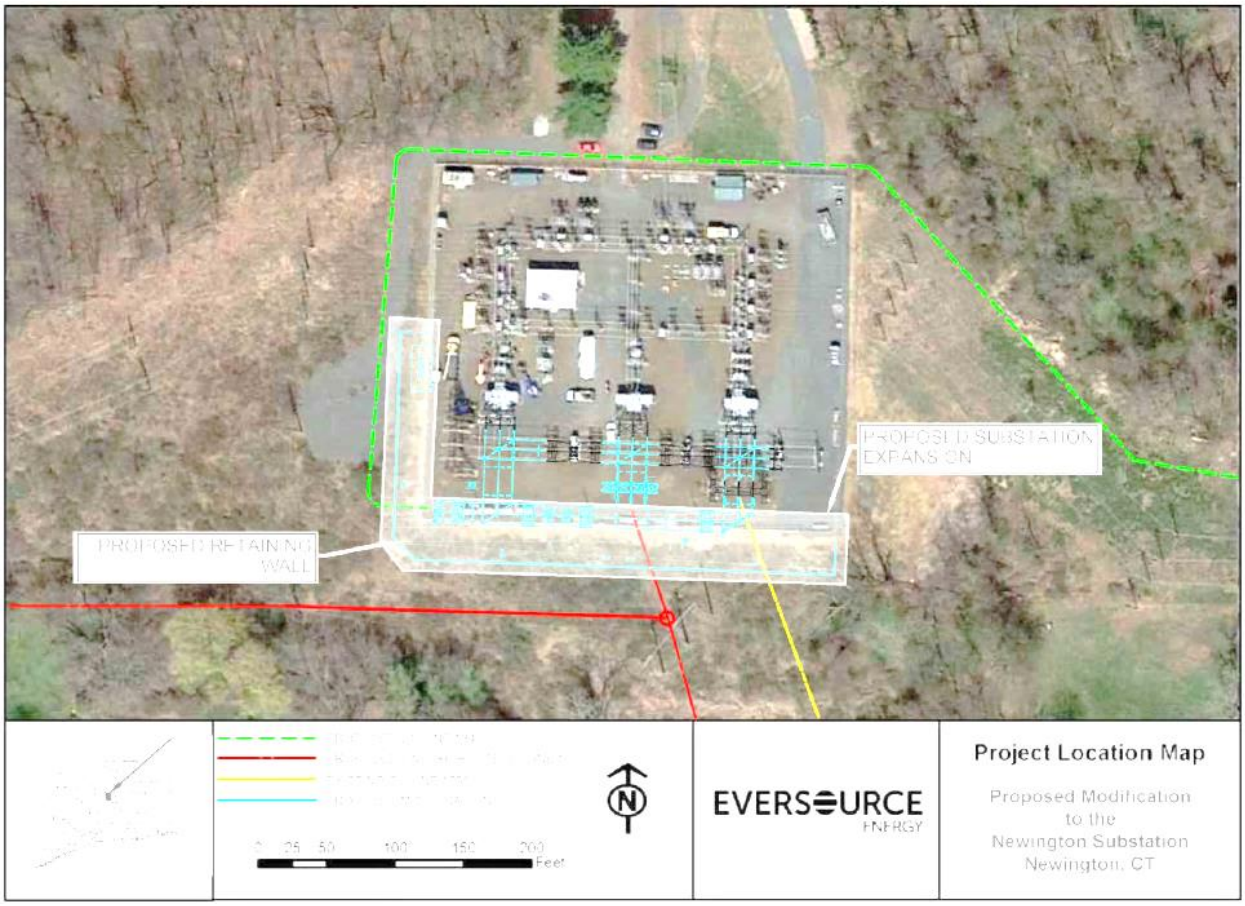
251. The overhead segment of the new line cannot be fenced off from the public. However, the setting of this overhead portion of the proposed transmission facility poses no particular security concern. Specifically, in the transportation corridor, the presence and activities of Amtrak and DOT personnel provide deterrents to attempted hostile activities. (Eversource 1, Vol. 1, p. 4-39 and 4-40)

252. Signs are installed at Newington Substation and Southwest Hartford Substation warning the public of the presence of high-voltage equipment. (Eversource 1, Vol. 1, p. 4-39)

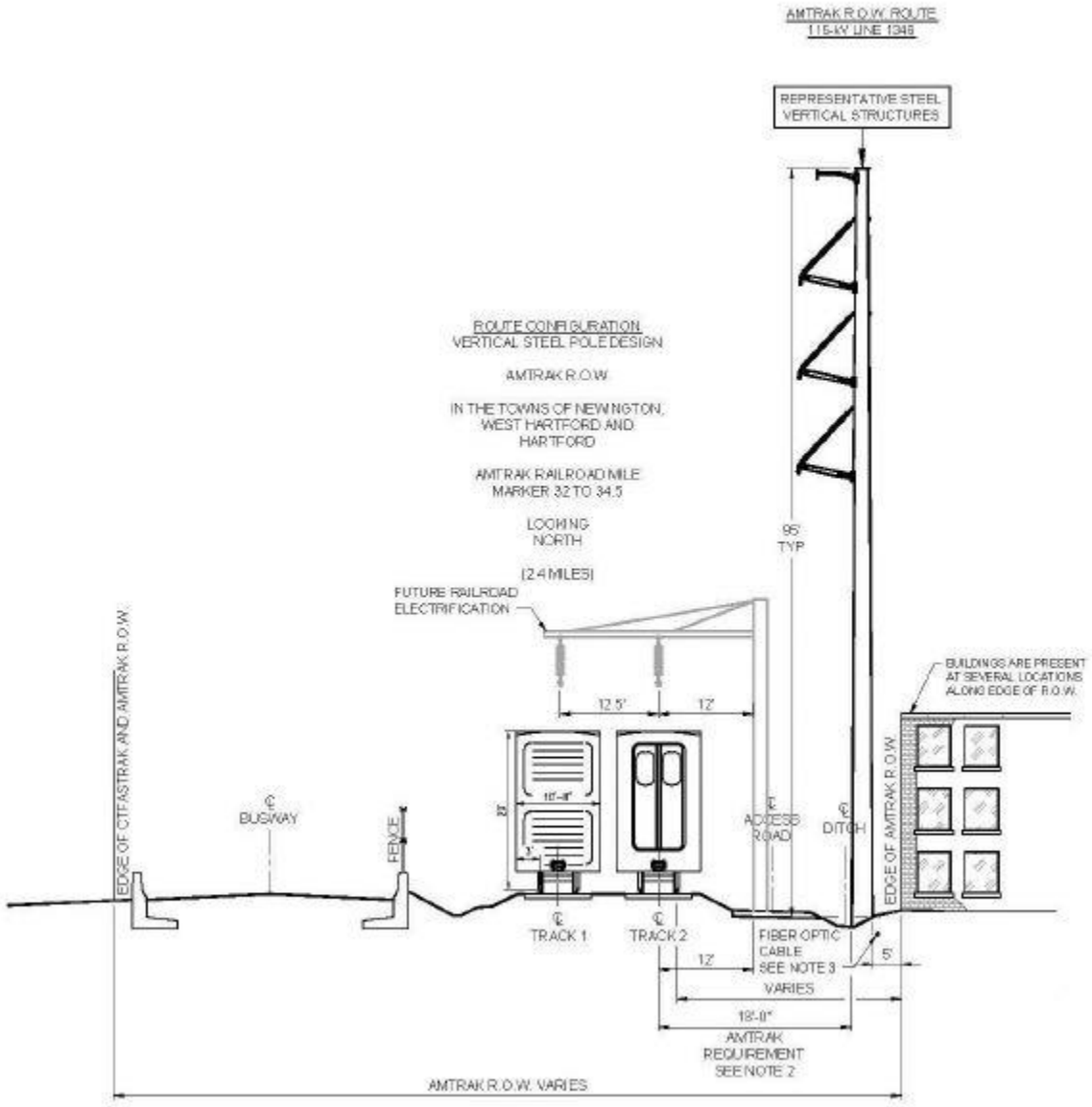
Attachment 1- Route Map (Eversource 1, Vol. 1, p. 3-2)



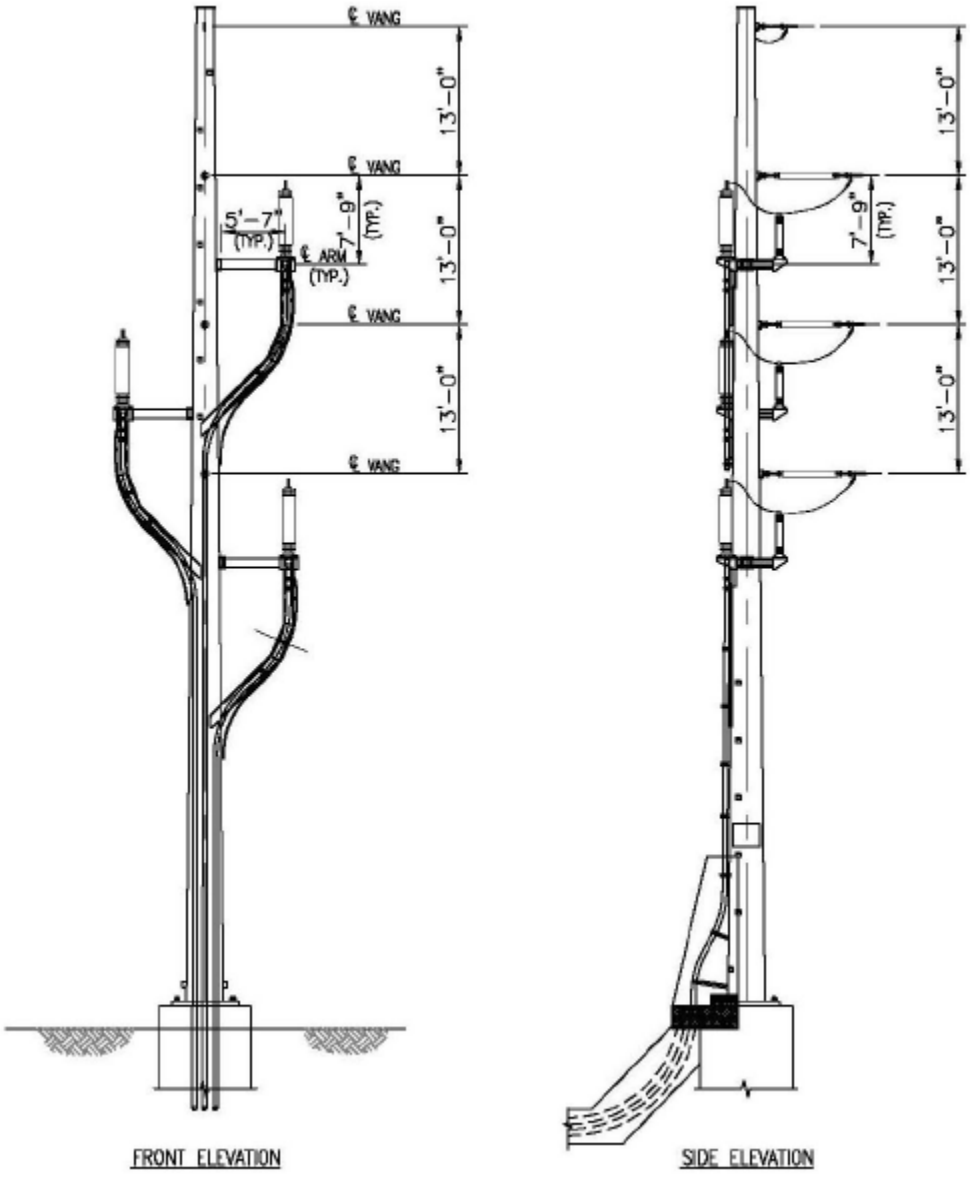
Attachment 2 - Aerial Photograph of Newington Substation (Eversource 1, Vol. 1, p. 3-19)



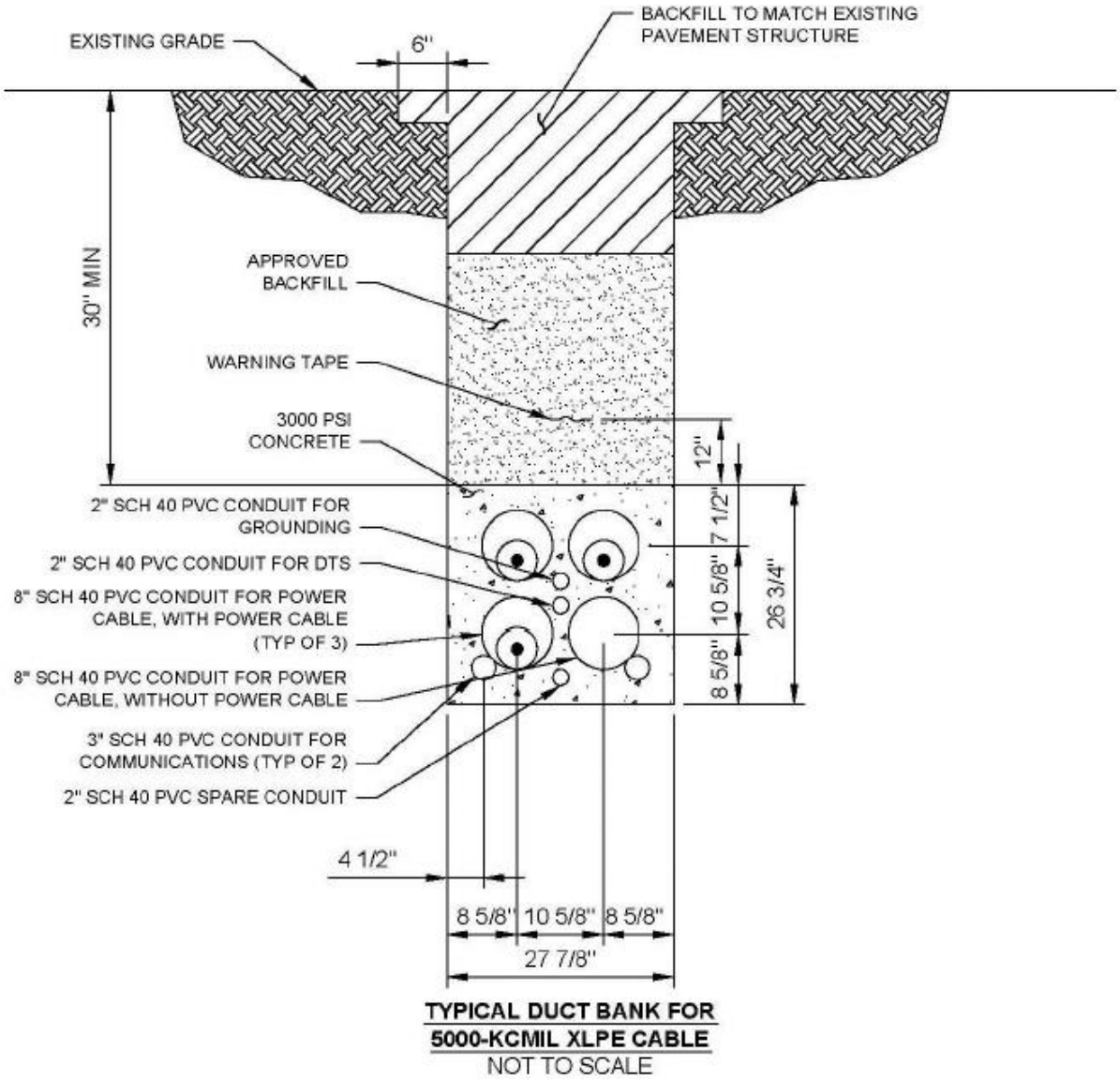
Attachment 3 – Typical Transmission Configuration along Amtrak ROW (facing north-northeast)
(Eversource 1, Vol. 1, p. 3-11)



Attachment 4 – Typical Transition Structure Configuration (Eversource 1, Vol. 1, p. 3-12)

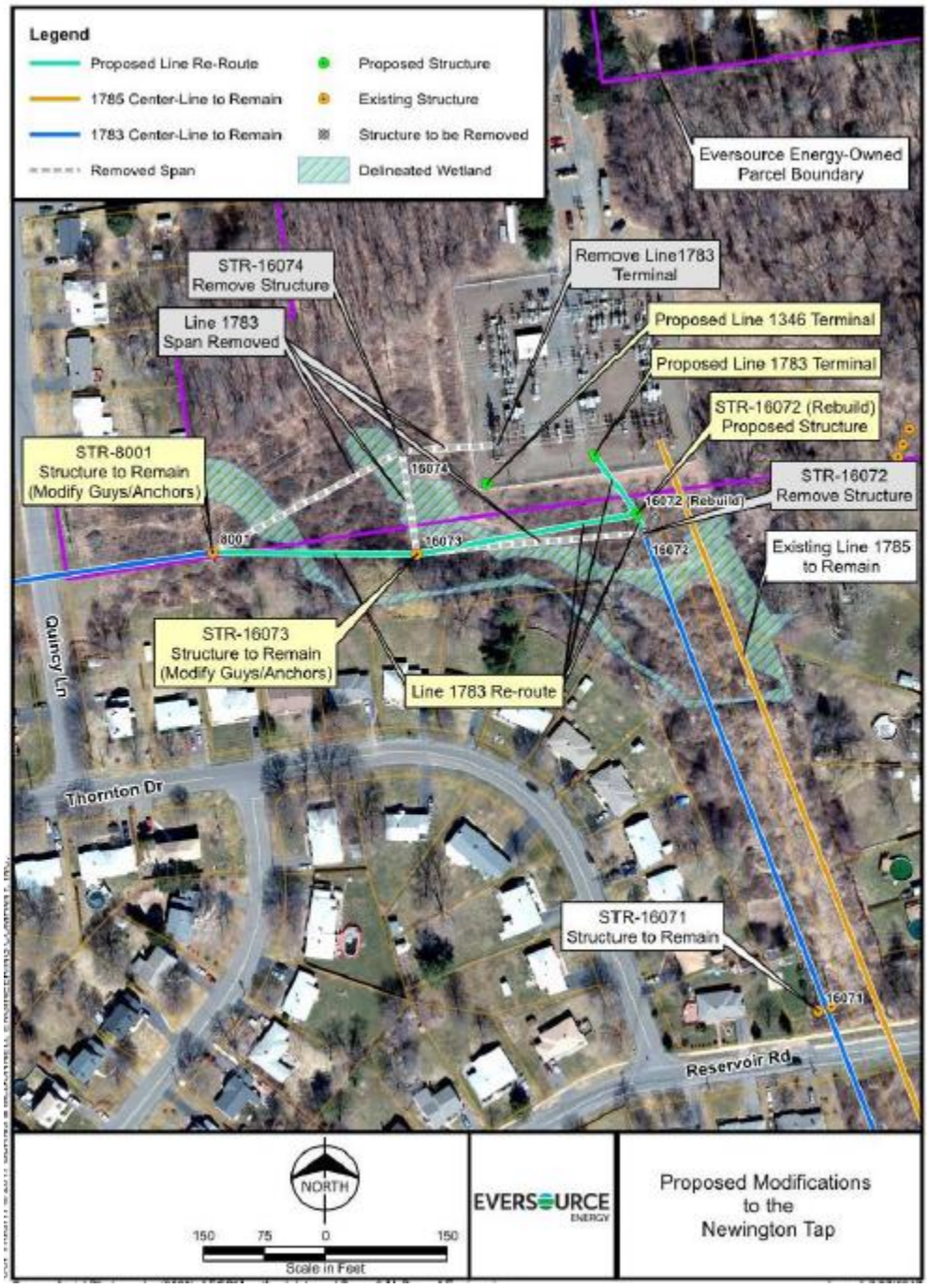


Attachment 5 – Typical Underground Cable Duct Bank (Eversource 1, Vol. 1, p. 3-15)



TYPICAL DUCT BANK FOR 5000-KCMIL XLPE CABLE
NOT TO SCALE

Attachment 6 - Aerial Photograph of Newington Tap (Eversource 1, Vol. 1, p. 3-22)



Attachment 7 - Aerial Photograph of Southwest Hartford Substation (Eversource 1, Vol. 1, p. 3-24)