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November 2, 2023

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: Docket No. 516 – The United Illuminating Company Application for a Certificate of Environmental Compatibility and Public Need for the Fairfield to Congress Railroad Transmission Line 115-kV Rebuild Project

Dear Ms. Bachman:

Enclosed for filing with the Connecticut Siting Council ("Council") are The United Illuminating Company's ("UI") Late Filed Exhibits as requested by the Council during the October 17, 2023 hearing.

An original and fifteen (15) copies of this filing will be hand delivered to the Council today.

Should the Council have any questions regarding this filing, please do not hesitate to contact me.

Very truly yours,

Bruce L. McDermott

Enclosure

cc: Service List (via Electronic Mail only)

Late Filed Exhibit 3-1

Q-LFE 3-1: Area and/or acreage of backyard easements required for the underground configuration within public roads described on page 9-7 of the Application.

A-LFE 3-1: The following is estimated as needed for temporary and permanent easement to underground the portion of the line from a transition structure at P648S to Westway Road in the Town of Fairfield.

Temporary Easement Outside of Wetlands (acres)	Temporary Easement within of Wetlands (acres)	Total Temporary Easement (acres)
0.53	0.09	0.62

Permanent Easement Outside of Wetlands (acres)	Permanent Easement within of Wetlands (acres)	Total Permanent Easement (acres)
0.33	0.06	0.39

These easement estimations are limited to the approximately 1,800-foot- long section of underground line between P648S and Westway Road, which would be located south of the CT DOT railroad corridor on private property. Additional temporary and permanent easement would likely be required throughout the remainder of an underground route. The estimated requirements for such additional permanent and temporary easements for the underground cable alignment would be determined once a final route is defined, and an underground/subsurface survey of the route is completed to determine route obstacles and where the underground infrastructure could be physically located.

Late Filed Exhibit 3-2

Q-LFE 3-2: Acreage of easements required for the north side of MNRR double-circuit monopole configuration alternative from Late File 2-5(a).

A-LFE 3-2: The estimated required acreage for the new double-circuit UI easement boundary (permanent for wire clearance requirements) would be approximately 8 acres. The proposed UI easement was assumed to be a 32-foot offset from the proposed centerline. The proposed centerline was generally assumed to be the centerline of the existing 1130 Line single-circuit poles. This estimate does not include temporary construction easements on the north side or temporary construction easements on the south side that would be needed for access and bonnet removal, respectively.

Late Filed Exhibit 3-3

Q-LFE 3-3: Acreage of tree clearing required for the double-circuit monopole configuration alternative from Late File 2-5(a).

A-LFE-3-3: Approximately 5.3 acres of clearing would be necessary. This does not include any clearing that may be necessary for temporary access roads or work pads that may be located outside of the new double-circuit UI easement boundary. For comparison purposes, the current proposed "south side" design would result in approximately 4.8 acres of clearing. This south side calculation does also include clearing associated with proposed temporary access and work pads. Therefore, the alternative from Late File 2-5(a) would increase tree clearing by at least 0.5 acres.

Late Filed Exhibit 3-4

The United Illuminating Company | Witnesses: Corene Auer/ Matthew Parkhurst

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Q-LFE 3-4: Acreage of reduced flood plain impact for the double-circuit monopole configuration alternative from Late File 2-5(a).

A-LFE 3-4: Shifting the poles from the south side of the railroad tracks, in a single-circuit configuration, to north side of the tracks in a double-circuit configuration, would result in the placement of five poles in the 100-year flood hazard zone and 10 poles in the 500-year flood hazard zone resulting in 192.5 square feet and 385 square feet of impact, respectively.

In comparison, along the south side of the tracks, UI's proposed Project would place nine structures in the 100-year flood hazard zone and four structures in the 500-year flood hazard zone. Therefore, the reduction due to not placing the structures on the south side of the railroad tracks would be 346.5 square feet from the nine structures in the 100-year flood hazard zone and 154 square feet from the four structures in the 500-year flood hazard zone. These calculations are based on an assumed foundation diameter of 7 feet.

Summarizing the net effect of the Late File 2-5(a), there would be a net decrease of 100-year flood hazard zone impact of 154 square feet and a net increase in 500-year flood hazard zone impact of 231 square feet.

Late Filed Exhibit 3-5

Q-LFE 3-5: Viewshed analysis for the double-circuit monopole configuration alternative from Late File 2-5(a);

A-LFE 3-5: Please see Attachment LFE 3-5-1.

Late Filed Exhibit 3-6

The United Illuminating Company | Witnesses: Correne Auer/ David George

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Q-LFE 3-6: Historic resource analysis for the double-circuit monopole configuration alternative from Late File 2-5(a);

A-LFE 3-6: UI and Heritage Consultants have reviewed the viewshed analysis and photo-simulations prepared by All-Points Technology Corporation for the Sasco to Ash Creek 1130 Line Rebuild Alternative, a double-circuit monopole configuration on the northern side of the MNR corridor. Both the viewshed analysis and the photo-simulation show that the proposed alternative double-circuit configuration does not appreciably reduce the indirect visual impacts of the Project from the original single-circuit configuration on the southern side of the MNR corridor.

Late Filed Exhibit 3-7

Q-LFE 3-7: Referencing Late File 2-2-1, ISO-New England, Inc. (ISO-NE) Schedule 12c, explain the statement, “Local siting requirements for transmission facilities shall not be dispositive of whether or not localized costs exist with respect to any particular transmission upgrade”;

A-LFE 3-7: The statement means local siting requirements does not dictate, decide, or determine whether there will be local cost. The determination of localized cost will be done by ISO-NE.

Late File Exhibit 3-8

Q-LFE 3-8: Referencing Late File 2-2-1, ISO-NE Schedule 12c, specifically define "localized costs" and how they are allocated.

A-LFE 3-8: Per Section I.2.2 Definitions, localized costs are costs that the ISO, with advisory input from the Reliability Committee, determines in accordance with Schedule 12C of the OATT shall not be included in the Pool-Supported PTF costs recoverable under this OATT, or in costs allocated to Regional Network Load according to Section 6 of Schedule 12. If there are any Localized Costs, the ISO shall identify them in the Regional System Plan.

Localized costs are allocated in accordance with ISO-NE Planning Procedure 4 (PP4) which is the procedure for pool supported PTF cost review. In making its determination of whether localized costs exist for a project the ISO, with advisory input from the RC, will consider the reasonableness of the proposed design and construction method with respect to:

(a) Good utility practice;

(b) Current engineering design and construction practices in the area in which the Project is proposed to be built/ is being built;

(c) Allowance for appropriate expansion and load growth;

(d) Alternate feasible and practical transmission alternatives; and

(e) The relative costs, operation, efficiency, reliability and timing of implementation of the proposed Project.

ISO-NE ultimately concludes what costs benefit the region and are regionally supported. Any cost not regionally supported is considered a localized cost. The responsibility of local cost recovery is left to the Transmission Owner and local interested parties such as PURA and OCC.

Late File Exhibit 3-9

Q-LFE 3-9: Describe the ISO-NE process, if any, for private funding of a pool transmission facility.

A-LFE 3-9: ISO-NE does not provide any process for private funding of a pool transmission facility. ISO-NE would defer the responsibility of local cost recovery, including private funding, to the Transmission Owner and local interested parties such as PURA and OCC.

Late File Exhibit 3-10

Q-LFE 3-10: Referencing Attachment 2 to the October 3, 2023 Pre-Filed Testimony of Correne Auer, for areas where proposed monopoles on the south side of MNRR are located in flood plains, describe the acreage of easements and tree clearing required to shift those monopoles to the north side of MNRR, the acreage of reduced flood plain impact, viewshed analysis, historic resource analysis and associated structure numbers and estimated costs.

A-LFE 3-10: The following describes, by floodplain location, the potential effects of shifting the proposed monopoles in FEMA-designated floodplains from the south side of the railroad tracks to the north:

Shifting the of monopoles to the north between Catenary Structures 652 to 655 (crossing the railroad tracks at P652S and crossing back at P655S). This shift would add up to four poles on the north side of the tracks, while removing one currently proposed pole on the south side (P654S). This alternative would require approximately 0.1 acres of additional UI easement and approximately 0.4 acres of additional tree clearing; a reduction of approximately 39 square feet of 100-year flood hazard zone impact would result. Project costs would increase by approximately $10 million increasing the total estimated Project cost to $265 million.

Shifting the monopoles to the north between Catenary Structures 692 and Ash Creek (crossing at P692S and crossing back to tie into Ash Creek Substation). This shift would add up to 23 poles to the north side while removing 17 poles from the south side. The need for UI easement would decrease by approximately 1.2 acres. Approximately 0.7 acres of additional tree clearing would be necessary. 100-year flood hazard zone impacts would be decreased by 154 sf and 500-year flood hazard zones impacts would increase by 39 sf. Project costs would increase by approximately $24 million increasing the total estimated Project cost to $279 million.

If both re-routes are combined, the increased Project costs would increase approximately $34 million and the total estimated Project cost would increase to $289 million. If both re-routes were implemented, there would be a 1.1-acre decrease in need for additional UI easement, a 1.1-acre increase in tree clearing, a 193 square foot decrease in 100-year flood

hazard zone impacts and a 39 square foot increase in 500-year flood hazard zone impacts.

These two reroutes would add four additional track crossings. Specific viewshed and historic resource analysis was not performed on these specific monopole shifts. However, this information can be deduced from the analyses performed for Late File 3-5 and 3-6 for the double-circuit monopole configuration alternative from Late File 2-5(a). Due to the addition of monopoles with these re-routes, there could be a slight increase in viewshed impacts.

The remaining proposed monopoles listed on the October 3, 2023 Pre-Filed Testimony of Correne Auer are either located on the north side currently, cannot be moved to the north side of the CT DOT corridor as the connection to the Ash Creek Substation is physically located on the south side of the CT DOT Corridor, or the shift of the poles to the north side of the CT DOT corridor would also locate the monopoles in a flood hazard area (floodplain).

Late File Exhibit 3-11

Q-LFE 3-11: Any changes to EMF on the north side of MNRR for the configurations identified in Late File request Nos. 2 through 6 and 10 above;

A-LFE 3-11: Please see Attachment LFE 3-11-1.

Late File Exhibit 3-12

The United Illuminating Company | Witnesses: Meena Sazanowicz/ Matthew Parkhurst

Docket No. 516 |

Q-LFE 3-12: Provide the estimated costs to rebuild the 1130 Line from Structure 648S to Ash Creek Substation at the end of its useful life.

A-LFE 3-12: The conceptual grade estimate to rebuild only the 1130 Line between Catenary Structure 648S and Ash Creek substation is approximately $104 million.

The following are the assumptions associated with this estimate:

- Conceptual level (-50% / +200%) estimate; with 50% contingency
- The new 1130 Line single circuit monopoles would be in line with the existing monopoles
- New monopoles every 300 feet, approximately
- In-Line Replacement would require a 115-kV outage for phases of work.
    - If there is 4-8 hour restoration time for the 1130 Line. The return time may limit the ability to perform an in-line replacement and would extend the constructure timing.
    - For this very high-level conceptual analysis, UI is assuming an in-line replacement and not considering return time.
- If during a future detailed design stage, it is deemed that the poles need to be offset, additional easements/tree clearing, and work pad acreage would be required.
    - Wetland impacts may increase. Initial survey completed for the preferred solution was limited to the south side of the railroad tracks. Full scope of impacts will not be fully understood until a survey is completed on the north side of the tracks and access roads/work pads are defined.
    - In many locations, the MNR feeder and/or signal wires are attached to the existing 1130 Line monopoles. In an offset configuration, these MNR facilities would need to be reattached to the catenaries or brought over on the UI towers some distance from the catenary structures.

While a minimum of 40 years is considered the typical design life of transmission assets such as the 1130 Line, there are many industry cases of infrastructure lasting 70 or more years in the field. Age alone may not be enough to justify full-scale replacement of assets to internal and external stakeholders. Especially without other factors such as material section loss,

poor performance and subsequent evaluation, or capacity (electrical and there for larger conductors and new structures needed) increases.

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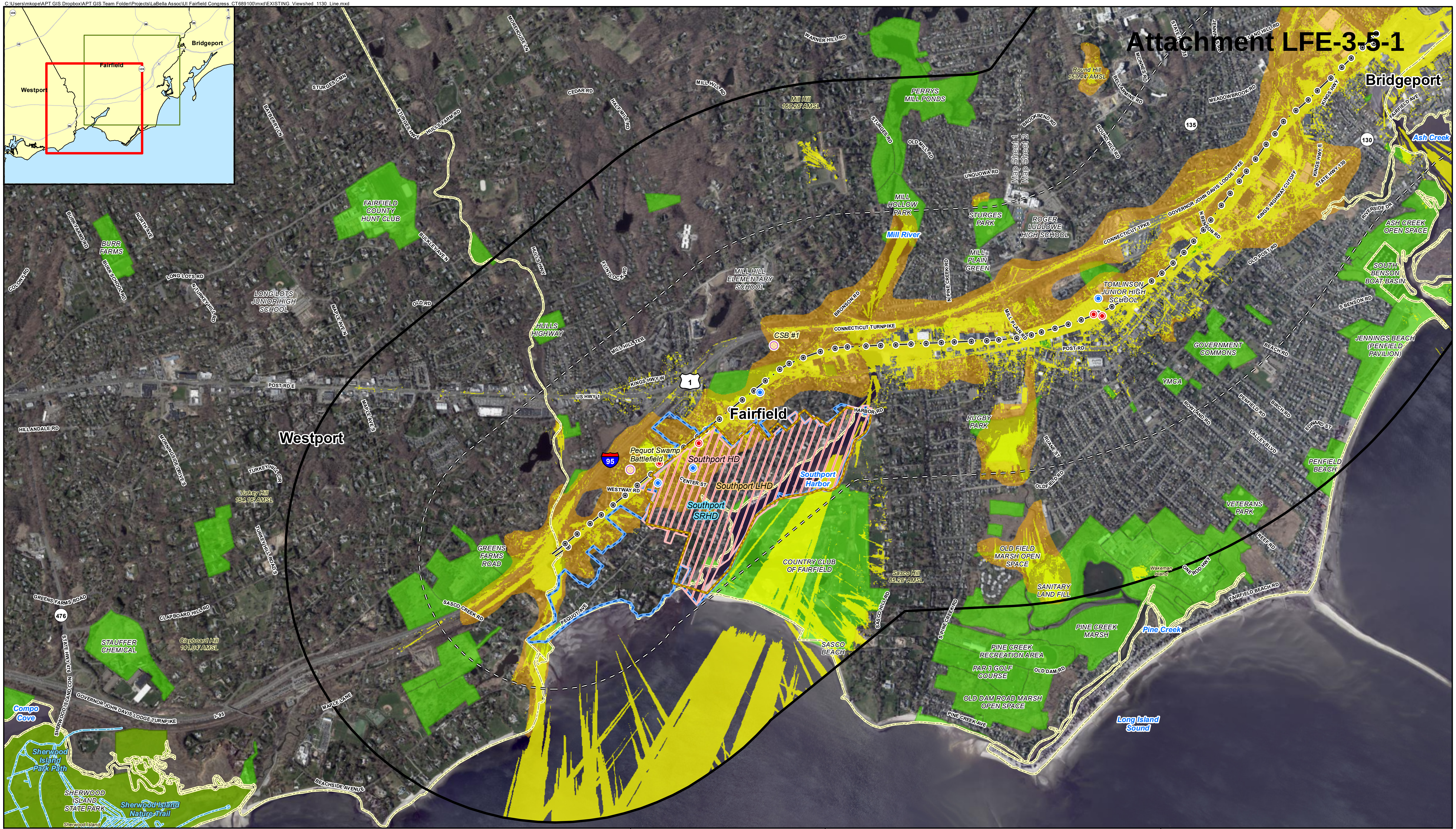
Attachment LFE-3-5-1



Bridgeport
Fairfield
Westport
Fairfield
Westport
Bridgeport
PERRYS MILL PONDS
FAIRFIELD COUNTY HUNT CLUB
BURR FARMS
LONG LOTS JUNIOR HIGH SCHOOL
MILL HILL ELEMENTARY SCHOOL
MILL HOLLOW PARK
Mill River
STURGES PARK
ROGER LUDLOWE HIGH SCHOOL
MILL PLAIN GREEN
TOMLINSON JUNIOR HIGH SCHOOL
HULLS HIGHWAY
CSB #1
CONNECTICUT TURNPIKE
POST RD
GOVERNMENT COMMONS
YMCA
JENNINGS BEACH (PENFIELD PAVILION)
ASH CREEK OPEN SPACE
SOUTH BENSON BOAT BASIN
Ash Creek
RUGBY PARK
Pequot Swamp Battlefield
Southport HD
Southport LHD
Southport SRHD
Southport Harbor
PENFIELD BEACH
VETERANS PARK
OLD FIELD MARSH OPEN SPACE
SANITARY LAND FILL
COUNTRY CLUB OF FAIRFIELD
Sasco Hill 85.28' AMSL
GREENS FARMS ROAD
Turkey Hill 154.16' AMSL
Clapboard Hill 141.84' AMSL
Mill Hill 167.29' AMSL
Round Hill 157.44' AMSL
STAUFFER CHEMICAL
SASCO BEACH
PINE CREEK MARSH
Pine Creek
PINE CREEK RECREATION AREA
PAR 3 GOLF COURSE
OLD DAM ROAD MARSH OPEN SPACE
Long Island Sound
Compo Cove
Sherwood Island Park Path
SHERWOOD ISLAND STATE PARK
Sherwood Island Nature Trail
Map Sheet 1
Map Sheet 2

Legend

- Existing Structure
- Project Transmission Line
- Year-Round Visibility (761 Acres; +/- 265 Acres occur over open water)
- Areas of Potential Seasonal Visibility (+/- 600 Acres)
- Study Area (1 Mile Radius)
- Half Mile Radius
- Archeological Site
- National Register Point
- State Register Point
- Local Historic District
- State Register Historic Area
- National Register Historic Area
- Municipal Boundary
- Scenic Highway
- Trail
- DEEP Boat Launches
- Municipal and Private Open Space Property
- State Forest/Park

Protected Open Space Property

- Land Trust
- Municipal
- Private
- State

N

1,000 500 0 1,000 Feet

Limitations

This map depicts areas where existing infrastructure may potentially be visible to the human eye without the aid of magnification based on a viewer eye-height of 5 feet above the ground and intervening topography, tree canopy, and existing structures. This analysis is based on a combination of computer modeling, incorporating the DSM, and 2019 digital aerial photographs.

This analysis does not necessarily depict all locations where views may occur. It is intended to provide a representation of those areas where at least a portion of the existing infrastructure may be seen, but may actually over-predict visibility in some locations.

Physical Geography / Background Data

Study area encompasses a 1-mile radius surrounding the existing structures and includes 6,910 acres.
A digital surface model (DSM) was created from the State of Connecticut 2016 LiDAR LAS data points.
The DSM captures the natural and built features on the Earth's surface.
Forest canopy height derived from LiDAR data.

Map Sources

*Note: Not all data layers appear on map sheet.
Ortho Base Map: State of Connecticut 2016 (coast) and 2019 aerial imagery (CTECO Map Service)
CTDEEP's data library (http://www.ct.gov/deep)
Data layers are maintained and updated by CTDEEP and represent the most recent publications.
Scenic Roads: CTDOT State Scenic Highways (2015)
Connecticut Forest and Parks Association, Connecticut Walk Books East and West

Map Date: October 31, 2023

Existing Conditions Viewshed Analysis Map with Federal, State, and Local Cultural Resources 1130 Line Rebuild Alternative Design Fairfield to Congress Street Substation

Bridgeport, Farifield, and Westport, CT
Map Sheet 1 of 2

UI

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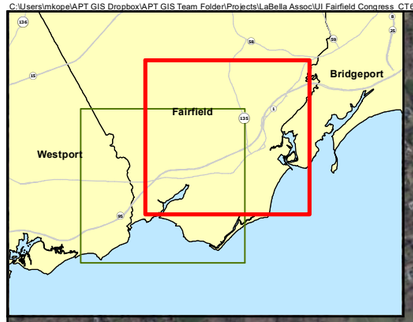

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Bridgeport, Farifield, and Westport, CT
Map Sheet 2 of 2

UI

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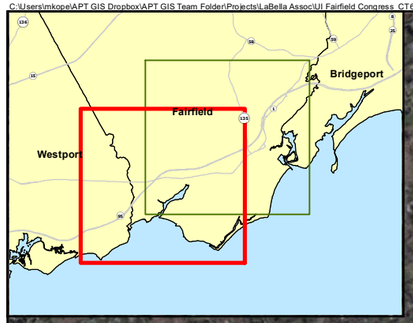

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Bridgeport, Farifield, and Westport, CT
Map Sheet 1 of 2

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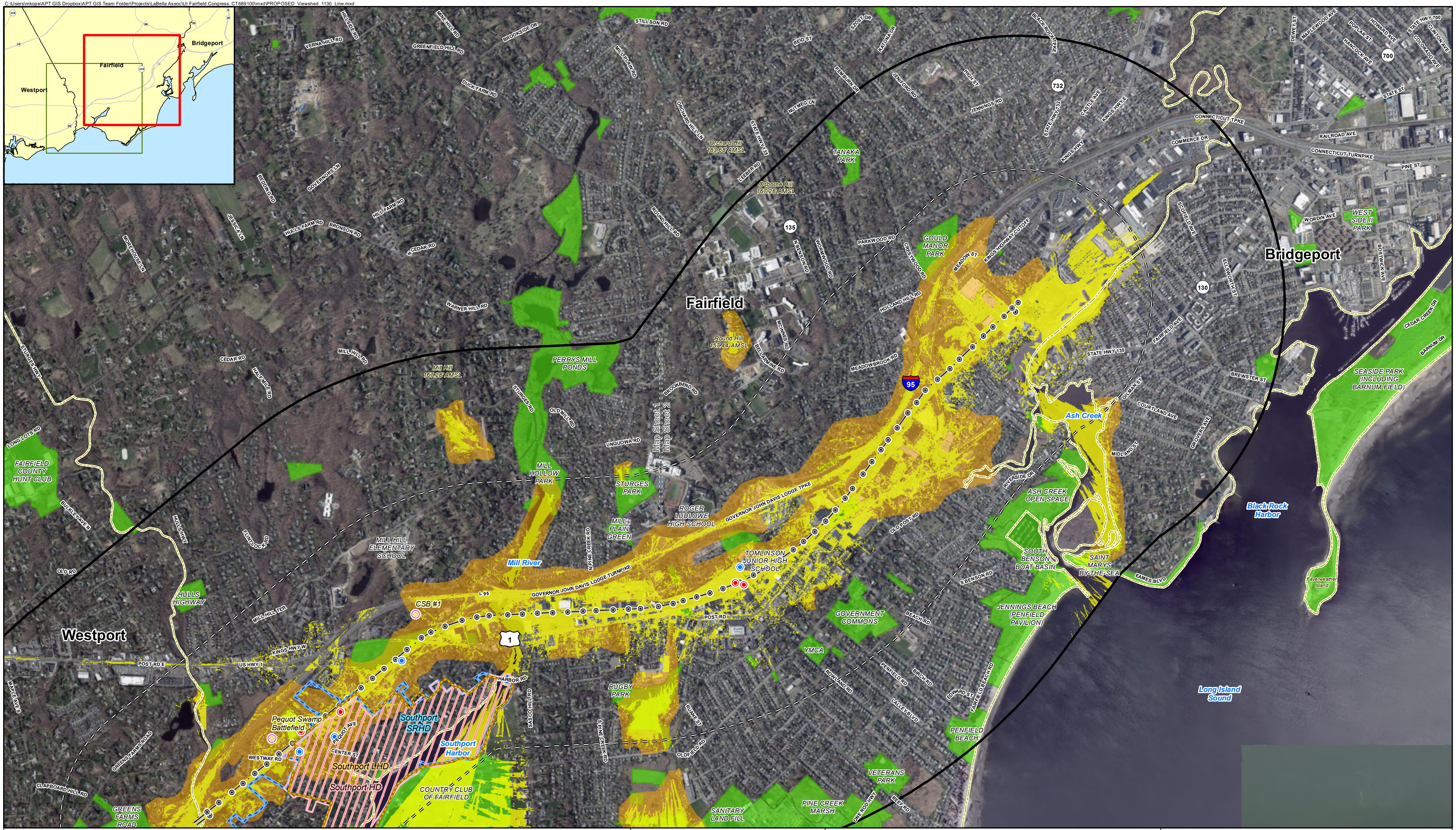

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Bridgeport, Farifield, and Westport, CT
Map Sheet 2 of 2

UI

ALL-POINTS TECHNOLOGY CORPORATION

Technical Memorandum

Fairfield to Congress Railroad Transmission Line 115-kV Rebuild Project
Magnetic Field Calculations for Redesigned Structures in Fairfield, Connecticut

Prepared for

The United Illuminating Company
100 Marsh Hill Rd.
Orange, CT 06477

Prepared by

Exponent
17000 Science Drive, Suite 200
Bowie, MD 20715

November 2, 2023

Acronyms and Abbreviations

BMP	Best Management Practices
CSC	Connecticut Siting Council
CT DOT	Connecticut Department of Transportation
EMF	Electric and magnetic fields
Exponent	Exponent, Inc.
ft	Feet
ICES	International Committee on Electromagnetic Safety
ICNIRP	International Commission on Non-Ionizing Radiation Protection
kV	Kilovolt
mG	Milligauss
MNR	Metro-North Railroad
Project	Rebuild of 115-kV overhead transmission lines spanning the MNR tracks in the Town of Fairfield and City of Bridgeport
UI	United Illuminating Company

Executive Summary

On March 17, 2023, The United Illuminating Company (UI) submitted an Application to the Connecticut Siting Council (CSC) for the rebuild of 115-kilovolt (kV) overhead transmission lines that parallel the Metro-North Railroad (MNR) tracks, principally on top of the railroad catenary support columns, in the Town of Fairfield and City of Bridgeport (the Project). As part of the Application, UI submitted an electric and magnetic field (EMF) report prepared by Exponent Inc. (Exponent) as Appendix E to Volume 1 (i.e., "Original Exponent EMF Report").

The purpose of this technical memorandum is to present the EMF levels for an alternative design that involves relocating both existing overhead transmission lines (i.e., the existing 1430 Line, located on the southern MNR catenary support columns, and the 1130 Line, located on independent monopoles north of the tracks) between existing Catenary Structure 648S and the point at which UI's lines extend south from the railroad tracks to Ash Creek Substation to double circuit structures to be aligned on the north side of the MNR tracks and to compare the EMF levels from the "Existing," "Proposed" and "Double-Circuit" configurations.[1]

The evaluation of the Double-Circuit configuration indicates a decrease in the overall EMF levels relative to either Existing or Proposed Configurations. This includes a decrease in maximum EMF levels, a large decrease in EMF levels on the south side of the tracks, and smaller decrease in magnetic-field levels on the north side of the tracks. The Double-Circuit also would result in a slight increase in electric-field levels on the north side of the tracks in some portions of the route, as compared to either the Existing or Proposed configurations.

Although EMF levels from this Double-Circuit configuration would generally decrease compared to either Existing or Proposed configurations, the overall conclusions of the Original Exponent EMF Report would remain the same, that:

[1] In the current evaluation the double-circuit structures are assumed to be installed in line (in a one-for-one swap) with the existing single-circuit monopoles supporting the 1130 Line.

- "Elements of the Project design reduce magnetic-field levels, a goal consistent with design goals outlined in the CSC BMP (e.g., taller structures and optimal phasing)" and
- "[A]ll measured and calculated EMF levels associated with the Project were a far below limits recommended for the general public by international health-based standards (i.e., ICES [International Committee on Electromagnetic Safety] and ICNIRP [International Commission on Non-Ionizing Radiation])."

Introduction

On March 17, 2023, The United Illuminating Company (UI) submitted an Application to the Connecticut Siting Council (CSC) for the rebuild of 115-kilovolt (kV) overhead transmission lines that presently extend along or near the Connecticut Department of Transportation (CT DOT) corridor occupied by the Metro-North Railroad (MNR) tracks, principally on top of the railroad catenary support columns, in the Town of Fairfield and City of Bridgeport (the Project). For the Project, UI proposes to remove the 115-kV transmission line infrastructure from the railroad catenary structures and rebuild the lines on monopoles between catenaries 648S and UI's Congress Street substation in Bridgeport. The Project, as proposed by UI, does not involve the removal or rebuild of the 115-kV 1130 Line in locations where the line is aligned, on independent single-circuit monopoles installed in the early 1990s, on the north side of the MNR tracks. As part of the Application, UI submitted an electric and magnetic field (EMF) report prepared by Exponent Inc. (Exponent) as Appendix E to Volume 1 (CSC Application, Appendix E of Volume 1A, hereafter "Original Exponent EMF Report").

During the October 17, 2023, evidentiary hearing session regarding the Project, the CSC requested that UI submit an evaluation of changes to EMF if the Project were re-designed to use a double-circuit monopole configuration, to be located on the north side of the railroad tracks between existing Catenary Structure 648S and the point at which UI's lines extend south from the railroad tracks to Ash Creek Substation (i.e., modeling cross sections XS-1 through XS-7 in the Original Exponent EMF Report).

Double-Circuit Redesign in Fairfield

In Fairfield, existing Line 1430 is constructed on the south side of the Connecticut Department of Transportation (CT DOT) catenary structure and is currently proposed to be rebuilt on monopoles on the south side of the CT DOT corridor. Line 1130 was constructed in the early 1990s on single-circuit monopoles at a distance of approximately 0 to 9 feet (ft) north of the CT DOT catenary structures.

The requested redesign of the Project would involve replacing the existing single-circuit monopole structures currently supporting Line 1130 and rebuilding both Line 1130 and Line 1430 on double-circuit monopole structures on the north side of the CT DOT corridor.[2]

Along different portions of the route, the existing Line 1130 monopoles are offset by varying distances (approximately 0 to 9 ft) from the existing catenary structures based on the CT DOT corridor's width and clearance requirements specified by the CT DOT and the MNR at the time that the 1130 Line was constructed approximately 32 years ago. The new double-circuit structures are assumed to be rebuilt in line with the existing structures.[3] However, under the double-circuit configuration, since there would be transmission line conductors on both sides of each monopole structure, UI would have to procure an additional easement up to 32 ft from the center line of the new double-circuit monopole structure, where needed.[4]

EMF levels in the portion of the route between Structure 648S and the Ash Creek Substation were modeled in cross sections XS-1 through XS-7 of the Original Exponent EMF Report. The differences among these cross sections involve variations in the monopole structure locations,

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[2] Although the existing Line 1130 has an estimated remaining design life of approximately 8 years, the rebuilding of both Lines 1430 and 1130 on double-circuit monopole structures on the north side of the CT DOT corridor would require removal of the existing Line 1130 monopoles and replacement with double-circuit monopole structures. During and after the estimated design life, UI would monitor it's assets through inspections to determine if the assets need upgrades or replacement.

[3] The current CT DOT policy requires greater spacing between the CT DOT catenary structures and the UI monopole structures; this evaluation assumes that the new double-circuit monopole structures would replace existing Line 1130 structures in a one-for-one, in line swap.

[4] If greater spacing between the CT DOT catenary structures and the monopole structures were required, additional easement beyond the 32 feet from pole centerline assumed here also would be required.

the design of existing structures, and the widths of existing and proposed UI easements, as described in greater detail in the Original Exponent EMF Report. Several dimensions vary through the modeled route, as illustrated in Figure 1:

- Dimension I: Existing pole offset distance from the existing catenary structure, north side.
- Dimension II: Existing distance from the existing catenary structure to the CT DOT corridor boundary, north side.
- Dimension III: New pole offset distance from the existing catenary structure, south side.
- Dimension IV: Existing distance from the existing catenary structure to the CT DOT corridor boundary, south side.

The variation in these dimensions and a summary of parameters used for modeling cross sections XS-1 through XS-7 are listed in Exponent's Original EMF Report in Table A-3. Note that the redesigned, double-circuit structures are proposed to be constructed in line with the existing poles on the north side, so their location is described by Dimension I. Exponent also anticipates that it would be possible to rebuild Line 1130 and Line 1430 with optimal phasing (i.e., top-down 2, 1, 3, and 3, 1, 2, for Line 1130 and Line 1430, respectively). Thus, Exponent's analysis discussed below assumes optimal phasing of the Double-Circuit configuration.

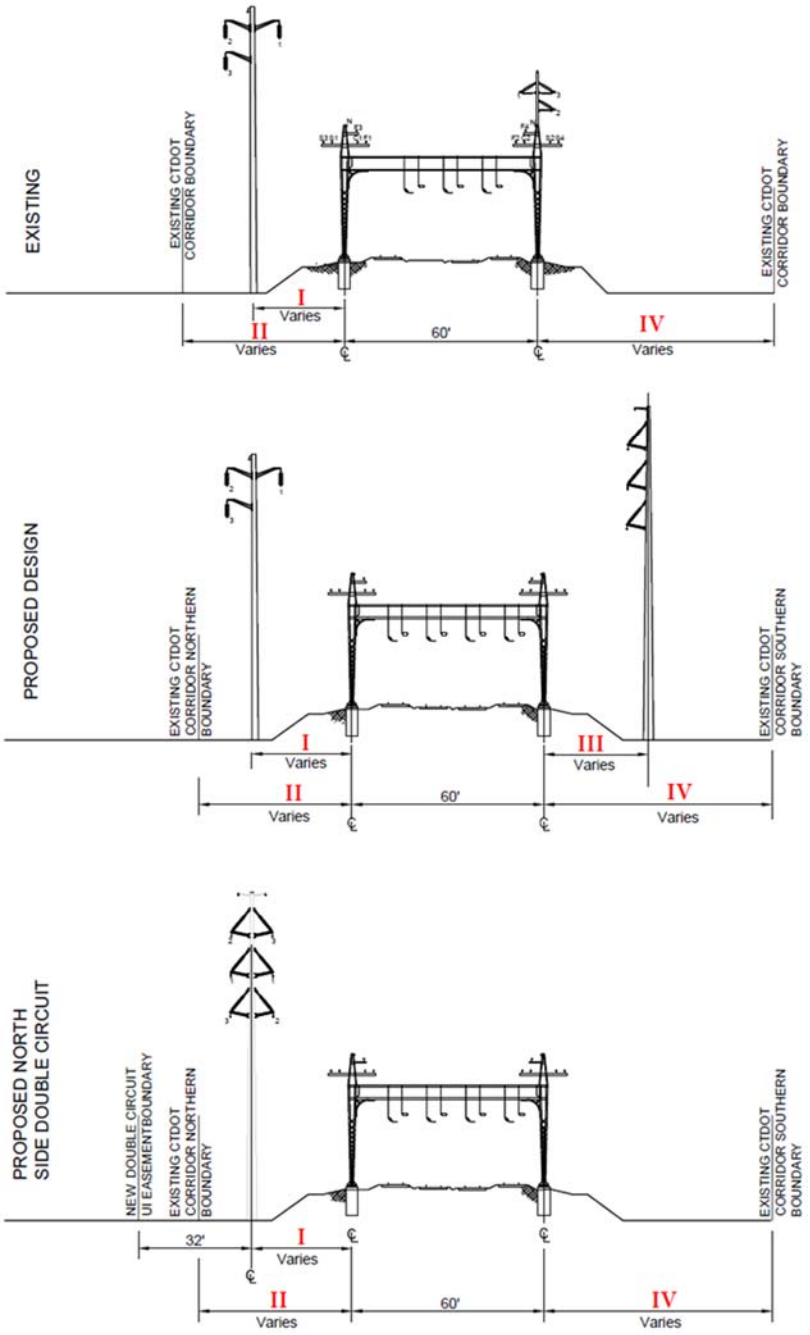

Figure 1. Configurations of the Project-related transmission lines and CT DOT catenary structure (view facing northeast) for XS–2.

Existing (top-; 1130 Line to the north, 1430 Line on catenary to the south); Proposed Project (middle – 1130 Line to the north, 1430 Line rebuilt to the south; and Double-Circuit (bottom – both 115-kV lines to the north)

Modeling Results

The EMF levels among modeling cross sections XS-1 to XS-7 differ quantitatively from one another but are qualitatively similar. Figure 2 to Figure 8 provide a graphical summary of the calculated magnetic field (including the Double-Circuit configuration) of cross sections XS-1 through XS-7, evaluated at average loading and a height of 1 meter (m) (3.3 ft) above ground. Figure 9 to Figure 15 show the same summary for electric fields at a height of 1 m (3.3 ft) above ground. Table 1 and Table 2 show tabular data for magnetic-field levels of the Existing, Proposed, and Double-Circuit configurations at average and peak loading, respectively. Calculated electric-field levels are shown in Table 3.

Both Proposed and Double-Circuit redesign configurations are calculated to reduce the maximum EMF levels compared to Existing levels. As expected, moving both transmission lines to the north side of the CT DOT corridor and rebuilding both on double-circuit monopoles (with optimal phasing) will result in a significant decrease in EMF levels south of the CT DOT corridor compared to either the Existing or Proposed configurations.

Additionally, at the south side edge of the existing CT DOT corridor, the Double-Circuit configuration is calculated (with respect to the Proposed configuration) to reduce magnetic-field levels by between 20 milligauss (mG) and 54 mG. Reductions at 100 ft from the south edge of the existing CT DOT corridor (where people would be expected to spend more time) are smaller, between approximately 3.4 mG and 6.9 mG. On the north edge of the CT DOT corridor, the Double-Circuit redesign also is calculated (with respect to the Proposed configuration) to decrease magnetic-field levels by 3.1 mG to 10 mG. At a distance of 100 ft from the north side edge of the existing CT DOT corridor, magnetic-field levels are calculated to decrease by between 2.2 mG and 4.8 mG.

Changes in electric-field levels are qualitatively similar to the magnetic field with a decrease in the maximum electric field (generally on the CT DOT corridor). The Double-Circuit configuration also reduces the electric field levels at the southern CT DOT corridor and, for the majority of the route, smaller reductions on the northern side of the CT DOT

corridor. Additionally, in cross sections XS-1, XS-4, and XS-5, electric-field levels for the Double-Circuit configuration increase (relative to the Proposed configuration) slightly at the north (–) Double-Circuit UI Easement boundary, due to the relocation of transmission lines to the north. However, all electric-field levels for Existing, Proposed or Double-Circuit configurations remain far below the guideline levels established by the ICNIRP and ICES discussed in the Original Exponent EMF Report.

Conclusions

This technical memorandum summarizes EMF calculations levels associated with the Existing and Proposed configurations of the UI Fairfield to Congress 115-kV transmission lines, as well as those from a Double-Circuit configuration. The evaluation of the Double-Circuit configuration indicates a decrease in the overall EMF levels relative to either Existing or Proposed configurations, including a decrease in maximum EMF levels, a large decrease in EMF levels on the south side of the tracks, and smaller decrease in magnetic-field levels on the north side of the tracks.

Although EMF levels from this Double-Circuit configuration would generally decrease compared to either Existing or Proposed configurations, the overall conclusions of the Original Exponent EMF Report remain the same—the calculated EMF levels resulting from the Project, whether from Existing, Proposed, or Double-Circuit configurations, will be a far below the reference levels recommended for the general public in international health-based standards (i.e., ICES and ICNIRP).

Graphical Results

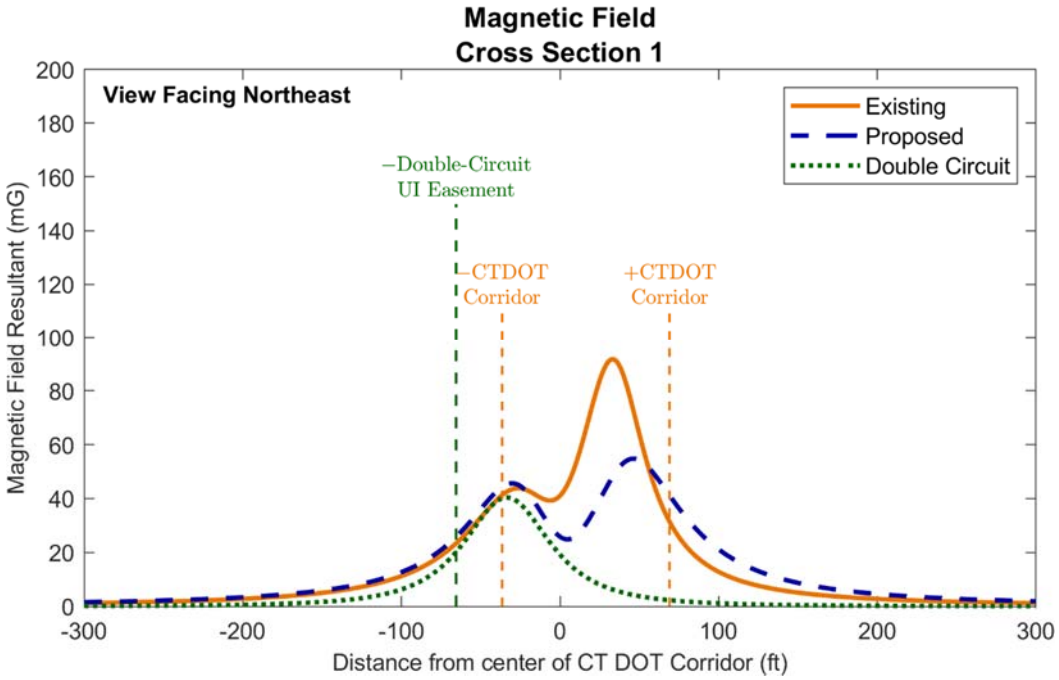

Figure 2. Magnetic-field profile across XS-1 at average loading.

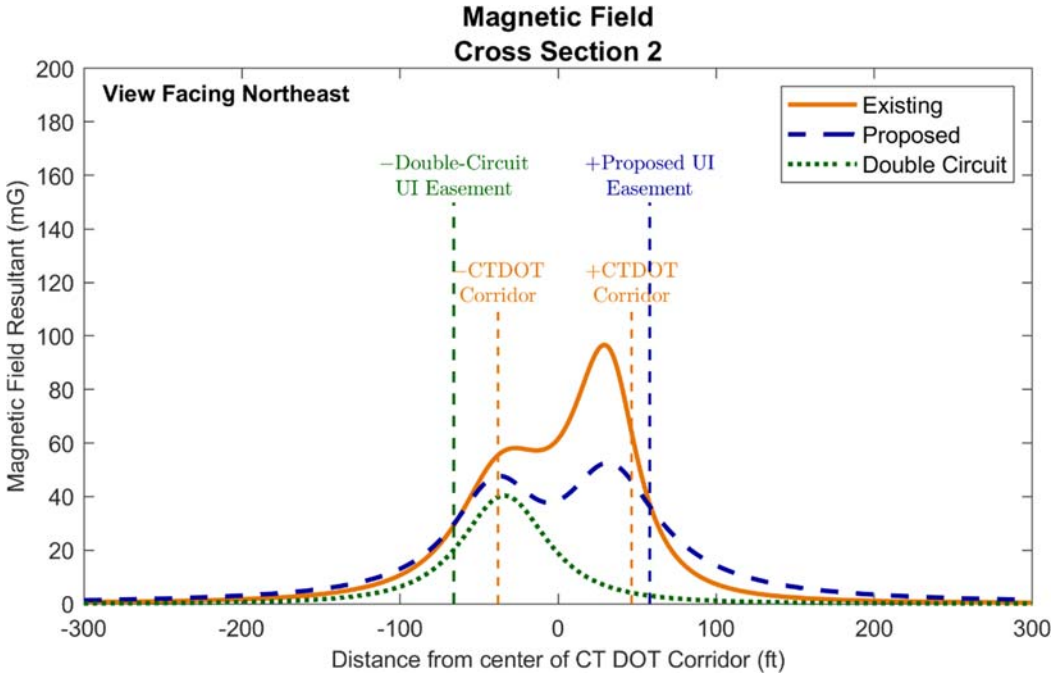

Figure 3. Magnetic-field profile across XS-2 at average loading.

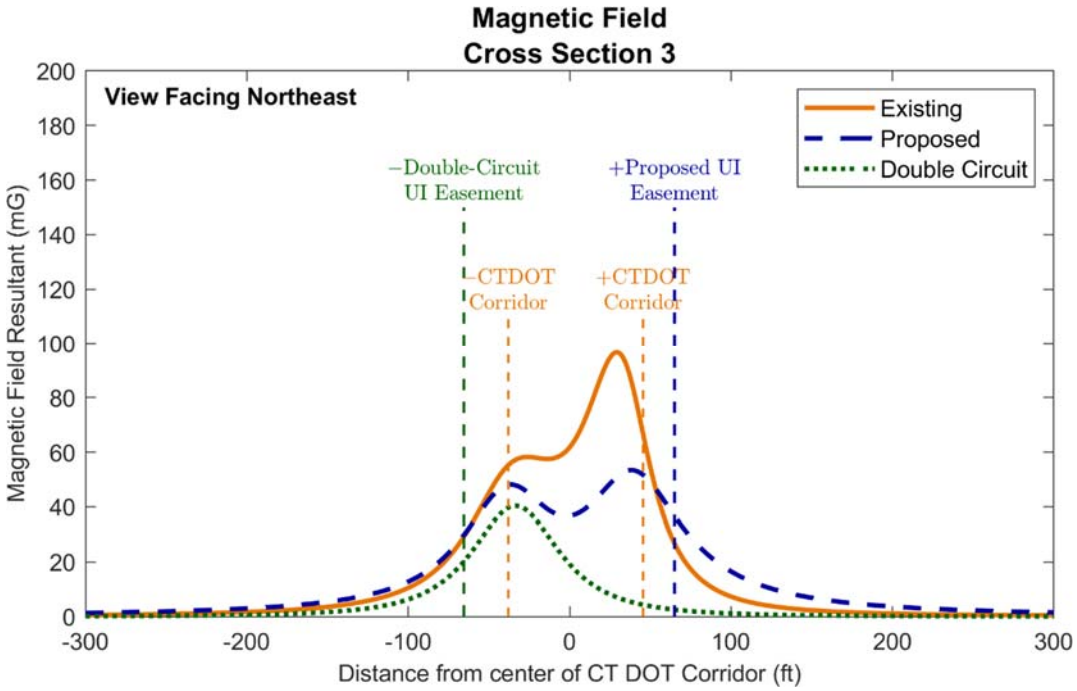

Figure 4. Magnetic-field profile across XS-3 at average loading.

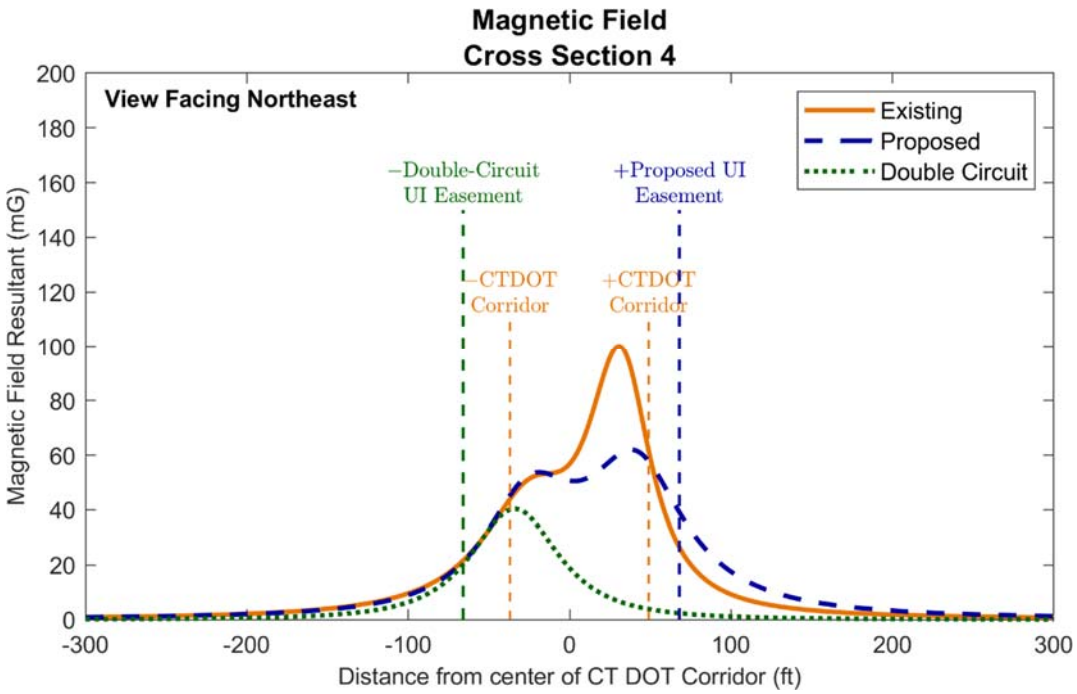

Figure 5. Magnetic-field profile across XS-4 at average loading.

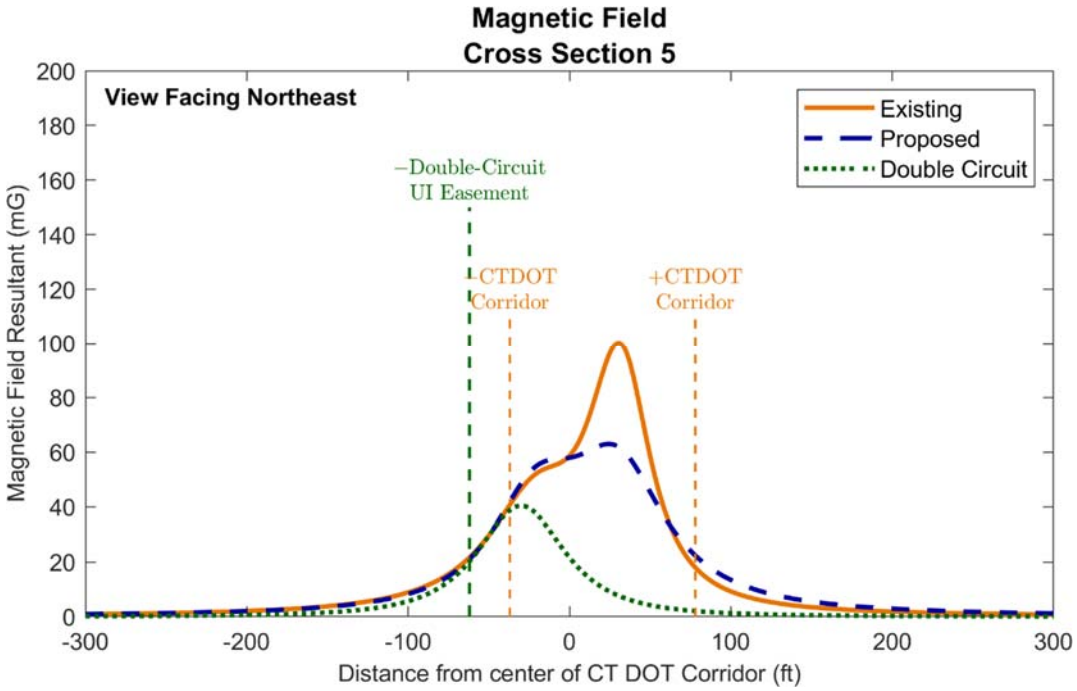

Figure 6. Magnetic-field profile across XS-5 at average loading.

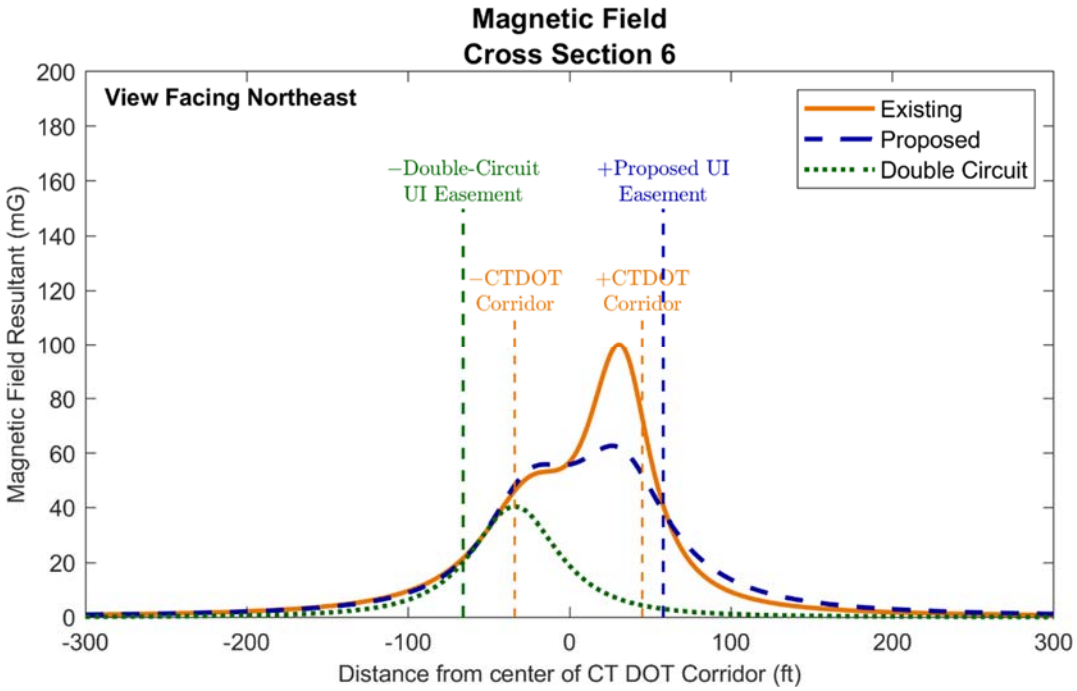

Figure 7. Magnetic-field profile across XS-6 at average loading.

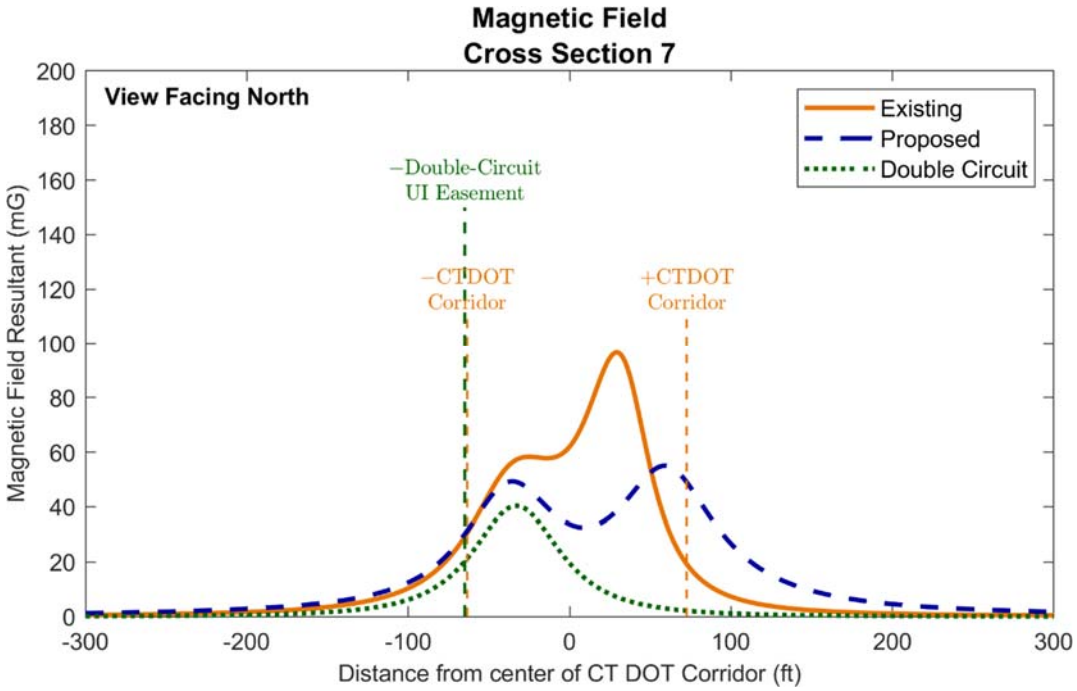

Figure 8. Magnetic-field profile across XS-7 at average loading.

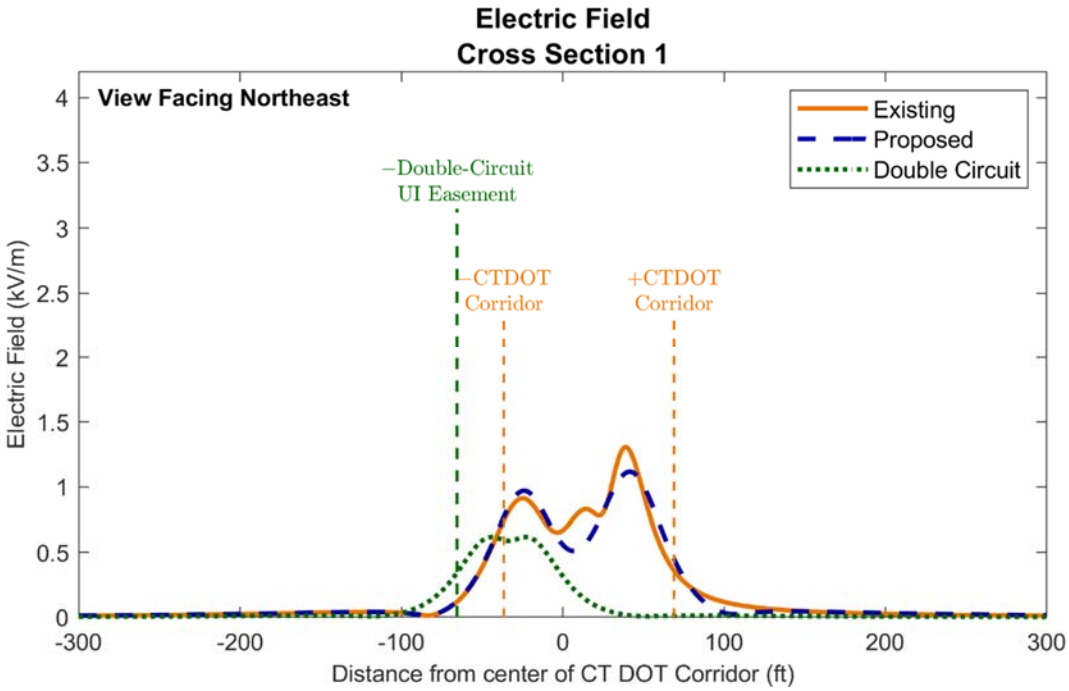

Figure 9. Electric-field profile across XS-1.

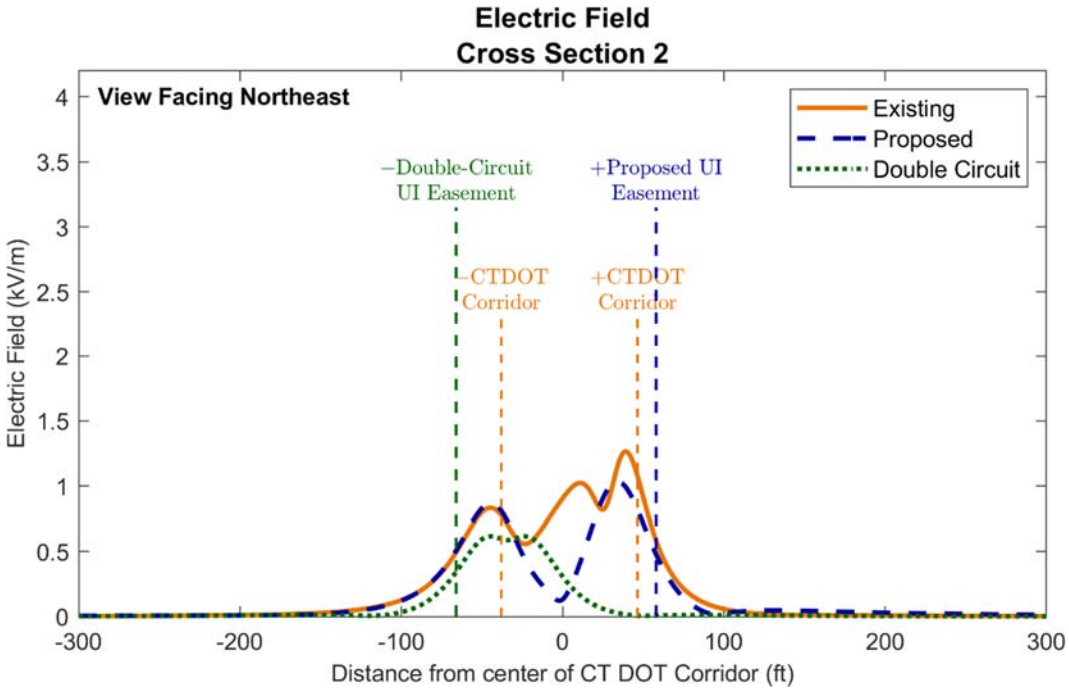

Figure 10. Electric-field profile across XS-2.

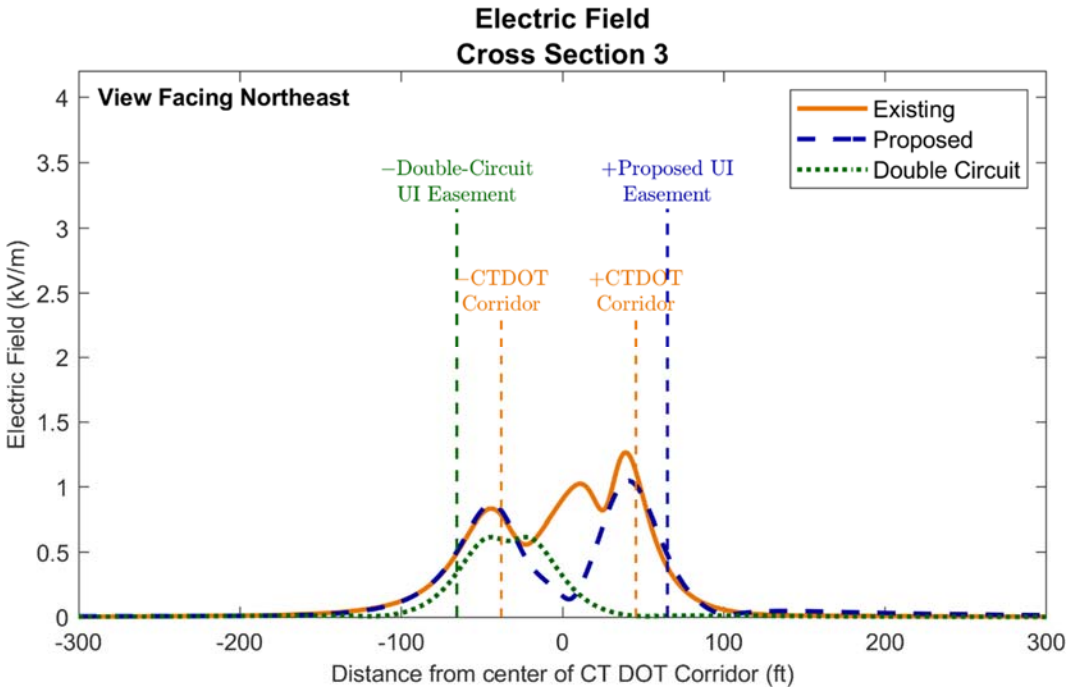

Figure 11. Electric-field profile across XS-3.

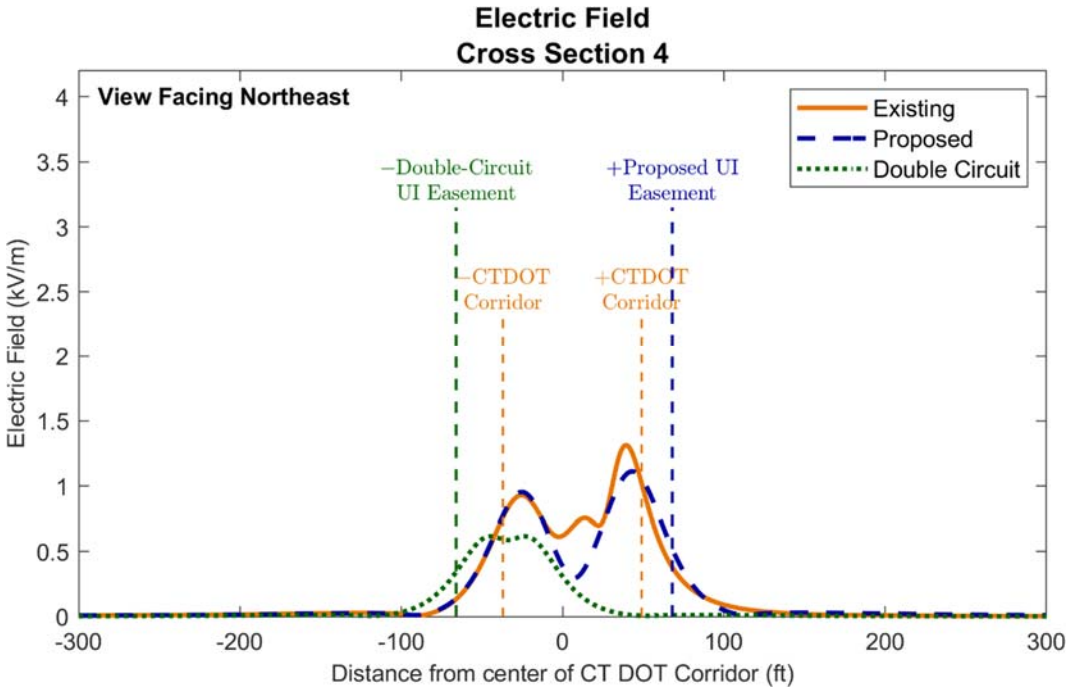

Figure 12. Electric-field profile across XS-4.

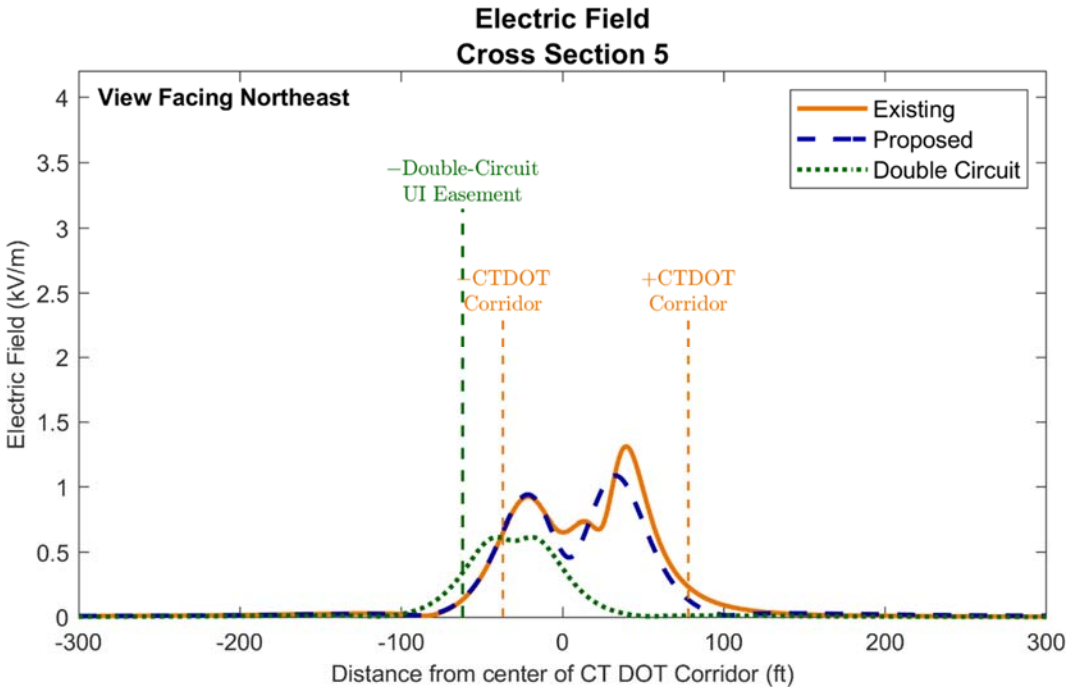

Figure 13. Electric-field profile across XS-5.

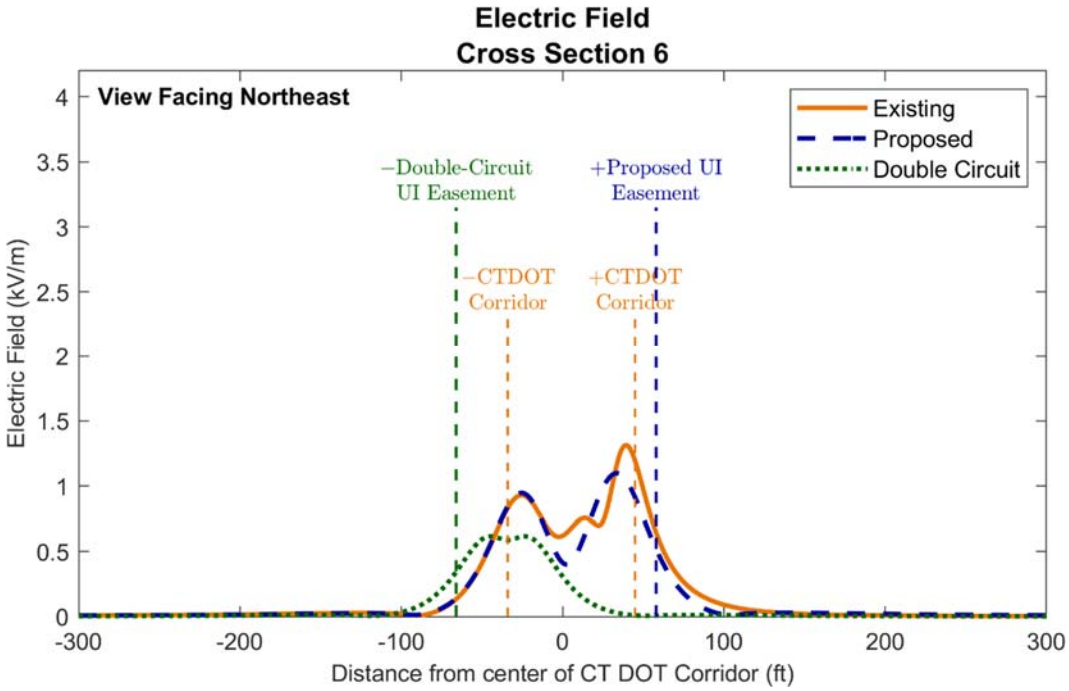

Figure 14. Electric -field profile across XS-6.

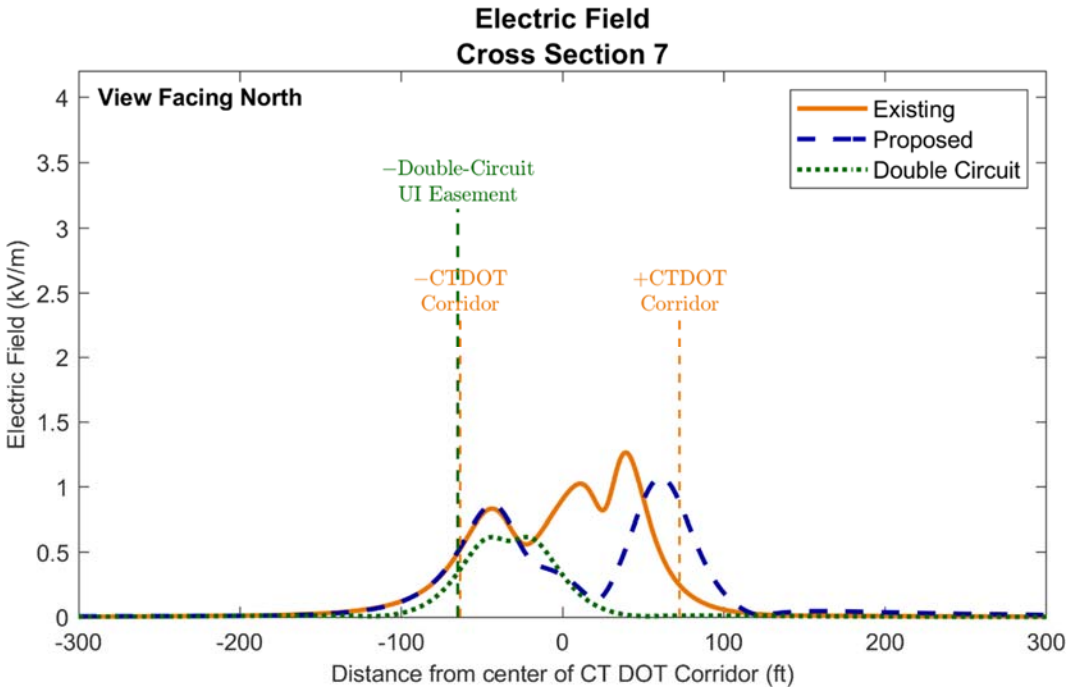

Figure 15. Electric-field profile across XS-7.

Tabular Results

Table 1. Magnetic-field levels (mG) at average loading

Cross section	Configuration	Location								
		–Double-Circuit UI Easement – 100 feet	–Existing CTDOT Corridor – 100 feet	–Double-Circuit UI Easement	–Existing CT DOT Corridor	Maximum	+Existing CT DOT Corridor	+Proposed UI Easement	+ Existing CT DOT Corridor + 100 feet	+Proposed UI Easement + 100 feet
1	Existing	4.1	6.1	23	41	92	31	31	4.0	4.0
	Proposed	4.9	7.1	26	44	55	41	41	6.7	6.7
	Double Circuit	1.2	2.3	20	40	40	2.3	2.3	0.4	0.4
2	Existing	2.8	4.5	29	56	97	64	37	2.5	2.0
	Proposed	4.5	6.6	30	48	53	46	36	6.6	5.6
	Double Circuit	1.2	2.2	20	40	40	4.2	3.0	0.5	0.4
3	Existing	2.8	4.5	29	55	97	67	27	2.5	1.8
	Proposed	4.4	6.5	30	48	53	52	37	7.4	5.6
	Double Circuit	1.2	2.2	20	40	40	4.3	2.6	0.5	0.4
4	Existing	3.2	4.9	22	44	100	62	26	3.5	2.7
	Proposed	3.0	4.5	21	45	62	58	39	6.7	5.0
	Double Circuit	1.2	2.3	20	40	40	3.9	2.4	0.5	0.4
5	Existing	3.2	4.6	22	41	100	18	18	2.4	2.4
	Proposed	3.1	4.3	21	42	63	22	22	3.7	3.7
	Double Circuit	1.2	2.1	20	39	40	2.0	2.0	0.3	0.3
6	Existing	3.2	5.1	22	46	100	73	41	3.7	3.1
	Proposed	3.0	4.8	21	48	62	52	39	6.1	5.0
	Double Circuit	1.2	2.5	20	40	40	4.3	3.0	0.5	0.4
7	Existing	2.8	2.8	29	31	97	19	19	1.6	1.6
	Proposed	4.2	4.3	30	31	55	49	49	6.7	6.7
	Double Circuit	1.2	1.2	20	21	40	2.2	2.2	0.4	0.4

Table 2. Magnetic-field levels (mG) at peak loading

Cross section	Configuration	Location								
		– Double-Circuit UI Easement – 100 feet	–Existing CT DOT Corridor – 100 feet	–Double-Circuit UI Easement	–Existing CT DOT Corridor	Maximum	+Existing CT DOT Corridor	+Proposed UI Easement	+ Existing CT DOT Corridor + 100 feet	+Proposed UI Easement + 100 feet
1	Existing	4.6	6.7	26	46	101	35	35	4.4	4.4
	Proposed	5.4	7.8	29	49	61	46	46	7.4	7.4
	Double Circuit	1.3	2.5	22	44	45	2.6	2.6	0.4	0.4
2	Existing	3.1	5.0	32	61	107	71	41	2.8	2.3
	Proposed	5.0	7.3	33	53	58	51	40	7.3	6.2
	Double Circuit	1.3	2.5	22	44	45	4.6	3.4	0.6	0.5
3	Existing	3.1	4.9	32	61	107	74	30	2.8	2.0
	Proposed	4.9	7.1	33	53	59	57	41	8.2	6.2
	Double Circuit	1.3	2.4	22	44	45	4.8	2.8	0.6	0.4
4	Existing	3.6	5.4	24	49	111	68	29	3.9	2.9
	Proposed	3.3	5.0	23	50	69	64	43	7.4	5.6
	Double Circuit	1.3	2.5	22	44	45	4.3	2.6	0.5	0.4
5	Existing	3.6	5.1	24	45	111	20	20	2.6	2.6
	Proposed	3.4	4.8	23	46	70	25	25	4.1	4.1
	Double Circuit	1.3	2.3	22	43	45	2.2	2.2	0.4	0.4
6	Existing	3.6	5.7	24	51	111	81	45	4.1	3.4
	Proposed	3.4	5.3	23	53	69	58	43	6.7	5.5
	Double Circuit	1.3	2.7	22	45	45	4.8	3.4	0.6	0.5
7	Existing	3.1	3.1	32	34	107	21	21	1.8	1.8
	Proposed	4.7	4.8	**33**	35	61	54	54	7.4	7.4
	Double Circuit	1.3	1.4	22	24	45	2.4	2.4	0.4	0.4

Table 3. Electric field levels (kilovolts per meter)

Cross section	Configuration	Location								
		– Double-Circuit UI Easement – 100 feet	–Existing CT DOT Corridor – 100 feet	–Double-Circuit UI Easement	–Existing CT DOT Corridor	Maximum	+Existing CT DOT Corridor	+Proposed UI Easement	+ Existing CT DOT Corridor + 100 feet	+Proposed UI Easement + 100 feet
1	Existing	< 0.1	< 0.1	0.1	0.7	1.3	0.4	0.4	< 0.1	< 0.1
	Proposed	< 0.1	< 0.1	0.1	0.8	1.1	0.5	0.5	< 0.1	< 0.1
	Double Circuit	< 0.1	< 0.1	0.3	0.6	0.6	< 0.1	< 0.1	< 0.1	< 0.1
2	Existing	< 0.1	< 0.1	0.5	0.8	1.3	1.1	0.6	< 0.1	< 0.1
	Proposed	< 0.1	< 0.1	0.5	0.8	1.0	0.8	0.5	< 0.1	< 0.1
	Double Circuit	< 0.1	< 0.1	0.3	0.6	0.6	< 0.1	< 0.1	< 0.1	< 0.1
3	Existing	< 0.1	< 0.1	0.5	0.8	1.3	1.1	0.4	< 0.1	< 0.1
	Proposed	< 0.1	< 0.1	0.5	0.8	1.1	1.0	0.5	< 0.1	< 0.1
	Double Circuit	< 0.1	< 0.1	0.3	0.6	0.6	< 0.1	< 0.1	< 0.1	< 0.1
4	Existing	< 0.1	< 0.1	0.1	0.8	1.3	1.0	0.4	< 0.1	< 0.1
	Proposed	< 0.1	< 0.1	0.1	0.8	1.1	1.1	0.5	< 0.1	< 0.1
	Double Circuit	< 0.1	< 0.1	0.3	0.6	0.6	< 0.1	< 0.1	< 0.1	< 0.1
5	Existing	< 0.1	< 0.1	0.1	0.6	1.3	0.2	0.2	< 0.1	< 0.1
	Proposed	< 0.1	< 0.1	0.1	0.7	1.1	0.1	0.1	< 0.1	< 0.1
	Double Circuit	< 0.1	< 0.1	0.3	0.6	0.6	< 0.1	< 0.1	< 0.1	< 0.1
6	Existing	< 0.1	< 0.1	0.1	0.8	1.3	1.2	0.6	< 0.1	< 0.1
	Proposed	< 0.1	< 0.1	0.1	0.8	1.1	0.9	0.5	< 0.1	< 0.1
	Double Circuit	< 0.1	< 0.1	0.3	0.6	0.6	< 0.1	< 0.1	< 0.1	< 0.1
7	Existing	< 0.1	< 0.1	0.5	0.5	1.3	0.2	0.2	< 0.1	< 0.1
	Proposed	< 0.1	< 0.1	0.5	0.5	1.1	0.9	0.9	< 0.1	< 0.1
	Double Circuit	< 0.1	< 0.1	0.3	0.4	0.6	< 0.1	< 0.1	< 0.1	< 0.1

Notice

At the request of UI, Exponent modeled electric and magnetic fields associated with the rebuild of 115-kV transmission lines that extends within the CT DOT corridor from catenary structure 648S in the Town of Fairfield east to UI's Ash Creek Substation. This technical memorandum summarizes revised work to date and presents the findings resulting from that work related to an alternative Double-Circuit configuration redesign of the rebuilt line, moving both existing transmission lines to double-circuit monopoles on the north side of the CT DOT corridor.

In the analysis, we have relied on geometry, material data, usage conditions, specifications, and various other types of information provided by UI. We cannot verify the correctness of these input data and rely on the client for the data's accuracy. UI has confirmed to Exponent that the summary of data provided to Exponent contained herein is not subject to Critical Energy Infrastructure Information restrictions. Although Exponent has exercised usual and customary care in the conduct of this analysis, the responsibility for the design and operation of the Project remains fully with the client.

The findings presented herein are made to a reasonable degree of engineering and scientific certainty. Exponent reserves the right to supplement this technical memorandum and to expand or modify opinions based on review of additional material as it becomes available, through any additional work, or review of additional work performed by others.

The scope of services performed during this investigation may not adequately address the needs of other users of this technical memorandum, and any re-use of this technical memorandum or its findings, conclusions, or recommendations presented herein other than for permitting of this Project are at the sole risk of the user. The opinions and comments formulated during this assessment are based on observations and information available at the time of the investigation. No guarantee or warranty as to future life or performance of any reviewed condition is expressed or implied.