Exhibit A:
Proposed Modified Project

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Contents

Table of Figures

Table of Tables

Exhibit A, Section A

Detailed Description of Proposed Modified Project

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A. Detailed Description of Proposed Modified Project

This *Exhibit A* supporting Eversource's Petition for Reconsideration describes the Proposed Modified Project, identifying the revised Project components, noting the differences between the original and presently proposed Project elements, and detailing the proposed construction procedures and environmental effects/mitigation measures for the Proposed Modified Project. *Exhibit B* of this document discusses an all-underground configuration preferred by the Town; the Alternate Modified Route.

The "Project Area" discussed in this Petition is within that which was the subject of Docket 461. It is generally bound to the west by the intersection of Railroad Avenue and Field Point Road; to the east by Cos Cob Substation; and to the north and south by the Proposed Modified Route and Alternate Modified Route, respectively.

The components of the Proposed Modified Project are illustrated in *Figure A-1*. Variations considered for the Proposed Modified Project also are described. Appendices to this Exhibit provide detailed information regarding the Proposed Modified Project, including the following:

- *Appendix 1: Supplemental Wetlands and Watercourses Report*
- *Appendix 2: Supplemental Cultural Resources Report*
- *Appendix 3: Environmental Agency Responses*
- *Appendix 4: Substation Drawings*
- *Appendix 5: Visual Simulations*
- *Appendix 6: 100-Scale Maps*
- *Appendix 7: Plan and Profiles and Cross Sections*
- *Appendix 8: EMF Calculations*

Further details concerning the Proposed Modified Project facilities would be provided in the Development and Management Plans (D&M Plans) for the Project. A D&M Plan is required by the Council subsequent to receipt of a Certificate and prior to the Council's issuance of approval for the commencement of construction of a Project. Assuming Council approval of the Proposed Modified Project, Eversource anticipates that it would prepare two D&M Plans: one addressing the transmission line construction and one focusing on the proposed Greenwich Substation and Cos Cob/Prospect substation facilities.

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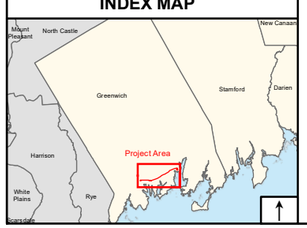
INDEX MAP



Legend

- Proposed Overhead Route
- Proposed Underground Route
- Railroad
- Proposed Greenwich Substation Location (290 Railroad Ave)
- Proposed Materials Staging Area (281 Railroad Ave)
- Existing Cos Cob Substation Location
- Existing Prospect Substation Location

1 inch = 650 feet

650 325 0 650 Feet

Base Map: ESRI Street Map

Exhibit A Figure A-1
Proposed Modified Route
Project Location

Greenwich Substation and Line Project
Greenwich, Connecticut

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

May 2017

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A.1 Proposed New Modified Greenwich Substation

As stated in Docket 461, Eversource proposes to locate the new Greenwich Substation at 290 Railroad Avenue. However, Eversource has reduced the scope and cost of the proposed substation primarily by switching from a gas-insulated station (GIS) to an open-air insulated station (AIS) design configuration, and installing two rather than three new transformers. The modifications to the proposed Greenwich Substation (herein after referred to as the Proposed Modified Greenwich Substation) are summarized in *Table A-1* and are compared to the substation proposed as part of the original Greenwich Substation and Line Project (GSLP). Preliminary plan and section views are included in *Appendix 4*. A visual simulation depicting the appearance of the proposed substation is contained in *Appendix 5*.

Table A-1, Greenwich Substation Components

PROPOSED MODIFIED PROJECT: GREENWICH SUBSTATION COMPONENTS		ORIGINAL GSLP PROJECT: SUBSTATON COMPONENTS (Revised or Eliminated)
Substation Components (Unchanged from the Original Project)	**Substation Components (new for the Modified Project)**	
Future mobile transformer position	AIS design	GIS design
Junction boxes and yard control boxes, connected to a pre-existing conduit raceway for control cable	One 115-kV circuit breaker	Six 115-kV circuit breakers in a ring bus configuration
	Two 60-megavolt ampere (MVA) transformers	Three 60-megavolt ampere (MVA) transformers
	Two 115-kV underground termination structures, each protected by a circuit switcher, two circuit switchers to protect the two transformers, two disconnect switches on each side of a tie breaker, and two neutral reactors (there is a position for a third underground termination structure and disconnect switch for the future)	Three terminations for Underground cables in the GIS (two incoming transmission lines and a future position), three circuit switchers, and three neutral reactors
	Two new 115-kV solid dielectric cross-linked polyethylene (XLPE) underground transmission line exits from two new terminal structures, approximately 15 feet in height	▪ Two new 115-kV High Pressure Fluid Filled (HPFF) underground transmission line exits to Cos Cob Substation ▪ A HPFF Pump Station (50 feet long by 12 feet wide by 12 feet high), and an emergency generator
	15-foot-tall brick veneer wall around the entire substation site	An architecturally embellished building (approximately 134 feet long by 33 feet wide by 33 feet high plus a 19-foot-long by 17-foot-wide by 16 foot-high-extension) to house the GIS, control room, battery room and toilet; a 20-foot-long by 20-foot-high screen wall along the southwest corner of the site to match the appearance of the building. The remainder of the distribution yard would be fenced in with an 8-foot-tall perforated metal fence
	One lightning mast approximately 65 feet in height	Air terminals[1] installed on the top of the Transformer firewalls and along the parapets of the GIS Building
	One 13.2-kV switchgear enclosure (85 feet long by 24 feet wide)	One 13.2-kV Switchgear enclosure (approximately 115 feet long by 24 feet wide by 13 feet high. NOTE: bus duct would enter the enclosure through the roof and add approximately 12 feet to the overall height)
	Control enclosure (approximately 42 feet long by 14 feet wide by 12 feet high with new protection and control equipment, a new battery system and a toilet installed inside	Control equipment, battery system and toilet located in the GIS Building (Control room dimensions would be approximately 30 feet long by 27 feet wide; the battery room and toilet would be contained in the 19 feet long by 17 feet wide by 16 feet high extension mentioned above)

[1] Air terminals perform the same lightning protection function as lightning masts.

A.2 Proposed Modifications to Cos Cob Substation

The existing Cos Cob Substation is located in the southeastern portion of Greenwich, off Sound Shore Drive. Eversource currently utilizes 0.47 acre of a 1.5-acre Eversource-owned property for its existing substation equipment and operation. In addition, Eversource also utilizes 0.59 acre of a 1.44-acre easement provided by the State of Connecticut. The Proposed Modified Project would require an approximately 0.80-acre expansion of the existing substation. The existing substation fence line would be moved to accommodate this expansion. This proposed expansion would not affect the adjacent Town of Greenwich fence that was installed to delineate the Cos Cob Park.

The proposed electrical changes to the Cos Cob Substation for the Proposed Modified Project are the same as detailed in the Docket 461 Project Application, except that Eversource has revised the footprint of the modifications. The developed portion of the substation would be expanded and the substation fence extended to avoid conflicts with an adjacent Town of Greenwich property. In addition, the Proposed Modified Project would include the installation of the following facilities, which were not included in the original GSLP plans:

- One 115-kV double breaker for the 1703 line.
- Reconfigure the existing 1020 line-terminal position to accommodate an in-line PASS M0.
- Two 65-foot-tall lightning masts.
- New retaining walls as required to protect the Town Park property line and the existing Metro North Railroad substation.

Table A-2 summarizes the other modifications proposed at Cos Cob Substation, which remain the same as detailed in the GSLP Application and the Council's Findings of Fact (FOF). Preliminary plan and section views for the proposed Cos Cob Substation modifications are included in *Appendix 4*.

Table A-2, Summary of Proposed Modifications to Cos Cob Substation

SUMMARY OF PROPOSED MODIFICATIONS TO COS COB SUBSTATION
Proposed New Facilities (Remain the same as described in the Original Application)
▪ Expand the existing ring bus to install a new 1703 line underground termination position. ▪ Reroute the 1750 line to facilitate the expansion. ▪ Install one new 85-foot-tall monopole and a new 58-foot-tall terminal structure to facilitate relocating the 1750 transmission line. ▪ Install one steel structure and accessory equipment to reconstruct the mobile transformer position. ▪ Install underground conduits and duct banks for communication and control cables. ▪ Install relays, and, control and communication equipment within the existing control enclosures. ▪ Extend the substation's existing ground grid, grading as appropriate to accommodate stormwater management controls.
Proposed Equipment to be Removed (Remain the same as described in the Original Application)
▪ Two steel A-Frame line structures and one wood H-frame structure. ▪ One lattice communication/transmission line structure. ▪ Strain overhead bus sections. ▪ One line trap. ▪ One manual disconnect switch. ▪ One wood pole structure with guy wires.

A.3 Prospect and Byram Substations

The proposed modifications to the Prospect Substation remain as described by the Council in FOF No. 274 in Docket 461. In contrast to GSLP, the Proposed Modified Project would leave Byram Substation in service with no modifications.

A.4 Transmission Supply Lines

For the Proposed Modified Project, Eversource proposes to install two new 115-kV transmission circuits (designated as the 1020 and 1703 circuits) in a hybrid overhead and underground configuration, generally consistent with the Council's description of the "Hybrid Alternative" in its Findings of Fact and its Opinion in Docket 461, which Eversource has since "fully vetted" and designed. The two circuits would extend approximately 2.1 miles from Cos Cob Substation to the proposed Greenwich Substation.

Approximately 1.5 miles (71%) of the 2.1-mile transmission line route would be aligned on property owned by the Connecticut Department of Transportation (ConnDOT) and occupied by MNR New Haven Line. Along this route segment, the new 115-kV line would be configured overhead. *Table A-3* provides a summary of the various overhead cross sections within the right-of-way (ROW) in addition to the cross-section drawings in *Appendix 7*. The remaining 0.6 mile of the Proposed Modified Route would consist

of underground 115-kV cable, which would be located primarily along public roads. This alignment, referred to as the Proposed Modified Route, is illustrated in detail on the 1"=100' scale maps (100-Scale Maps) included in *Appendix 6*.

Table A-3, Summary of Overhead Line Cross Sections

Cross-Section Identification	Description
XSECT-1	Transition Structures east of Steamboat Road
XSECT-2	Structure 14001, South Side of ROW
XSECT-3	Structures 14002-14003, South Side of ROW
XSECT-4	Structures 14004-14005, South Side of ROW
XSECT-5	Structures 14006-14007, South Side of ROW
XSECT-6	Structures 14008-14009, South Side of ROW
XSECT-7	Structures 14010-14012, South Side of ROW
XSECT-8	Structures 14013-14014, crossing between north and south side of ROW at Indian Field Road
XSECT-9	Structure 14015, North Side of ROW
XSECT-10	Structure 14016, North Side of ROW
XSECT-11	Structure 14017, North Side of ROW, Crossing of I-95
XSECT-12	Structures 14018-14019, crossing between north and south side of ROW at Sound Shore Drive

A.4.1 115-kV Underground Line Segments: Cable Type, Size, and Specifications

Two separate segments of the 115-kV transmission facilities, one at Cos Cob Substation and one extending into the proposed Greenwich Substation, would consist of underground cable. Specifically, underground cable would be used for two separate single-circuit 0.1-mile exits out of Cos Cob Substation and a 0.5-mile double-circuit 115-kV line segment that would extend from approximately 260 feet east of Steamboat Road to the proposed Greenwich Substation.

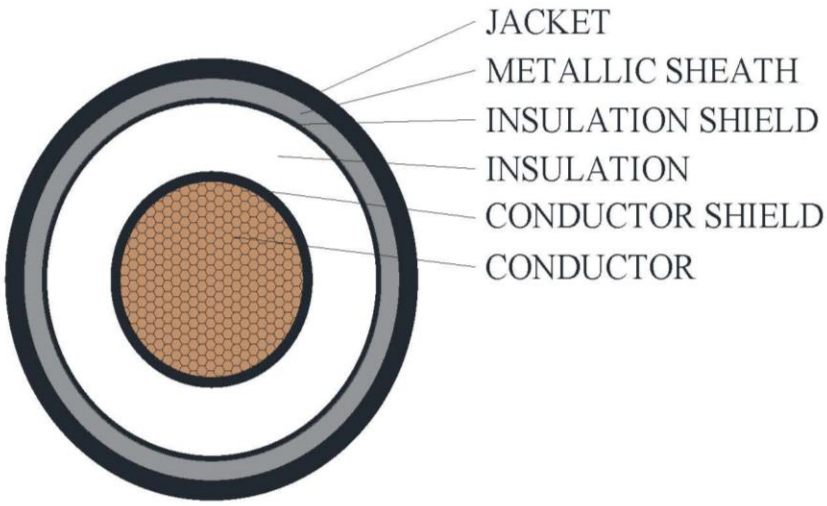
The underground cable segments would consist of cross-linked polyethylene (XLPE), solid dielectric cable system. No splice vaults would be required along either of the underground cable segments. Above-ground transition structures would be required where the underground cable segments would connect to the overhead portion of the 115-kV lines.

A.4.1.1 Cos Cob Substation Line Exits

The Proposed Modified Project's two 0.1-mile underground 115-kV transmission line exits at Cos Cob Substation would each comprise of three phases (or cables) and be installed one cable per duct for a total of three ducts. Each circuit would be located in a separate trench between the substation and proposed transition structures east of Sound Shore Drive, east of the MNR overpass.

Each phase of the circuit would consist of one 3500-kcmil copper-conductor cable insulated to 115-kV with approximately 750 mils of XLPE insulation. Each cable would be approximately 4 inches in diameter.

Figure[2] *A-2* provides a cross section of a typical copper-conductor XLPE 115-kV cable. Three electric cables would be installed in PVC ducts encased in concrete. Smaller conduits would also be installed for communications, temperature monitoring, and ground continuity cables. *Appendix 7* illustrates a typical underground duct bank cross section for this underground segment.



Item	Description	Outer Diameter (inches)
Conductor	Segmented, stranded and compacted copper; watertight	2.00
Conductor Shield	Supersmooth semiconducting copolymer compound	2.20
Insulation	Extruded Solid Dielectric Compound	3.60
Insulation Shield	Supersmooth semiconducting copolymer compound	3.70
Metallic Sheath	Extruded Lead Sheath (Alloy E) or copper shield wires with copper laminate tape	4.10
Jacket	Black Polyethylene with semiconducting coating	4.50

Figure A-2, 3500-kcmil Copper Conductor 750 mil XLPE 115-kV Cable Cross Section

A.4.1.2 Steamboat Road to Proposed Greenwich Substation

The proposed 0.5-mile underground 115-kV transmission system segment, which would extend from approximately 260 feet east of Steamboat Road to the proposed Greenwich Substation, would consist of the double-circuit XLPE cable system described above.

[2] All drawing details within this document are preliminary and are not intended to be used for construction at this time.

A.4.2 115-kV Overhead Line Segment

The proposed overhead 115-kV transmission line segment, composed of two circuits, would consist of three phase conductors per circuit. Each phase conductor would be comprised of one 556,500 circular mil (556.5-kcmil) Aluminum Conductor Steel Supported.

The new line would be protected by two optical ground wires (or OPGW), a shield wire containing optical glass fibers for communication purposes.

Overhead Configuration

The proposed 115-kV transmission line would be located entirely within the ConnDOT rails/Metro North Railroad (MNR) ROW, differing from the description of the "Hybrid Alternate" Route in the Council's Docket 461 where it was stated that some private property easements would be required. The width of the railroad corridor ranges from approximately 90 feet to 270 feet and includes four rail lines. From Cos Cob Substation, the proposed 115-kV line would head west and be situated on the north side of the corridor from new structures 14018 to 14014, cross the MNR ROW and continue on the south side of the rail corridor until transitioning to an underground configuration approximately 260 feet east of Steamboat Road (refer to *Appendices 6 and 7*).

As illustrated in *Appendix* 7, the majority of the proposed 115-kV overhead transmission line would be supported on galvanized steel double-circuit monopole structures in a vertical configuration and extend for approximately 1.5 miles. The overhead line would be comprised of 22 structures, four of which would be transition structures. At each overhead-to-underground transition location, two single-circuit monopoles would be utilized for the transition. In response to a request from the Town of Greenwich, Eversource has located the westernmost transition structures as far as technically possible from Steamboat Road – approximately 260 feet east of the road. The other proposed transition structures are adjacent to Sound Shore Drive (just south of the rails corridor).

Of the new structures, approximately half would be direct-buried tubular steel monopoles and half would be drilled shaft-supported tubular steel monopoles. The direct-buried structures would have a typical height of 105 feet, whereas the drilled shaft-supported structures would have a typical height of 120 feet. Cross sections depicting the typically proposed structures are included in *Appendix 7*.

Line Design Voltage and Capacity

The proposed transmission line cables will be designed to operate at a nominal voltage of 115,000 volts and would provide approximately 192 megavolt amperes (MVA) of summer normal line capacity. The overhead transmission lines will have a summer normal capacity of 223 MVA.

Overhead Line Proposed Structure Locations

The proposed location for each transmission line structure was determined using transmission line design software (Power Line System's PLS-CADD™) and LiDAR[3] data obtained from aerial flight in February 2016 in addition to incorporating input from ConnDOT Rails and MNR.

The new transmission structures are proposed to be placed parallel to the MNR tracks and will be located in close proximity to I-95. For the majority of the transmission structures, the proposed height of each structure is not determined by necessary ground clearance requirements. Rather it is governed by the railroad's parallel catenary structures and required horizontal clearances from the railroad's power feeders and signal feeders. Adequate clearance is required so as not to provide working clearance for MNR personnel to maintain power and communication systems without an outage of the ES transmission lines.

Due to the unique circumstances, Eversource performed an analysis to determine the optimal span length for minimizing conductor blowout to adjacent MNR facilities, while reducing structure height and limiting structure cost as much as possible. Based on this analysis, an approximate span length of 425 feet was determined to satisfy these requirements and provides the best overall balance to address these considerations.

Eversource met with representatives of both MNR and ConnDOT to discuss the Proposed Modified Project and to solicit feedback on the proposed design. As a result of these meetings, adjustments were made to the Proposed Modified Project line design. Specifically, in response to ConnDOT requests, Eversource:

- Relocated proposed structures 14018, 14019A, and 14019B to the east to avoid possible future expansion of the Cos Cob Train Station platforms (refer to the *Appendix 6* maps).
- Increased the clearance between the transmission conductor and MNR's power and signal feeders.

[3] LiDAR is an acronym for Light Detection and Ranging. It is a technology that utilized lasers to determine the distance to an object or surface. LiDAR is similar to radar, but incorporates laser pulses rather than sound waves. It measures the time delay between transmission and reflection of the laser pulse.

Structure locations may further change as the Project design process continues and could result from more detailed information obtained from further field studies (e.g., subsurface investigations, final engineering and environmental surveys, constructability reviews). Once this additional information has been evaluated, final, detailed line engineering would be performed to determine the exact locations of the new structures.

A.4.3 Distribution Feeder Relocation

The scope of the relocation of the distribution feeder system from the existing Prospect Substation to the proposed Greenwich Substation remains the same as the original GSLP.

A.4.4 Construction and Operations/Maintenance Procedures

A.4.4.1 Underground Line

The XLPE cable design planned for the Proposed Modified Project would be essentially the same as specified for the Hybrid Alternative in Docket 461 with the following exceptions. The construction, operation and maintenance procedures for the cables would:

- Require a trench approximately 2 feet wide by a minimum 5 feet deep for each single-circuit duct bank, and approximately 3.5 feet wide by a minimum 5 feet deep for the double-circuit duct bank. In comparison, the dimensions of the HPFF trench proposed in the GSLP were 4.5 feet wide by 5.5 feet deep, with splice vaults, requiring excavations of about 16 feet wide by 12 feet deep by 24 feet long, proposed (on average) every 1,500 to 2,000 feet.
- Not require any splice vaults and associated splicing activities.
- Not require any horizontal direction drilling (HDD).

A.4.4.2 Overhead Construction and Operations/Maintenance Procedures

A.4.4.2.1 Introduction and Overview of Construction Sequencing

Eversource would construct the overhead transmission line segment of the Proposed Modified Project in several stages, some overlapping in time. To avoid or minimize the potential for disruption to railroad service, Eversource anticipates that some construction activities, such as structure erection and stringing work, would be limited to the hours of 1 AM to 4 AM Monday through Saturday. MNR communicated this timeframe during its consultations with Eversource.

The list below summarizes the activities, materials, and equipment generally expected to be involved in the construction of the overhead transmission line facilities. More details about each primary overhead line construction activity are included in the subsections that follow.

- Survey and stake the ROW boundaries and monument line (where necessary), vegetation clearing boundaries, and proposed structure locations.
- Mark the boundaries of previously delineated inland/tidal wetland and watercourse areas.
- Establish construction field office area(s), typically including space for office trailer(s), equipment storage and maintenance, sanitary facilities, and parking.
- Prepare material storage site (e.g., storage, staging and laydown areas) to support the construction effort. The proposed location for the material storage site is at 281 Railroad Avenue.
- Perform vegetation clearing. Vegetation would be removed along those portions of the railroad corridor to be used for the construction of the overhead 115-kV line segment, as well as adjacent areas that contain undesirable, tall-growing, woody species that could reach heights that would interfere with the future operation of the line. Vegetation would be removed to the designated limits of clearing as required, including at work sites (work pads), as well as along existing or new access roads including off ROW access required to reach the ROW. In addition, as authorized by its easements or permission from the landowner, hazard trees outside the limits of clearing would be removed as necessary to protect the integrity of the proposed transmission lines. Vegetation removal activities typically require flatbed trucks, brush hogs or other types of mowing equipment, skidders, and bucket trucks for canopy trimming, tree shears for larger trees, wood chippers, log trucks, and chip vans. Effects on wetlands, watercourses, or other environmentally sensitive areas would be minimized to the extent practicable (refer to *Section C* for a discussion of potential mitigation measures). Vehicles with tracks or low-ground-pressure tires may be used to remove vegetation in the one affected wetland. In addition, depending on soil saturation, vegetation removal activities in wetlands may include the use of temporary timber mats or equivalent to provide a stable base for clearing equipment or hand cutting to avoid any vehicular access.
- Install erosion and sedimentation (E&S) controls in accordance with best management practices and in particular the requirements of Eversource's Best Management Practices Manual for Massachusetts and Connecticut (Construction and Maintenance Environmental Requirements), September 2016 (Eversource BMP Manual). Typically, controls are deployed using pickups and other small trucks, or small track vehicles). After vegetation removal, soil erosion and sedimentation controls typically are installed around work limits (e.g., access roads, work pads) in or near wetlands and streams.
- Construct new access roads or improve existing access roads to provide a minimum travel-way of 12 to 16 feet in width. This typically requires bulldozers or front loaders, excavators, dump trucks for crushed stone or gravel, pickups or stake-body trucks for culverts, and/or mat installers

for wetland mats. Access roads may be temporary (for use during construction only) or permanent (for use during both construction and the subsequent maintenance of the lines). Temporary roads may be constructed of timber mats or gravel, whereas permanent access roads are generally constructed of gravel only. Roads must have sufficient width and capacity for heavy construction equipment for both over-the-road and off-road vehicles, including oversized tractor trailers. The need for access by flat-bed trailers and concrete trucks often determines the scope of access road improvements. In addition, temporary lane closures on I-95 and special procedures would likely be required for some access road construction between structures 14002 and 14006.

- Prepare level work (crane) pads as necessary at new structure sites, conductor pulling sites, and guard structure sites. Work pads would be located within the ROW (refer to the *Appendix 6* maps.) Work pad installation may involve grading and requires the installation of a stable base (consisting of gravel, timber mats, or equivalent) for drilling and other equipment.
- Construct structure foundations and erect/assemble new structures. This activity requires flat-bed trucks for delivering new structure components, new hardware, and augers, other trucks for hauling reinforcing steel rods, drill rigs, cranes, concrete trucks for structures that require concrete for foundations, dump trucks for structures that require crushed rock backfill, and bucket trucks. Dump trucks are also needed for foundation work to remove excess excavated material. In wet conditions or if groundwater is encountered during excavation, pumping (vacuum) trucks or other suitable equipment would be used to pump water from the excavated areas. The water then would be discharged in accordance with applicable local, state, and federal requirements. Excavated material will be disposed off-site in accordance with Eversource specifications and applicable regulatory requirements. Install counterpoise, where needed. Depending on site-specific soil conductivity, supplemental grounding will be installed. A Ditch Witch® (or similar) is typical equipment used for this activity.
- Install OPGW and conductors. The equipment required for these activities would include conductor reels, conductor pulling and tensioner rigs, and bucket trucks. Helicopters also may be used to install the initial pulling lines for the conductors or shield wires.
- Remove temporary roads and construction debris and stabilize disturbed sites. Haul construction debris from work sites for appropriate disposal.
- Maintain temporary erosion and sediment controls until vegetation is re-established or disturbed areas are otherwise stabilized. Culverts or crushed stone fords installed along access roads would be either left in place or removed pursuant to regulatory approvals. After site stabilization is

achieved, all temporary erosion and sedimentation controls that are not biodegradable (e.g., geotextile material, twine, stakes) would be removed from the ROW and disposed of properly.

A.4.4.2.2 Material Staging, Storage Sites, and Contractor Yards

To support the construction of the proposed 115-kV transmission line, a temporary contractor yard and a staging and storage site would be necessary. The proposed location for the material staging and storage site is an Eversource-owned property located at 281 Railroad Avenue near the Proposed Modified Project Area. The proximity of this proposed staging and storage site to the Project would facilitate construction efficiency and minimize the potential nuisance effects to the public (e.g., as a result of the movement of equipment, manpower, and supplies to and from the ROW along public roads).

If it is determined that additional material staging and storage site(s) would be necessary to support Project construction, other properties may be evaluated as potential sites. If Eversource-owned properties are not available or suitable, previously developed sites (such as parking lots, previously used commercial or industrial properties) or vacant land would be evaluated, taking into consideration parcel size requirements and location in relation to the Proposed Modified Route. Depending on the location and past use, some work may be required to prepare the site for use as a material staging and storage location. Such site preparation work may include vegetation removal, grading, adding gravel, installing fencing, and installing crushed stone anti-tracking pads at vehicular access points from public roads.

Contractor yards provide construction field headquarters for both the contractor and Eversource's construction field representatives, engineers, and other Project personnel. Typically, such contractor yards are located in existing commercial or industrial facilities near the Project. These sites typically would consist of office and storage/equipment trailers, associated parking areas, and portable sanitary facilities and are frequently co-located with other construction support sites, such as staging or storage areas. At the completion of the Project, the office trailers and other construction support equipment or materials would be removed, and the area would be restored pursuant to landowner agreements, as applicable.

The Project construction contractor(s) would be responsible for identifying and presenting for Eversource's review, any additional temporary sites (contractor yards) from which to stage their work activities (e.g., typically including space for an office, equipment and vehicle parking, employee reporting). Following the selection of the contractor(s), Eversource would review and approve any

proposed temporary contractor yards, and then would submit these locations to the Council for its review and approval.

A.4.4.2.3 Right-of-Way Preparation

Along with the installation or improvement of access roads (refer to *Section A.4.4.2.4*), ROW preparation constitutes the first step in the transmission line construction process. ROW preparation activities typically involve vegetation removal and the associated deployment of E&S controls. In addition, during this phase of construction, exclusion fencing or other types of boundary markings are typically installed to demarcate areas of restricted construction access or environmental sensitivity.

A.4.4.2.3.1 Temporary Erosion and Sedimentation Controls

Temporary E&S controls would be deployed as appropriate to minimize the potential for eroded soils or sedimentation to impact water resources during construction. Temporary E&S controls (e.g., silt fence, hay/straw bales, filter socks, mulch, and seeding) would be initially installed as practicable prior to and/or during vegetation clearing operations, and deployed during any work involving soil disturbance, in compliance with the *2002 Connecticut Guidelines for Soil Erosion and Sedimentation Control* and Eversource's BMP Manual. In addition, temporary erosion and sedimentation controls (e.g., silt fence, straw/hay bales), orange construction fencing, or signs/flagging may be deployed after vegetation removal to demarcate the limits of work within sensitive environmental areas (i.e., limits of access roads, work pads).

The controls would be maintained (i.e., sediment build up removed, fencing repaired and replaced as necessary) throughout the construction period, until disturbed areas are re-vegetated or otherwise stabilized. After stabilization is achieved, the E&S controls would be removed.

The need for and extent and location of temporary E&S controls would be a function of such considerations as:

- Slope (steepness, potential for erosion, and presence of environmentally sensitive resources, such as wetlands or streams, at the bottom of the slope).
- Type of vegetation removal method used and the extent of vegetative cover remaining after clearing (e.g., presence/absence of understory or herbaceous vegetation to minimize the potential for erosion and degree of soil disturbance as a result of the clearing equipment movements).
- Type of soil.
- Soil moisture regimes.
- Schedule of future construction activities.

- Proximity of cleared areas to water resources, roads, or other sensitive environmental resources.
- Time of year. The types of erosion and sedimentation control methods would depend on the time of year construction work is initiated and completed. For example, re-seeding is typically ineffective during the winter months. In winter, with frozen ground, controls other than re-seeding (such as wood chips, straw and hay, geotextile fabric, erosion control logs) typically would be deployed or maintained to control erosion and sedimentation and thus to stabilize disturbed areas until reseeding can be performed under optimal seasonal conditions.

A.4.4.2.3.2 Vegetation Removal, Including Tree Clearing

Vegetation Clearing Requirements and Estimates

Vegetation would need to be removed to allow access for construction equipment at each structure location, to provide sufficient and cleared access roads and spurs to structure sites, to provide the required electrical clearance to the proposed line.

Generally, all tall-growing tree species would be removed from the managed portion of the ROW and low-growing tree species and taller shrub species would be retained in the areas outside of the conductor[4] zones (the area directly under the conductors extending outward a distance of 15 feet from the outermost conductors).

The cross sections included in *Appendix 7* illustrate the location of the proposed transmission line along each ROW segment, along with expected clearing requirements. In addition to the clearing that would be within the MNR ROW, additional vegetation removal would be needed on adjacent ConnDOT (highway) property to satisfy conductor blowout clearance requirements.

For the construction of the proposed overhead transmission facilities, undesirable, tall-growing, woody species within the MNR and ConnDOT Highway ROWs, as identified in *Table A-4*, would be removed. Overall, approximately 5.5 acres of clearing would be performed within the MNR ROW.

In selected cases, certain desirable, low-growing trees may be kept on the ROW in specific locations and only trimmed to ensure adequate clearance from wires and structures, pursuant to Eversource's *Right-of-Way Vegetation Initial Clearance Standard for 115-kV and 345-kV Transmission Lines*.

[4] The term "conductor" is used interchangeably with "line" throughout this document.

Table A-4, Summary (by Cross-Section) of Total ROW Widths and Additional New Vegetation Clearing Widths Required for the Proposed 115-kV Transmission Line

Cross-Section Reference (refer to *Appendices 6* and *7*)	Total MNR (ConnDOT Rails) ROW Range of Widths (feet)	Estimated Range of New Vegetation Clearing along MNR ROW (feet, typical)	Estimated Range of New Vegetation Clearing along ConnDOT Highway ROW (feet, typical)
XSECT -1	140-150	40	20-30
XSECT -2	125-140	40	20-30
XSECT -3	110-125	20-40	20-30
XSECT -4	95-110	0-20	25-30
XSECT -5	95-105	0-15	25-30
XSECT -6	90-100	0-10	15-25
XSECT -7	125-150	0-30	15-30
XSECT -8	150-165	40-60	0-25
XSECT-9	175	0-45	0-15
XSECT-10	175	0-45	0
XSECT-11	230-270	0-45	0
XSECT-12	270	0-45	0

Vegetation Clearing Methods

Vegetation would be typically removed from the proposed transmission line construction workspace using mechanical methods. Where necessary, Eversource will require the selected vegetation clearing contractor to use low-impact tree clearing means and methods to remove forested vegetation.

During vegetation removal, timber mats or equivalent may be used to provide a stable base for clearing equipment across or within wetlands along the MNR ROW. Such temporary support would minimize rutting in wetlands and would be removed after the clearing activities are completed. The locations where temporary support would be required would be determined in the field, based on site-specific conditions (e.g., soil saturation) present at the time of construction, and may not be the same as the permanent or temporary access roads illustrated on the *Appendix 6* maps.

Where removal of woody vegetation is required, vegetation would typically be cut to within 3 inches of ground surface to the extent possible. Where practical, trees would be felled parallel to and within the ROW to minimize the potential for damage to surrounding vegetation.

Eversource would direct the Project contractor to retain lower growing vegetation along stream banks and within wetlands, to the extent possible. In general, Eversource may alter to some degree vegetation management activities in the following areas, provided that the construction and operation of the facilities remains in accordance with national transmission line vegetation management standards and consistent with Project permits and approvals:

- Areas of visual sensitivity where vegetation removal may be limited for aesthetic purposes;
- Indian Harbor;
- Residential areas where maintained landscapes do not interfere with the construction, maintenance, or operation of the transmission lines.

A.4.4.2.4 Access Roads

Contiguous access along the existing MNR ROW is generally not necessary for the construction of the proposed 115-kV overhead transmission line, although access to each proposed transmission structure location is required. Existing MNR access roads would be used for the construction of the Project wherever possible. Some new access roads would be needed only during construction and thus would be used temporarily, whereas other access roads would be required permanently for the long-term operation and maintenance of the proposed transmission lines. Access roads anticipated for the proposed Project are illustrated on the maps in *Appendix 6*.

Where access roads intersect with public roads, rock aprons or equivalent would typically be installed to minimize tracking of dirt from the ROW onto the public road as a result of construction vehicle movements. Public roads in the vicinity of access roads may also be periodically swept to remove dirt that is tracked from construction activities. Typically, at points of intersection with public roads, Eversource would also install signage that specifies that the access roads are for construction purposes and are restricted from use by public vehicular traffic.

Most of the existing MNR access roads would have to be improved, widened, or otherwise modified to be used safely and effectively during Project construction with a stable base and grades that typically must be 10% or less.

Access road improvements typically include clearing adjacent vegetation and widening roads as needed to provide a minimal travel surface approximately 12 to 16 feet wide (additional width would be needed at turning or passing locations). Access roads would be graveled. Erosion and sedimentation controls would be installed as necessary before the commencement of any improvements to or development of access roads.

Access to the MNR ROW would be provided by the existing network of public roads in Greenwich. Based on a review of public roads in the Project Area, Eversource identified the roads listed in *Table A-5* as providing primary access to the transmission line ROW.

Table A-5, Proposed Public Road Access to ROW

1"=100' Aerial Map Sheet No. (*Appendix 6*)	Access to ROW via the following City Streets or Sites
1	Cos Cob Park Driveway (existing access to MNR ROW)
1	Sound Shore Drive
1	Station Drive
2	Sachem Road (existing access to MNR ROW)
2	Indian Field Road (existing access to MNR ROW)
4	I-95
5	I-95
5	Davis Avenue (existing access to MNR ROW)
6	Steamboat Road

As planning for the Project continues, proposed access roads may be added, modified or eliminated to minimize adverse effects on environmental resources, address abutter and/or municipality concerns, and address any constructability concerns that may arise.

A.4.4.2.4.1 Work Pads

Work pads would be required at each transmission line structure site, as well as at conductor and OPGW pulling sites and at locations where temporary road/rail guard structures (or boom trucks) are necessary during wire installation.

Work pads are also utilized to stage structure components for final on-site assembly and to provide a safe, level work base for the construction equipment used to install foundations and erect the structure. The size and configuration of the work pad at a particular line structure location would vary based on site-specific conditions; however, a typical pad for a tangent structure averages about 100 feet by 50 feet and for a deadend structure averages about 200 feet by 50 feet.

The preliminary location and configuration of the work pads, as determined based on the environmental field studies and constructability reviews conducted to date, are depicted on the *Appendix 6* maps. The sizes and locations of work pads may be adjusted during the D&M phase of the project, based on site-specific conditions.

For the Proposed Modified Project, all but one of the work pads would be located in uplands. The single work pad that must unavoidably be located in a wetland (refer to Wetland 1 on *Appendix 6*, Map Sheet 2) would be temporary and that portion of the pad within the wetland would be constructed of timber mats, which would be removed after the completion of the overhead line work.

The installation of a work pad at an upland structure location would involve several steps, beginning with the removal of vegetation. The work pad site then would be graded to create a level work area and, if necessary, the upper three to six inches of topsoil (which is typically unsuitable to support the necessary construction activities) would be removed. For the Proposed Modified Project, most of the proposed work pads would be built on existing MNR access roads, and therefore already have a suitable base. Topsoil (if any) would be temporarily stockpiled within the ROW, typically near the work pad. A rock base, which allows drainage, would be put down and may be layered on top of filter fabric. Additional layers of rock with dirt/rock fines are typically placed over this rock base. Finally, a roller typically is used to flatten and compact the pad.

Pull pads, which would be required in certain locations along the ROW for conductor and OPGW installation, typically would be 70 feet by 200 feet, but can be as large as 100 feet by 300 feet. Pull pads would be constructed using techniques similar to those for work pads at structure locations.

Guard structure pads are typically required at road and other crossings to provide locations for guard structures or equipment used during conductor and OPGW installation. Typically, such stand-alone temporary guard structure work pads are 30 feet by 50 feet, and may require an associated 12 to 16-foot-wide access road if not located directly adjacent to a public road or a structure work pad. Alternatively, in lieu of guard structures, boom trucks with arms may be positioned along public roads (typically in road shoulder areas) during wire pulling.

Upon completion of the transmission line installation, work pads in uplands would remain in place.

A.4.4.2.5 Structure Installation

A.4.4.2.5.1 Foundation Work (Foundation Types and Excavation)

The proposed 115-kV transmission line structures would be either direct embedded or supported on drilled shaft foundations. The tangent structures would typically be direct embedded. Angle and deadend structures would typically have a drilled shaft foundation. Expected diameters for direct embedded foundations would be approximately five feet, while drilled shaft concrete foundation diameters would

range from six to 10 feet. Excavations for line-structure foundations are expected to be accomplished using mechanical excavators (drill rigs) and pneumatic hammers. During non-working hours, fencing or other barricades would be placed around and/or over open foundation excavations for structures. Blasting is not anticipated to be used.

A.4.4.2.5.2 Structure Placement

Structures would be delivered to installation locations in sections, then assembled and installed with a crane. Insulators and connecting hardware would be installed on most structures at this time. Supplemental grounding also would be installed on the new structures. Such grounding consists of a ground ring and sometimes counterpoise (i.e., buried conductors). The type of grounding required at each structure would depend on the electrical characteristics of the soil.

A.4.4.2.6 Conductor Work

The installation of overhead line conductors and shield wires requires the use of special pulling and tensioning equipment, which would be positioned at pre-determined locations as illustrated on the *Appendix 6* maps. Helicopters may be used to install the initial pulling lines at the commencement of the conductor/shield wire pulling process.

The wires would be pulled under tension to avoid contacting the ground and other objects. The remaining insulators and hardware would then be installed at angle and deadend structures. Finally, the conductors and shield wires would be pulled to their design tensions and attached to the hardware by linemen in bucket trucks in accordance with industry standards and design specifications.

The selection of conductor pulling sites was based upon a variety of factors including: accessibility, terrain, angles within the line sections where the conductors would be pulled, the locations of deadend structures (which keep installed conductors under high tension), the length of conductors and OPGW to be pulled, puller capacity, and snub structure[5] loads. Other considerations include the placement of pullers, tensioners, conductor anchors, and other associated pulling equipment, including the installation of a temporary grounding system. Along the Proposed Modified Route, conductor pulling sites were determined based on the consideration of these factors, the design load of the structures, and the avoidance or minimization of environmental effects.

[5] A snub structure is a structure located at one end of a sag section and considered as a zero point for sagging and clipping offset calculations. It is a pole stub or log that is set or buried in the ground to serve as a temporary anchor. Snub structures are often used at pull and tension sites.

A.4.4.2.7 Cleanup and Restoration

ROW cleanup and restoration activities would include the removal of construction debris, signs, flagging, fencing, temporary access roads, and temporary work pads. Areas affected by construction would be re-graded as practical and stabilized using re-vegetation or other measures before removing temporary E&S controls.

A.4.4.2.7.1 Final Grading, Revegetation, and Permanent Erosion and Sedimentation Controls

During final grading, areas of the ROW disturbed by construction and not otherwise occupied by permanent access roads or work pads generally would be graded to approximate preconstruction contours, where possible. Some areas (e.g., slopes, bluffs) affected by construction activities may not be fully restored to original contours. Such areas would be stabilized as warranted by site-specific conditions.

Permanent controls, such as water diversion bars or crushed stone, would be installed as appropriate to minimize the potential for future erosion and sedimentation. Other permanent ROW stabilization measures include re-vegetation, or the use of erosion control blankets to promote re-vegetation.

Temporary E&S controls would be left in place and maintained until final stabilization is achieved.

Restoration typically is deemed successful based on the effectiveness of stabilization measures as defined in and in accordance with applicable permit and certificate requirements. Based on the results of inspections of ROW stabilization, Eversource would determine the appropriate time frame for removing temporary E&S controls.

Upland areas disturbed by construction activities typically would be seeded with appropriate seed mixes, as needed. Mulch or other erosion controls would be applied as necessary based on slope and land use. Similarly, construction activities that disturb existing graveled or paved areas (that ConnDOT does not want left in place) would be restored to their original conditions.

The one affected wetland disturbed by construction would be reseeded with annual rye, or an equivalent native seed mix, which would serve to provide a temporary vegetative cover until wetland species become reestablished. No fertilizer, lime, or mulch would be applied in wetlands unless specified in regulatory approvals for the Project.

Vegetative species compatible with the use of the ROW for transmission line purposes are expected to regenerate naturally over time. Eversource would promote the re-growth of desirable species by

implementing vegetation management practices to control tall-growing trees, and where practicable, undesirable invasive species, thereby enabling native plants to dominate the ROW. Vegetation management practices along the ROW also would conform to Project-specific conditions regarding habitat restoration and enhancement as may be included in approvals from the Council, CT DEEP, and USACE (refer to *Section A.4.4.2.3.2* for additional information regarding Eversource's long-term ROW vegetation management program, including invasive species control).

A.4.4.2.7.2 Permanent Access Roads and Work Pads

All improvements to access roads would be left in place to facilitate future line maintenance. Structure work pads in uplands, however, would be removed, unless directed by ConnDOT to remain.

A.4.4.2.8 Traffic Considerations and Control

During the installation of the proposed transmission line, construction-related vehicular and equipment movements would occur on public roads and MNR access roads in the Project Area. The Project-related traffic along state and Town roads is generally expected to be temporary and highly localized in the vicinity of the ROW, contractor yards, and staging area(s). In addition, the construction activities occurring on these roads would not affect the railroad service.

Special considerations would be given, however, to work in the vicinity of I-95 that would require temporary lane closures. Specifically, one lane of I-95 would have to be temporarily closed to facilitate the construction of the access road and the installation of Structures 14002 through 14005, and 14006 (refer to *Appendix 6*). These activities, as well as the conductor/ OPGW pulling across I-95, would be closely coordinated with ConnDOT and the Connecticut State Police to identify appropriate work schedules and procedures designed to minimize I-95 lane closures to as short of a duration as possible.

During the Project construction phase, vehicles and equipment would enter and exit the ROW from various public roads. To safely move construction vehicles and equipment onto and off the ROW while minimizing disruptions to vehicular traffic along public roads, Eversource or its Project contractor would, as appropriate, work with representatives of the Town of Greenwich and ConnDOT. The construction contractor is typically responsible for posting and maintaining construction warning signs along public roads near work sites and for coordinating the use of flaggers or police personnel to direct traffic, as necessary.

Any construction work that takes place along the MNR ROW would also require the presence of a MNR flagman(s) who is designated to direct or restrict the movement of trains past a point on a track and to

provide on-track protection for construction workers. Outages on the MNR tracks would be required for all wire stringing activities and any activities that would be within 15 feet of the catenary power cables. Construction activities, such as foundation drilling and structure setting that are outside of this 15-foot requirement would only require a flagman(s).

A.4.4.3 Conditions Requiring Special Construction Procedures

The Proposed Modified Route extends across one wetland, as well as a small area where bedrock outcrops are exposed or close to the surface. Furthermore, the Proposed Modified Route may traverse certain areas that may potentially contain contaminated soils or groundwater.

The following subsections describe the general construction procedures that Eversource would use for wetland crossings, groundwater characterization and management, and construction site dewatering. Additional, site-specific procedures would be provided in the D&M Plans, as applicable, after the completion of a final Project design.

A.4.4.3.1 Wetlands

Based on the current line design, no proposed structures would be situated in a wetland; however, a work pad for one structure would be located in a wetland. Eversource would limit the effects to the wetland to the extent practical.

Temporary construction mats would be used for matting across the wetland to construct the temporary work pad within this resource. After the completion of the line installation work, the temporary matting would be removed and the affected area restored.

The wetland boundaries along the ROW would be clearly flagged prior to the commencement of work. When working in or traversing wetlands, Eversource would:

- Install, inspect, and maintain erosion and sedimentation controls and other applicable construction best management practices;
- Conduct vegetation clearing to minimize adverse effects such as by using low-impact equipment and installing temporary timber mats (or equivalent) to minimize rutting;
- Pile cut woody vegetation only in upland areas so as not to block surface water flows within wetlands or otherwise to adversely affect wetland integrity;
- Cut forested wetland vegetation without removing stumps unless it is determined that intact stumps pose a safety concern for the installation of structures, movement of equipment, or the safety of personnel;

- Install temporary construction matting (or equivalent) to establish a safe and stable construction work pad within the wetlands.
- Install and maintain temporary erosion controls around work sites in or near the wetland to minimize the potential for erosion and sedimentation;
- Store petroleum products in upland areas more than 25 feet from the wetland; refuel construction equipment in upland areas. Similarly, except for equipment that cannot be practically moved (e.g., cranes), equipment would not typically be parked overnight on access roads or the work pad in the wetland;
- Restore structure work site and remove temporary access ways through the wetland following the completion of line installation activities; and
- Restore the wetland, as part of Project restoration, to pre-construction configurations and contours to the extent practicable, and stabilize such areas by initial re-vegetation with annual ryegrass or native seed equivalent.

A.4.4.3.2 Soils and Groundwater Testing and Management

A.4.4.3.2.1 Pre-Construction Studies and Plans

The groundwater and soils testing and management approach described in the original Application remains valid for the Proposed Modified Project.

A.4.5 Estimate Project Costs

The estimated capital cost for the Proposed Modified Project is approximately $78 million, subdivided by component as follows:

- Transmission line: Approximately $36.3 million, with transmission totaling approximately $33.4 million and distribution $2.9 million.
- Proposed Greenwich Substation: Approximately $28.2 million with transmission totaling approximately $14 million and distribution $14.2 million.
- Proposed modifications at Cos Cob Substation: Approximately $12.7 million.
- Proposed modifications at the existing Prospect Substation: Approximately $0.9 million.

A.4.6 Facility Service Life and Life-Cycle Costs

In accordance with the Council's *Life-Cycle Cost Studies for Overhead and Underground Transmission Lines* (2012), Eversource performed a present-value analysis of capital and operating costs over a 40-year economic life of the Project. The following items were considered:

- Project Capital Cost (Transmission Line Only) is $ 33.4 million
- Annual carrying charges of the capital cost (14.1%)

- Annual operation and maintenance costs ($3,833 per mile for 1.5 miles of OH Construction, and $11,435 per mile for 0.6 miles of UG construction)
- Cost of energy losses (load factor of 0.62, load growth of 2.0%, cost of electricity of $48/mil, Peak current of 218 Amps/phase)
- Present Value Discount Factor is assumed to be 8%
- Cost of Capacity (assumed to be zero for this Project)

Applying these factors, the life-cycle cost for the proposed transmission lines is approximately $57.1 million. The resulting life-cycle cost per mile is $27.2 million.

Exhibit A, Section B

Existing Environmental Conditions

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B. Existing Environmental Conditions

In Docket 461, the Council made extensive findings concerning the existing environmental conditions at the sites of the Cos Cob Substation and proposed new Greenwich Substation, and the impacts of the proposed substation construction, all of which remain valid. The Council also made similar findings with respect to the Hybrid Alternative Route, but noted that the Council required a more detailed environmental and visual analysis of the Hybrid Alternative Route (the Proposed Modified Route in this petition) to consider this option as a viable alternative to the proposed project. (Docket 461, Opinion, p.8). The following sections refer the Council to pertinent findings describing current environmental conditions at the existing and proposed substation sites and along the Proposed Modified Route, and supplement this information, as appropriate. *Section C*, which considers the extent to which the Project could potentially affect environmental resources and how such effects may be mitigated, will follow a similar outline.

Note that all proposed modifications to Prospect Substation are internal to the existing confines (fence) of this facility and will not create any new disturbances beyond its footprint. As a result, no adverse environmental effects would occur and thus no discussion of Prospect Substation is included in *Sections B and C*.

B.1 Land Uses

B.1.1 Proposed Greenwich Substation Site

The proposed location of the new Greenwich Substation associated with the Proposed Modified Route is 290 Railroad Avenue. Nearly the entire 0.81-acre parcel is currently developed and covered by impervious surfaces. As the Council found in FOF No. 372, the site is "located in a highly-urbanized area and is developed as a commercial property."

Environmental resources associated with the property at 290 Railroad Avenue are depicted on *Figure B-1*.

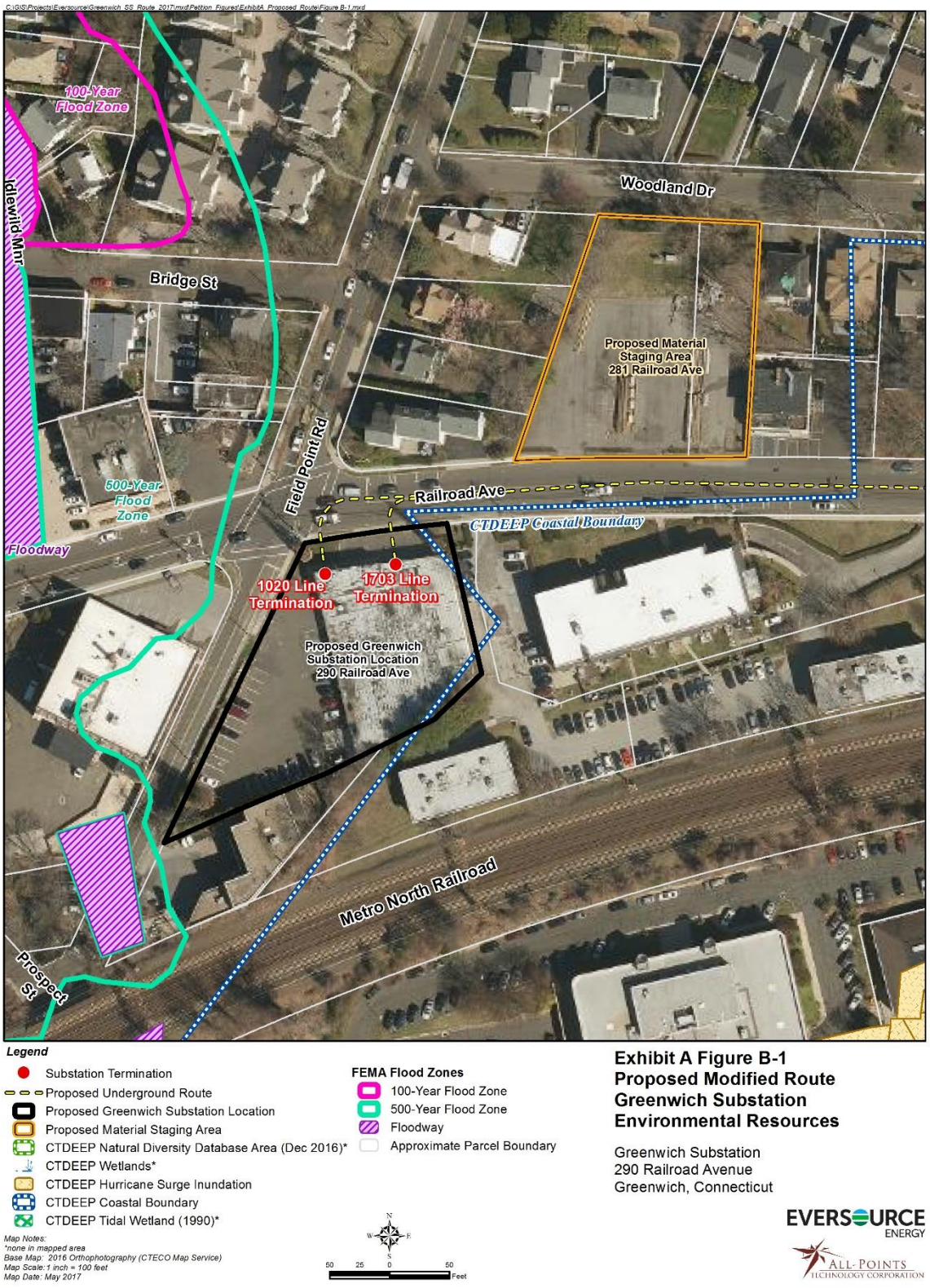


Figure B-1, Greenwich Substation Environmental Resources Map

B.1.2 Cos Cob Substation

The Cos Cob Substation property on Sound Shore Drive consists primarily of previously disturbed and developed land, where both Eversource and the MNR maintain extensive substation and other electrical infrastructure. As the Council found in Docket 461: "Expansion of the Cos Cob Substation would occur to the south of the existing fence line in an area containing a lattice transmission structure and a wood pole transmission structure" (FOF No. 372); and "the Cos Cob Substation expansion would remain on Eversource and State of Connecticut property and would not affect recreational facilities in Cos Cob Park." (FOF No. 374). Environmental resources associated with Cos Cob Substation are depicted on *Figure B-2*.

B.2 Proposed Route

As the Council found, with respect to the Hybrid Alternative Route in Docket 461, the Proposed Modified Route "would be installed within heavily developed areas of Greenwich. Predominate land uses include transportation corridors, commercial development and residential areas." (FOF No. 375). Environmental Features proximate to the Proposed Modified Route are shown in *Figure B-3*.

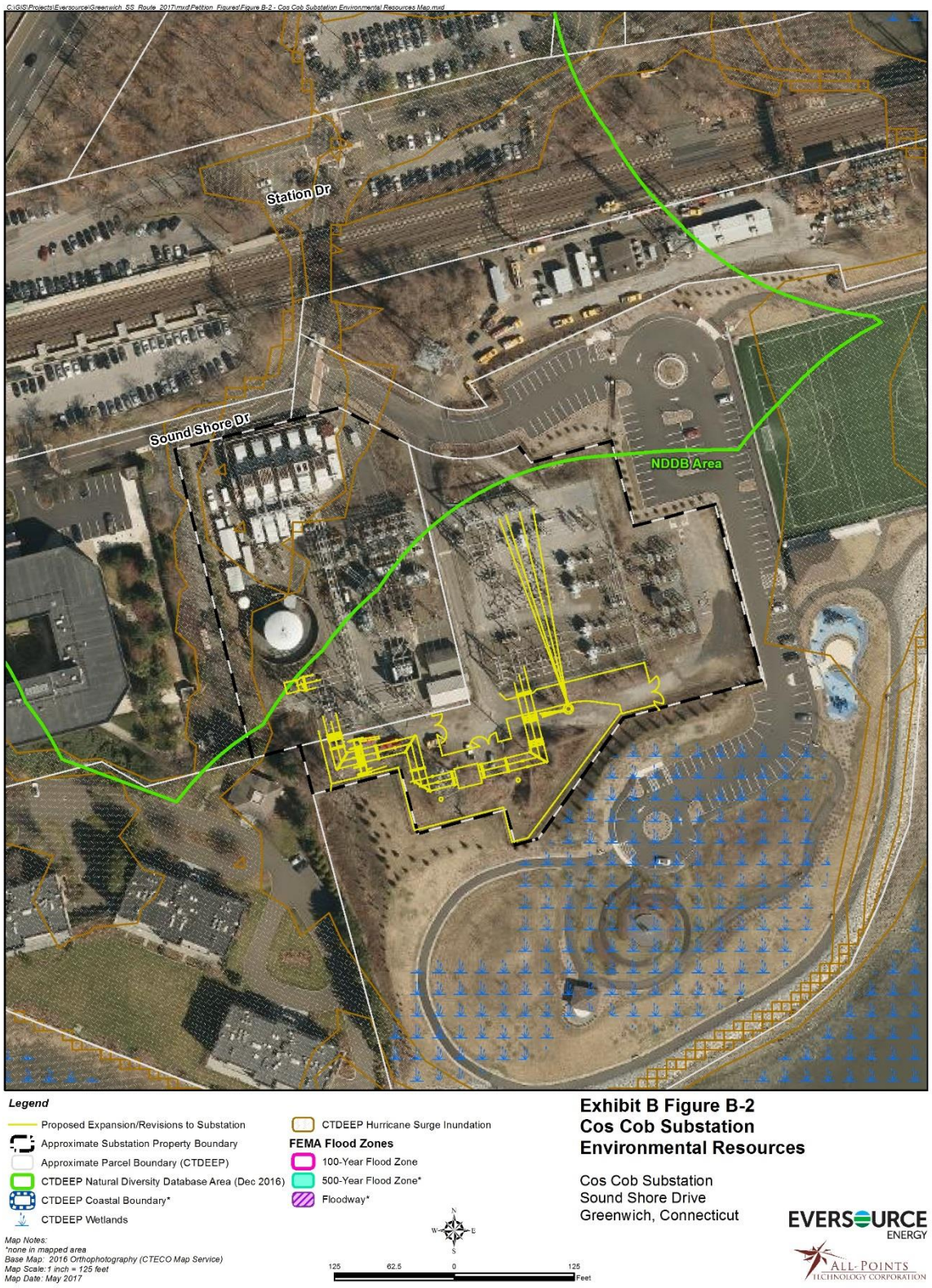
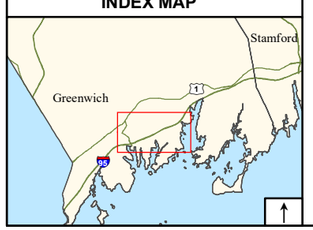


Figure B-2, Cos Cob Substation Environmental Resources Map

Greenwich Avenue Historic District
Town Hall Playground
Greenwich Town Hall
Greenwich Municipal Center HD
Town Hall & Fields
U.S. Post Office
Proposed Material Staging Area 281 Railroad Ave
Proposed Greenwich Substation Location 290 Railroad Ave
Horseneck Brook
Greenwich Harbor
Roger Sherman Baldwin Park
Smith Cove
Indian Harbor
Bruce Park
Cos Cob Harbor
Cos Cob Railroad Station
Existing Cos Cob Substation
Wetland 1
Wetland 2
Wetland 3
Wetland 4
Watercourse 1
Watercourse 2
Watercourse 3
MORNINGSIDE DR
STATION DR
SACHEM RD
LAUGHLIN AVE
STRICKLAND RD
CIRCLE DR
SOUND SHORE DR
CIRCLE DRIVE EXT
MNR
COBB ISLAND DR
BRUCE PARK AVE
BRUCE PARK DR
KINSMAN LN
INDIAN FIELD RD
WOODS RD
DAVIS AVE
HOME PL
ORCHARD PL
INDIAN HARBOR RD
STEAMBOAT RD
SHORE RD
ARCH ST
MUSEUM DR
GREENWICH PLZ
RAILROAD AVE
HORSENECK LN
I95

INDEX MAP



Legend

- Proposed Overhead Route
- Proposed Underground Route
- Proposed Greenwich Substation Location (290 Railroad Ave)
- Proposed Material Staging Area
- Existing Cos Cob Substation Location
- Approximate Parcel Boundary

Base Map: 2016 Orthophotography (CTECO Map Service)

- National Register of Historic Places Site
- National Register of Historic Places Historic District
- Natural Diversity Database Area (12/2016)
- Inland Wetland
- Tidal/Coastal Resource
- CTDEEP Wetlands
- CTDEEP Tidal Wetland (1990)
- CTDEEP Watercourse
- CTDEEP Coastal Boundary
- CTDEEP Hurricane Surge Inundation
- Bedrock Outcrops

FEMA Flood Zones

- 100-Year Flood Zone
- 500-Year Flood Zone
- Floodway

1 inch = 625 feet

625 312.5 0 625 Feet

Exhibit A Figure B-3
Proposed Modified Route
Environmental Resources

Greenwich Substation and Line Project
Greenwich, Connecticut

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

May 2017

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B.3 Topography, Geology and Soils

Topography at the Substation sites and along the Proposed Modified Route can be characterized as generally flat with no major topographic features of note and consistent with the Council's finding, "Minimal grading would be required at both the proposed Greenwich Substation site and Cos Cob Substation" (FOF No. 383). Bedrock geology consists of two different formations. The Nodular member of Harrison Gneiss, which contains prominent quartz-sillimanite nodules, is the principal bedrock formation along the Proposed Modified Route. Bedrock west of Steamboat Road is identified as Golden Hill Schist. Golden Hill Schist is described as a gray to silvery, medium to coarse-grained, generally layered schist and granofels, composed of quartz, muscovite, biotite, plagioclase, and garnet.

Surficial geology along the Proposed Modified Route consists of thin deposits of glacial till and artificial fill. Information concerning the physical properties and classification of soils in the vicinity of the Project is presented in *Table B-1*.

Table B-1, Principal Soil Associations within the Proposed Route

Soil Map Unit Name and Symbol	General Description	Hydric Soil	Depth to Bedrock
Udorthents - Urban land complex	Areas of substantial cutting or filling interspersed with highly developed areas	No	0-25 feet
Urban land	Highly developed areas	No	0-25 feet

Sources:USDA Soil Conservation Service, Soil Surveys of Fairfield County Soil Survey Staff; Natural Resources Conservation Service, United States Department of Agriculture; Soil Survey Geographic (SSURGO) http://soildatamart.nrcs.usda.gov.

B.4 Water Resources

The Proposed Modified Route is located within the Southwest Coast Major Drainage Basin. Major surface water bodies include Greenwich Creek[6], Indian Harbor, Cos Cob Harbor, Horseneck Brook, and Greenwich Harbor. As the Council found in Docket 461: "Portions of the [Modified Project] are located within the coastal resource boundary (Coastal Boundary), as defined by the Connecticut Coastal Management Act (CCMA) and established by CT DEEP. However, none of the coastal resources identified by the CCMA would be adversely affected." (FOF No. 408).

B.4.1 Groundwater Resources

The following FOF in Docket 461, with respect to the GSLP, continue to apply to the Proposed Modified Project:

[6] In this document, the waterbody north of the MNR bridge will be referred to as Greenwich Creek and the waterbody beneath the MNR bridge and southward will be referred to as Indian Harbor.

424. The GSLP area has groundwater classified as GA or GB. No GSLP facilities are located within a designated Aquifer Protection area. Construction of GSLP would not affect groundwater resources or quality.

425. There are no public or private water supply wells in the GSLP area.

The GB classification indicates a water supply not fit for human consumption without treatment. This classification applies to the substation sites and to the eastern and western ends of the Proposed Modified Route. The GA groundwater classification assumes ground water quality is fit for human consumption without treatment, and applies primarily within the central section of the Proposed Modified Route.

B.4.2 Flood Hazard Areas

Greenwich Substation

The following FOF in Docket 461 remains valid:

422. The proposed substation site is not within a 100-year or 500-year flood zone as determined by the Federal Emergency Management Agency. The southern portion of the site is 10 feet from the edge of a designated 500-year flood zone associated with Horseneck Brook.

Cos Cob Substation

As seen in *Figure B-2*, this property is located outside of the 100-year and 500-year flood zones.

Transmission Supply Line Route

Two distinct areas along the Proposed Modified Route lie within the flood zones established by the Federal Emergency Management Agency (FEMA). These include the intersection of Arch Street and Railroad Avenue (which lies within both 100-year and 500-year flood zone boundaries) and the MNR ROW as it crosses Greenwich Creek/Indian Harbor. Note that the 100-year base flood elevation is located well beneath the grade of the rail line and bridge that spans this watercourse. There is no 500-year flood zone mapped for this area.

Worst Case Hurricane Surge Inundation data developed by the National Hurricane Center indicate that portions of the Proposed Route are located within Category 1, 2, 3, and 4 areas[7]. These Hurricane Surge Inundation Areas are primarily located in the west and central portions of the Proposed Modified Route, including the intersection of Arch Street and Railroad Avenue, along the MNR corridor and the northwest

[7] CT DEEP Geographic Information System data, based on *Worst Case Hurricane Surge Inundation* Areas for category 1 through 4 hurricanes striking the coast of Connecticut. Hurricane surge values were developed by the National Hurricane Center using the SLOSH (Sea Lake and Overland Surge from Hurricanes) Model to assist emergency management officials in hurricane preparedness and operations.

corner of the Cos Cob Substation property. No Hurricane Surge Inundation Areas encumber the property at 290 Railroad Avenue.

B.4.3 Coastal Area Resources

The east and west ends of the Proposed Modified Route lie within the Coastal Boundary pursuant to the CCMA [8]. About half of the MNR ROW proposed as part of the Proposed Route is located within the Coastal Boundary. At 290 Railroad Avenue, portions of the northeast and southeast corners of the parcel lie within the Coastal Boundary. In total, an area of approximately 1,120 square feet of the Proposed Site is physically located within the Coastal Boundary. The entire Cos Cob Substation is located within the Coastal Boundary.

B.4.4 Inland and Tidal Wetlands and Watercourses

The Council found in Docket No. 461 that "None of the…substation work would directly affect any inland wetlands or watercourses." (FOF No. 419). That remains the case. The Council also found that none of the GSLP routes, including the Hybrid Alternative would do so. *Id.* However, to address the Council's determination in its Opinion, Eversource has performed an analysis of wetlands and watercourses along the Proposed Modified Route and (in the following section) potential effects from the Modified Project.

A total of four wetland resources, three watercourses and one non-jurisdictional drainage ditch were identified proximate to the Proposed Modified Route, as depicted on *Figure B-4* and discussed further in this section.

All wetlands and watercourses proximate to the Proposed Modified Route (and discussed herein) are located on the north side of the MNR ROW. With the exception of Wetland 1, the Proposed Modified Route does not intercept any of these resources.

[8] Connecticut's coastal zone has two tiers incorporated within the 36 coastal townships. The first tier is bounded by a continuous line delineated by a 1,000-foot linear setback measured from the mean high water mark in coastal waters; or a 1,000-foot linear setback measured from the inland boundary of state regulated tidal wetlands; or the continuous interior contour elevation of the 100-year frequency coastal flood zone; whichever is farthest inland. The second tier is the area between the inland boundary of the 36 coastal communities and the inland boundary of the first tier.

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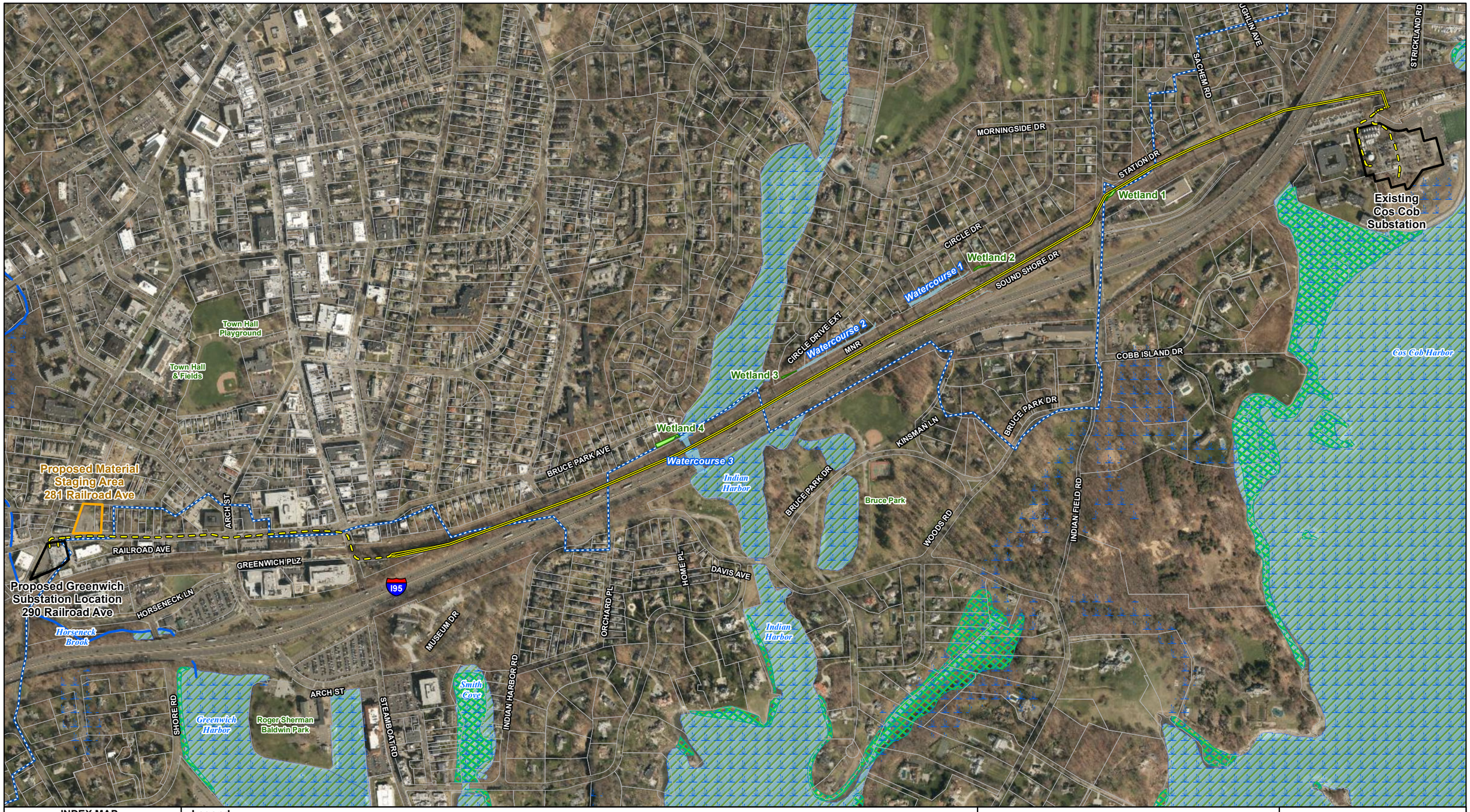
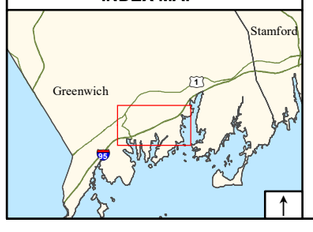


INDEX MAP



Legend

- Proposed Overhead Route
- Proposed Underground Route
- Proposed Greenwich Substation Location (290 Railroad Ave)
- Proposed Material Staging Area
- Existing Cos Cob Substation Location
- Approximate Parcel Boundary
- Inland Wetland
- Tidal/Coastal Resource
- CTDEEP Wetlands
- CTDEEP Tidal Wetland (1990)
- CTDEEP Watercourse
- CTDEEP Coastal Boundary

Base Map: 2016 Orthophotography (CTECO Map Service)

1 inch = 625 feet

625 312.5 0 625 Feet

Exhibit A Figure B-4
Proposed Modified Route
Wetlands Map

Greenwich Substation and Line Project
Greenwich, Connecticut

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

May 2017

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Wetland 1

Wetland 1 is located east of Indian Field Road and north of the MNR. Wetland 1 is a small, isolated Palustrine Emergent Marsh (PEM) and Palustrine Scrub-Shrub (PSS) wetland with no vernal pool potential. Soils in this location are heavily disturbed while plant communities are dominated by invasive species. The Proposed Route crosses this area and, as introduced in *Section A*, will require temporary matting to construct a work pad.

Wetland 2

Wetland 2 is located south of Circle Drive and abuts the north side of the MNR ROW. Wetland 2 is a small, isolated PEM/PSS wetland with no vernal pool potential. Although adjacent to Watercourse 1, Wetland 2 has no surface connection to this watercourse. Similar to Wetland 1 characteristics, soils are heavily disturbed and invasive plants dominate Wetland 2.

Watercourse 1

Watercourse 1 is an unnamed intermittent tributary to Greenwich Creek, flowing west into Watercourse 2 before its confluence with Greenwich Creek. This watercourse has been heavily disturbed by historic development activities. Its hydrology is dominated by stormwater runoff from the MNR ROW and adjacent residential development with a lesser component of surface conveyance of seasonal high groundwater.

Watercourse 2

Watercourse 2 is also an unnamed intermittent tributary to Greenwich Creek, flowing west from Watercourse 1. It is similar in hydrology and disturbance characteristics as Watercourse 1.

Wetland 3

Wetland 3 is located just east of Greenwich Creek and abuts the north side of the MNR ROW. Wetland 3 is defined as a PEM and PSS wetland. Wetland 3 exhibited large areas of un-vegetated heavily disturbed wetland soils indicating an extended hydroperiod. However, given the landscape condition and characteristics of this wetland and its surrounding terrestrial habitat (heavily developed with MNR ROW, I-95 and suburban development), it is unlikely this wetland would function as a vernal pool habitat.

Watercourse 3

Watercourse 3 is a perennial watercourse known as Greenwich Creek. This watercourse flows south under the MNR ROW and I-95 where it enters into an unnamed pond in Bruce Park. The pond is created by a culvert under Bruce Park Drive that restricts the flow of the watercourse before it enters into Indian

Harbor located on the south side of Bruce Park Drive. The Proposed Modified Route would have an aerial crossing of this watercourse.

Wetland 4

Wetland 4, located just west of Greenwich Creek and adjacent to the northern embankments of the MNR ROW, is a palustrine forested wetland (PFO) that flows east into Greenwich Creek. As found in the other wetlands, soils in Wetland 4 are heavily disturbed and plant communities are dominated by invasive species. This wetland exhibited no vernal pool potential.

In addition to these jurisdictional resources, a ±3,000-foot long drainage ditch exists between the south side of the MNR ROW and north side of I-95. The hydrology of this drainage ditch is isolated to stormwater runoff from I-95 and the rail road bed. No wetland soils or dominance of wetland vegetation is present within this drainage ditch feature. Therefore, it is not regulated as a wetland or watercourse resource.

B.5 Wildlife and Vegetation

Greenwich Substation

The property at 290 Railroad Avenue provides no significant habitat for wildlife.

Cos Cob Substation

The Substation property provides minimal wildlife habitat, with the exception of ospreys and other birds that perch or nest on taller structures.

Transmission Supply Line Route

The Proposed Route possesses little to no wildlife habitat due to its highly-developed nature. Vegetation along the Proposed Route consists of maintained lawns and a combination of native and ornamental trees and shrubs by roadsides and on private properties. In general, larger stands of trees are found along the I-95 and MNR transportation corridors, generally providing screening from adjacent properties.

B.5.1 Threatened and Endangered Species

CT DEEP's Natural Diversity Data Base (NDDB) mapping depicts polygons (areas of known habitat for state-listed endangered or threatened species, or species of special concern) on the Cos Cob Substation property. The Company consulted with CT DEEP NDDB regarding the Proposed Modified Project, and the agency determined that no such resources would be impacted by the proposed activities. A copy of

the CT DEEP letter is provided in *Appendix 3, Environmental Agency Responses*. No mapped areas of Critical Habitat[9] are identified along the Proposed Modified Route.

The Company also completed consultations with the U.S. Fish and Wildlife Service (USFWS), in accordance with Section 7 of the Endangered Species Act (Section 7), through its Information, Planning, and Conservation System (IPaC)[10] to determine if any federally-listed or proposed, threatened or endangered species or critical habitats exist in proximity to the Proposed Modified Route. The IPaC system identified two species (listed as "threatened") potentially occurring within the Project Area, including: red knot (*Calidris canutus*) and northern long-eared bat (NLEB; *Myotis septentrionalis*). Please see *Section C.3* for additional information. Results of the IPaC review are provided in *Appendix 3*.

Northern long-eared bat

The Proposed Modified Project is not within 150 feet of a known occupied maternity roost tree and is not within 0.25 mile of a known NLEB hibernaculum. There are currently no known NLEB maternity roost trees in Connecticut. The nearest NLEB habitat resource to the proposed activity is located in Greenwich ±4.3 miles to the north.

Red knot

The red knot is a shorebird typically found along the Connecticut coastline during northbound and southbound migration. These birds spend most of their time foraging along the waterline within the intertidal zone. Not known to occur at inland locations, red knots can be found on Connecticut's barrier beaches from mid-April to the end of May, and then again from July through mid-September[11]. Sometimes non-breeding individuals may linger along Connecticut barrier beaches between migratory periods, and late individuals may pass through on southbound migration well into November. Migration and wintering habitats include both high-energy ocean- or bay-front areas, as well as tidal flats in more sheltered bays and lagoons. Preferred wintering and migration microhabitats are muddy or sandy coastal areas, specifically, the mouths of bays and estuaries, unimproved tidal inlets and tidal flats. In many wintering and stopover areas, quality high-tide roosting habitat (i.e., close to feeding areas, protected from predators, with sufficient space during the highest tides, free from excessive human disturbance) is limited.

[9] Connecticut Critical Habitats depict the classification and distribution of 25 rare and specialized wildlife habitats in the state. It represents a compilation of ecological information collected over many years by state agencies, conservation organizations and individuals. Critical habitats range in size from areas less than one acre to areas that are tens of acres in extent. The Connecticut Critical Habitats information can serve to highlight ecologically significant areas and to target areas of species diversity for land conservation and protection.

[10] IPaC Consultation Tracking Number: 05E1NE00-2017-SLI-0969, dated March 3, 2017.

[11] Connecticut Audubon Society Bird Finder for May 23: Red Knot - http://www.ctaudubon.org/2014/05/connecticut-audubon-society-bird-finder-for-may-23-red-knot/#sthash.oT1QBhV3.dpuf.

B.5.2 Fisheries

No CT DEEP Fisheries Management Areas exist proximate to the Proposed Modified Route. According to CT DEEP Fisheries Management data, the nearest fishery is associated with the upper portion of the Mianus River, approximately 1.2 miles northeast of the Cos Cob Substation.

B.6 Historic and Archaeological Resources

The Company retained the services of Heritage Consultants, LLC of Newington, Connecticut (Heritage), to review and evaluate historic and archaeological resources (collectively, "cultural" resources) associated with the Proposed Modified Route. This review confirmed the four previously identified archaeological sites, a single National Register of Historic Places (NRHP) property (Cos Cob Railroad Station), two NRHP historic districts (Greenwich Avenue Historic District and Cos Cob Power Station Historic District[12]), and one property (former New York, New Haven & Hartford rail line) eligible for listing on the NRHP located within or in close proximity (500 feet).

Based on the results of its evaluation, Heritage concluded that the Proposed Modified Route would have a low probability of encountering intact cultural deposits or artifacts of archaeological significance. Further, Heritage determined that the Project will not have adverse impacts on historic built resources or archaeological deposits.

The Heritage assessment report, entitled *Preliminary Cultural Resources Review of the Proposed Greenwich Substation and Line Project in Greenwich, Connecticut* is provided as *Appendix 2*. A copy of this report has been forwarded to the State Historic Preservation Office (SHPO) for review and comment.

B.7 Noise

The Council's FOF No. 442 in Docket No. 461 remains valid:

> *442. [T]he existing noise environment along most of the GSLP is dominated by urban noise related to local traffic, transportation corridors, and commercial uses. Construction activities are exempt from noise regulations.*

B.8 Air Quality

The state is currently designated as in attainment or is unclassified with respect to the National Ambient Air Quality Standards (NAAQS) for five criteria air pollutants: particulate matter no greater than 10 micrometers in diameter (PM10), sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. In

[12] The Cos Cob Power Station was demolished in 2001 and as a result, lost much of its integrity of setting, materials, workmanship, design, and feeling. It is the opinion of Heritage Consultants, LLC that it is no longer eligible for inclusion in the National Register of Historic Places.

addition to these criteria pollutants, the state is currently designated as being in non-attainment with the 8-hour NAAQS standard for ozone, and the 2006 24-hour fine particulate matter (PM2.5) standard. Fairfield County is non-attainment for both the 8-hour ozone and 24-hour PM2.5 standard.

The U.S. Environmental Protection Agency (EPA) has determined that carbon dioxide (CO_2) is a greenhouse gas. Areas of non-attainment have not yet been established for CO_2 or other greenhouse gases.

B.9 Scenic and Recreational Areas, Statutory Facilities and Surrounding Features

Four (4) Statutory Facilities[13] are located proximate to the Proposed Modified Route. These include:

- A child day care facility at the Putnam Indian Field School (101 Indian Field Road) is located approximately 740 feet southeast of the Proposed Route (and separated by I-95 and the MNR).
- Bruce Park. The Proposed Modified Route would follow the south side of the MNR ROW and is separated physically from Bruce Park by I-95, approximately 150 feet to the north.
- Cos Cob Park is adjacent to the Cos Cob Substation and shares a common entrance from Sound Shore Drive.
- The Boys & Girls Club of Greenwich (located at 4 Horseneck Lane) lies approximately 375 feet to the south of the Proposed Modified Route on Railroad Avenue, approximately 657 feet west of the Proposed Modified Route on Arch Street and approximately 560 feet south of the Proposed Substation at 290 Railroad Avenue.

Scenic and recreational opportunities exist in the southern portion of the Project Area, primarily associated with Bruce Park and Cos Cob Park.

[13] "Statutory Facilities" is a term of convenience that refers to the following uses listed in CGS § 16-50l(a)(1)(A) and The Council's Electric and Magnetic Fields Best Management Practices: "residential areas, public and private schools, licensed child day care facilities, licensed youth camps [and] public playgrounds."

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Exhibit A, Section C

Potential Environmental Effect and Mitigation Measures

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C. Potential Environmental Effect and Mitigation Measures

This section identifies the potential short and long-term environmental effects that construction of the Proposed Modified Project could have on the environment, including scenic, historic, and recreational resources. It also discusses the measures that Eversource proposes to avoid, minimize, or mitigate any potential adverse effects.

The proposed design, construction, and operation of the Proposed Modified Project would not have significant permanent adverse effects on the existing environment or on the scenic, historic or recreational values of the surrounding area. Eversource has incorporated, and will continue to incorporate, procedures into all phases of Project development and implementation to promote environmental protection measures, in accordance with federal, state and local requirements.

As the Council noted in its FOF and Opinion in Docket No. 461, the Proposed Modified Route (called the "Hybrid Alternative" route in the Council's Opinion) would be 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" because it "jointly utilizes existing rights-of-way that are occupied by different kinds of utility services." (Docket 461, FOF No. 296, Opinion, p.7).

Each category of the Proposed Modified Project's potential environmental effects is discussed in the following subsections. Environmental resources and Proposed Modified Route facilities are depicted on the 100-Scale Maps in *Appendix 6*.

C.1 Topography, Geology and Soils

Substations

As the Council found in Docket 461, "Minimal grading would be required for construction at both the proposed Greenwich Substation site and Cos Cob Substation" (FOF No. 383).

Additional findings of the Council concerning the GSLP, relating both to substation and line work, continue to apply to the Proposed Modified Project, including:

> *382. Eversource would deploy erosion and sedimentation controls in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control at the limits of work, adjacent to sensitive areas, and around adjacent catch*

basins. Erosion controls would be maintained until construction is completed and exposed soils in the work area have stabilized.

386. Excavated soils would be placed in designated areas, surrounded by appropriate erosion and sedimentation controls.

388. Excess excavated material or materials not suitable for backfilling would be removed from the construction area and disposed of in accordance with applicable regulations and per a pre-existing DEEP agreement regarding excavated soils.

Proposed Modified Route

Installation of the underground transmission supply lines and overhead structures along the Proposed Modified Route (including cable, conduit, as well as access roads, work pads, guard pads and pull pads within the MNR ROW) will require substantial earthwork. However, all disruptions to existing soils would be temporary in nature as excavations would be backfilled upon completion of the transmission line installations. Upon completion of construction, work pads at structure sites in uplands will remain in place, unless directed to be removed. All work pads or portions of work pads in wetlands will be removed and the affected wetlands restored, pursuant to Project permits and approvals. Guard pads and pulling pads also typically will be removed.

Prior to the commencement of construction activities, Eversource will provide its contractors with drawings that incorporate Eversource's BMP Manual, which contains guidance and other information designed to minimize or eliminate potential adverse environmental effects that may result from construction activities. The drawings will include specific details as to the procedures and/or methods to be utilized for the selected route and provide information on erosion control, construction site dewatering, spill prevention and control, construction staffing and hours of work, and restoration.

The following FOF from Docket 461 continue to apply to the proposed transmission line construction:

318. During construction, Eversource would require support areas for temporarily storing and staging construction materials and equipment in the vicinity of the transmission route. These areas would include one or more primary construction yards and several, smaller staging areas.

319. To the extent possible, storing and staging areas would be located on Eversource property, previously developed sites (such as paved parking lots), vacant land or properties previously used for construction support, depending on the parcel size requirements and location in relation to the GSLP route.

320. Once storage and staging areas are no longer needed, they would be restored substantially to their previous conditions.

321. Prior to the commencement of construction, Eversource would conduct studies and surveys to develop procedures aimed at minimizing adverse impacts on the environment and the public. Pre-construction planning activities would include: surveys to identify underground and overhead infrastructure that would be affected by the GSLP; studies of soil and groundwater conditions along the transmission line route; and identifying potential locations for construction support areas.

322. Prior to construction activities within public roads, details of methods and procedures would be reviewed with the Town, the MNR, and the DOT for any work that is near or impacts their facilities.

323. Excavated material would be located off-site for disposal or for reuse as backfill.

324. In the event bedrock is encountered during excavation, drilling or pneumatic hammer would be the preferred method of rock removal. Blasting would only occur if necessary and would be conducted by a certified blasting specialist and in accordance with applicable regulations.

325. If groundwater is encountered during excavation, dewatering would be performed in accordance with applicable regulatory agencies. Water may be discharged to nearby catch basins, temporary basins or into holding tanks or trucks.

C.2 Proposed Transmission Line Effects on Water Resources

In Docket 461, the Council found that the proposed substation work (which has been reduced in scope by the Proposed Modified Project) would have no adverse effect on coastal resources (FOF No. 408), inland wetlands and watercourses (FOF No. 419), groundwater (FOF No. 424), or flood hazard areas (FOF No. 422); these findings continue to apply to the proposed substation construction. These findings also applied, by implication, to the GSLP transmission routes, including the Proposed Modified Route. However, as part of the further evaluation that Eversource performed pursuant to the direction of the Docket 461 Opinion, Eversource has performed a more detailed assessment of the potential effects of the proposed transmission line route on water resources. As discussed in the following sections, neither the construction nor the operation of the proposed transmission line along the Proposed Modified Route would have any long-term adverse effects on surface or groundwater resources or water quality.

C.2.1 Inland and Tidal Wetlands and Watercourses

As introduced in *Section B.4.4*, there are four wetlands and three watercourses proximate to the Proposed Route. Utilization of the south side of the MNR ROW avoids conflicts with the three wetland resources

and two watercourses located on the north side of the MNR ROW. There are two locations along the MNR ROW where these resources will be spanned.

The construction of proposed transmission structure number 14014, located near the intersection of the northern MNR ROW and Indian Field Road, will require ±1,077 square feet of temporary impacts to Wetland 1 to accommodate a ±10,830 square foot work pad. Eversource will utilize timber mats to protect this wetland resource during construction. Upon completion of the construction, the timber mats will be removed from those portions of the work pad and the affected wetland restored pursuant to Eversource's BMPs and Project permits and approvals.

Aboveground transmission lines will need to be pulled approximately 73 feet across Watercourse 3 (Indian Harbor) from proposed structure 14005 to 14006 over an existing bridge within the MNR ROW. The rail bed and bridge lie more than 12 feet above the water in this location. No work within Greenwich Creek or its banks is necessary to install these two structures or to pull the conductors.

In these areas, E&S controls will be installed as necessary before the commencement of any improvements to or development of access roads or work pads. Eversource will implement appropriate E&S control measures to minimize or eliminate potential adverse environmental effects during the construction phase of the Project.

C.2.2 Groundwater Resources

It is possible that groundwater may be encountered during installation of the underground transmission line segments (which require excavation depths necessary to avoid existing subsurface utilities) as well as excavations of the foundations for above ground transmission structures. If groundwater or surface water is present in excavations that requires removal, appropriate dewatering techniques would be performed in accordance with authorizations from applicable regulatory agencies. Options include discharges to catch basins, pumping and temporary storage within holding tanks (frac tanks), or using vacuum trucks for expedited disposal. Portions of the Proposed Modified Route traverse areas with presumably impaired groundwater (based on the CT DEEP's GB classification) and will require sampling to determine the most appropriate treatment.

C.2.3 Flood Hazard Areas

Sections of the Proposed Modified Route will pass through mapped flood hazard areas. Underground cables and associated conduit will extend ±155 feet through the 100-year flood zone and ±1,532 feet

through Hurricane Surge Inundation Areas. Overhead lines and structures are proposed within ±116 feet of the 100-year flood zone and ±3,286 feet of the Hurricane Surge Inundation Area. The flood hazard areas associated with the overhead lines required to cross over Indian Harbor lie well below the proposed installation elevations. The only activity proposed "within" these zones is pulling the transmission lines between new structures 14005 and 14006. The transmission lines and structures within all of the aforementioned flood hazard areas have been designed to be protected from water.

C.2.4 Coastal Resources

Approximately 2,760 feet of underground and ±4,330 feet of overhead transmission lines lie within the Coastal Boundary. However, based on existing land uses and the location and design of the proposed installations, no adverse effects on coastal resources are anticipated as a result of the Project.

Line construction activities would take place in previously developed areas and would have no effect on access to the shoreline. Along the portion of the route that traverses within the Coastal Boundary, any effects would be short-term, limited to the construction phase, and highly localized. The new above ground structures to support the transmission lines will be visible from some locations within the Coastal Boundary; however, those views will not significantly alter the natural features of vistas and viewpoints. Today, existing conditions along the Proposed Route include substantial utility infrastructure (e.g., steel monopoles, catenary towers, and wooden telephone poles), major transportation corridors, and industrial and commercial development.

The CCMA identifies eight potential adverse impacts to coastal resources defined below. The following discussion summarizes why the proposed transmission line would not result in, or contribute to, adverse impacts to these resources.

1. *Degrading **water quality** of coastal waters by introducing significant amounts of suspended solids, nutrients, toxics, heavy metals or pathogens, or through the significant alteration of temperature, pH, dissolved oxygen or salinity.*

   During construction, E&S controls would be established and maintained in accordance with the CT DEEP Bulletin 34, *Connecticut Guidelines for Soil and Erosion and Sediment Control*, dated 2002. Construction activities associated with the Project are temporary and, with the appropriate E&S measures in place and maintained, are not expected to impact water quality. Throughout construction of the Project, stormwater generated along the Proposed Modified Route and at the Substation sites would be adequately treated, both in quantity and quality, in

accordance with the *2004 Connecticut Stormwater Quality Manual*. The existing development at 290 Railroad Avenue consists of a pre-1980s style stormwater management system that currently provides minimal stormwater quantity and quality treatment. The proposed Substation stormwater management system will be designed to manage stormwater runoff and treatment to improve pre-development hydrologic conditions and substantially reduce the average annual total suspended solids loadings. Similarly, new construction at the Cos Cob Substation may require modifying the stormwater management system to increase its capacity, as necessary. With incorporation of these stormwater management measures, the Project would not result in degradation of coastal water quality. Post-construction, stormwater runoff along the transmission line route will not change substantially from existing conditions.

2. *Degrading **existing circulation patterns of coastal waters** by impacting tidal exchange or flushing rates, freshwater input, or existing basin characteristics and channel contours.*

   The Proposed Modified Route is located entirely within currently developed, and outside of tidally influenced, areas. Therefore, it would not impact current drainage or circulation patterns of coastal waters.

3. *Degrading **natural erosion patterns** by significantly altering littoral transport of sediments in terms of deposition or source reduction.*

   The Proposed Modified Route does not border any watercourses or shoreline resources. Accordingly, the construction and operation of the proposed transmission line would not alter natural erosion patterns or affect littoral transport of sediments.

4. *Degrading natural or existing drainage patterns by significantly altering groundwater flow and recharge and volume of runoff.*

   Drainage patterns would not be significantly altered by the construction and operation of the proposed transmission line. The Proposed Modified Route currently consist of impervious and highly compacted surfaces. The construction of the proposed transmission line would not substantially change existing drainage patters, alter groundwater flow and recharge or the volume of runoff experienced today.

5. *Increasing the hazard of **coastal flooding** by significantly altering shoreline configurations or bathymetry, particularly within high velocity flood zones.*

Project activities within the two locations along the Proposed Modified Route that traverse flood zones include: installation of the underground transmission supply lines and an overhead span of Greenwich Creek/Indian Harbor. No above ground structures are planned in these areas. The remainder of the Project Area lies outside of the 100-year and 500-year flood zones. Therefore, development and operation of the transmission line would not affect the shoreline configurations or bathymetry.

6. *Degrading **visual quality** by significantly altering the natural features of vistas and viewpoints.*

   The overhead segment of the proposed transmission line will be located at distances remote from the shoreline and within developed areas. The MNR and I-95 transportation corridors located between the shore and residential/commercial areas currently include substantial utility infrastructure. Therefore, the Project would not degrade the visual quality of the natural features and viewpoints within the coastal zone.

7. *Degrading or destroying essential **wildlife, finfish or shellfish habitat** by significantly altering the composition, migration patterns, distribution, breeding or other population characteristics of the natural species or significantly altering the natural components of the habitat.*

   The Proposed Transmission Route is currently developed with impervious or highly compacted surfaces and contains minimal vegetated or open water habitat. Therefore, the proposed transmission line would not degrade or destroy essential wildlife, finfish or shellfish habitat.

8. *Degrading **tidal wetlands, beaches and dunes, rocky shorefronts, and bluffs and escarpments** by significantly altering their natural characteristics or function.*

   Development and operation of the proposed transmission lines would not alter the natural characteristics of any coastal resources as none exist on or adjacent to the proposed construction areas.

C.3 Wildlife and Vegetation

No significant negative effects to wildlife habitat are anticipated from the construction of the Project. The areas planned for construction at the Substation sites have been previously disturbed and have little if any vegetation or wildlife habitat value.

The Proposed Modified Route travels through areas that are highly developed and provide limited opportunities for wildlife foraging and nesting.

The following findings of the Council in Docket 461 with respect to the proposed GSLP concerning Fish and Wildlife effects continue to apply to the Proposed Modified Project:

> *432. Development of the GSLP would not impact any fishery resources.*
>
> *434. None of the GSLP routes or associated substation work would impact any USFWS or State-listed endangered, threatened, or special concern species. The river herring, listed by the National Oceanic and Atmospheric Administration as a special concern species, migrates in tidal waters in Greenwich, including Indian Harbor in Bruce Park.*
>
> *435. The GSLP would not impact any DEEP designated critical habitats.*
>
> *437. The Hybrid Alternative…would not require a route through Bruce Park, thus avoiding direct and/or potential impacts to fish and wildlife and related habitats within the park.*
>
> *433. Bruce Park is part of the Atlantic flyway and is an important stop for migrating birds. Over 120 bird species have been recorded in the park.*

Recent correspondence with CT DEEP and the USFWS has identified two federally-listed threatened species as potentially occurring within the Project Area.

Northern long-eared bat

The Proposed Modified Project is not located within 150 feet of a known occupied maternity roost tree or within 0.25 mile of a known NLEB hibernaculum. Therefore, construction activities are not likely to adversely affect NLEB.

Red knot

The Proposed Modified Route Project is located within highly developed areas that provide no suitable habitat (either feeding or roosting) for red knot. Therefore, construction activities would not result in an impact to or an "incidental take" of this species.

Copies of correspondence from the CT DEEP and USFWS received since the Council's decision in Docket 461 are provided in *Appendix 3.*

Clearing would be necessary along portions of the MNR ROW, between its south side and the I-95 transportation corridor, to provide equipment (such as excavators and cranes) the necessary overhead clearances to work safely and to achieve conductor blowout clearance requirements. Areas required to be

cleared consist of approximately 5.5 acres of vegetation removal within the ROWs and approximately 3.4 acres would be cleared in adjacent off-ROW areas, avoiding residential properties.

Upon completion of construction, Eversource would restore disturbed areas with seed mixtures or plantings, where necessary. In the absence of other specific requirements, disturbed areas would be re-vegetated in compliance with the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control* and other approvals, as appropriate.

C.4 Local, State and Federal Land Use

The following findings of the Council in Docket 461 with respect to the GSLP continue to apply to the Proposed Modified Project:

> *368. The GSLP is consistent with the Conservation and Development Policies Plan for Connecticut 2005-2010 in that it serves a public need for a reliable source of electricity to the Town of Greenwich.*
>
> *369. The GSLP is consistent with the future land use and planning objectives of the Southwestern Regional Planning Agency's 2006 – 2015 Regional Plan of Conservation and Development 2006 – 2015 in that it improves the regions electric transmission grid.*

According to the Town of Greenwich Zoning Regulations, the proposed Greenwich Substation site at 290 Railroad Avenue is located within a General Business Zone and surrounded by commercial properties. The Proposed Route lies within areas listed as state property or zoned for Business and Waterfront Business uses.

There are no federal properties or federally-designated areas located on or proximate to the Project Area.

C.5 Historic and Archeological Resources

The Company's consultant, Heritage, completed a cultural resource assessment of the Project Area which included review of both historic and archeological resources. Refer to *Appendix 2.* A copy of this report has been forwarded to the CT State Historic Preservation Office (SHPO) for review and comment on March 13, 2017. The SHPO responded in writing on April 25, 2017 with the determination that "*no historic properties will be affected by this project. No further review is requested*". A copy of the SHPO's response letter is provided in *Appendix 3* of Petition *Volume 2.*

Greenwich Substation

Construction of the Substation would not result in impacts to historic or archaeological resources. No inventoried historic structures or archaeological resources were identified on or adjacent to the Proposed Site.

Cos Cob Substation

No inventoried historic structures or archaeological resources were identified on this site. The current location of Cos Cob Park remains listed on the NRHP for its former use as the Cos Cob Power Plant. The Cos Cob Power Plant was demolished in 2001 and as a result, lost its integrity of setting, materials, workmanship, design, and feeling. It is the opinion of Heritage Consultants, LLC that it is no longer eligible for inclusion in the National Register of Historic Places.

Transmission Supply Line Route

As previously introduced, review of the Proposed Modified Route confirmed that there are four previously identified archaeological sites, a single National Register of Historic Places property, two National Register of Historic Places historic districts, and one property (eligible for listing on the National Register of Historic Places located within 500 feet of the Proposed Modified Route. However, as noted it its evaluation, Heritage concluded that the Proposed Modified Route would have a low probability of encountering intact cultural deposits or artifacts of archaeological significance. Further, Heritage determined that the Project will not have adverse impacts on historic built resources or archaeological deposits.

C.6 Noise

The following findings of the Council in Docket 461 with respect to the GSLP continue to apply to the Proposed Modified Project:

> *442. Eversource expects only short-term and highly localized construction-related noise effects from the GSLP, including noise from truck traffic, drill rigs, jackhammers. The existing noise environment along most of the GSLP is dominated by urban noise related to local traffic, transportation corridors, and commercial uses. Construction activities are exempt from noise regulations.*
>
> *446. Once operational, noise from GSLP operations would be minimal and would meet applicable noise standards.*

However, because the proposed new substation, as compared to that proposed in Docket 461, will have less noise generating equipment, noise levels associated with the operation of the substation will be less than reported in Docket 461. Moreover, there will be less construction noise associated with the Proposed

Modified Project as compared to the GSLP originally proposed, since the Proposed Modified Route will occur, in part, between two transportation facilities (I-95 and the MNR), as compared to the GSLP, and include less excavation in streets.

Greenwich Substation

Noise from the new facility will be minimal. The predominant noise contribution from the Substation would be steady state noise from the new transformers. Infrequent impulse noise would be generated from switching and circuit breaker opening and closing. The projected noise levels at the Property lines will comply with applicable levels permitted by both the Town of Greenwich Noise Ordinance and CT DEEP's noise regulations. Noise levels will be at or below the most restrictive regulation, which is the Greenwich Noise Ordinance. Neighboring properties in the Business Zone will not be subjected to substation noise in excess of 62 dBA. Neighboring properties in the Residential Zone will not be subjected to substation noise in excess of 55 dBA during the day or 45 dBA at night.

Cos Cob Substation

The predominant existing noise emitters at the Cos Cob Substation are the transformers and only a portion of these are owned by Eversource (the others are owned by MNR or by Connecticut Jet Power LLC[14]). As part of the Project, Eversource is proposing to make certain modifications to Cos Cob Substation, but these modifications do not include adding new transformers. After the Cos Cob Substation modifications are in service, infrequent noise would be generated from switching and from the additional circuit breakers opening and closing. The planned new equipment will not increase existing steady state noise levels at the facility.

Proposed Modified Route

Construction-related noise for the transmission supply lines would be short-term and highly localized in the vicinity of work sites, and would result from the operation of construction equipment including truck traffic, earth moving equipment, drill rigs, and jackhammers.

A majority of the underground transmission line construction would be aligned within busy road ROWs, and the overhead construction would be adjacent to the active MNR corridor. In general, construction activities for the transmission supply lines are expected to occur over a 12- to 18-month period. The overhead line work would be restricted to hours allowed within the ROW by the MNR (likely between 1 AM and 4 AM). Underground cable installations would be coordinated with the Town and anticipated to occur during daytime hours (7 AM to 7 PM), 6 days per week (Monday through Saturday). Eversource

[14] Connecticut Jet Power LLC is a subsidiary of NRG Energy Inc.

expects to further define appropriate work hours for construction activities in coordination with the Town and MNR.

C.7 Air Quality

The following finding of the Council relating to air quality effects of the GSLP continues to apply to the Proposed Modified Project:

> *441. Construction of the Project would have short-term, localized effect on air quality, mostly from dust and equipment emissions. In order to minimize dust, Eversource would limit the extent of exposed/disturbed areas and install temporary gravel tracking pads wherever necessary to prevent dirt from being tracked onto public roadways. Water may be used to control dust emissions, as needed.*

Vehicle emissions will be limited by requiring contractors to properly maintain construction equipment and vehicles, and by minimizing the idling time of diesel construction equipment in accordance with regulatory standards.

In contrast to the GSLP, the Proposed Modified Project does not include a Gas Insulated Substation or other related facilities.

C.8 Scenic and Recreational Areas

No direct, permanent adverse effects are anticipated to scenic areas and features or to recreational areas, primarily because of the distances of these receptors from the components of the Proposed Modified Project. Some indirect effects, primarily in the form of aesthetics, are unavoidable as a result of the necessary heights associated with new structures along the Proposed Modified Route.

Greenwich Substation

Construction and operation of the Greenwich Substation would not result in any adverse effects to Statutory Facilities or on recreational and/or scenic resources. No municipal land, open space, recreation areas or parks are located proximate to the proposed Substation site, which is surrounded by commercial properties.

Cos Cob Substation

Construction activities associated with the proposed modifications to Cos Cob Substation would not result in any direct effects to Statutory Facilities or to recreational and/or scenic resources, including Cos Cob Park. The property is located adjacent to the Town's recently developed recreational park and is close to Long Island Sound. Trenching for the proposed underground transmission lines would temporarily affect access to Cos Cob Park during construction but would not cause any long-term effect to park access.

Existing utility infrastructure is currently installed on the property in the form of substation equipment and numerous transmission structures and overhead lines. The addition of the relatively modest proposed substation expansion would not increase the visual impact of the substation, as compared to existing conditions.

Transmission Supply Line Route

As noted in Docket 461, FOF No. 296, Opinion, p.7, the Council found that the Hybrid Route (now the Proposed Modified Project) would be consistent with the FERC *Guidelines for the Protection of Natural, Historic, Scenic and Recreational Values in the Design and Location of Rights-of-Way and Transmission Facilities.*

In discussing the Hybrid Alternative in its Opinion for Docket 461, the Council expressed concern "about the visual impact of the necessary tall transmission line structures from adjacent residential areas, Bruce Park and arterial roads," and stated that it did not have "enough information to determine the visual impact of the overhead portion of the Hybrid Alternative at this time." (Opinion, p.7).
In response to this concern, Eversource designed the Proposed Modified Route to incorporate the shortest necessary heights of the transmission lines from underlying infrastructure. Further, Eversource opted to locate the overhead transmission lines and support structures on the south side of the MNR ROW, between Indian Field Road and Steamboat Road, thus providing additional distance from residential properties on Circle Drive and Bruce Park Avenue. This also provided adequate separation distance from Eversource's existing distribution circuit within the northern MNR ROW.

Views at Cos Cob Park will not be substantially impacted because the proposed new monopole structures will be placed within an existing transmission and MNR corridor that is currently occupied with numerous lattice towers (with both electrical and telecommunications appurtenances), rail line catenary wire support structures and electrical distribution poles. See Photo 1 in *Appendix 5*.

The overhead transmission line would transition from the north to south side of the MNR at Indian Field Road and extend west, providing distance from Circle Drive, as introduced above, and from Bruce Park to the south. This alignment also preserves existing vegetative screening along the north side of the MNR ROW and the northern limits of Bruce Park, adjacent to I-95. Tree clearing will be required to install the new lines and structures on the south side of the MNR ROW.

Along Circle Drive, homes bordering the MNR ROW do have some mature deciduous trees in the side and back yards. The immediate proximity of these properties to the ROW, and the need to maintain safety clearances for the Eversource distribution line and railroad catenaries, result in minimal opportunity to create a more substantial vegetative buffer. The proposed new structures would be visible above the existing distribution and catenary line structures. From Circle Drive direct views of the new structures would be partially obstructed by the mature trees, as can be seen in Photos 3 through 5 in *Appendix 5*. Similar conditions exist along Bruce Park Avenue to the west (see Photo 12).

From several locations in Bruce Park, several of the proposed transmission line structures would be visible, particularly when the leaves are off the trees. See Photos 6 through 10 in *Appendix 5*. During "leaf-on" conditions, views would be limited to the upper portions of the structures where they would eclipse the deciduous tree line separating Bruce Park from I-95 and the MNR ROW. The separating distances of the Proposed Modified Route from Bruce Park locations assist in reducing the overall visual impact of the new structures.

Beyond Bruce Park heading west, the roadway is at a lower elevation than that I-95 and the MNR ROW. This grade differential, combined with the presence of intervening mature trees provides effective screening from these arterial roads. This is even more so during "leaf-on" periods.

The two proposed transition structures at the west end of the overhead portion of the transmission line have been positioned along the MNR ROW to reduce the views from the intersection of Greenwich Avenue and Railroad Avenue. Although visible from some locations within this area, the two structures would be partially concealed behind existing buildings and appear proportionate to other surrounding structures. See Photo 12 in *Appendix 5*.

C.9 Vehicle and Pedestrian Traffic

Eversource recognizes that construction of the underground segments of the Modified Proposed Project in streets would cause temporary inconvenience to the public with respect to pedestrian and vehicle traffic patterns. As compared to GSLP, the underground transmission line segments have been reduced from approximately 2.3 miles to approximately 0.6 mile. Construction of the overhead segment along the MNR ROW will have minimal effect on traffic. As explained in *Section A*, construction work would be accomplished in several stages, and each stage may require in-road activities that temporarily affect vehicle and pedestrian traffic patterns and land uses in the immediate vicinity.

Exhibit A, Section D

Electric and Magnetic Fields

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D. Electric and Magnetic Fields (EMF)

The Council's Findings in Docket 461 concerning the characteristics of EMF (FOF Nos. 447-449); national standards and guidelines (FOF No. 450); the *Council's Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Lines in Connecticut* (Council's EMF BMP) and Eversource's compliance therewith (FOF Nos. 451-454) remain accurate and relevant to the Proposed Modified Project (and the Alternate Modified Project). The Council's Findings with respect to the major and minor EMF sources of the GSLP (FOF Nos. 456 and 457) also apply to the Proposed Modified Project. As suggested in the Council's Opinion in Docket 461, p. 7, this section provides a full EMF characterization of the Proposed Modified Project, which is based on the Hybrid Alternative considered in the original proceeding, including project-specific projections for future EMF levels associated with the proposed hybrid underground and overhead transmission supply lines and measurements of existing fields along the proposed transmission line route and the proposed Greenwich Substation site.

D.1 Supplemental Measurements of Existing EMF Environment

In Docket 461, Eversource presented magnetic field measurements taken at several locations within the GSLP Project Area. Additional measurements were taken along the route proposed by this Petition are presented in this section. Together, these measurements illustrate the levels of electric and magnetic fields in the existing environment of the Project Area. For the measurement traverses along Sachem Road and Davis Avenue, measurements were performed underneath the railroad tracks, where pedestrians have access. It should be noted that much of the exposure in the existing environment comes from the electrified railroad system during the passing of trains. Measurements of the fields during this event are also included for reference.

The supplemental measurements were performed on January 12, 2017. Measurements were performed with an EMDEX II meter with various attachments including an E-Probe attachment for measuring electric fields and a "LINDA" wheel (LINear Data Acquisition) for measuring magnetic field profiles. These devices were manufactured by Enertech Consultants. These measurements were performed consistent with the methods prescribed in *IEEE Standard 644: Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines*.

It should be noted that the measured magnetic fields from the passing trains were the dominant source of magnetic fields in the area. This occurred just as the trains were arriving and departing the area with measurements consistently above 20 mG. However, all of these measured levels are orders of magnitude below the accepted international guidelines.

D.1.1 Measurements at Sachem Road

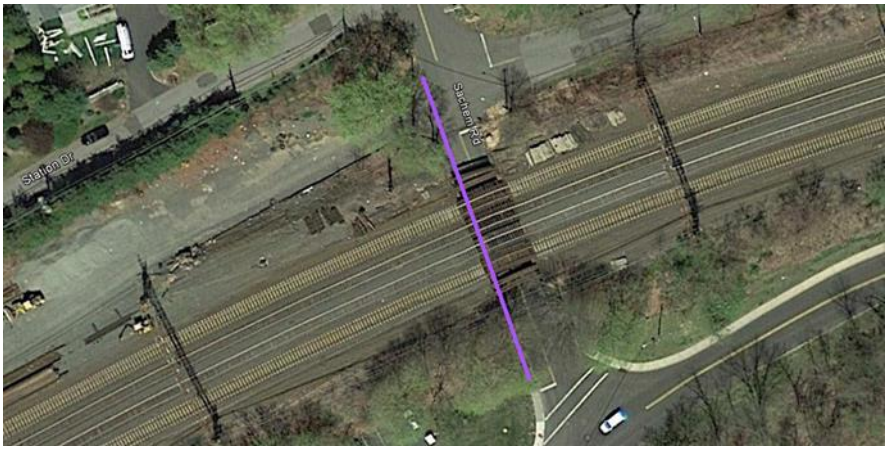

Figure D-1, Sachem Road Measurement Location

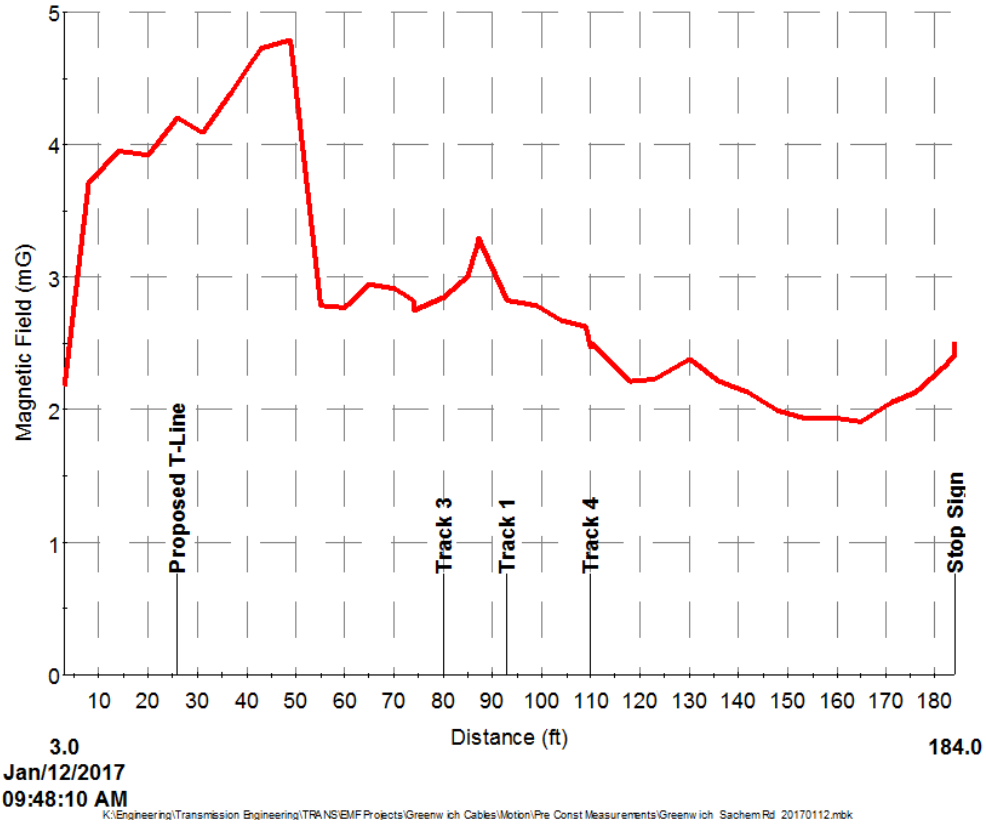

Figure D-2, Sachem Road Magnetic Field Measurements

Table D-1, Sachem Road Magnetic Field Measurement Summary

Field Measured	Minimum	Average	Maximum
Magnetic Field (mG)	1.9	2.9	4.8

D.1.2 Measurements at Davis Avenue

Figure D-3, Davis Avenue Electric and Magnetic Field Measurement Locations

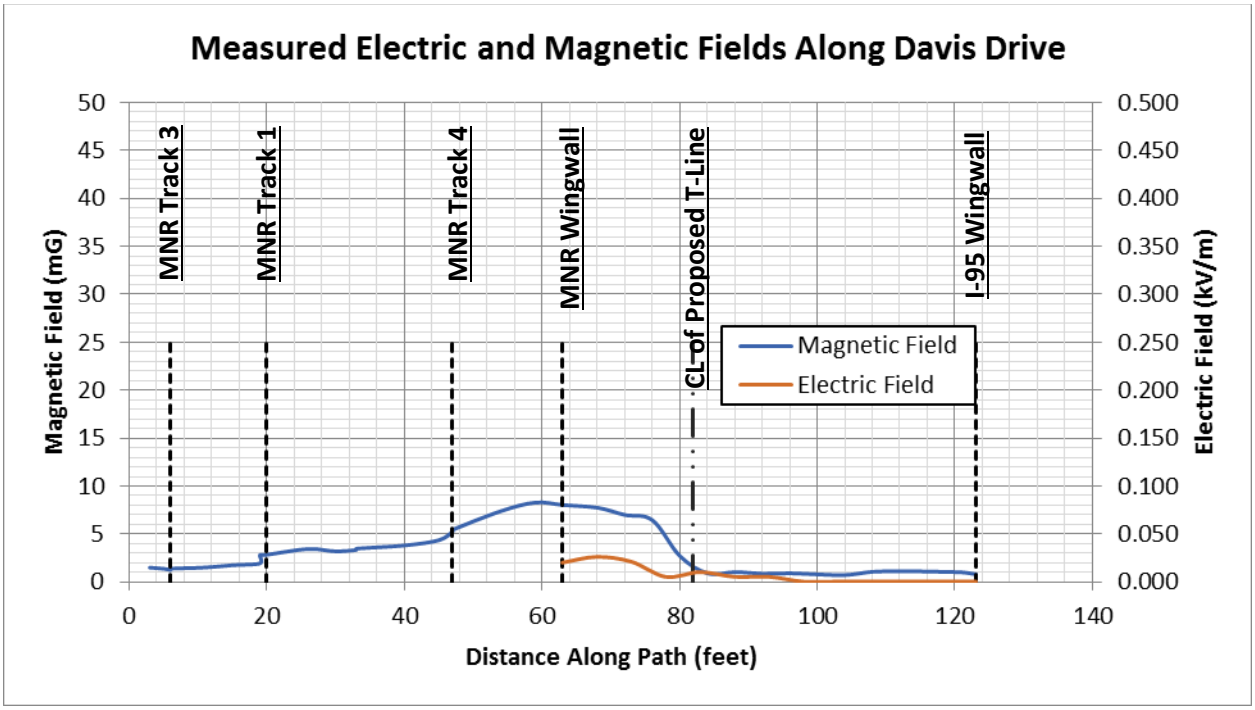

Figure D-4, Davis Avenue Electric and Magnetic Field Measure

Table D-2, Davis Avenue Electric & Magnetic Field Measurement Summary

Field Measured	Minimum	Average	Maximum
Magnetic Field (mG)	0.8	3	8.2
Electric Field (kV/m)	0	0.01	0.03

D.1.3 Measurements at Railroad Avenue

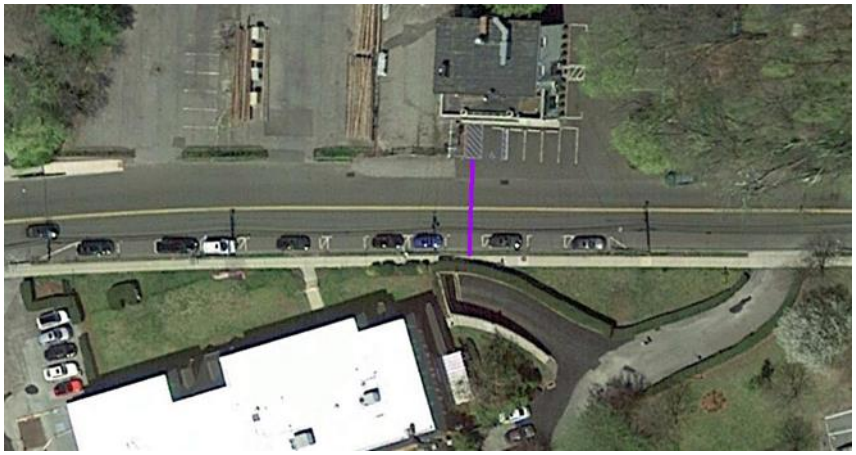

Figure D-5, Railroad Avenue Measurement Location

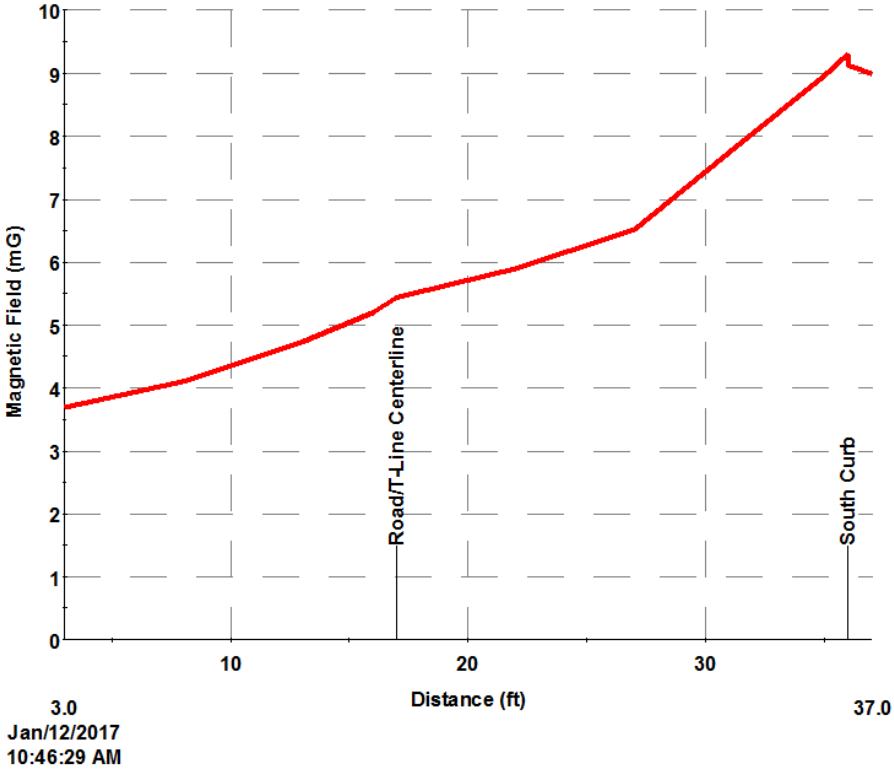

Figure D-6, Railroad Avenue MF Measurements

Table D-3, Railroad Avenue Magnetic Field Measurement Summary

Field Measured	Minimum	Average	Maximum
Magnetic Field (mG)	3.7	6.6	9.3

D.1.4 Measurements at Indian Field Road as Trains Pass

Figure D-7, Indian Field Road Measurement Location

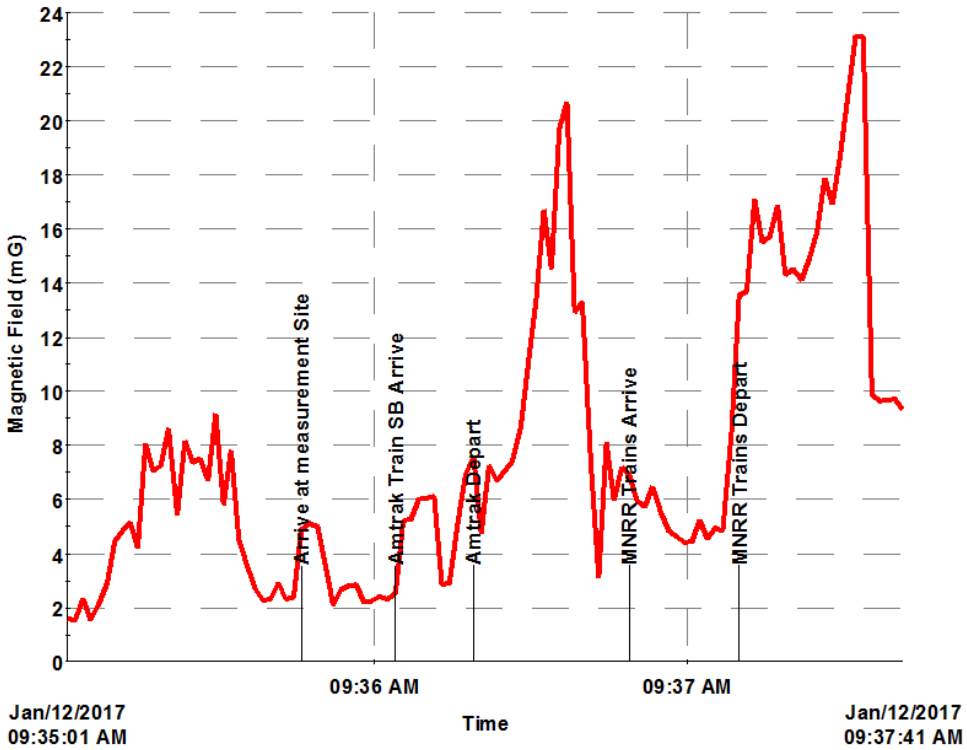

Figure D-8, Indian Field Magnetic Field Measurements

Table D-4, Indian Field Magnetic Field Measurement Summary

Field Measured	Minimum	Average	Maximum
Magnetic Field (mG)	1.5	7.8	23.1

D.2 Calculated Electric and Magnetic Field Levels from the Proposed Project

This section describes the calculated electric and magnetic fields from the proposed transmission lines. These calculations represent only the transmission contribution of the electric and magnetic fields in the vicinity of the proposed route. It should be noted that existing distribution and railroad power facilities are the major contributor to the magnetic fields in the area. The peak and edge of MNR ROW values for the proposed line are summarized in *Table D-5*. Calculations presented in this section are based on Average Annual Loads (AAL). Calculations for the Peak Day Average Loads (PDAL) and the Annual Peak Load (APL) can be found in *Appendix 8*.

Table D-5, Summary of Electric and Magnetic Field Calculations

Calculated Magnetic Field Levels (mG; AAL)			
Section	North Edge of ROW	Max in ROW	South Edge of ROW
Transition Structure to Harbor Crossing	0.11	0.51	0.44
Indian Harbor Crossing	0.22	0.84	0.75
Harbor Crossing to Indian Field Rd	0.11	0.51	0.44
Indian Field Road to I-95 Crossing	0.31	0.51	0.09
Interstate 95 Crossing	0.31	0.41	0.04
Calculated Electric Field Levels (kV/m)			
Section	North Edge of ROW	Max in ROW	South Edge of ROW
Transition Structure to Harbor Crossing	0.04	0.14	0.12
Indian Harbor Crossing	0.03	0.12	0.12
Harbor Crossing to Indian Field Rd	0.04	0.14	0.12
Indian Field Road to I-95 Crossing	0.13	0.14	0.03
Interstate 95 Crossing	0.07	0.08	0.01

D.2.1 From Riser Structure to Harbor Crossing

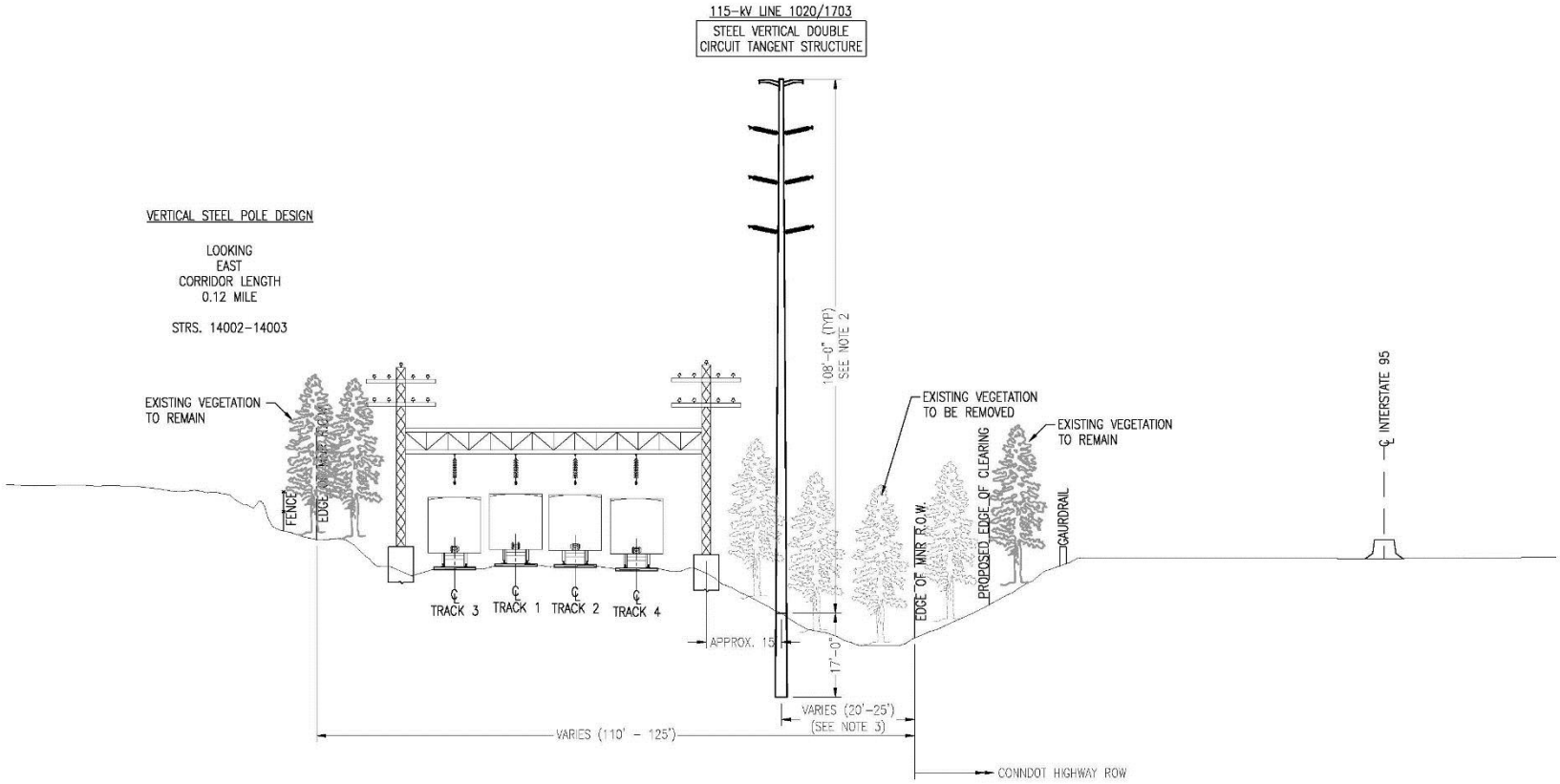

Figure D-9, Typical Cross Section from Riser Structure on Steamboat Road to Harbor Crossing

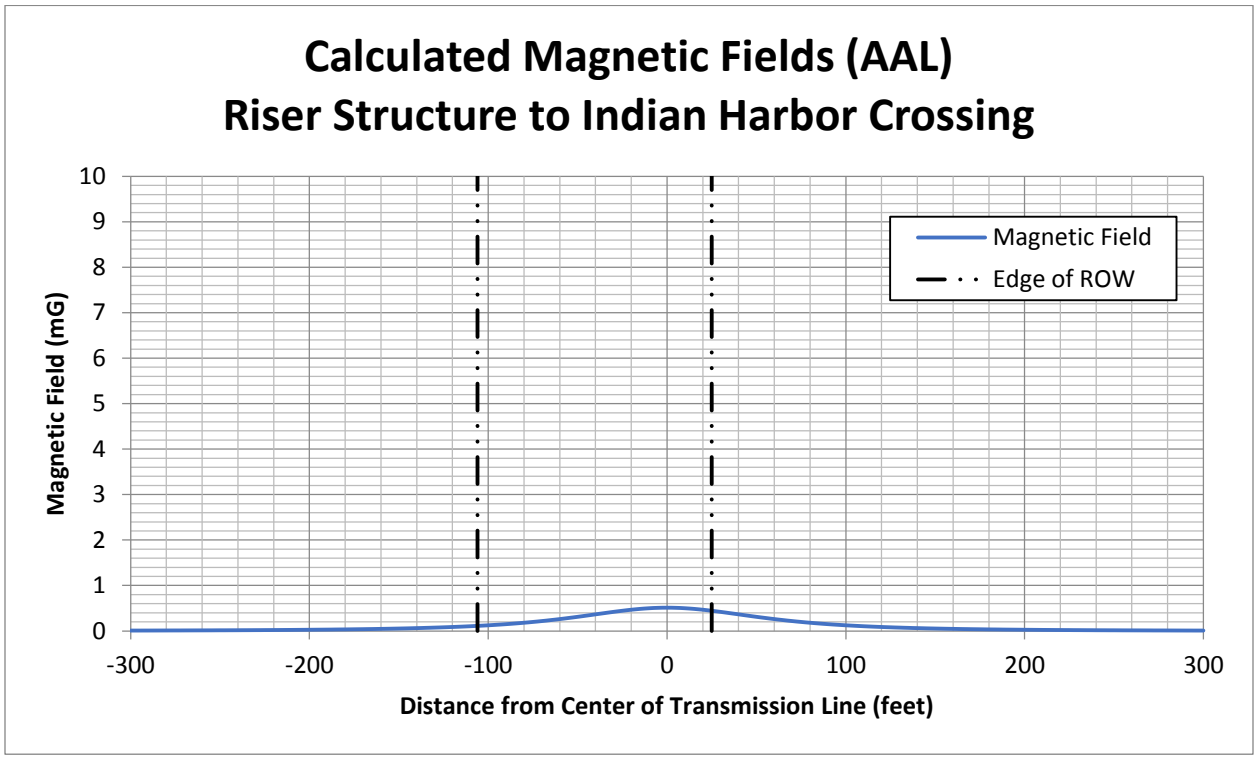

Figure D-10, Calculated Magnetic Fields from Riser Structure to Harbor Crossing

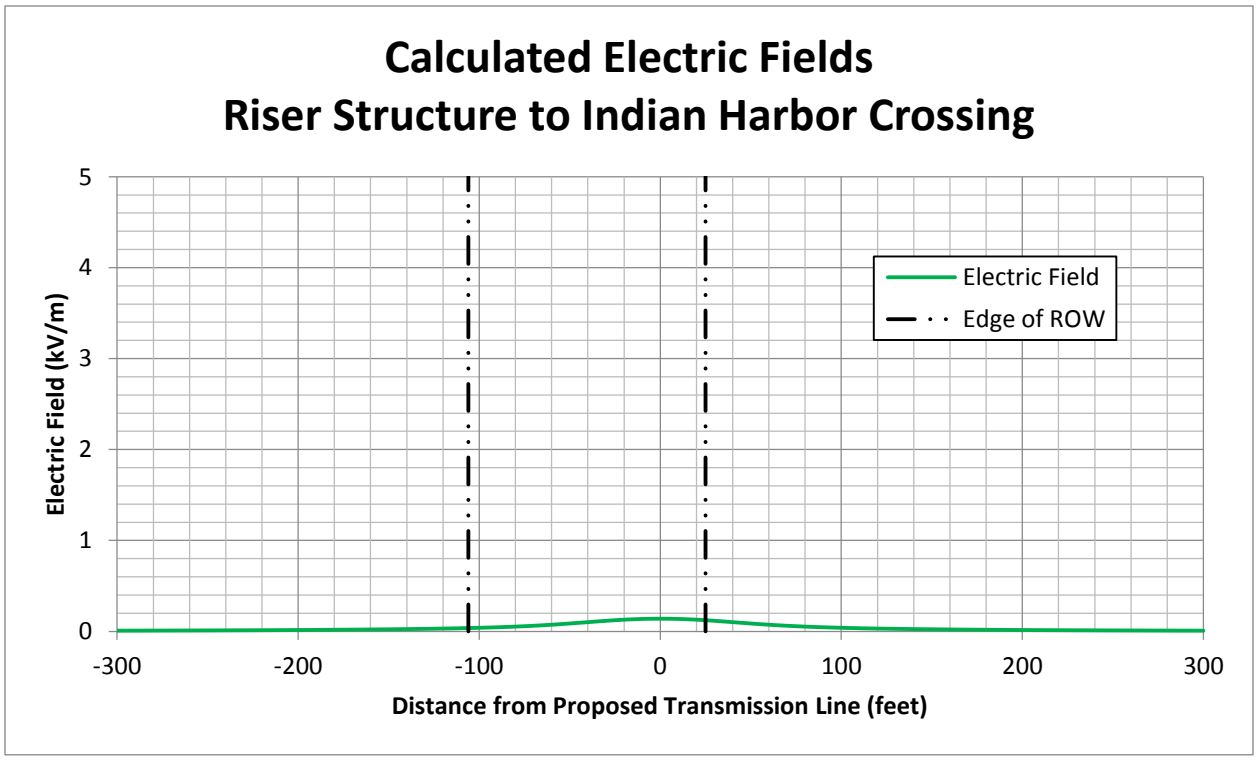

Figure D-11, Calculated Electric Fields from Riser Structure to Harbor Crossing

D.2.2 Calculated Fields at Indian Harbor Crossing

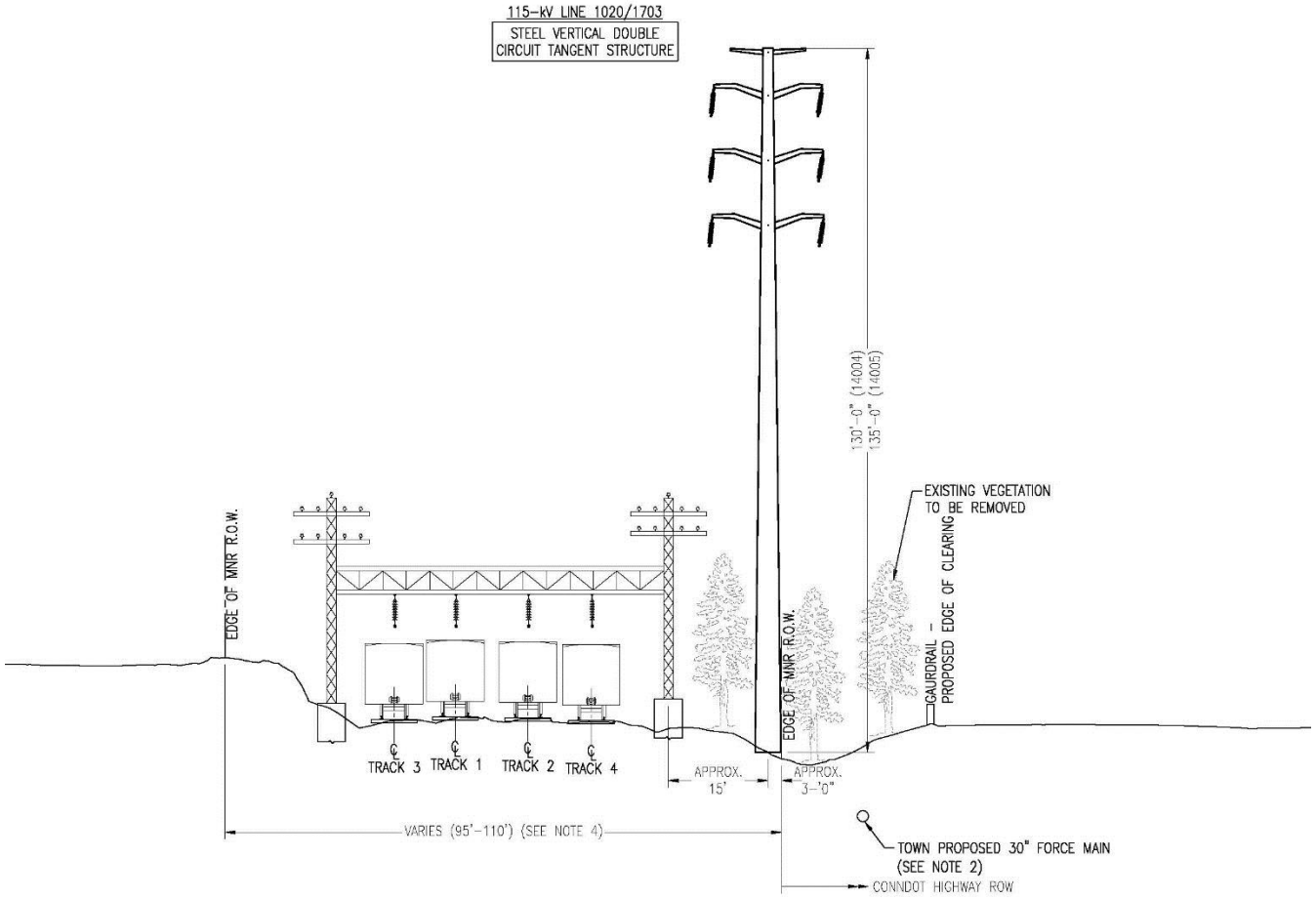

Figure D-12, Typical Cross Section for Indian Harbor Crossing

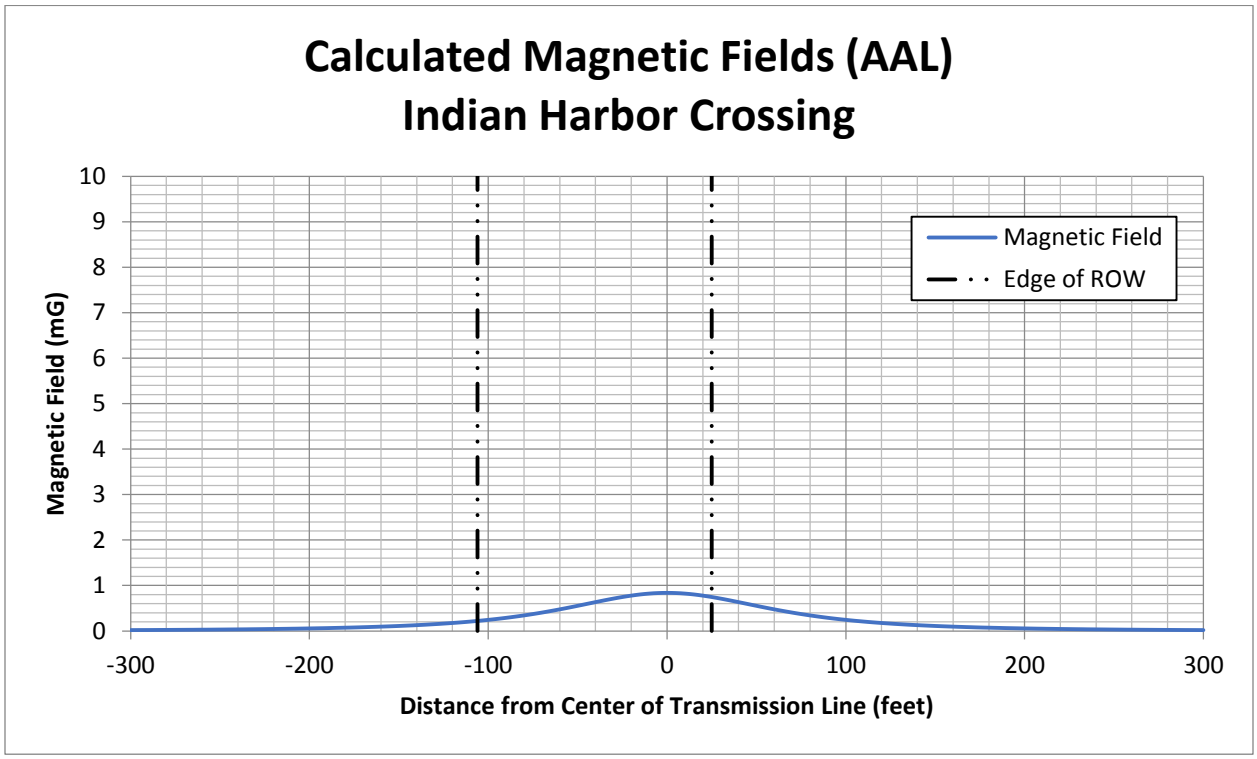

Figure D-13, Calculated Magnetic Fields for Indian Harbor Crossing

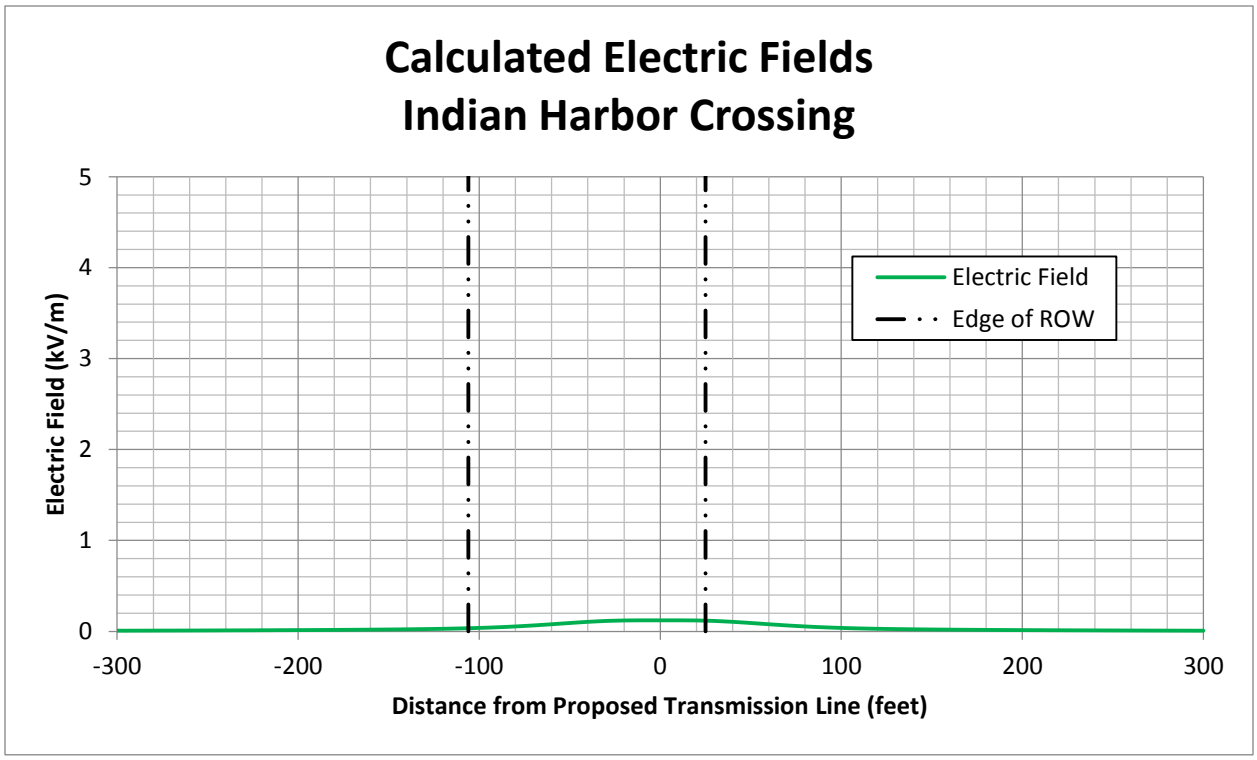

Figure D-14, Calculated Electric Fields for Indian Harbor Crossing

D.2.3 Calculated Fields from Indian Harbor to Indian Field Rd

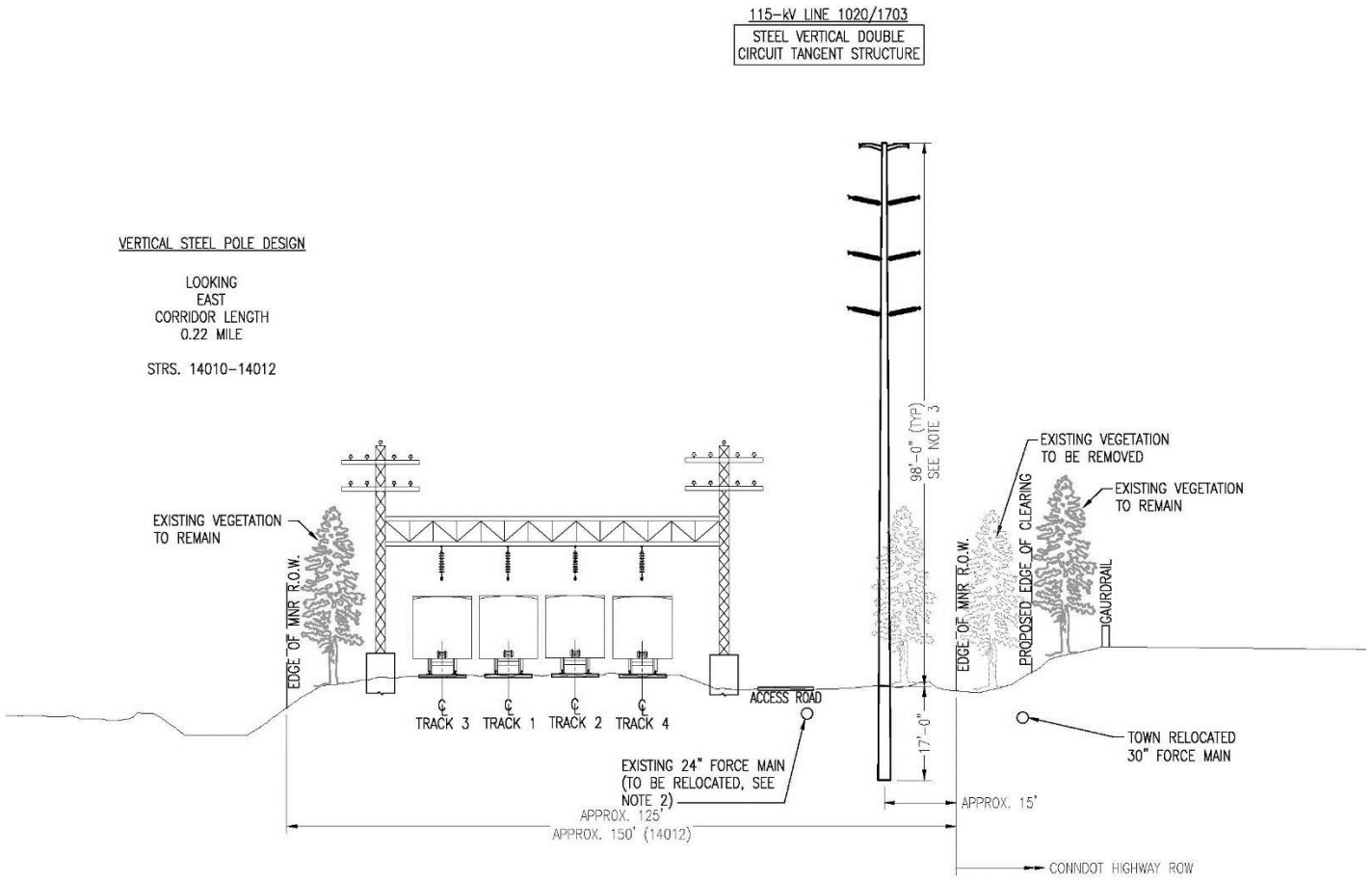

Figure D-15, Typical Cross Section for Harbor Crossing to Indian Field Road

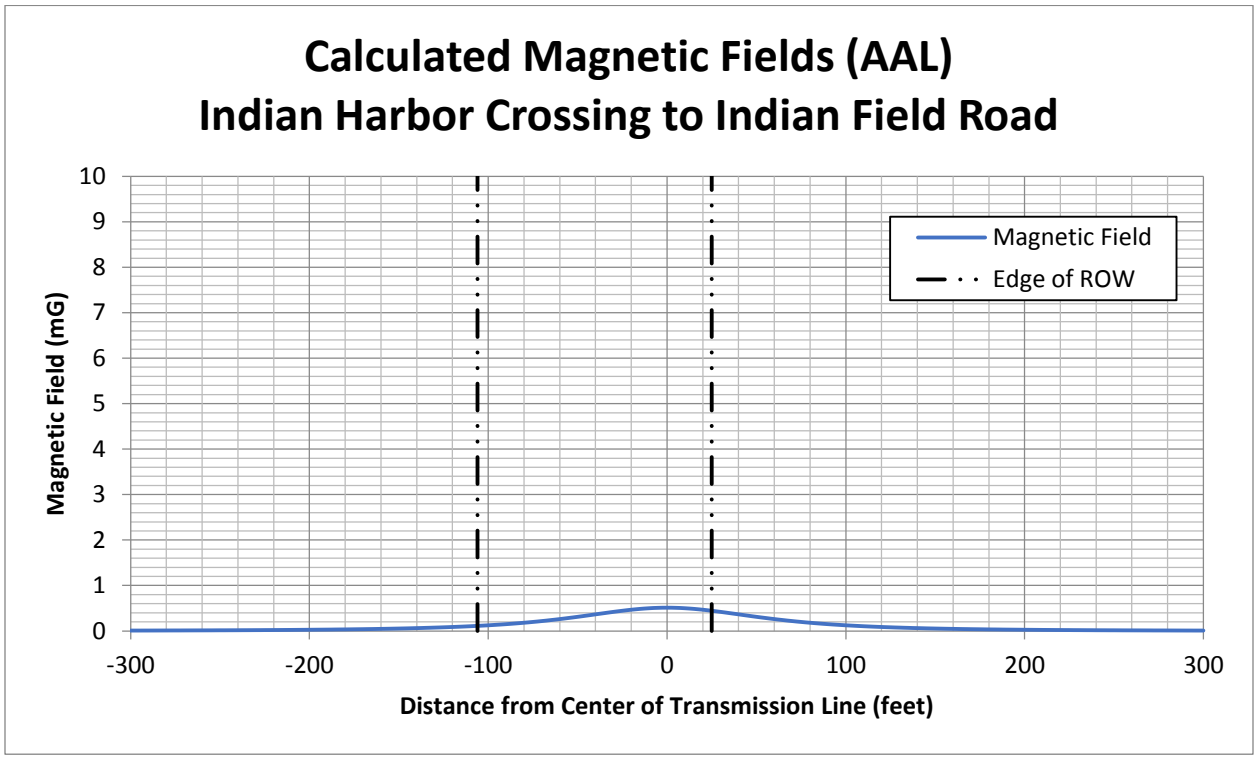

Figure D-16, Calculated Magnetic Fields for Harbor Crossing to Indian Field Road

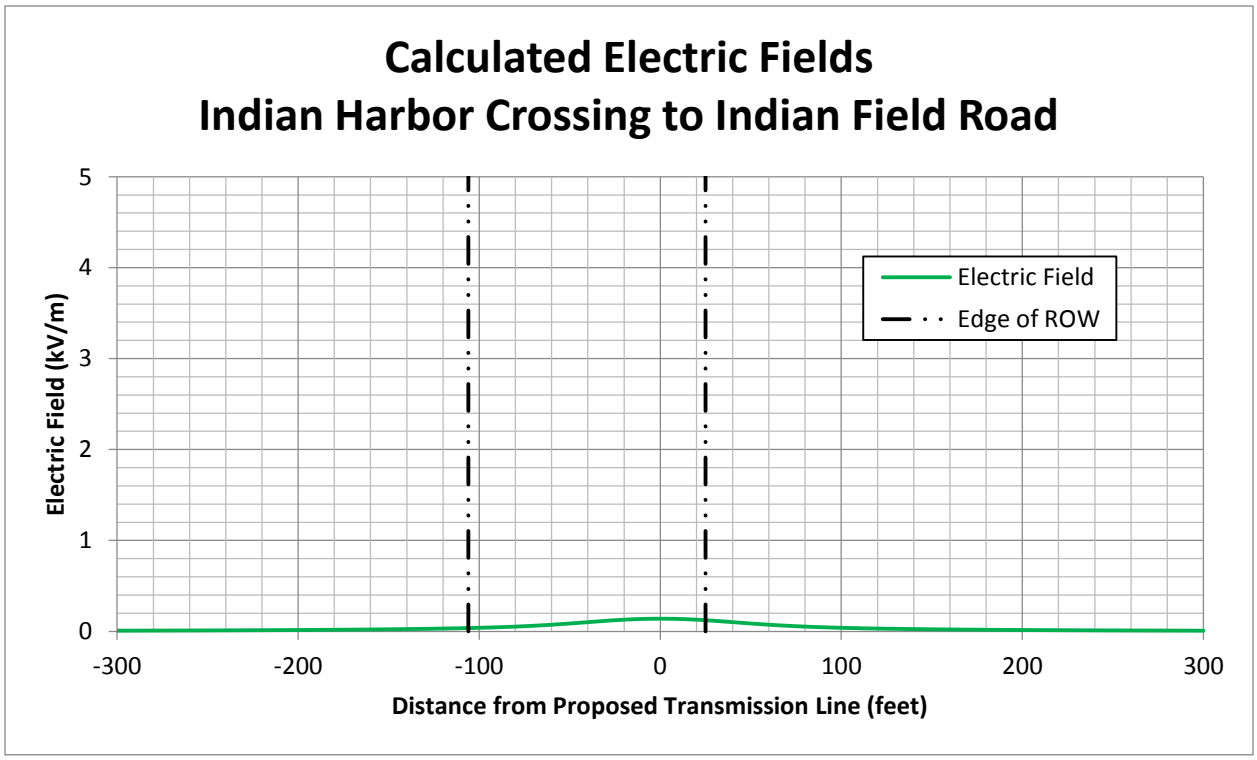

Figure D-17, Calculated Electric Fields from Indian Harbor Crossing to Indian Field Road

D.2.4 Calculated Fields Indian Field Rd to Interstate 95 Crossing

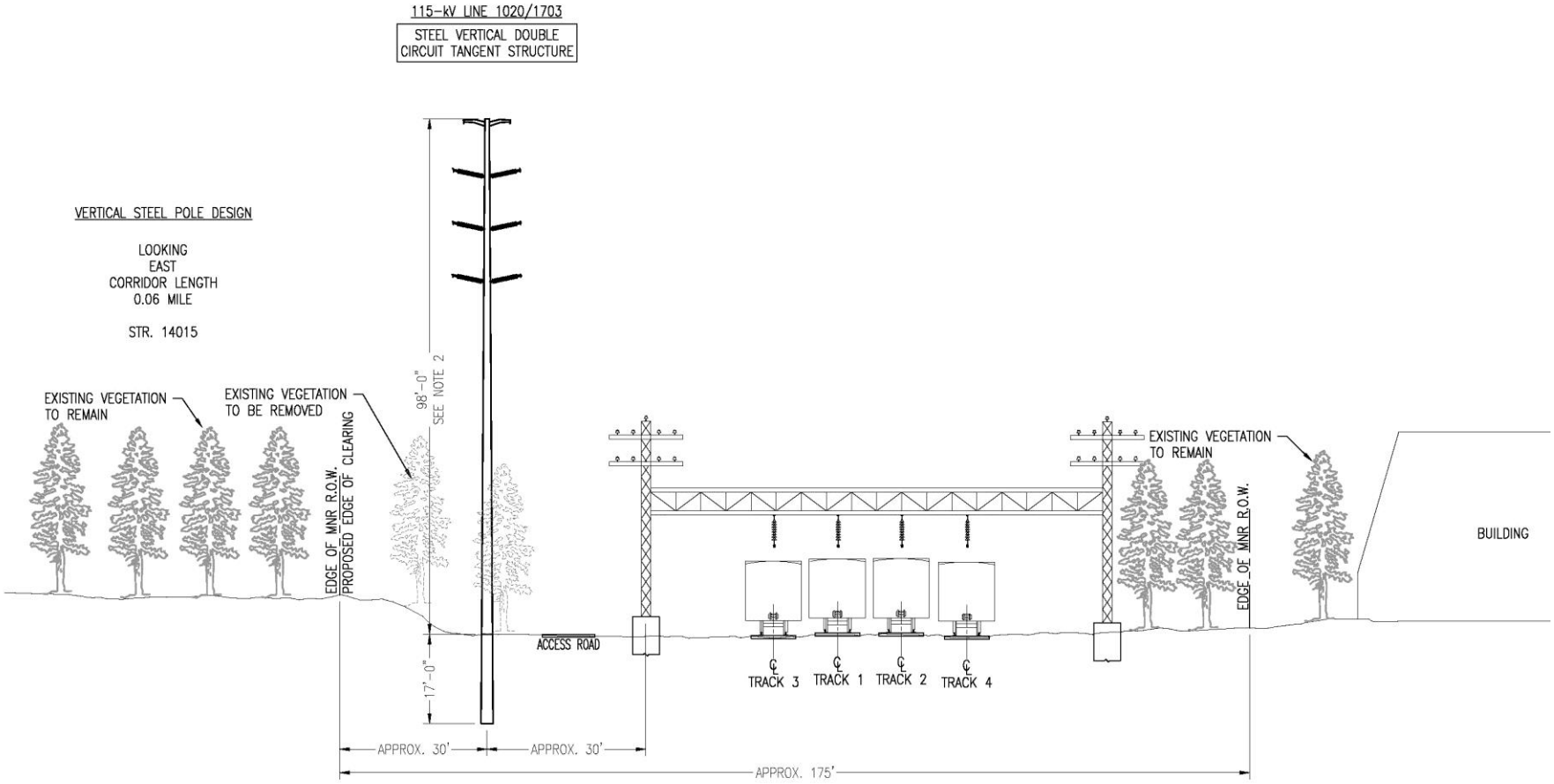

Figure D-18, Typical Cross Section from Indian Field Road to I-95 Crossing

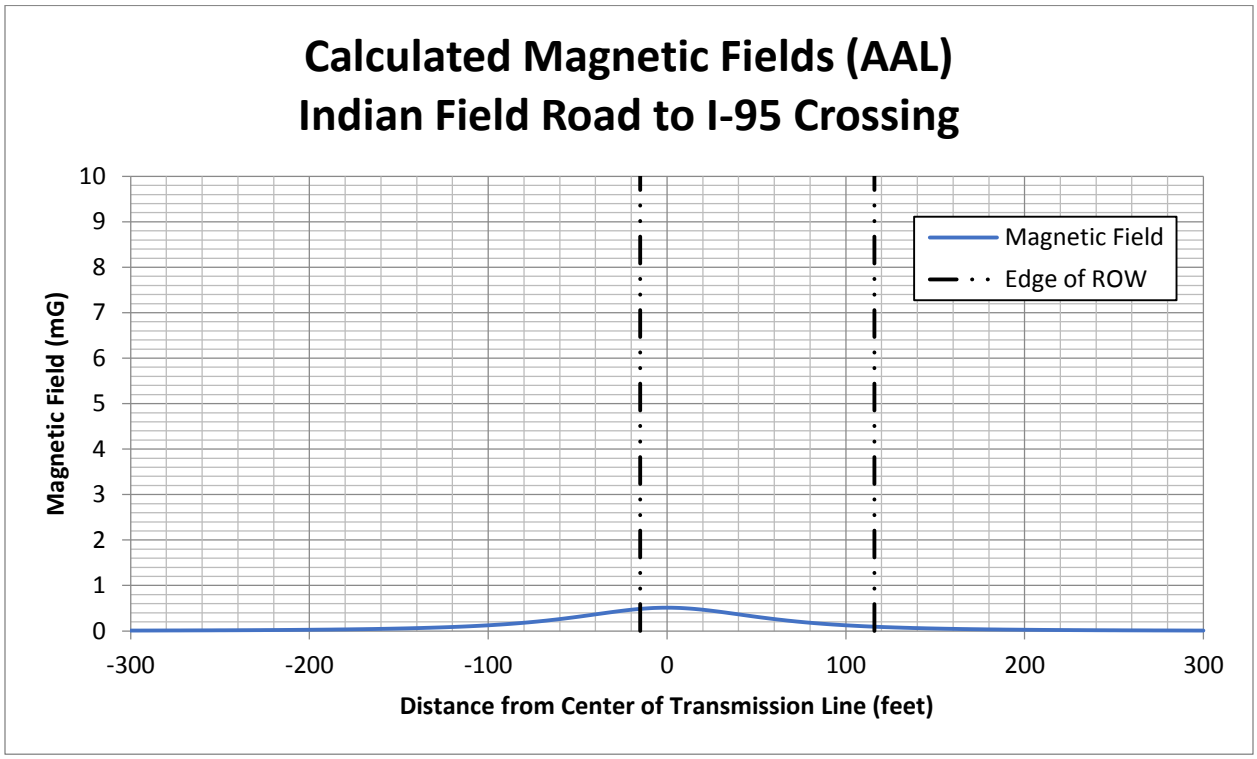

Figure D-19, Calculated Magnetic Fields from Indian Field Road to I-95 Crossing

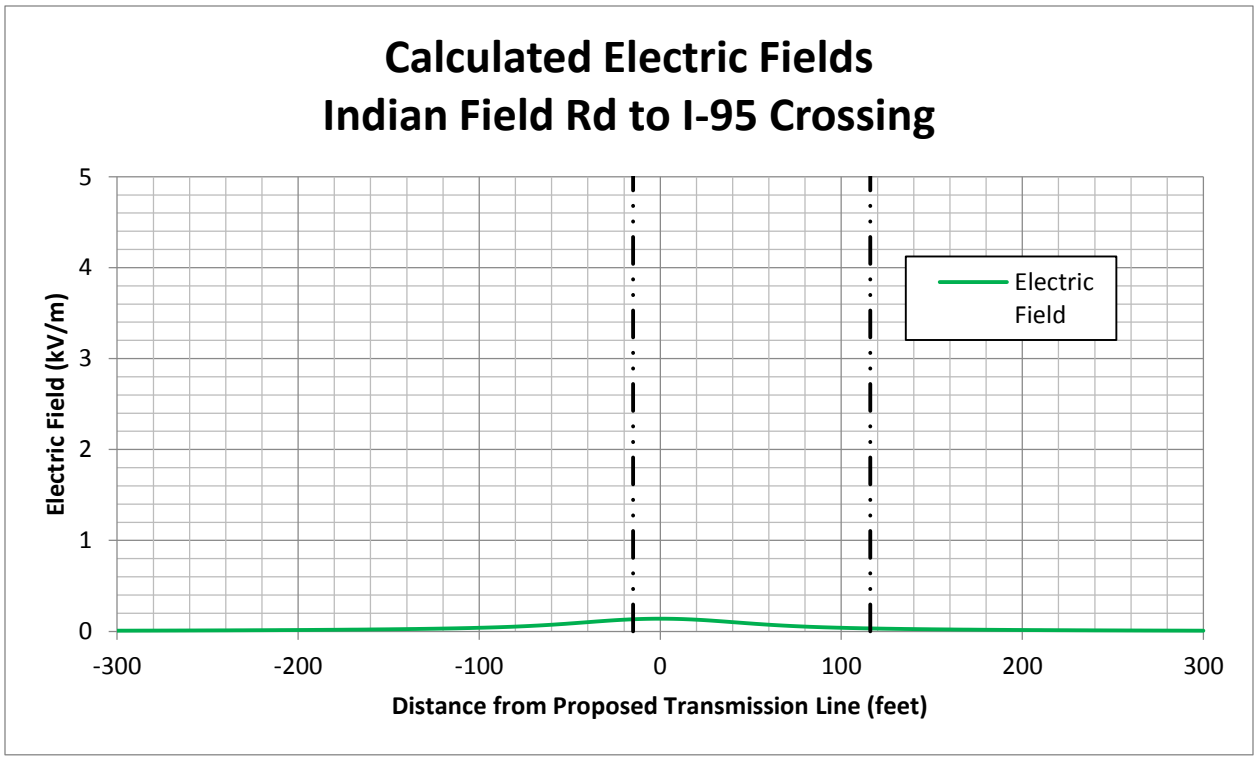

Figure D-20, Calculated Electric Fields from Indian Field Road to I-95 Crossing

D.2.5 Calculated Fields at Interstate 95 Crossing

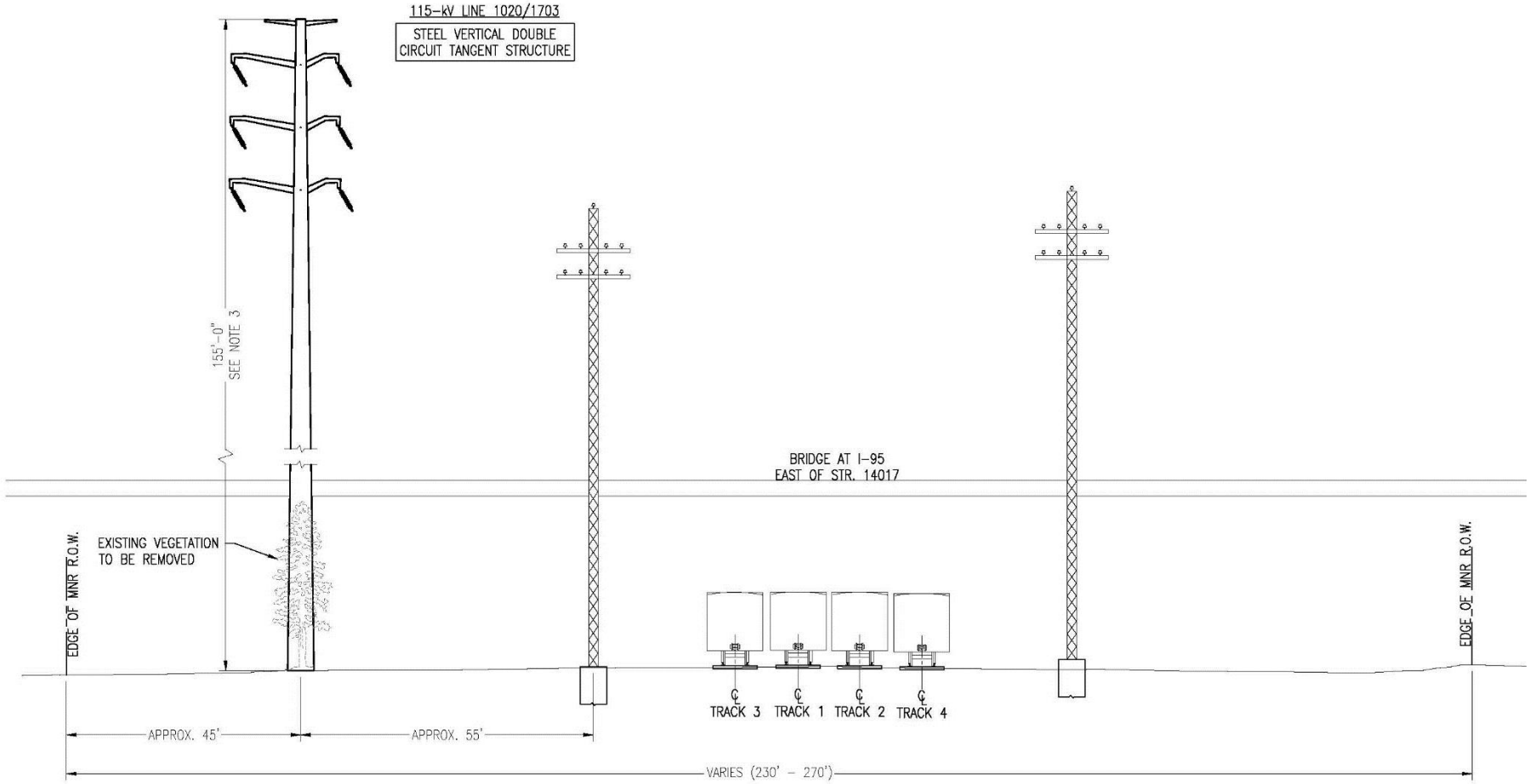

Figure D-21, Typical Cross Section for Interstate 95 Crossing

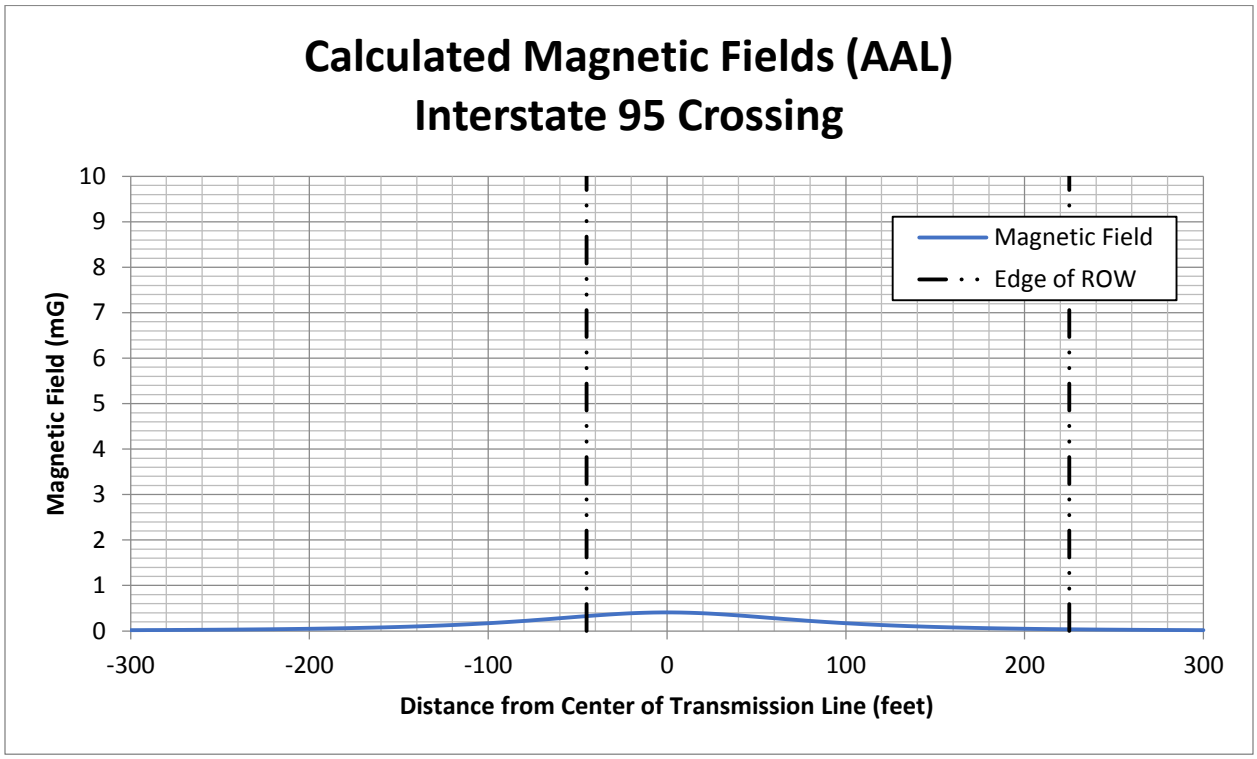

Figure D-22, Calculated Magnetic Fields for Interstate 95 Crossing

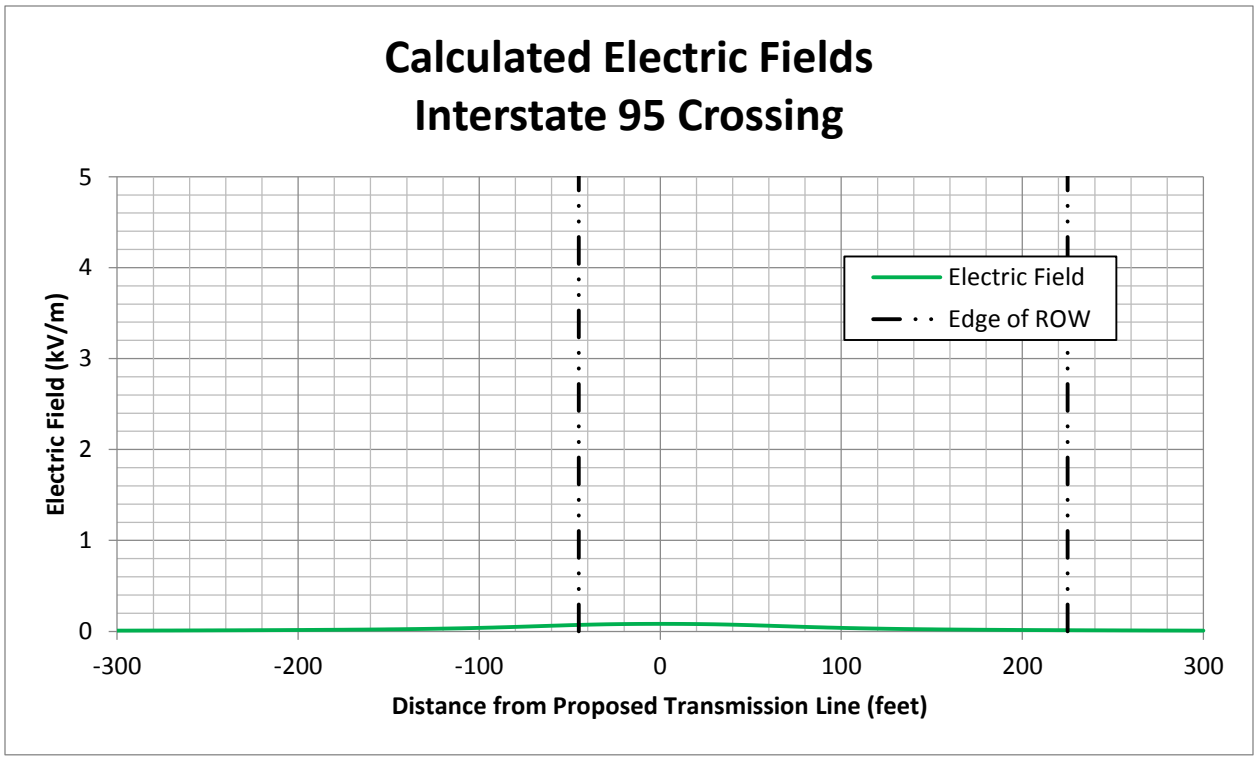

Figure D-23, Calculated Electric Fields for Interstate 95 Crossing

D.2.6 Calculated Fields from UG Portions of the Hybrid Route

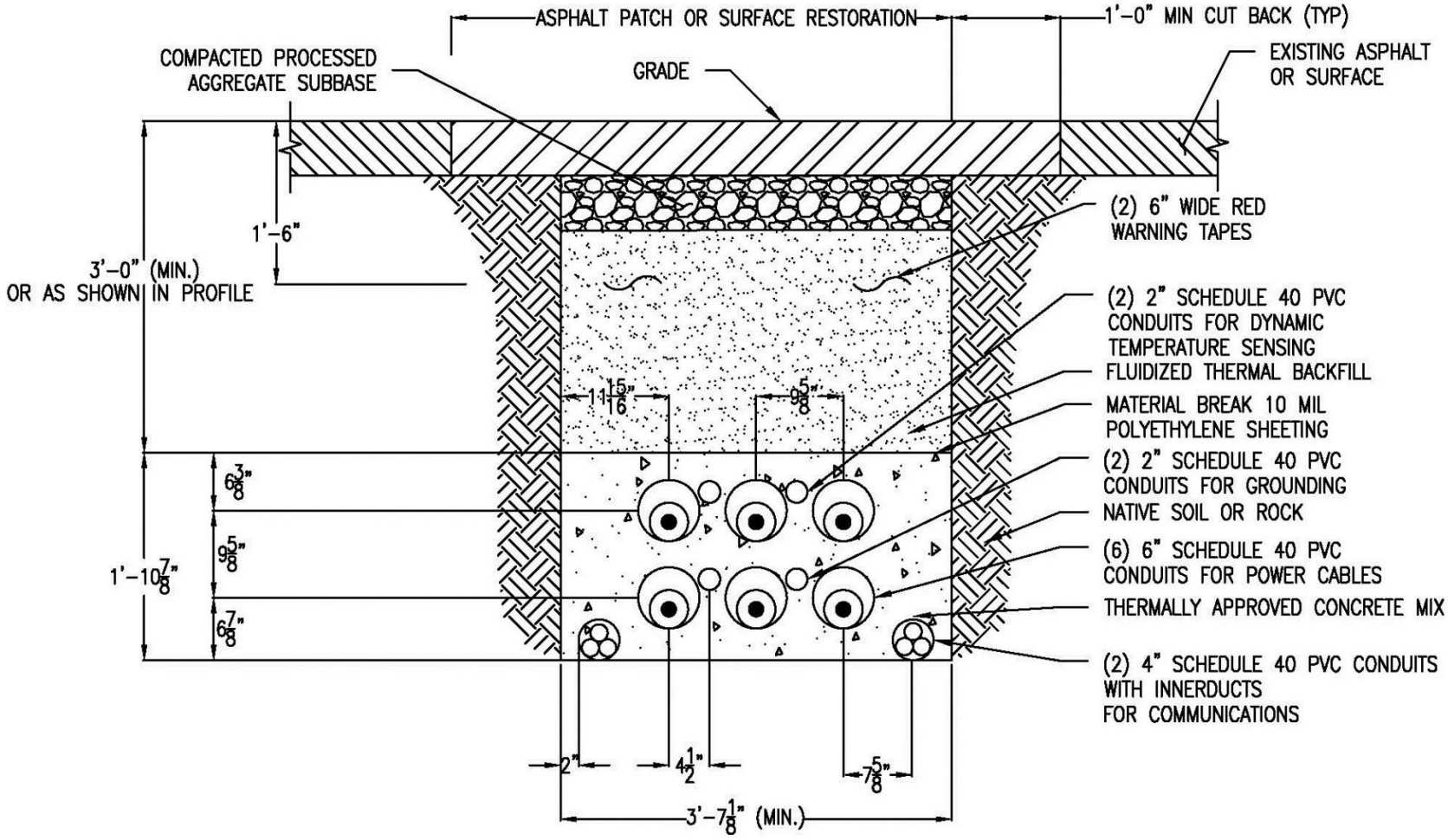

Figure D-24, Typical Underground Trench Cross Section

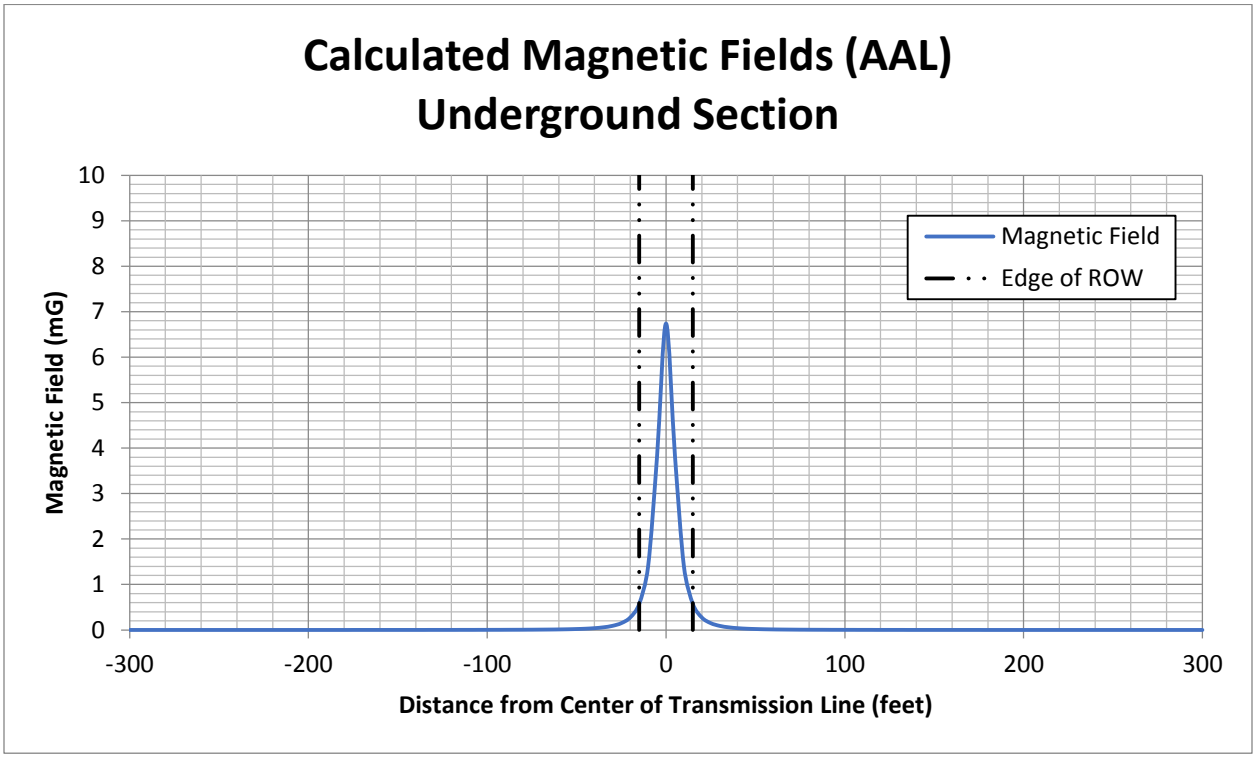

Figure D-25, Calculated Magnetic Fields from UG Transmission Lines

There are no external electric fields from underground transmission lines.

D.3 Electric and Magnetic Fields from Substations

In Docket 461, the Council found:

> *Transformers and other equipment at the Cos Cob Substation and proposed Greenwich Substation are potential EMF sources. These sources, however, would be expected to cause little or no exposure to the general public because the strength of fields from typical substation equipment decreases rapidly with distance and reaches very low levels at relatively short distances beyond the substation perimeter. The exception to the normally low levels of EMF associated with substations is where transmission and distribution lines enter the substation. (FOF No. 456).*

This statement continues to be accurate as applied to the Proposed Modified Project. The proposed substation construction will cause a negligible increase in the existing magnetic fields in its vicinity.

D.4 Field Management Design Plan

The Council's EMF BMP requires applicants to "develop a baseline Field Management Design Plan" (FMDP) that incorporates "no-cost" design mitigation measures. Because the overhead section of the transmission line has been designed to accommodate the MNR catenary supply lines, its structures are necessarily tall (ranging from 80 feet to 150 feet above ground) and the conductors supported by the

structures are therefore high above the ground and relatively distant from nearby structures. Additionally, to minimize blowout and structure heights, rigid post insulator designs have been added where possible reducing the phase spacing of the proposed circuits. Lastly, the Company has incorporated best phasing to further achieve magnetic field reductions. Accordingly, the expected magnetic field levels at the nearest residential building would be at background levels (less than 1 mG).

The Council's EMF BMP then directs the applicant to investigate additional "low cost" mitigation measures to reduce fields associated with overhead transmission lines "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 transmission line is not adjacent to residential facilities, nor would it be in proximity to licensed child day-care facilities, schools or public playgrounds. Some segments of the overhead transmission line which are close to groups of homes that may be considered residential areas; however, as explained in the FDMP, the EMF levels that will be associated with the line are so low, and further mitigation is so impractical, that no additional mitigation measures are recommended.

In Docket 461, the Council found that no FDMP should be prepare for the portion of the Hybrid route comprised of underground XLPE cable, because there are no "special circumstances" that would require one. (FOF No. 462). That continues to be the case with respect to the underground segment of the Proposed Modified Project.

D.5 Statement of Compliance with CSC Best Management Practices

This project proposal complies with Council's EMF BMP. It does so by the following means:

- The overhead segment of the line incorporates low-cost magnetic field mitigation measures such as optimized phasing, tall structures creating vertical distance from people on the ground, and optimum spacing and phasing of the conductors.
- The line is constructed partially underground.
- A field management design plan with respect to the overhead section of the Proposed Modified Project has been included.
- Tabulated calculations of electric and magnetic fields at 25-foot intervals are included in *Appendix 8.*
- The Project's original application included a report detailing the state of the science regarding research into the health effects of electric and magnetic fields. (*See* FOF No. 463)

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Exhibit A, Section E

Proposed Modified Project Schedule

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E. Proposed Modified Project Schedule

In light of the project delays experienced to date, and the urgent need for improvements to the Greenwich electrical system, Eversource intends to start construction of a modified project as soon as the required Council approvals have been obtained. In contrast to a full application, there is no statutory time frame prescribed for action on this Petition. Eversource is hopeful that the Council will issue a decision promptly and anticipates that 16 to 18 months from the date of the Council's approval will be required to complete the project and place its facilities in service.

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Exhibit A, Section F

Potential Project Variations

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F. Potential Project Variations

In the course of designing the Proposed Modified Project, Eversource evaluated potential variations to each Project component. The following sections summarize these analyses, which supplement those contained in the GSLP Application and Docket 461 record.

F.1 Proposed Greenwich Substation

The Proposed Modified Project proposes a revised design and smaller footprint for the Greenwich Substation, as detailed in this Petition for Reconsideration. In addition, in response to comments from the Town of Greenwich, Eversource analyzed potential variations that would improve the appearance of the proposed Greenwich Substation and/or accommodate the Town's preference for its location.

F.1.1 All-Indoor Substation Variation

The Town of Greenwich has expressed opposition to an Air-Insulated Substation (AIS) design, and takes the position that any substation should be completely enclosed for aesthetic purposes.

The variation to the proposed Greenwich Substation would be designed to be entirely surrounded by an architecturally treated building enclosure; the design of the substation would be identical to the Proposed Alternate Greenwich Substation detailed in *Exhibit B*, except that the variation is being proposed at either of the properties at 290 Railroad Avenue or 281 Railroad Avenue. Compared to the overarching characteristics of the proposed AIS substation, the all-indoor substation would:

- Not include room for a future mobile transformer position;
- Include a plug and switch system rather than a traditional circuit breaker;
- Not include a 13.2-kV switchgear enclosure (switchgear would remain);
- Not include one lightning mast approximately 65 feet in height;
- Not include a separate control house for transmission relaying, battery and toilet; and,
- Not include a 15-foot tall brick veneer wall surrounding the substation.

Adoption of the all-indoor substation configuration preferred by the Town would cost approximately $1.4 million more than Eversource's proposed AIS substation configuration.

F.1.2 Pole Yard Variation

The Town of Greenwich has expressed a preference for locating the new Greenwich Substation at 281 Railroad Avenue, on property owned by Eversource and used for material storage. Because of its current use, this location is often referred to as the "Pole Yard" site. It is smaller than the 290 Railroad Avenue site – 0.75 acre as opposed to 0.81 acre. Nevertheless, there is sufficient room to construct either an AIS

or all-indoor substation on the Pole Yard site. Like the 290 Railroad Avenue site, the Pole Yard site is located within the customer load pocket. A substation at the Pole Yard site would be adjacent to residential areas and the property is encumbered by two utility easements.

The principal differences between the two sites are:

Table F-1, 290 Railroad and 281 Railroad Avenue Comparison

Feature	290 Railroad Avenue (Proposed Site)	281 Railroad Avenue (Alternative Site)
Site size	0.81 acres	0.75 acres
Current site land use	Commercial – Pet Pantry	▪ Industrial – Eversource Pole Yard ▪ Abutting residential properties
Project development requirements	Demolition of Pet Pantry building Additional grading required for retaining wall	▪ Town of Greenwich noise ordinance at residential properties is 45 dBA. This noise limit would not be exceeded at 290 Railroad Avenue. At 281 Railroad Avenue noise mitigation measures may need to be incorporated ▪ Additional distribution feeder work required to tie into 13.2-kV feeders

Because the footprint of the substation would be smaller than that of the substation originally proposed in Docket 461, would include less noise producing equipment, and would be entirely enclosed by a building, it should be possible to comply with applicable noise regulations at the property boundaries without acquiring three abutting parcels. Eversource would still suspect that some Substation noise would be perceptible at neighboring residences.

F.1.3 Overall Evaluation of Greenwich Substation Variations

The all-indoor substation and Pole Yard variations would affect only the appearance of the new substation, not the reliability of the Proposed Modified Project. Accordingly, the Council's decision whether to adopt either of these variations will turn on its judgment as to whether the incremental costs are justified by the improvement in the substation's appearance.

Eversource continues to prefer the 290 Railroad Avenue site because of its larger size and, in particular, its lesser impact on neighboring residential properties. However, the Pole Yard Variation would not impair the reliability of the Proposed Modified Project and could be constructed if the Council were to prefer it.

F.2 ConnDOT Line Exit Variation

During consultations with ConnDOT, representatives requested that Eversource evaluate the installation of the new 115-kV transmission lines beneath, rather than over, the I-95 overpass to avoid the possibility of electric transmission lines falling onto the highway in the event of a structural failure. Accordingly, Eversource investigated a route variation involving the alignment of both the proposed 1020 and 1703 line exits in an underground configuration to two transition structures west of I-95 before crossing MNR tracks in an overhead configuration. This variation is illustrated in *Figure F-1*.

The incremental cost of this variation is approximately $2.2M; therefore, an all-underground exit of the 1020 and 1703 lines to two transition structures east of Sound Shore Drive was chosen as the proposed design rather than the variation requested by ConnDOT. However, the ConnDOT line exit variation could be constructed should the Council prefer it.

F.3 Two Single-Circuit Transmission Line Variation

At the suggestion of a Council member made during the Council's deliberations in Docket 461, Eversource investigated constructing the proposed overhead segments of 1020 and 1703 circuits on two separate sets of structures, one located on each side of the MNR Railroad (refer to *Figure F-2*).

From an operational perspective, construction of the two circuits on separate structures would be a more reliable configuration than the -proposed line design, in which the overhead segments of the two circuits would predominately be supported on double-circuit structures (except for the two sets of transition structures). Two circuits on a single set of structures are exposed to a common mode failure, while two separate circuits are not. Thus, in planning studies, both circuits of a double-circuit line are assumed to be lost in the event either of them fails. In this case, the loss of both circuits does not result in a violation of mandatory ISO-NE reliability criteria because the result would be a consequential loss of load that would not exceed that allowed by the criteria. Moreover, as a practical matter, the Greenwich load is already exposed to a DCT contingency because the two circuits that feed the Cos Cob Substation are constructed on double-circuit structures along the MNR between South End and Cos Cob substations. Finally, in the event of a DCT contingency involving the new circuits from Cos Cob to Greenwich, the load can be restored 100%.

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INDEX MAP

Legend

- Proposed Route Transmission Structure
- Proposed Route Variation Transmission Structure
- Substation Termination
- Proposed Overhead Route
- Proposed Underground Route
- Proposed Overhead Route Variation
- Proposed Underground Route Variation
- Approximate Parcel Boundary

Base Map: 2016 Aerial Imagery (CTECO)

1 inch = 150 feet

150 75 0 150 Feet

Exhibit A Figure F-1
Proposed Modified Route
Cos Cob Exit Variation
Project location

Greenwich Substation and Line Project
Greenwich, Connecticut

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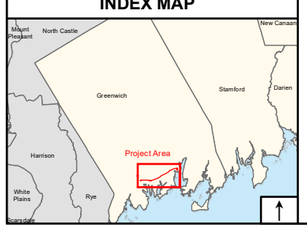
INDEX MAP



Legend

- Proposed Transmission Structure
- Proposed Overhead Route Variation
- Proposed Underground Route Variation
- Railroad
- Proposed Greenwich Substation Location (290 Railroad Ave)
- Proposed Materials Staging Area (281 Railroad Ave)
- Existing Cos Cob Substation Location
- Existing Prospect Substation Location

Base Map: ESRI Street Map

1 inch = 650 feet

650 325 0 650 Feet

Exhibit A Figure F-2
Two Single-Circuit Transmission Line Variation Project Location

Greenwich Substation and Line Project
Greenwich, Connecticut

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May 2017

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Under the Two Single- Circuit Transmission Line Variation, the proposed 1703 Line would continue east along the northern part of the MNR ROW past Indian Field Road and the proposed 1020 line would be located on the south side of the ROW – where Eversource proposes to construct the Proposed Modified Route (a double-circuit line).

Based on field reconnaissance, the north side of the MNR ROW is constrained by space limitations, steep grades, and watercourses. There simply is not enough room to accommodate necessary construction equipment without building retaining walls and encroaching into residential backyards. The presence of perennial streams in this corridor would create additional challenges for structure locations and long-term maintenance.

Table F-2 lists differences between the Proposed Modified Project and the Two Single-Circuit Transmission Line Variation:

Table F-2, Two Single-Circuit Transmission Line Variation Comparison

	Proposed Modified Project Design	Single-Circuit Variation
Number of Structures	22	43
Average Structure Height (feet)	110	105
Number of Property Easements Required	0	55
Number of ConnDOT Highway/Rails Licenses Required	2	2
Number of Structure Work Pads Impacting Wetlands/Watercourses	1	4
Number of residential properties requiring tree clearing or trimming	0	55

Effects of Constructing a 115-kV Line on the North Side of the Railroad ROW

If construction constraints could be overcome, building a transmission line on the north side of the railroad ROW would substantially impact residential property owners on Circle Drive and Bruce Park Avenue as follows:

- Require 55 easements from direct abutters, either for temporary construction or permanent aerial easements.

- Removal of all vegetation between the northern boundary of the MNR ROW and the transmission line along with some tree clearing/trimming on residential properties to provide enough clearance to the energized conductors and/or for construction and maintenance access. In addition to the tree clearing required on the south side of the ROW the following clearing would take place on the north side of the ROW:
- Approximately 6.7 acres of tree clearing would be required on the MNR ROW and,
- Approximately 1.7 acres of tree clearing would be required off the MNR ROW.
- Additional wetlands and watercourses would be affected by construction activities on the northern MNR ROW.
- Currently the vegetative buffer between the railroad corridor and the residents of Circle Drive and Bruce Park Avenue blocks most of the existing railroad facilities. Not only would the removal of this vegetative buffer open up the railroad corridor to these facilities, but it would also increase the visual impact of the proposed transmission structures on both the north and south side of the railroad tracks.
- Night work would be required due to railroad track outage constraints, and would require construction vehicles to access the corridor through residential streets and properties.

Incremental Cost of Splitting Overhead Circuits

The incremental cost of installing the new lines on two separate single-circuit pole lines would be approximately $10.5 million.

Evaluation of the Two Single-Circuit Transmission Line Variation

Based on the construction difficulties, much higher cost of this variation and its environmental and visual impacts, Eversource determined that splitting the overhead circuits would not be a practical solution, nor would it be consistent with PUESA notwithstanding that it could provide a somewhat more reliable configuration. Eversource does not advocate constructing the Two Single-Circuit Transmission Line Variation given the limitations on the MNR ROW north side.

F.4 Force Main Variation

An approximately 1,500 feet long portion of the Town's existing force main, consisting of 24-inch cast iron pipe, would conflict with the proposed overhead transmission line. In Docket 461, the Town made known its plans for replacing a sewer force main within the MNR ROW. Although the new force main would not conflict with the Proposed Modified Project route alignment on the south side of the tracks, Eversource understands that the Town must maintain its existing sewer line in place as a backup facility. If the existing sewer line remains in its current location, it would conflict with four foundations for

proposed structures. As a result, Eversource has designed the Force Main Variation that would span approximately 1,850 feet across the entire area of conflict and Indian Harbor along the south side of the tracks.

This variation would involve reducing a total of six proposed structures down to two support structures on the south side of the MNR rails (refer to *Figure F-3)*.

Table F-3, below, provides a comparison of the major components of the Proposed Modified Project and the Force Main variation.

Table F-3, Comparison between Proposed Modified Project and Force Main Variation

	Proposed Modified Project Design	Force Main Variation
Total Length (miles)	2.1	2.1
Number of Total Structures	22	18
Tallest Structure Height along Force Main Conflict (between structures 14005-14010)	135 ft.	195 ft.
Number of Property Easements Required	0	0
Number of ConnDOT Highway/Rails Licenses Required	2	2
Number of Wetlands Temporarily Impacted	1	1
Number of Watercourses Temporarily Impacted	0	0
Distance to closest residential structure (feet)	60	60
Number of residential properties requiring tree clearing or trimming	0	0
Number of Railroad Crossings Required	2	2

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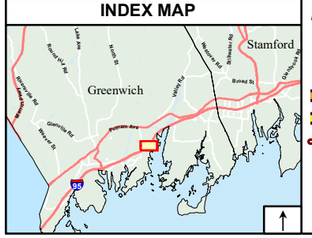
INDEX MAP



Legend

- Proposed Modified Route Variation Transmission Structure
- Proposed Modified Route Transmission Structure Excluded for Variation
- Proposed Modified Overhead Route Variation
- Proposed Modified Overhead Route
- Existing Force Main Line

Project Area Wetlands (AECOM Field Delineation, 2016)

- Delineated Watercourse Boundary
- Delineated Wetland Boundary
- Inland Wetland
- Waterbody
- Culvert

- Work Pad
- New Access Road
- Approximate Parcel Boundary

1 inch = 150 feet

150 75 0 150 Feet

Base Map: 2016 Aerial Imagery (CTECO)

Exhibit A Figure F-3
Proposed Modified Route
Town of Greenwich Force Main Variation

Greenwich Substation and Line Project
Greenwich, Connecticut

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F.4.1 Effects of Constructing the Force Main Variation

From an aesthetic perspective, the Force Main Variation would eliminate four structures by using two taller poles to span both the area of conflict and the harbor crossing. The increased structure heights in this area (from ±135 feet to ±195 feet tall) could result in a lighting requirement by the Federal Aviation Administration. The combination of increased height and lights raises the potential for adding an incremental visual impact throughout portions of the Project Area. However, the removal of four proposed structures along the MNR ROW would eliminate creating direct views of those additional poles and appurtenances from several of the residential properties on Circle Drive. This arrangement also affects two additional structures on either end of the span. On the west side of the overhead section, former tangent structure 14004 (135 feet tall under the Proposed Modified Project) would become a deadend structure (and reduced to 120 feet). Similarly, on the east end, former tangent structure 14011 (proposed at 98 feet tall) would also become a deadend structure (and require its rising by seven feet to 105 feet tall). As illustrated in *Table F-1*, the reduction of four poles and increase in structure heights is the only significant difference from the Proposed Modified Project. No additional wetlands or watercourses are impacted by this variation.

Cross sections of the transmission line support structures necessary to construct the Force Main Variation are provided in *Figure 4* and *Figure 5*.

Incremental Cost of the Force Main Variation

The preliminary estimated incremental cost of the Force Main Variation is approximately $0.7 million.

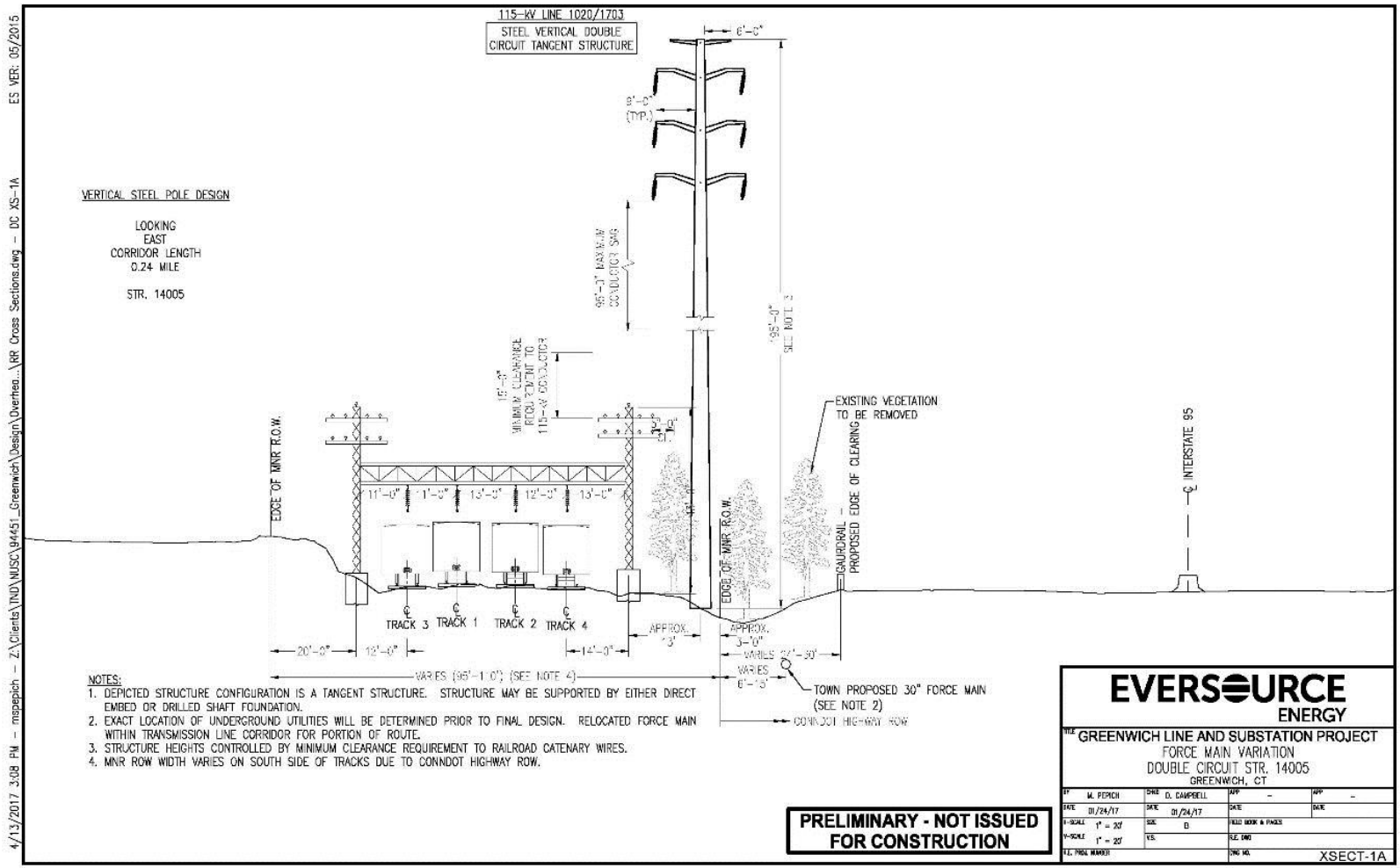

Figure F-4, Cross Section of Force Main Variation Support Structure 14005

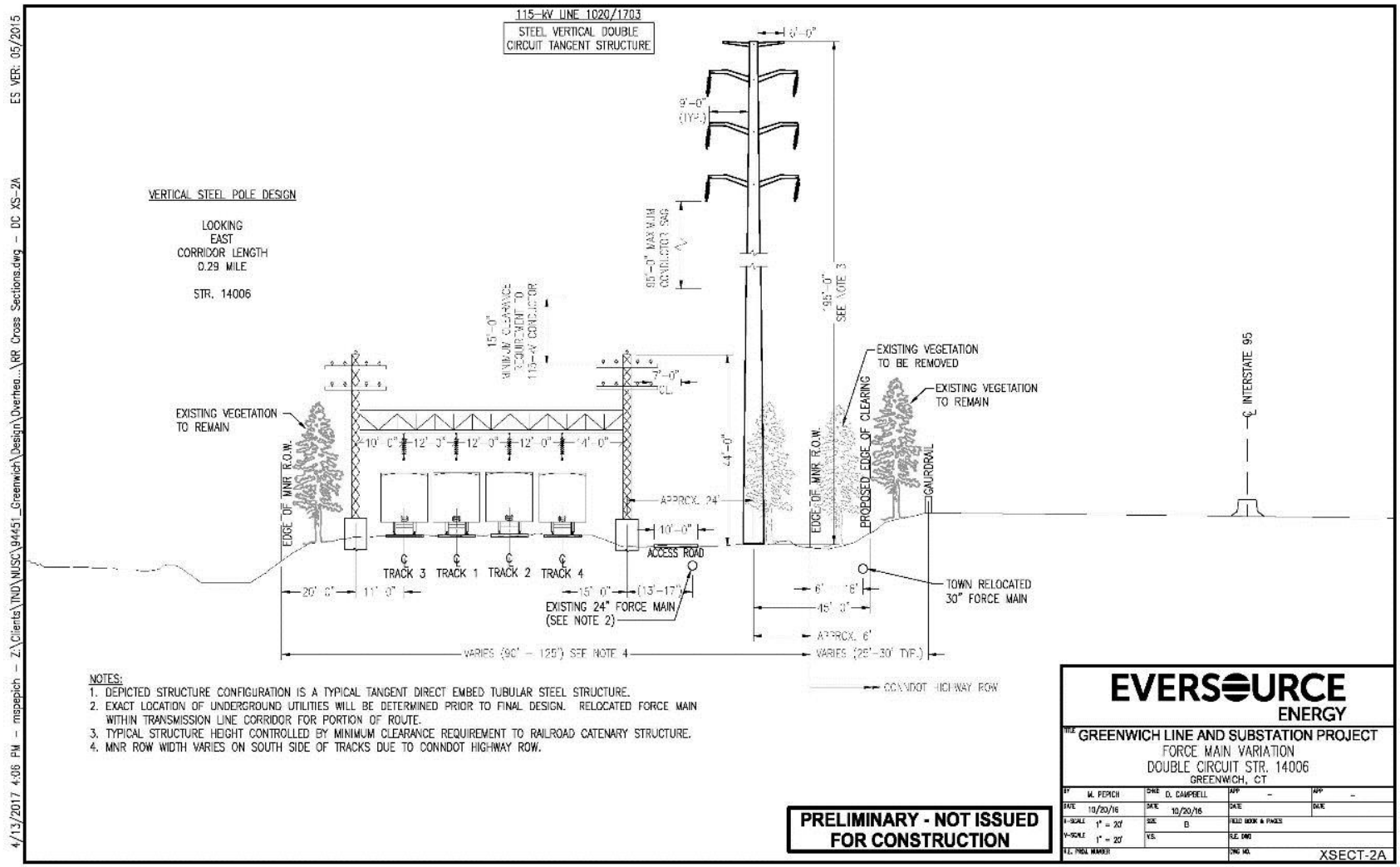

Figure F-5, Cross Section of Force Main Variation Support Structure 14006

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