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May 31, 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") is The United Illuminating Company's responses to the Council's May 10, 2023 interrogatories (Set One).

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

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Interrogatory CSC-1

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine
Page 1 of 1

Q-CSC-1: Is the project, or any portion of the project, proposed to be undertaken by state departments, institutions or agencies, or to be funded in whole or in part by the state through any contract or grant?

A-CSC-1: No portion of the project is proposed to be undertaken by state departments, institutions or agencies, or to be funded in whole or in part by the state through any contract or grant.

Interrogatory CSC-2

Q-CSC-2: Referencing Volume 1A of the Application, Appendix F, of the letters sent to abutting property owners, how many certified mail receipts were received? If any receipts were not returned, which owners did not receive their notice? Were any additional attempts made to contact those property owners?

A-CSC-2: Certified mail receipts were received from nine of the eleven property owners. Certified mail receipts were not received from MAT Construction (the owner of 88-92 Howard Avenue) or Gesswein Realty (the owner of 201 Hancock Avenue). Copies of the letter were also sent to MAT Construction and Gesswein Realty by regular mail.

Interrogatory CSC-3

The United Illuminating Company
Docket No. 516

Witness: Leslie Downey
Page 1 of 1

Q-CSC-3: Has The United Illuminating Company (UI) received any comments on the Project from abutting property owners and/or any of the municipalities since the application was submitted to the Council? If yes, please indicate what such comments were and how UI addressed such comments.

A-CSC-3: Four comments were received by Outreach post-application.

1. On March 23, 2023 State Representative Jennifer Leeper contacted UI Government Affairs with a customer concern about the Project. UI contacted Representative Leeper and set up a meeting with the Project Team. The customer was concerned about a potential monopole to be located on his property. After the briefing, Representative Leeper contacted the customer to follow-up and the customer asked about EMF exposure on the street and of children who play outside. UI forwarded the project's EMF report to Representative Leeper who provided it to the customer.

2. On March 21, 2023 a customer called the Outreach Hotline after receiving the Company's letter about the application. UI contacted the customer who informed the Company that UI did not have permission to enter his property for any reason. He stated that he would be detailing his concerns in a letter to Project Manager. The letter that reiterated the concerns was received by UI on April 4, 2023.

3. On March 24 and March 30, 2023 Jennifer Cote from BJ's Corporate offices called the Outreach Hotline. A Company representative called back and Ms. Cote said that BJ's was concerned that the plans on the website indicated a potential permanent easement that crossed BJ's loading dock. The Project team is in the process of arranging a meeting with representatives of BJ's to discuss its concerns.

4. On April 5, 2023 the owner of 32 & 54 Washburn Street in Bridgeport emailed the Company. He said that he had billboards on this property and was concerned about potential loss of revenue if the billboards had to be moved or were blocked. The Company provided information to customer on the process of submitting a comment on the application to the CSC.

Interrogatory CSC-4

The United Illuminating Company
Docket No. 516

Witness: Zachary Logan
Page 1 of 1

Q-CSC-4: Is the proposed project identified in any ISO-New England, Inc. (ISO-NE) needs and solutions analyses? Is the proposed project on the ISO-NE Regional System Plan (RSP), RSP Project List and/or Asset Condition List?

A-CSC-4: UI performed the Fairfield/Congress needs and solutions assessment independently as ISO-NE does not perform asset condition assessments on behalf of New England Transmission Owners. This project is listed in the ISO-NE RSP Asset Condition list.

Interrogatory CSC-5

The United Illuminating Company
Docket No. 516

Witness: Zachary Logan
Page 1 of 1

Q-CSC-5: Referencing page 1-14 of Volume 1 of the Application, UI notes that, "[T]he transmission lines exhibit various physical limitations." Identify such physical limitations/conditions. Please provide sample photos to depict such conditions.

A-CSC-5: Age-related physical limitations include elements such as the loss of structural steel thickness, missing structural members, corrosion expansion, and exposed anchor bolts. These age-related physical limitations are outlined further in the Black & Veatch Condition Assessment Report, June 2018. See UI's response to interrogatory CSC-12 in Docket No. 508.

Interrogatory CSC-6

Q-CSC-6: Referencing page 1-14 of Volume 1 of the Application, UI notes that it conducted engineering analyses of the 115-kV lines between Catenary Structure No. B648S and Congress Street Substation in 2018. Please provide a copy of the engineering studies.

A-CSC-6: Please see UI's response to interrogatory CSC-12 in Docket No. 508.

Interrogatory CSC-7

Q-CSC-7: Please describe how the proposed project is consistent with the recommendations of the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC) Report on Transmission Facility Outages During the Northeast Snowstorm of October 29-30, 2011 – Causes and Recommendations.

A-CSC-7: The main driver for transmission line outages during the Northeast Snowstorm of October 29-30, 2011, was due to contact from trees located both within and outside of the transmission right-of-way. A vast majority of these were healthy trees which were pulled down because of the saturated ground and heavy wet snow that accumulated on the tree and their still intact leaves. The recommendations proposed in the report by FERC and NERC will be implemented in the proposed Project by adhering to UI's Vegetation Management Operating Procedure (Transmission Vegetation Management Procedure OP-70) which covers transmission line right-of-way clearing requirements, inclusive of width of clearing and danger tree removal, and has been used by the Project to ensure the transmission right-of-way is wide enough to allow for proper vegetation management to the conductors. Any areas of expanded rights that are to be acquired by the Project will also include a provision for removal of danger trees outside of the right-of-way to mitigate fall ins under storm conditions such as the October 2011 snowstorm. UI's Transmission Vegetation Management Procedure is based on the latest requirements of the NERC FAC-003-4 standard and is used as a best management practice and applied to all transmission right-of-ways, both new and existing.

Q-CSC-8: Referencing page ES-1 of Volume 1 of the Application, UI notes that "The Project… is consistent with recent Federal commitments to modernize the nation's power grid to facilitate the transmission and delivery of clean and resilient energy to consumers." Identify which recent federal commitments are being referred to. How would the Project facilitate the transmission and delivery of clean and resilient energy to customers?

A-CSC-8: Page ES-1 of the Application refers generally to the several recent federal initiatives to support the build-out of transmission facilities that are critical to achieving President Biden's goal of 100% clean electric energy by 2035. Examples of such federal initiatives are:

In January 2022, the U.S. Department of Energy launched the "Building a Better Grid" initiative to catalyze the nationwide development of new and upgraded high-capacity electric transmission lines, as enabled by the Infrastructure Investment and Jobs Act. Building a Better Grid will work with community and industry stakeholders to identify national transmission needs and support the buildout of long-distance, high voltage transmission facilities that are critical to reaching President Biden's goal of 100% clean electricity by 2035 and a zero emissions economy by 2050. This program will make the U.S. power grid more resilient to the impacts of climate change, increase access to affordable and reliable clean energy and boost transmission jobs.

https://www.energy.gov/sites/default/files/2022- 01/Transmission%20NOI%20final%20for%20web_1.pdf

Similarly, in April 2021, the U.S. Department of Energy announced the availability of up to $8.25 billion in loans from its Loan Programs Office and the Western Area Power Administration for efforts to expand and improve the nation's transmission grid, specifically facilitate the construction of high-voltage transmission lines to enhance the reach, reliability, and resilience of the nation's electricity and unlock more of the nation's clean energy resources.

https://www.energy.gov/articles/doe-announces-825-billion-loans-enhance-electrical-transmission-nationwide

The Fairfield-Congress Project also is well-placed in the coastal Connecticut area to potentially support the transmission of clean energy from offshore wind projects.

Interrogatory CSC-9

The United Illuminating Company
Docket No. 516

Witness: Meena Sazanowicz
Page 1 of 1

Q-CSC-9: Referencing page ES-2 of Volume 1 of the Application, how is the project "targeted to meet the growing consumer demand for electricity, including clean energy generated by sources such as solar and wind power, in the Company's service territory"? Explain.

A-CSC-9: The Project will install conductors and associated structures that are capable of delivering and accepting future capacity (load and generation) to be connected to the transmission system.

Interrogatory CSC-10

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine

Q-CSC-10: Referencing page 2-17 of Volume 1 of the Application, what are the major components driving the total cost for the Project?

A-CSC-10: The major components driving the total cost are as follows

1. Construction (~$123.5M)
2. Allowance for Funds Used During Construction & Overheads (~$78.2M)
3. Land Rights (~$32.2M)
4. Materials (~$10.7M)
5. Engineering Design & Permitting (~$10.4M)

Interrogatory CSC-11

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine

Q-CSC-11: Referencing page 2-17, of the $255M total cost, approximately how much is associated with transmission line upgrades, and how much is associated with the substation upgrades?

A-CSC-11: Based on current design and cost estimation, allocation of total Project estimated cost are as follows: transmission line upgrades = ~99% and substation upgrades = <1%.

Interrogatory CSC-12

The United Illuminating Company
Docket No. 516

Witness: Zachary Logan
Page 1 of 1

Q-CSC-12: Of the approximately $255M cost total, what costs would be regionalized, and what costs would be localized? Estimate the percentages of the total cost that would be borne by UI ratepayers, Connecticut ratepayers and the remainder of New England (excluding Connecticut) ratepayers, as applicable.

A-CSC-12: The entire scope of work is to upgrade the 115-kV transmission lines which are pool-transmission facilities, and therefore, UI can expect the entire project cost to be regionalized.

See table below for percentages of the total cost that would be borne by UI ratepayers.

	Approximate PTF Regionalized Cost Allocation
UI Retail Customers	5%
ES+UI CT Retail Customers	24%
CMEEC + Wallingford Retail Customers	1%
Remaining New England Customers	75%

Interrogatory CSC-13

The United Illuminating Company | Witnesses: Brian Ragozzine, Shawn Crosbie

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Q-CSC-13: What methodology does UI use to determine an acceptable delta between estimated project costs and actual project costs? What is the acceptable delta?

A-CSC-13: UI follows the rules outlined in ISO-NE Planning Procedure 4 (PP4) to determine the level of accuracy required at various stages of a project. A "proposed project" requires the level of accuracy to be within a +50/-25% range while a "final project design" requires a +10/-10% range.

Interrogatory CSC-14

The United Illuminating Company
Docket No. 516

Witness: Meena Sazanowicz
Page 1 of 1

Q-CSC-14: Provide a matrix of all relocation project alternatives reviewed and cost data utilizing a similar matrix format to Docket 508, Findings of Fact, Figure 15 (page 54): https://portal.ct.gov/-/media/CSC/1_Dockets-medialibrary/1_MEDIA_DO500_600/DO508/Decision/D508-FOF-Final.pdf

A-CSC-14: See Attachment CSC-14-1.

Interrogatory CSC-15

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine
Page 1 of 1

Q-CSC-15: Page 3-5 of Volume 1 of the Application references helicopters may be used to facilitate wire stringing or other activities. Where are the anticipated locations along the ROW that helicopters could be used and what is the approximate cost of using helicopters, including the cost delta over not using helicopters?

A-CSC-15: UI anticipates using a helicopter (1) for the removal of the lattice structure directly outside of Ash Creek Substation (this is based on a review of the constructability at this location aligned with permitting guidance and recommendations from CTDEEP and USACOE) and (2) for the removal of structures in certain logistically challenging areas along the Project area. However, the use of helicopters on the Project will not be known until the award of the Project construction contract, estimated for May of 2024. Based on the conceptualized constructability in the Project areas, UI estimates the cost to use a helicopter for the above activities will be approximately 3-4 times less expensive than the use of a crane.

Q-CSC-16: Under Regulations of Connecticut State Agencies (RCSA) §16-50j-2a(29), "**Site**" means a contiguous parcel of property with specified boundaries, including, but not limited to, the leased area, right-of-way, access and easements on which a facility and associated equipment is located, shall be located or is proposed to be located. Throughout the Application generally, there is reference to other terms that may or may not be synonymous with the definition of "**Site**." Please define the "**Site**" consistent with RCSA §16-50j-2a(29) and more specifically define the following terms from the Application in relation to the **"Site"**:

a) Project Area;
b) Project Location;
c) CDOT Corridor;
d) Existing Site; and
e) Limits of Disturbance.

If none of these terms is coextensive with the definition of "**Site**," provide maps clearing depicting the boundaries of the "**Site**."

A-CSC-16: For the purposes of defining the term "Site," all referenced terms "a" through "e" will serve as such definition. "Project Area" encompasses the locations of UI's existing facilities and proposed 115-kV rebuild work, which extend within and outside of the CT DOT railroad corridor from Catenary Structure B648S in the Town of Fairfield east to Congress Street Substation in the City of Bridgeport, as well as along UI's existing and proposed ROW from the CT DOT railroad corridor to Ash Creek Substation. Application pages ES-2 and 10-2.

"Project Location" means the general location of the Project within Fairfield and Bridgeport, as well as in relation to other features such as I-95, Long Island Sound, Bridgeport Harbor, the Town of Westport, and major roads, including U.S. Route 1 and the Merritt Parkway. See Application page 1-2, which provides the "General Project Location" map.

"CDOT Corridor" means the long-established linear corridor, owned entirely by CT DOT, within which the MNR tracks are aligned, as well as the railroad catenary structures that support not only the existing UI bonnets and 115-kV lines, but also MNR signal, feeder, and communication lines critical to the operation of the trains. Other UI 115-kV infrastructure, including the 1130 Line monopoles and the 215-foot-tall lattice steel tower at the Bridgeport Train Station, also is located within the CT DOT-owned corridor. In the Project area, the 7.6-mile CT DOT-owned corridor includes four MNR tracks, which provide passenger service with stops at four MNR train

stations: Southport, Fairfield Center, and Fairfield Metro stations in Fairfield and the Bridgeport Train Station in Bridgeport. Application pages 1-1 and 1-4, 1-12 to 1-13, 2-9 to 2-10.

The term "existing site" is not used in the Application. However, "site" is used throughout the Application to refer to more specific locations of proposed Project work, within the Project area. Examples include "new monopole sites", "conductor pulling sites" (Application page ES-7), "construction sites" (page 1-16), "bonnet removal site" (page 2-12), and "site restoration". Page ES-6.

The term “Limits of Disturbance" is not used in the application.

UI notes that in the Application, the term "right-of-way" (ROW) refers to the Company's permanent 0.23-mile easement that extends from the CT DOT corridor to Ash Creek Substation. Application page ES-1.

Interrogatory CSC-17

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine
Page 1 of 1

Q-CSC-17: Pursuant to CGS §16-50o, please submit any agreements entered into with any third party in connection with the construction or operation of the proposed Project.

A-CSC-17: No agreement currently exists with any third party in connection with the construction and operation of the proposed Project.

Interrogatory CSC-18

The United Illuminating Company
Docket No. 516

Witness: Annette Potasz
Page 1 of 1

Q-CSC-18: Pages 1-4 and 3-1 of Volume 1 of the Application refer to a lease agreement with Connecticut Department of Transportation (CDOT). Is the CDOT lease agreement that was submitted into the Council Docket 272 record at the following link the most current? https://portal.ct.gov/lib/csc/NH1-462721-v1-CDOT-Agreement1.pdf. If no, please provide a link to the most up to date lease agreement between UI and CDOT.

A-CSC-18: The CDOT lease agreement that was submitted into the Council's Docket 272 record is the most current version of the lease agreement.

Interrogatory CSC-19

The United Illuminating Company
Docket No. 516

Witness: Annette Potasz
Page 1 of 1

Q-CSC-19: Pages 1-4 and 3-1 of Volume 1 of the Application refer to a maintenance agreement with Metro North Railroad (MNR). Please provide a link to the most up to date maintenance agreement between UI and MNR.

A-CSC-19: There is no standing agreement with MNR that governs the maintenance of UI work activities such as the one UI currently has with CTDOT for access to the property. However, on a case-by-case basis, UI works with MNR to submit Entry Permits to perform both capital and maintenance work such as vegetation clearing, insulator replacements, splices, and structure replacements.

Interrogatory CSC-20

The United Illuminating Company

Witnesses: Meena Sazanowicz
Aziz Chouhdery

Docket No. 516

Q-CSC-20: Will the Project support MNR rail lines operations? Explain.

A-CSC-20: UI's transmission system supports a portion of MNR's power needs out of a substation in New Haven, CT. Construction of the lines in the project area will not affect operation of the trains. All construction, Project planning and design has been coordinated with CTDOT and MNR through re-occurring meetings. The coordinated Project construction schedule will accommodate MNR rail operation requirements.

Interrogatory CSC-21

The United Illuminating Company | Witnesses: Meena Sazanowicz, Aziz Chouhdery

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Q-CSC-21: Do any of the four substations (i.e. Ash Creek, Resco, Pequonnock, and Congress Street) supply power to the MNR rail line? Explain.

A-CSC-21: None of the substations supply power to the MNR rail line. There are three high-voltage substations along the railroad corridor that provide power to MNR.

Interrogatory CSC-22

Q-CSC-22: Referencing the July 5, 2017 correspondence from the CDOT Rail Administrator to Kenneth Bowes of Eversource from Council Docket No. 461A available at this link: https://portal.ct.gov/-/media/CSC/1_Dockets-medialibrary/Docket_461A/Pre-Filed_Exhibits/Eversource/461A20170710SupplementalTestimonyBowespdf.pdf. Please explain how the proposed Project would not impact the New Haven Line service as described in each numbered paragraph of the CDOT Rail Administrator correspondence.

A-CSC-22: UI has an active and long-standing relationship with CT DOT/MNR in coordinating Project or maintenance activities along the CT DOT corridor. The proposed project will use the following to ensure the operation of the New Haven Line are not impacted:

a. Ongoing and for the foreseeable future re-occurring or as-needed meetings and feedback from CT DOT and MNR on Project design
b. Ongoing and for the foreseeable future re-occurring or as-needed meetings and feedback from UI on CT DOT and MNR Project(s)
c. Communication with CT DOT on the re-occurring or as-needed meetings relative to Project activities such as:
    1. Scope
    2. Schedule
    3. Staff Resources
    4. CT DOT/MNR Projects

Interrogatory CSC-23

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine
Page 1 of 1

Q-CSC-23: Referencing page 5-43 of Volume 1 of the Application, there is reference to CTDOT and MNR performing corridor and track improvements along the New Haven Line. Where would potential CDOT/MNR projects include station improvements?

A-CSC-23: There are no known or scheduled capital corridor or track improvement projects within the Project area. However, maintenance activities may occur during the Project or CTDOT and MNR may in the future coordinate with UI on anticipated projects.

Interrogatory CSC-24

The United Illuminating Company
Docket No. 516

Witness: Aziz Chouhdery
Page 1 of 1

Q-CSC-24: What other existing collocated uses (ex. wireless telecommunications equipment, water and sewer lines, etc.) are within the project area? Would any have to be removed, relocated or modified, either temporarily or permanently, for construction of the proposed project?

A-CSC-24: In general, the proposed poles have been strategically placed to avoid any known active subsurface utilities with a few exceptions. Utilities adjacent to or crossing the project area include underground electrical, storm, water, sewer, communications, and gas lines. Based on the current design and the due diligence activities conducted to date, in certain locations there are underground street lighting cables and sprinkler systems which will have to be relocated. In addition, abandoned utilities will be removed where they conflict with pole locations.

Interrogatory CSC-25

The United Illuminating Company — Witness: Meena Sazanowicz/ Matt Parkhurst

Docket No. 516 —

Q-CSC-25: Are the proposed monopoles capable of hosting telecommunications equipment collocations?

A-CSC-25: No, the proposed monopoles have not been designed to accommodate third party telecom equipment.

Interrogatory CSC-26

The United Illuminating Company
Docket No. 516

Witness: Annette Potasz
Page 1 of 1

Q-CSC-26: Referencing page ES-5 of Volume 1 of the Application, has UI notified the property owners of its intent to obtain the 19.25 acres of permanent easements?

A-CSC-26: No property owners have been directly advised of the intent to obtain permanent easements. The process of negotiation and obtaining land rights will begin after approval of the project by the Council.

Interrogatory CSC-27

The United Illuminating Company
Docket No. 516

Witness: Matthew Scully
Page 1 of 1

Q-CSC-27: Referencing page ES-6 of Volume 1 of the Application, please describe any limitations related to working in or adjacent to MNR.

A-CSC-27: Work limitation relating to working with or adjacent to MNR are as follows:

- Any work within the CTDOT railroad corridor will require a flagger provided by Metro North.
- Any work within 10-feet of the Metro North Signal and Feeder wires will require an outage on those facilities.
- Any work that will require a person or piece of equipment to foul the tracks (meaning it would come within 4 feet of the tracks) will require a track outage.
- Any work requiring installation or removal of wires crossing the tracks will require a 4-track outage, which is limited to Friday, Saturdays, and Sunday nights.

Interrogatory CSC-28

The United Illuminating Company | Witnesses: Brian Ragozzine/ Matt Parkhurst

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Q-CSC-28: Referencing page ES-6 of Volume 1 of the Application, explain why the construction time period spans roughly five calendar years. Could any of the segments be constructed in parallel to expedite the schedule?

A-CSC-28: Due to system outage limitations, the four segments cannot be built in parallel. Further description of work activities are outlined in Sections 3 and 4 of the application.

Specific outage limitations and construction/engineering requirements which lead to the specific durations as laid out above include:

- Outages for this Project are estimated to not begin until January 2025 due to planned outages to support UI's New Pequonnock Substation Project.
- Outage Timing Restrictions on Line 91001-2 so that Ash Creek Substation is not solely supported by a line co-owned by Eversource in the winter months.
- Ash Creek Substation needs to be supported by at least one of the two 115-kV lines that currently support it.
- The existing configuration and the proposed rebuilt alignment of Lines 1430 and 91001-2 between the railroad tracks and Ash Creek Substation require Line 91001-2 to be partially rebuilt (everything except for the removal of the existing tower on the island in Ash Creek and connecting shield and conductors) prior to re-building Line 1430 and fully re-built after the re-building of Line 1430.
- Resco Substation supports the operation of a generating facility and outages to this facility are limited.
- Construction durations have been planned to allow for flexibility in the timing of four track crossings (which can only take place on Friday, Saturday, and Sunday nights) and interstate highway crossings.
- The design of the existing tower straddling the tracks between Pequonnock and Congress Street Substations and the locations of the existing attached conductors over I-95 and the railroad require a long duration to account for potential timing restrictions with MNR and CTDOT.

Interrogatory CSC-29

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

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Q-CSC-29: Referencing page 1-14 of Volume 1 of the Application, would the Project comply with the 2023 National Electrical Safety Code (NESC), effective February 1, 2023? What are the NESC and UI standards?

A-CSC-29: The State of Connecticut adopts the newest version of the NESC as the minimum requirement for safe design, construction and operation of electric supply stations and associated supply and communications (i.e., electrical clearances and structure loading requirements). Per Section 1, Rule 016 of the NESC, the newest version is defined as the latest version at the start of design. The Project's design started in early 2021 and thus follows the version of the NESC that was effective at that time (2017). Per Section 1, Rule 016 of the NESC, only designs that are started after the effective date of February 1, 2023, are required to follow the 2023 NESC.

Many utilities across the country, including UI, have their own design standards exceeding the minimums laid out in the NESC. For example, as a result of recent hurricanes and future climate change, UI standard structure loading criteria includes Category 3 wind loading.

Interrogatory CSC-30

The United Illuminating Company

Witnesses: Brian Ragozzine
Meena Sazanowicz

Docket No. 516

Q-CSC-30: Referencing page 2-7 of Volume 1 of the Application, what is the source of the 25-foot minimum clearance requirement? For example, is it due to the MNR requirements, the NESC, or vegetation management?

A-CSC-30: The source of the 25-foot minimum clearance requirement is vegetation management requirements based on UI's Transmission Vegetation Management Program.

Q-CSC-31: Referencing Drawing Cross Section 1 of Volume 2 of the Application, would the existing MNR signal and feeder wires remain on the catenary structures? If the catenaries were rebuilt and the 115-kV transmission lines were re-installed on the catenaries, what height would be required to meet clearance requirements?

A-CSC-31: These lines are owned and operated by the Metro North Railroad. These cross sections are typical drawings. Where the offsets (Variable B) are large enough the existing MNR signal and feeder wires (owned and operated by the Metro North Railroad) will remain on the catenary structures. In locations where the steel poles do not have enough space to be offset to a large enough distance, the new monopoles will support either the signal wires (in the case of Structures P684S through P686S) or the signal and feeder wires (in the case of P659S). In most cases, where these wires are supported by the new monopoles, they will be removed from being supported by the closest corresponding catenary structure. Exceptions include where the new monopoles are planned to be installed approximately mid-span between two existing catenary structures (i.e. P686S).

If the catenary structures were rebuilt, and the Metro North signal and feeder wires were to stay at their existing elevations, the bonnet structures, carrying the 115-kV lines in similar configuration as existing, would have to increase in height by approximately 15' in order to meet today's more stringent clearance requirements.

Interrogatory CSC-32

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

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Q-CSC-32: Referencing page 2-7, Section 2.1.2 of Volume 1 of the Application, please explain in further detail what is meant by "[J]umper connections at the riser structures for the 1130 and 8909B lines will be modified to correctly align the phases of the re-built circuits to the existing line terminal structures in the Pequonnock Substation yard."

A-CSC-32: UI's project to cut-in existing transmission lines 1130 and 8909B to the New Pequonnock Substation and to align the phasing to match the phasing of the remainder of the existing lines so that phase-to-phase clearances met NESC and UI requirements. The proposed project is re-doing the phasing arrangements so that the phasing is reversed in the double circuit configuration portion of the Project in order to minimize EMF. The transmission line conductors terminate at monopoles located at UI's New Pequonnock Substation in a vertical configuration and jumper down and around the pole to the gas to air bushing. These jumper conductors will have to be re-routed up and around the monopoles in order correctly align the existing phasing at the substation with the proposed phasing change of the transmission line.

Interrogatory CSC-33

The United Illuminating Company
Docket No. 516

Witness: Meena Sazanowicz
Page 1 of 1

Q-CSC-33: Referencing page 2-13 of Volume 1 of the Application, aside from the span between Pequonnock Substation and Congress Street Substation, when does UI anticipate a future conductor upgrade to 2156 aluminum conductor steel supported (ACSS) conductors for the portions of the Project with 1590 ACSS?

A-CSC-33: There are no current or immediate future plans to upgrade conductors to 2156 ACSS.

Interrogatory CSC-34

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

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Q-CSC-34: Referencing page 2-13 of Volume 1 of the Application, what are the benefits of the "Bluebird" conductors over the existing "Lapwing" conductors?

A-CSC-34: "Bluebird" conductors have a higher conductor ampacity than "Lapwing" conductors and therefore can support a larger amount of current carrying capacity than "Lapwing" conductors - all else being equal (i.e. conductor operating temperature).

Interrogatory CSC-35

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine
Page 1 of 1

Q-CSC-35: Referencing page 2-13 of Volume 1 of the Application, explain why galvanized steel finish was selected for the proposed monopoles versus, for example, weathering steel? What is the cost difference among these two structure types?

A-CSC-35: Galvanized steel poles have a longer lifecycle than weathering steel. Galvanized steel is about 5-10% less expensive than weathering steel.

Interrogatory CSC-36

The United Illuminating Company | Witnesses: Brian Ragozzine/ Matt Parkhurst

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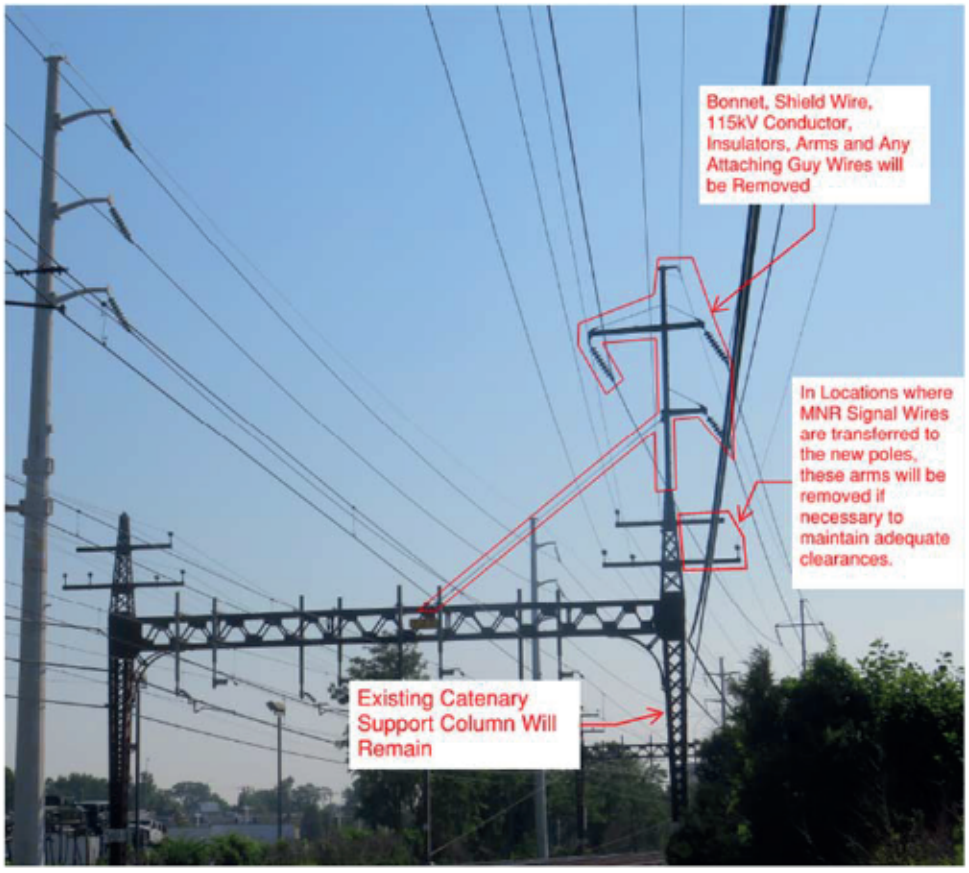
Q-CSC-36: Referencing Page 2-14 of Volume 1 of the Application, would the existing catenary support columns from which MNR electrical facilities would be transferred remain in place or would they be removed? If they remain in place, which entity would own the columns? If removed, which entity would be responsible for decommissioning the columns and how would the columns be decommissioned?

A-CSC-36: The catenary support columns from which the MNR electrical facilities will be transferred will remain in place to support the bridge component of the structure spanning the tracks and supporting the trolley wires. The catenary support structures/columns are owned by CTDOT and will remain as such. UI primarily will only be removing the bonnet section of these structures. However, in certain locations where the MNR electrical facilities will be transferred, some of the MNR arms will be removed as well. A typical scenario is depicted in the picture below:



Interrogatory CSC-37

The United Illuminating Company | Witnesses: Brian Ragozzine, Matt Parkhurst

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Q-CSC-37: Page 2-14 of Volume 1 of the Application states there are some locations where MNR electrical facilities will be transferred from the existing catenary support columns and underbuilt on the new UI-owned monopoles. Please respond to the following:

a) What type of MNR electrical facilities would be transferred?
b) At what height would the MNR electrical facilities be underbuilt on the monopoles?
c) Which entity is responsible for the costs associated with the transfer of the MNR electrical facilities?
d) If UI is responsible for the costs, what are the costs, are the costs included in the total project cost and would the costs be recovered from UI ratepayers?

A-CSC-37: a) In one location, the aerial ground wire, signal wires and feeder wires owned by Metro North will be transferred from the existing catenary support column and underbuilt on the adjacent new UI-owned monopole (P659S). In all other locations, only the signal wires owned by Metro North will need to be transferred and supported by the new monopoles (P668S, P684S, P685S, P686S, P710S, P723S, P725S, P726S, P727S, and P730S).

b) The height of the underbuilt facilities will vary per structure within the range between 30' and 58' above ground.

c) UI is responsible.

d) Estimated costs are approximately $265,000 for all materials and labor related to transferring or installing new MNR hardware, insulators, and wire and would be recovered from ratepayers.

Interrogatory CSC-38

The United Illuminating Company | Witnesses: MeeNa Sazanowicz/ Matt Parkhurst

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Q-CSC-38: Are there any clearance issues associated with the existing #1130 Line structures that would remain? Explain why the height would not be increased to the same as the #1430 and #91001-12 Lines.

A-CSC-38: There are no existing clearance violations (per NESC Code) associated with the existing 1130 line structures which are to remain. In 2010, UI performed a survey of all of their existing lines to ensure no clearance violations based on current line ratings existed in its service territory. Any such violations that were found have been mitigated. Existing lines only have to maintain clearances mandated by the NESC Code. They do not have to maintain additional clearances that new designs shall follow such as clearances mandated by MNR/CTDOT. A s such, the height of structures do not need to be increased.

Interrogatory CSC-39

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine
Page 1 of 1

Q-CSC-39: Could any construction areas (ex. staging areas, access roads or traffic routes) be collocated with construction areas of any potential future CDOT and/or MNR projects, if CDOT and/or MNR were amenable to negotiating arrangements? In what areas of the Project would this be most feasible?

A-CSC-39: Collocating construction areas is possible. However, based on the current status of UI's procurement of a construction contractor, design status of the Project, certain regulatory approvals for UI's Project and any potential future CTDOT and/or MNR Projects, the exact locations are known at this time. UI is, of course, willing to work with these stakeholders should an opportunity present itself.

Interrogatory CSC-40

The United Illuminating Company
Docket No. 516

Witness: Meena Sazanowicz
Page 1 of 1

Q-CSC-40: Referencing page ES-2, what are the designed Category 3 wind loads? What is the minimum wind speed of a Category 3 hurricane?

A-CSC-40: The transmission poles are designed to withstand all Category 3 winds which range from 111 to 129 mph.

Interrogatory CSC-41

The United Illuminating Company | Witnesses: Matthew Scully, Matt Parkhurst

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Q-CSC-41: Referencing Volume 1A of the Application, Appendix A.4, Federal Aviation Administration (FAA) consultation, prior to commencement of construction, would UI file with the FAA for review of its temporary structures (e.g. cranes)?

A-CSC-41: Yes. UI is aware they will have to file with the FAA for review of temporary structures (e.g. cranes) for the far eastern portion of the Project (from Structures P756N/P756S east to Congress Substation). This will occur approximately one year prior to the start of the construction in these areas.

Interrogatory CSC-42

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-42: Referencing pages 2-12, 3-5 and 3-17 of Volume 1 of the Application and Sheet 28 of 29 of Volume 2 of the Application, there is reference to possible construction staging from a barge anchored near the west bank of the Pequonnock River. How could staging from a barge at that location potentially impact the following:

a) recreational uses;
b) river navigation and commerce;
c) national historic and archeological resources;
d) scenic views; and
e) wildlife habitat?

A-CSC-42: a) Due to the temporary and mobile nature of the barge(s) and its proposed location, no significant impacts are anticipated to recreational users. In addition, the barge will be situated along the side of the river outside the navigational channel.

b) The proposed barge locations are outside of the river's navigation channel and thus will have no impact on navigation and commerce in the Pequonnock River.

c) The proposed barge(s) are not anticipated to have any adverse impacts to known or unidentified archeological resources or objects eligible for/listed on the National Register of Historic Places.

d) Due to the temporary and mobile nature of the barge(s) and its proposed location, and the existing surrounding landscape, no significant impacts are anticipated to scenic views.

e) Fish migration will not be impacted. The Connecticut Department of Energy and Environmental Protection's Fisheries Division does not consider the use of spud barges to be in-water work and considers the installation of such exempt from the time-of-year restriction established for fish migration. Additionally, the proposed barge locations are outside of the 330 foot nest buffer and not in the line of sight of the peregrine falcon nest identified in the vicinity of the I-95 Bridge.

Interrogatory CSC-43

The United Illuminating Company | Witnesses: Correne Auer/ Matt Parkhurst

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Q-CSC-43: What type of equipment would be delivered by barge?

A-CSC-43: Types of possible equipment to be used on the barge are cranes, manlifts, and bucket trucks needed for the removal of the existing assets and installation of new anti-galloping devices on the new conductors.

Interrogatory CSC-44

The United Illuminating Company
Docket No. 516

Witness: Meena Sazanowicz
Page 1 of 1

Q-CSC-44: Referencing page 3-21 of Volume 1 of the Application, identify the FERC physical security standards that apply to the electric transmission lines and substations.

A-CSC-44: As certified by FERC as the Electric Reliability Organization (ERO) for North America, NERC proposes and enforces mandatory reliability standards subject to FERC's review and oversight. Avangrid Networks maintains a NERC Reliability Assurance Internal Compliance Program that ensures compliance with all applicable NERC Rules of Procedure (ROP), Reliability Standards, and regional Compliance Criteria.

A full listing of mandatory standards can be found on the following NERC directory: https://www.nerc.com/pa/Stand/Pages/USRelStand.aspx under United States Mandatory Standards Subject to Enforcement.

Interrogatory CSC-45

Q-CSC-45: Please describe how the proposed Project is consistent with the NERC Evaluation of the Physical Security Reliability Standard and Physical Security Attacks to the Bulk-Power System, dated April 14, 2023 and available at: https://www.nerc.com/FilingsOrders/us/NERC%20Filings%20to%20FERC%20DL/NERC%20Report%20on%20CIP-014-3.pdf

A-CSC-45: The NERC Evaluation of the Physical Security Reliability Standard and Physical Security Attacks to the Bulk-Power system report is applicable to the physical security of transmission substations and how to protect assets contained within its fence line. The Project scope is mainly focused on the rebuild of transmission lines outside of the substation fence lines with minor modifications from the new lines to the substation terminal structures and equipment to accommodate the new conductors.

The Project will utilize industry standards and best practices in design and construction of the Project, but since the Project is not constructing or modifying major substation equipment or their security systems this report is not applicable.

UI's NERC compliance group actively reviews and implements applicable NERC Reliability Standards as they are created or modified and approved for implementation.

Interrogatory CSC-46

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-46: Referencing page 5-12 of Volume 1 of the Application, what were the results of the 2017 Fairfield resiliency study relative to Ash Creek?

A-CSC-46: While the 2017 Fairfield Resiliency Study focus area is immediately south and outside the UI's proposed project area, UI is aware of and acknowledges the flood risks challenges in the general vicinity related to sea level rise and extreme weather events. Considering the size of the Ash Creek floodplain, the effect of the proposed monopole foundations on flood storage capacity will be negligible. Within floodplains, the top of the proposed structure foundations will be designed one-foot above the 100-year flood elevation and within coastal areas, UI's structure foundations will be designed to account for sea level rise (20 inches).

Interrogatory CSC-47

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-47: Referencing page 5-12 of Volume 1 of the Application, have any flood mitigation measures been installed, or are any flood mitigation measures proposed, at Congress Street, Resco or Ash Creek Substations as part of the Project?

A-CSC-47: No flood mitigation measures are proposed or planned to be installed as part of the Project at Congress Street, Resco or Ash Creek Substations. However, the proposed monopole structures associated with substation tie-ins at Congress Street, Resco, and Ash Creek substations are located in floodplains and will be designed to rise one foot above the 100-year flood elevation and will also account for sea level rise.

Apart from this project, UI's Congress Street Substation is currently in the construction phase of a perimeter floodwall system. The Congress Substation flood wall is being installed based on the recommendations of UI's 2016 Coastal Substation Flooding Asset Condition Review Study that also determined that flood mitigation measures were not warranted at UI's Ash Creek Substation. Resco Substation was not part of UI's 2016 Study as it is not a UI-owned asset.

Interrogatory CSC-48

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-48: Referencing page 9-22 of Volume 1 of the Application, please describe how the proposed Project is consistent with the "Selection and Clearing of Rights-of-Way Routes" recommendations in 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.

A-CSC-48: The Project is fully consistent with the above-referenced FERC guidelines, which advocate the prioritization of the use of existing rights-of-way or the joint use of existing ROWs by different kinds of utilities, in order to avoid or minimize impacts to existing land uses and environmental resources. Specifically, UI proposes to rebuild UI's existing 115-kV transmission lines, which presently are located principally on the CT DOT catenary structures, within or parallel to the long-established CT DOT railroad corridor. The alignment of the Project facilities along the CT DOT corridor, which has been a dominant landscape feature for over 150 years, will continue the colocation of the transmission line and railroad facilities, to the extent practical, and thereby will limit potential impacts to natural, historic, scenic, and recreational features in the surrounding urban areas.

Interrogatory CSC-49

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-49: Please describe how the proposed Project is consistent with the DEEP Long Island Sound Blue Plan.

A-CSC-49: According to the Long Island Sound Blue Plan 2019, "Under the legislation mandating the creating of the Blue Plan (CGS § 25-157t), its policies are meant to apply to activities taking place in waters seaward of a 10' depth line". As a result, the Blue Plan does not apply, and was never intended to apply, to a large number of regulated coastal activities." Based on the Blue Plan Viewer mapping, the Project does not include any activities within the Blue Plan Policy Area and the Project activities involving water resources will be regulated via CT DEEP and US Army Corps of Engineers.

Interrogatory CSC-50

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

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Q-CSC-50: Referencing page 8-3 of Volume 1 of the Application, in the CT SHPO row of the chart, it states, "Cultural Resource Consultation under C.G.S. §16-50*l*(e)." That provision relates to municipal consultation. Should this row state, "… under C.G.S. §16-50*l*(b)" that relates to proof of service of a copy of the application on state agencies, including, but not limited to SHPO?

A-CSC-50: Yes. On page 8-3 of Volume 1 of the Application, the CT SHPO row of the chart should state "under C.G.S. §16-50l(b)"

Interrogatory CSC-51

The United Illuminating Company
Docket No. 516

Witness: David George
Page 1 of 1

Q-CSC-51: Referencing pages 5-37 and 5-38 of Volume 1 of the Application, what is the basis for the distance of 500 feet on either side of the Project for historic and archaeological resources review?

A-CSC-51: The 500-foot search area was selected to identify archaeological sites within the vicinity of the Project that could provide a context for the general patterns of settlement and use of the Project area from the pre-contact period Native American era to the beginning of the modern era. This is in keeping with Connecticut State Historic Preservation Office requirements for providing contextual information for use during agency review of the Project.

Interrogatory CSC-52

The United Illuminating Company
Docket No. 516

Witness: David George
Page 1 of 1

Q-CSC-52: Referencing the Project map sheets, what are the distances of the existing structures and the replacement structures from the identified historic and archaeological resources? How many existing structures would be eliminated from the area of potential effect identified by SHPO?

A-CSC-52: Please see Attachment CSC-52-1.

Interrogatory CSC-53

The United Illuminating Company
Docket No. 516

Witness: David George
Page 1 of 1

Q-CSC-53: Referencing Appendix A of Volume 1A of the Application, Letter from SHPO, dated October 31, 2022, and page 5-40 of Volume 1 of the Application, how does the 0.5-mile study area for visual impacts (APE-VE) under the Federal Communications Commission (FCC) *Nationwide Programmatic Agreement (NPA) Regarding the Section 106 National Historic Preservation Act Review Process* for new cellular tower installations under 200 feet in height apply to the Project? The NPA is available at: https://docs.fcc.gov/public/attachments/FCC-04-222A1.pdf

A-CSC-53: The 0.5-mile study area for visual impacts (APE-VE) under the Federal Communications Commission (FCC) Nationwide Programmatic Agreement (NPA) Regarding the Section 106 National Historic Preservation Act Review Process was selected by the Connecticut State Historic Preservation Office. That agency referenced the FCC NPA because the Project structure heights will be taller than the existing structures and the FCC NPA stipulations contain review criteria that are broadly applicable to the Project.

Interrogatory CSC-54

The United Illuminating Company
Docket No. 516

Witness: David George
Page 1 of 1

Q-CSC-54: Referencing page 5-40 of Volume 1 and Appendix A of Volume 1A of the Application, if replacement cell towers are exempt under section III. C. 1. a. ii. of the NPA, and new cell towers located within 50 feet of a ROW designated for above-ground utility transmission are exempt under section III. C. 1. a. iv of the NPA, how could the FCC APE-VE apply to replacement transmission lines and new transmission lines within a designated transmission line ROW?

A-CSC-54: The FCC NPA guidelines do not apply strictly to the replacement of transmission lines and new transmission lines within a designated transmission line ROW. However, these guidelines were selected and applied by the Connecticut State Historic Preservation Office during consideration of the Project because they provide a basis from which to review potential Project effects on above-ground historic resources from proposed structures that may reach up to 200 feet in height. The Connecticut State Historic Preservation Office does not currently have review guidelines for the replacement of transmission lines and new transmission lines with structures reaching up to 200 feet in height.

Interrogatory CSC-55

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-55: Referencing page 4-1 of Volume 1 of the Application, when would UI perform the deep archaeological testing recommended by SHPO? How could this impact UI's proposed Project and schedule? For example, if a Certificate is issued for the Project, would a Partial Development and Management Plan be submitted for the monopole foundation installations? Explain.

A-CSC-55: Due to the soil characteristics and existing developed condition (impervious surfaces) at the proposed structure locations identified in the letter received from SHPO on October 31, 2022, UI determined that excavation equipment will be necessary to conduct any form of subsurface investigation. UI's intent is to perform the deep archaeological testing/investigation in conjunction with the foundation excavation, prior to drilling, with the direction and oversight of an archeologist.

The deep archeological testing recommended by SHPO at selected locations will be conducted at the beginning of the Project and UI does not anticipate the activities will cause delays.

Interrogatory CSC-56

The United Illuminating Company
Docket No. 516

Witness: Matthew Parkhurst
Page 1 of 1

Q-CSC-56: Referencing Volume 2 of the Application, Sheet 13 of 29 (1" = 100' scale), please describe the potential impact of the proposed Project on properties SAS-1786 through SAS-1790. Were any design alternatives explored at these locations?

A-CSC-56: The Project will require a permanent transmission easement on these properties and vegetation clearing will be required between the residences and the tracks.

Alternatives were not considered, as the area around this location is highly congested with residences. As such, any design alternative would require the addition of two crossings of the railroad tracks and could introduce environmental impacts to the wetland complex on the north side of the railroad corridor. Due to the narrow CTDOT corridor, UI kept the poles as short and few in number as possible. Removing one pole in this area would result in at least three poles in this vicinity becoming taller (5'-20').

Interrogatory CSC-57

The United Illuminating Company
Docket No. 516

Witness: David George
Page 1 of 1

Q-CSC-57: Referencing page 5-37 of Volume 1 of the Application, under the heading, "Historic Resources," a portion of the sentence appears to be missing. Please complete the sentence.

A-CSC-57: The sentence should read, "A review of data on file with the SHPO completed during the Phase 1A investigation revealed that there are seven individually listed NRHP and SHRP properties, as well as six NRHP and the SHRP historic districts (and portions of their contributing elements), located within…"

Interrogatory CSC-58

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine
Page 1 of 1

Q-CSC-58: Referencing Volume 2 of the Application, Sheet 7 of 7 (1" = 400' scale) and Sheet 26 of 29 (1" = 100' scale), what are the heights of the exhaust stacks for former Bridgeport Harbor Unit No. 3 and new Bridgeport Harbor Unit No. 5 at PSEG Power Connecticut, LLC's electric generating facility?

A-CSC-58: The height of the exhaust stack for former Bridgeport Harbor Unit No. 3 is 498 feet. The height of the exhaust stack of the new Bridgeport Harbor Unit No. 5 is 300 feet. Petition 1218, Findings of Fact No. 152.

Interrogatory CSC-59

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-59: Please identify the types of acceptable low growth vegetative species referenced on page 6-15 of Volume I of the Application.

A-CSC-59: Two tables (Trees with Short Mature Heights and Selected Shrubs Suitable for Planting Near Utilities) produced by the State of Connecticut Vegetation Management Task Force are attached. Attachment CSC-59-1. While not all inclusive, this list is an indicator of the types of trees and shrubs that will be allowed along the Transmission line corridor. Invasive plants encountered will be removed by vegetation management, including invasive vines, where possible.

Interrogatory CSC-60

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine

Q-CSC-60: Referencing the footnote on page 2-9 of Volume I of the Application, what are UI's standards relative to the width of the permanent easement for transmission vegetation management? What are the mandated electric transmission line standards?

A-CSC-60: UI complies with NERC Reliability Standard FAC-003-4 to maintain Minimum Vegetation Clearance Distance (MVCD), as outlined in the "Transmission and Vegetation Management Operating Procedure." Transmission line MVCD is maintained to prevent vegetation-related outages under different weather and operating conditions. For this particular right-of-way, a minimum of 25' from the conductors at rest was calculated based on UI's Operating Procedure. UI's Transmission and Vegetation Management Operating Procedure is based on the following Industry Standards and Practices:

- OSHA 29 CFR 1910.269 Electric Power Generation, Transmission and Distribution
- ANSI Z133.3 "Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and Cutting Brush Requirements"
- ANSI A300 Part 1 "Tree, Shrub, and other Woody Plant Maintenance – Standard Practices"
- ANSI A300 Part 7 "Integrated Vegetation Management, Electric Utility Rights-of-Way"
- NESC Rule 218

Interrogatory CSC-61

The United Illuminating Company
Docket No. 516

Witness: Brian Ragozzine
Page 1 of 1

Q-CSC-61: Page 3-6 of Volume 1 of the Application mentions hazard trees outside easement areas would be removed in coordination with the landowner. Is landowner permission required? What if the landowner denies the request?

A-CSC-61: In accordance with the easements that will be obtained as part of this Project, permission from a landowner will not be required. Where no new easements have been obtained, vegetation clearing will be coordinated with local tree wardens and other community officials to inform them of hazardous tree conditions that threaten electric reliability and public safety. However, in all cases UI coordinates with the landowner for the removal of vegetation.

Interrogatory CSC-62

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-62: Referencing the February 21, 2023 correspondence from the Town of Fairfield Conservation Commission, would UI be amenable to a restoration plan in the vicinity of Structure Nos. P708S, P713WS, P714ES, P714ES-1, and P713WS-1 to replace lost vegetation during construction with native plant species consistent with safety and height requirements for UI and meeting ecological and habitat functionality needs of the impacted parcel(s)? Explain.

A-CSC-62: Yes, UI is amenable to developing a restoration plan in the vicinity of Structure Nos. P708S, P713WS, P714ES, P714ES-1, and P713WS-1 to replace lost vegetation during construction with native plant species consistent with safety and height requirements to meet clearance requirements, provided that the proposed vegetation is not unduly restrictive, or cost prohibitive. UI will comply with the restoration components of the CT DEEP General Permit (DEEP-WPED-GP-015) and associated Stormwater Pollution Control Plan (SWPCP).

Interrogatory CSC-63

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-63: Referring to the Wetland Report Volume 1A, Appendix B, in the Application, what precautions would be taken in the area identified as "prohibited" on wetland maps?

A-CSC-63: The areas identified as "prohibited" within the Wetland Report Volume 1A, Appendix B refer to shellfish classification. Those areas identified are prohibited from shellfish harvesting due to contamination concerns of the corresponding water resource. This classification will not impact the Project, and therefore no precautions are necessary.

Interrogatory CSC-64

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-64: Referencing pages 3-8 and 3-17 of Volume 1 of the Application, how would UI protect the perennial freshwater stream and tidal wetland when installing the temporary timber mat access road and removing the existing structure from the island in Ash Creek?

A-CSC-64: Timber mats will be (1) confirmed clean of invasive species prior to being installed, (2) placed in such a manner that they will span streams to allow the conveyance of water and (3) inspected and cleaned as necessary during the Project within these areas. The primary purpose/function of the utilization of timber mats is to distribute the loads during construction to prevent the compaction, intermixing, and disruption of soil and soil layers and thus protect the aforementioned resources.

Interrogatory CSC-65

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-65: In addition to UI's Best Management Practices, what other specific environmental mitigation measures and/or monitoring would be conducted for construction within environmentally sensitive areas?

A-CSC-65: During Project construction, UI will assign personnel to monitor work activities and to verify that the work is performed in accordance with State and Federal permit and approval requirements. UI will prepare and submit to CT DEEP a Project-specific SWPCP and register under the appropriate General Permit (DEEP-WPED-GP-015). CT DEEP approval of this plan will be required before construction can commence. Pursuant to the SWPCP and General Permit, UI will retain a qualified environmental inspector(s) to monitor project construction, specifically to verify the effectiveness of erosion and sedimentation controls, stabilization practices, and any other controls implemented to prevent pollution and determine if it is necessary to install, maintain, or repair such controls/or practices to improve the quality of stormwater discharge.

Q-CSC-66: Describe site construction inspections that are required for this Project under the DEEP General Permit.

A-CSC-66: All construction activities authorized by the General Permit will be inspected initially for Plan implementation and then weekly for routine inspections. Upon Project completion and prior to submission of a Notice of Termination, post-construction and final stabilization inspections will also be conducted. UI will comply with the site construction inspection requirements and conditions of Section 5(b)(4) of the general permit:

Implementation inspections:

"For each phase of construction, the site shall be inspected at least once within the first thirty (30) days of construction activity and at least three times, with seven (7) or more days between inspections, within the first ninety (90) days of construction activity to confirm compliance with the general permit and proper initial implementation of all control measures designated in the Plan for each phase of construction."

For routine inspections:

"The permittee shall maintain a rain gauge on-site to document rainfall amounts. At least once a week and within 24 hours of the end of a storm that generates a discharge, a qualified inspector (provided by the permittee), shall inspect, at a minimum, the following: disturbed areas of the construction activity that have not been finally stabilized; all erosion and sediment control measures; all structural control measures; all soil stockpile areas; all washout areas and locations where vehicles enter or exit the site. For storms that end on a weekend, holiday or other time after which normal working hours will not commence within 24 hours, a routine inspection is required within 24 hours only for storms that equal or exceed 0.5 inches. For storms of less than 0.5 inches, an inspection shall occur immediately upon the start of the subsequent normal working hours."

"During each routine inspection the qualified inspector(s) shall, among other things, evaluate the effectiveness of erosion and sediment controls, structural controls, stabilization practices, and any other controls implemented to prevent pollution and determine if it is necessary to install, maintain, or repair such controls and/or practices to improve the quality of stormwater discharge(s). In addition, during each routine inspection all of the areas shall be inspected for evidence of, or the potential for, pollutants discharging to waters, or entering the drainage system and impacts to the receiving waters. Locations where vehicles enter or exit the site shall also be inspected for evidence of off-site sediment tracking. The qualified inspector conducting routine inspections shall prepare a report of each

inspection…In areas of the site where temporary stabilization has been implemented, a routine inspection shall be conducted at least weekly until final stabilization has been achieved."

Post-Construction Inspection:

"...once all post-construction stormwater measures have been installed in accordance with the Section 5(b)(2)(C) of the general permit, "Post-Construction Stormwater Management", and cleaned of any construction sediment or debris, the permittee shall ensure that a qualified soil erosion and sediment control professional or a qualified professional engineer inspects the site to confirm compliance with the post-construction stormwater management requirements of the general permit. A report shall be prepared and certified in accordance with Sections 6(a) and (b) of the general permit to indicate compliance with this requirement on the Notice of Termination form."

Final Stabilization Inspection

"For all projects, once the site has achieved final stabilization for at least one full growing season (April – October) in the year following the end of construction, the Permittee shall have the site inspected by a qualified inspector to confirm such stabilization is maintained. The Permittee shall indicate compliance with this requirement on the Notice of Termination form."

UI may conduct additional construction inspections as needed to comply with the General Permit and CTDEEP requirements.

Interrogatory CSC-67

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-67: Referencing pages 5-15 and 6-16 of Volume 1 of the Application regarding osprey nest management, what methods could UI proactively employ at what cost to manage and/or deter nesting that poses a risk for outages and reliability on any Project replacement structures? For example, could UI recycle, reuse or redesign the existing lattice structures for osprey?

A-CSC-67: UI has not employed measures to deter osprey nesting and therefore will not reuse/re-purpose the existing lattice tower for osprey nesting.

Interrogatory CSC-68

The United Illuminating Company
Docket No. 516

Witness: Correne Auer
Page 1 of 1

Q-CSC-68: Referencing page 5-5 of Volume 1 of the Application, provide the total number of acres of prime farmland soils within the project area, and indicate how many acres of prime farmland soils within the project area would be impacted by the Project.

A-CSC-68: The Project encompasses a total of less than 0.10 acres of prime farmland soil. These soils identified as prime farmland are not located in areas of agricultural zoning nor are they actively being farmed. Within the less than 0.10-acre areas, only temporarily impacts from matting and/or clearing will be incurred.

Interrogatory CSC-69

The United Illuminating Company
Docket No. 516

Witness: Benjamin Cotts
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Q-CSC-69: Referencing pages 9-19 and 9-20 of Volume 1 of the Application, has UI performed the EMF alternatives analysis for the apartment buildings in Fairfield and Bridgeport? If yes, what are the results?

A-CSC-69: Please see Attachment CSC-69-1.

Interrogatory CSC-70

The United Illuminating Company
Docket No. 516

Witness: Benjamin Cotts
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Q-CSC-70: Referencing page 9-19 of Volume 1 of the Application and Volume 2 of the Application, Sheet 9 of 29 (1" = 100' scale), please describe the potential impact of the proposed Project on property SAS-1746. Were any design alternatives considered at this location, such as increasing the height of Structure No. B689S?

A-CSC-70: The owner of the property SAS-1746 (indicated on Sheet 9 of 29 as 79 Unquowa Place) is Jocko Enterprises LLC. This property is across Unquowa Place, just to the west of the Fairfield Apartment Building referenced in CSC-69. Therefore, the magnetic-field levels calculated at the Fairfield Apartment Building also will be similar to, and representative of, those expected at the building at 79 Unquowa Place.

The nearest portion of this building is approximately 70 feet from the southern edge of the CT DOT Corridor. At this location, the calculated magnetic-field level for the existing configuration is approximately 4.4 milligauss (mG) and would increase to 6.2 mG for the proposed project. The design alternative considered for the Fairfield Apartment building (see CSC-69) that included increasing pole height and decreasing phase spacing would reduce the magnetic field at this location to 4.7 mG.

Alternative	Project Component	Section Length in Linear Miles	Transmission Line Costs (A)	Distribution Related Costs (B)	Substation Costs (C)	Transition Station Costs (D)	HDD Costs (E)	Jack & Bore Costs (F)	Misc. Costs (e.g. bonnet decommissioning) (G)	Total Cost Estimate (H)[1] =[A+B+C+D+E+F+G]
2	Overhead Transmission Line Single Circuit Monopoles	9.0	$267,981,358	$0	$1,372,000	$0	$0	$0	$9,800,000	$279,153,358
3	Overhead Transmission Line[2] Single-Circuit, RR Structure Modifications	9.0	$528,986,377	$0	$1,372,000	$0	$0	$0	$9,800,000	$540,158,377
4	Overhead Transmission Line Double-Circuit, RR Structure Modifications	9.0	$504,987,729	$0	$1,372,000	$0	$0	$0	$9,800,000	$516,159,729
5	Overhead Transmission Line Hybrid Option		$266,806,161	$0	$1,372,000	$0	$0	$0	$9,800,000	$277,978,161
6	Unground Transmission Line Public Streets	9.14	$976,504,000	$0	$6,996,000	$0	$6,767,500	$518,000	$9,800,000	$1,000,585,500

[1] Costs are extrapolated using the 70% design cost estimate and the values in the Black and Veatch Engineering Report Dated 2018. Applicable for Alternatives 2 though 5.
[2] Per ISO-NE PP4, Appendix D, these are "Project Initiation" type estimates (-50%/+200% accuracy). Applicable to alternatives 3,4 and 6.

Property Name	Property Address	Status/Notes	Number of Proposed Monopoles to be Installed within 0.5 miles of Subject Property	Number of Existing Structures to be Removed within 0.5 miles of Subject Property	Closest UI Proposed Monopole(s) to Subject Property	Approximate Distance from closest UI Proposed Monopole(s) to Subject Property	Closest Existing Structure(s) to be Removed to Subject Property	Approximate Distance from closest Existing Structure(s) to Subject Property
Southport Historic District	Between Sasco Creek and the Old Post Road, Fairfield (Primary South of the CTDOT Corridor)	NRHD/SRHD /LHD	24	44	P655S, P656S, P657S & P659S	Within Historic District	B655AS, B655BS, B656S, B656AS, B657S, B658S, B659S and B660S	Within Historic District
Southport Railroad Stations (North and South)	96 Station Street & 400 Center Street, Fairfield	NRHP	16	33	P657S P661S	135' to Northern Railroad Station; 210' to Southern Railroad Station	B657S B660S	100' to Northern Railroad Station; 30' to Southern Railroad Station
Northrup Cottage	170 Pequot Avenue, Fairfield	SRHP	12	21	P664S	100'	B664S	90'
Jonathan Sturges House	449 Mill Plain Road, Fairfield	NRHP	11	14	P679S	1,960'	B679S	1,940'
Fairfield Historic District	Between Reef Road and Turney Road, Fairfield (South of the CTDOT Corridor and the Post Road)	NRHD	23	35	P695S	570'	B695S	590'
Fairfield Railroad Stations (North and South)	165 Unquowa Road & 916 Carter Henry Drive, Fairfield	NRHP	15	22	P688S	85' to Northern Railroad Station; 120' to Southern Railroad Station	B688S	75' to Northern Railroad Station; 45' to Southern Railroad Station
Powder House	230 Unquowa Road, Fairfield	SRHP	15	21	P690S	525'	B690S	515'
Cassidy House	691 Ellsworth Street, Bridgeport	NRHP	13	22	P728S	1,270'	B729S	1,270'
Railroad Avenue Industrial District	Between Fairfield Avenue and Wordin Avenue, Bridgeport (Both North and South of the Railroad Corridor)	NRHD	22	44	P739N, P740N, P742N, P743N, P744N, P745N, P745S, P746S & P748S	Within Historic District	B740N, B740S, B741N, B741S, B742N, B742S, B743N, B743S, B744N, B744S, B745N & B745S	Within Historic District

Property Name	Property Address	Status/Notes	Number of Proposed Monopoles to be Installed within 0.5 miles of Subject Property	Number of Existing Structures to be Removed within 0.5 miles of Subject Property	Closest UI Proposed Monopole(s) to Subject Property	Approximate Distance from closest UI Proposed Monopole(s) to Subject Property	Closest Existing Structure(s) to be Removed to Subject Property	Approximate Distance from closest Existing Structure(s) to Subject Property
West End Congregation	725 Hancock Avenue, Bridgeport	NRHP	14	32	P742N	790'	B741N & B742N	845'
Bassickville Historic District	Adjacent to Bassick Avenue, North of State Street, Bridgeport (North of the CTDOT Corridor)	NRHD	18	36	P744N	760'	B744N	790'
Seaside Village Historic District	Between South Avenue and Iranistan Avenue, Bridgeport (South of the CTDOT Corridor)	NRHD	19	28	P752S	635'	B752S	715'
Division Street Historic District	Between Iranistan Avenue and Route 8/25, Bridgeport (North of the CTDOT Corridor)	NRHD	23	50	P752N	125'	B752N	115'
Marina Park Historic District	Between Atlantic Street and Park Avenue, Bridgeport (South of the CTDOT Corridor)	NRHD	15	30	P758S	1,000'	B759S	1,020'
Barnum/Palliser Historic District	Between Park Avenue and Myrtle Avenue, Bridgeport (South of the CTDOT Corridor)	NRHD/SRHD /LHD	15	33	P760S	160'	B760S	215'
David Perry House	531 Lafayette Street, Bridgeport	NRHP	12	30	P762N	80'	B762N	125'
A.M.E. Zion Church Parsonage	12 Gregory Street, Bridgeport	SRHP	12	28	P765AS	475'	B764S	360'
A.M.E. Zion Church	427 Broad Street, Bridgeport	SRHP	12	28	P765AS	415'	B764S	345'
Bishop William D. Cottage Development Historic District	Between Broad Street and Main Street, Bridgeport (South of the CTDOT Corridor)	NRHD	12	28	P765AS	495'	B765AS	555'
Mary and Eliza Freeman Houses	352-354 & 358-360 Main Street, Bridgeport	NRHP	12	27	P765AS	320'	B765AS	410'

Property Name	Property Address	Status/Notes	Number of Proposed Monopoles to be Installed within 0.5 miles of Subject Property	Number of Existing Structures to be Removed within 0.5 miles of Subject Property	Closest UI Proposed Monopole(s) to Subject Property	Approximate Distance from closest UI Proposed Monopole(s) to Subject Property	Closest Existing Structure(s) to be Removed to Subject Property	Approximate Distance from closest Existing Structure(s) to Subject Property
Barnum Institute of Science & History	804-820 Main Street, Bridgeport	NRHP	11	46	P775AS	295'	North Tower (Existing Lattice Tower Above Tracks)	125'
Bridgeport Downtown South Historic District	Between I-95 and Fairfield Avenue, Bridgeport (West of the CTDOT Corridor)	NRHD	14	48	P775AS	500'	North Tower (Existing Lattice Tower Above Tracks)	165'
Bridgeport Downtown North Historic District	Between Fairfield Avenue and Congress Street, Bridgeport (West of the CTDOT Corridor)	NRHD	4	23	P779S	300'	B779AN	165'
Golden Hill Historic District	North of Golden Hill Street and West of Lyon Terrace, Bridgeport (West of the CTDOT Corridor)	NRHD	4	23	P779S	1,400'	B779N	1,280'
CT Railway and Lighting Co. Car Barn	55 Congress Street, Bridgeport	SRHP/ Demolished	4	23	P783N	60'	B783N	170'
Palace and Majestic Theaters	1315-1357 Main Street, Bridgeport	NRHP	4	23	P783N	975'	B783N	1,020'
Pequonnock River Railroad Bridge	CTDOT Corridor at Pequonnock River (North of Congress Street Substation)	NRHP/ Replaced	4	23	P783S	375'	B783S	470'
East Bridgeport Historic District	East of the Pequonnock River (North of Congress Street Substation and West of the CTDOT Corridor)	NRHD	3	21	P783N	835'	B783N	950'
Charles A Nicholas Meat Market	388 East Main Street, Bridgeport	SRHP	Within East Main Street Historic District					
Ralph's Barber Shop	420 East Main Street, Bridgeport	SRHP	Within East Main Street Historic District					

Property Name	Property Address	Status/Notes	Number of Proposed Monopoles to be Installed within 0.5 miles of Subject Property	Number of Existing Structures to be Removed within 0.5 miles of Subject Property	Closest UI Proposed Monopole(s) to Subject Property	Approximate Distance from closest UI Proposed Monopole(s) to Subject Property	Closest Existing Structure(s) to be Removed to Subject Property	Approximate Distance from closest Existing Structure(s) to Subject Property
East Main Street Historic District	Adjacent to East Main Street, North of I-95, and East of the Pequonnock River (South and East of the CTDOT Corridor)	NRHD	4	23	P783S	1,270'	B783S	1,320'

Trees with Short Mature Heights

Connecticut State Vegetation Management Task Force

Glenn Dreyer[1] (Connecticut College)
Jeffrey Ward[2] (The Connecticut Agricultural Experiment Station)

Common name	Scientific name[3]	Origin[4]	Height (ft)[5]		Not for	Notes
			Typical	CT max	Urban Sites	
Trident Maple	*Acer buergerianum*	NE Asia	20-25	57		
Hedge maple	*Acer campestre*	Europe	30+	60		Tolerates urban conditions well. No fall color.
Paperbark maple	*Acer griseum*	China	30	40		Beautiful shiny copper-colored bark
Japanese maple	*Acer palmatum*	NE Asia	15-30	48		Is spreading from planted locations; Invasive in nearby states
Tatarian maple	*Acer tataricum*	Europe	20-25			Is spreading from planted locations; Invasive in nearby states
Horsechestnut hybrids	*Aesculus hybrids*	Hybrid	30-35	45-55	?	
Common serviceberry	*Amelanchier arborea*	Native	<30	55		White flowers in late April; edible fruit in July
Allegheny serviceberry	*Amelanchier laevis*	Native	<30	50		White flowers in late April; tasty fruit in July
European hornbeam	*Carpinus betulus*	Europe	30-40	72		
American hornbeam	*Carpinus caroliniana*	Native	30+	37		Smooth, gray bark
Eastern redbud	*Cercis canadensis*	Native	25	45	?	Purple-pink spring flowers and heart-shaped leaves
Chinese Fringetree	*Chionanthus retusus*	NE Asia	15-25	17	?	Weak wood, bushy habit
Flowering dogwood	*Cornus florida*	Native	30	47	?	Showy white flowers in mid-May; (may be listed as *Benthamidia florida*)
Dogwood hybrids	*Cornus hybrids*					Dogwood hybrids

Selected shrubs suitable for planting near utilities

Connecticut State Vegetation Management Task Force

Glenn Dreyer[1] (Connecticut College)
Jeffrey Ward[2] (The Connecticut Agricultural Experiment Station)

Common name	Scientific name[3]	Origin[4]	Height (ft)[5]	Root suckers[5]	Notes
Canadian serviceberry	*Amelanchier canadensis*	Native	15	n	White flowers in late April; edible fruit in July
Red chokeberry	*Aronia arbutifolia*	Native	6	Yes	Good flowers and fall color (may be listed as *Photinia pyrifolia*) ,
Black chokeberry	*Aronia melanocarpa*	Native	6	Yes	Conspicuous white flowers, formerly (may be listed as *Photinia melanocarpa*)
Carolina allspice	*Calycanthus floridus*	Native	8	n	Fragrant flowers
Chinese fringetree	*Chionanthus retusus*	NE Asia	15	n	
White fringetree	*Chionanthus virginicus*	Native	20	n	Large clusters of white flowers in June
Japanese clethra	*Clethra barbinervis*	Japan	15	n	White flowers in summer, attractive bark
Alternate-leaved dogwood	*Cornus alternifolia*	Native	20	n	Large shrub with small clusters of creamy white flowers
Redosier dogwood	*Cornus sericea*	Native	10	Yes	Bright red stems maintained by cutting older stems
American hazelnut	*Corylus americana*	Native	12	n	Edible nuts are commercially cultivated
Redvein enkianthus	Enkianthus campanulatus	Japan	15		Great fall color follows midsummer flowers that attract bees
Chinese witchhazel	*Hamamelis mollis*	China	15	n	Flowers in early spring
Witchhazel	*Hamamelis virginiana*	Native	15	n	Small yellow flowers in October

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

The United Illuminating Company (UI) application for a Certificate of Environmental Compatibility and Public Need for the Fairfield to Congress Railroad Transmission Line 115-kV Rebuild Project that consists of the relocation and rebuild of its existing 115- kilovolt (kV) electric transmission lines from the railroad catenary structures to new steel monopole structures and related modifications along approximately 7.3 miles of the Connecticut Department of Transportation's Metro-North Railroad corridor between Structure B648S located east of Sasco Creek in Fairfield and UI's Congress Street Substation in Bridgeport, and the rebuild of two existing 115-kV transmission lines along 0.23 mile of existing UI right-of-way to facilitate interconnection of the rebuilt 115-kV electric transmission lines at UI's existing Ash Creek, Resco, Pequonnock and Congress Street Substations traversing the municipalities of Bridgeport and Fairfield, Connecticut.	:	Docket No. 516 May 31, 2023

DIRECT TESTIMONY OF BENJAMIN COTTS

ON BEHALF OF THE UNITED ILLUMINATING COMPANY CONCERNING

UPDATES TO THE PROJECT'S ELECTRIC AND MAGNETIC FIELD REPORT

Q. Please state your name, relation to the applicant and business address.

A. My name is Benjamin Cotts. I am a Principal Engineer at Exponent Inc. ("Exponent"), the company that was retained by The United Illuminating Company ("UI" or the "Company") to measure and model the electric and magnetic fields ("EMF") associated with the Fairfield to Congress Railroad Transmission Line project (the "Project"). My business address is 17000 Science Drive, Suite 200, Bowie, MD 20715.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to provide to the Connecticut Siting Council (the "Council") an overview of the updates that have been made to the Company's EMF Report that was originally submitted as Appendix E to Volume 1 (the "EMF Report") of UI's application for a Certificate of Environmental Compatibility and Public Need for the Project in the above-captioned docket (the "Application").

Q. What qualifications do you have to provide expert testimony on the subject of EMF?

A. My curriculum vitae, attached to this testimony, describes my education, certifications and professional experience. *See* Exhibit 1. Prior to joining Exponent, I was a leading figure in coordinating scientific outreach to developing countries in the field of electromagnetics through the United Nations ("UN") International Heliophysical Year ("IHY") and International Space Weather Initiative ("ISWI") programs. I was a founding member of a NASA/UN-sponsored conference series, organizing and leading multiple conferences on electromagnetic fields related to atmospheric electricity and space science.

As a Principal Engineer in the Electrical Engineering and Computer Science Practice, my responsibilities include reviewing, analyzing, and conducting studies related to electromagnetic fields from natural and manmade sources including those related to the operation of overhead and underground transmission lines operating using either alternating current (AC) or direct current (DC) technologies.

I am a leader of the Institute for Electrical and Electronic Engineer ("IEEE") Power Engineering Society ("PES") working group for Corona and Field Effects overseeing standards related to the modeling, measurement, and analysis of electric and magnetic fields ("EMF"), audible noise, and radio noise from alternating current ("AC") and direct current ("DC") transmission lines. In addition, I am a member of the IEEE TC95 committee of the International Committee for Electromagnetic Safety that develops standards related to electromagnetic safety, and a member of the Conseil International des Grands Réseaux Électriques ("CIGRE"). I am also a licensed Professional Engineer in the states of New York and California. A good deal of my work involves performing EMF modeling and evaluations for devices and systems for a variety of facilities including electric transmission lines. In addition, I am part of the team from Exponent that prepared the original EMF Report that was submitted with UI's Application, as well as the updates to such report that will be discussed in my testimony.

Q. Why has UI asked you to submit these updates?

A. These updates are being submitted with two purposes in mind. The first is to correct the calculated magnetic field levels at certain locations along the Project

route based on additional design information received and the second is to present the results of the evaluation of new alternative Project designs for reducing magnetic field levels in the vicinity of the abovementioned locations.

Q. At what locations on the proposed route are these revisions required?

A. Following the submittal of the Application to the Council, Exponent revised the magnetic field calculations associated with existing and proposed transmission lines near apartment buildings and other residential complexes located along the Project route in Fairfield, Bridgeport and surrounding areas. Specifically, at the two multi-story apartments located adjacent to the Connecticut Department of Transportation ("CT DOT") corridor, one in Bridgeport (including an outdoor playground area)[1] and the other in Fairfield,[2] as well as some residential buildings north of the CT DOT corridor in XS-17. These corrections were necessary to update Exponent's model based upon new data received relating to the height and spacing of some of the existing and proposed transmission line conductors at the two apartment buildings and corrected the modeled width of the proposed easement on the north side of the track near the Bridgeport apartment building.

Q. What do the proposed corrections entail?

A. The corrections consist of changes to the modeling inputs based on new design data that was obtained by Exponent and the corresponding changes to the calculated magnetic field levels. A detailed list of these corrections and page

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1 The Windward apartment building complex located south of the CT DOT corridor along Railroad Avenue, within the block bounded by Park Avenue, Johnson Street, and Columbia Street.

2 Located at 79 Unquowa Place in Fairfield, Connecticut, adjacent to the south side of the CT DOT corridor.

references (to Appendix E to Volume 1 of the Application) can be found in the memo dated May 19, 2023 that is attached hereto as Exhibit 2. Exhibit 2 also includes a narrative and supporting figures comparing the original and revised magnetic field levels (for the existing and proposed transmission lines) at the specified locations.

Q. How do the estimated pre-Project and post-Project magnetic field levels compare to the corrected levels?

A. At some locations, the corrections resulted in a decrease to the proposed magnetic field levels, i.e., the post-Project EMF, while at other locations, there was an increase in post-Project magnetic-field levels. Additionally, the (top) modeled conductor height of an existing transmission line conductor, located near the apartment building in Fairfield, increased by four feet due to the corrections resulting in a net increase in the phase spacing at that structure, which in turn increased the existing magnetic field level at that apartment building, i.e. the pre-Project magnetic-field levels. See Exhibit 2 for additional information

Q. Do the proposed corrections change the overall conclusion about the magnetic-field levels associated with the Project?

A. No. Despite the changes to the magnetic field levels at the specified locations resulting from the corrections, the overall conclusion of the original EMF Report remains valid and that is, all calculated magnetic-field levels associated with the Project, including those above ground at apartment buildings, are far below the reference levels recommended for the general public in international health-based standards for EMF (i.e., International Committee on Electromagnetic Safety

("ICES") and International Commission on Non-Ionizing Radiation ("ICNIRP")) and the engineering design and other activities initiated by UI include elements consistent with the Council's EMF Best Management Practices.

Q. What is your understanding as to why alternative Project designs were developed such that Exponent was asked to evaluate the new designs on magnetic fields?

A. In its Application, the Company indicated that it would be evaluating the viability of alternative designs for the rebuilt lines at two locations along the proposed Project route (the abovementioned apartment buildings in Bridgeport and Fairfield) given that UI's design as proposed would place the rebuilt lines in close proximity to these recently constructed and now occupied apartment buildings. The Company also stated that the options that it would evaluate would include, but would not be limited to, modifications to the heights of the transmission line structures in the vicinity of the buildings and conductor phase spacing.

Q. What are the results of the evaluation of alternative Project designs?

A. Exponent evaluated one alternative Project design at 79 Unquowa Place in Fairfield that changed the vertical phase spacing for two supporting structures, as well as the height of one of such structures. This alternative Project design reduced the Post-project magnetic field on the south side of the right-of-way, at the closest portion of the apartment building both at ground level as well as at the roof of the building. At ground level the redesign reduced the Post-project magnetic-field by 30% at the roof of the apartment building by 47% compared to the

proposed (revised) configuration.[3] At the Windward apartment building complex in Bridgeport, Exponent evaluated three alternative Project designs: (1) increasing the conductor height of the proposed transmission line on the south side of the CT DOT corridor, (2) constructing both rebuilt transmission lines on the same vertical monopole in a double-circuit configuration on the north side of the CT DOT corridor, and (3) constructing the transmission line on the south side of the CT DOT corridor in an underground duct bank north of the CT DOT corridor. These redesigns reduced the ground-level magnetic field from approximately 9% (alternative 1) to 88% (alternatives 2 and 3) compared to the proposed (revised) configuration. At the roof of the apartment building, the redesigns reduced the magnetic-field from approximately 27% (alternative 1) to 97% (alternatives 2 and 3) compared to the proposed (revised) configuration. Details of Exponent's analysis of the UI design alternatives can be found in the report dated May 30, 2023 that is attached hereto as Exhibit 3. Exhibit 3 also includes a narrative and supporting figures comparing the original, revised and redesigned magnetic-field levels (for the existing and proposed transmission lines) at the specified locations. This report also includes additional details of the Company's estimates of the cost of each of these alternatives .

Q. Are the alternative Project designs necessary for the Project to comply with the applicable magnetic-field standards?

[3] The "proposed (revised) configuration" refers to the configuration that was originally proposed and later revised to account for the corrections discussed in Exhibit 2.

A. No. As previously discussed, all magnetic field levels, including those at the identified apartment buildings, for the Project as proposed (including the corrections in Exhibit 2) are far below the guidelines established by ICNIRP or ICES. Thus, irrespective of whether the alternative Project designs are implemented, the magnetic-field levels associated with the Project are far below the international safety and health-based standards.

Q. Does this conclude your testimony?

A. Yes, it does.

Exponent®
Engineering & Scientific Consulting

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Professional Profile

Dr. Cotts is experienced in both applied and theoretical electromagnetics and plasma physics including modeling and measurement analyses of natural and anthropogenic electromagnetic fields such as space weather, and geomagnetic storms as well as in the initiation, field effects, and characteristics of lightning discharges. Dr. Cotts performs modeling and measurement studies of power system EMF, audible noise, and radio noise including evaluations of 500-kV AC and ±560 kV DC transmission lines. Dr. Cotts has further experience in modeling magnetic fields and induced electric fields for offshore wind farms including those from wind turbines, offshore substations and subsea AC and DC transmission lines and is an officer in the IEEE working group for Corona and Field Effects overseeing IEEE standards 644, 430, 656, 1542, 1227, 2746, 1829 and 1308.

Dr. Cotts also performs various types of electromagnetic field evaluations for devices and systems including smart meter mesh networks and government/military communications facilities as well as exposure, EMI or EMC assessments. These assessments are provided for clients such as federal and state agencies, utilities, hospitals, medical-device manufacturers, construction developers, the U.S. military. In addition, Dr. Cotts regularly receives requests to perform exposure assessments for patients with pacemakers, ICDs, and other implantable medical devices and to remediate EMI issues for medical devices and in health care settings.

Dr. Cotts has been a leading figure in coordinating scientific outreach to developing countries through the United Nations International Heliophysical Year (IHY) and International Space Weather Initiative (ISWI) programs and was a founding member of a NASA/UN-sponsored conference series organized and led multiple conferences on atmospheric and space science.

Dr. Cotts's has a decade of experience with the initiation, field effects, and propagation of lightning discharges; combining remote sensing measurements of ionospheric disturbances with numerical modeling of atmospheric, ionospheric, and magnetospheric interactions to determine the role of global lightning on the removal of radiation belt electrons. These radiation belt electrons are a critical factor in space weather for determining the effective lifetime of spacecraft with electronics that can be irreversibly damaged by radiation belt electrons.

Additionally, Dr. Cotts software engineering experience includes the use of Matlab, C, C++, and a variety of other scientific packages including Mathematica and COMSOL. He has experience with auditing software processes and algorithms used during his investigations related to control systems involved in failure events.

Academic Credentials & Professional Honors

Ph.D., Electrical Engineering, Stanford University, 2011

M.S., Electrical Engineering, Stanford University, 2004

B.S., Electrical Engineering, University of Portland, summa cum laude, 2002

Outstanding Student Paper Award, AGU Fall Meeting, San Francisco, California, 2004

Tau Beta Pi Engineering Honor Society

Delta Epsilon Sigma, National Scholastic Honor Society

Awarded "2017 IEEE Standards Medallion" For contributions to standards development in power and energy distribution.

Awarded the "2014 Fire Protection Research Foundation Medal" by the NFPA's Fire Protection Research Foundation for the 2013 research project ("Best Practices for Emergency Response to Incidents Involving Electric Vehicles Battery Hazards: A Report on Full-Scale Testing Results") that best exemplified the Foundation's fire safety mission at the National Fire Protection Association's Conference & Exposition, June 2014

Licenses and Certifications

Licensed Professional Electrical Engineer, California, #21277

Prior Experience

Post Doctoral Scholar, University of Colorado, Denver, 2011

International Science Outreach Manager, Stanford University, 2007-2011

Research Assistant, Stanford University, 2002-2011

Energy Research Fellow, Stanford Linear Accelerator Center, 2001

Professional Affiliations

Institute of Electrical and Electronics Engineers — IEEE

International Committee on Electromagnetic Safety — ICES

International Council on Large Electric Systems — CIGRÉ

Publications

Peer Reviewed Publications

Gołkowski M, Gross NC, Moore RC, Cotts BRT, Mitchell M. Observation of local and conjugate ionospheric perturbations from individual oceanic lightning flashes. Geophysical Research Letters 2014; 41:273-279. doi:10.1002/2013GL058861.

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Haldoupis C, Amvrosiadi N, Cotts BRT, Van der Velde O, Chanrion O, Neubert T. More evidence for a one-to-one correlation between Sprites and Early VLF perturbations. Journal of Geophysical Research 2010, 115:A07304. doi:10.1029/2009JA015165.

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Cotts BRT, Inan US. VLF observation of long ionospheric recovery events. Geophysical Research Letters 2007; 34:L14809. doi:10.1029/2007GL030094.

Reports

Snyder DB, Bailey WH, Palmquist K, Cotts BRT, Olsen KR. Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Headquarters, Sterling, VA. OCS Study BOEM 2019-049, August 2019.

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Peer Reviewer

Referee for Journal of Geophysical Research – Space Physics

Referee for Radiation Protection Dosimetry

Exponent

MEMORANDUM

TO:	Ms. Florencia Bugatti
FROM:	Benjamin Cotts, Ph.D.
DATE:	May 19, 2023
PROJECT:	UI Fairfield to Congress Railroad Transmission Line Project – 2104299.000
SUBJECT:	Revised Magnetic Field Calculations Near Apartment Buildings in Fairfield and Bridgeport

In our technical report submitted to the Connecticut Siting Council we calculated the electric and magnetic fields both pre- and post-construction at apartment buildings in Fairfield and Bridgeport (and surrounding areas). We have since obtained design data that warrants revision to our original calculations.

The table below summarizes the revisions to modeling inputs, and the general effect of those revisions on magnetic field calculations compared to those presented in the Application EMF Report. The table also summarizes which portions of the EMF Report are updated as a result of these revisions.

Portion of Route	Revision	General Effect of Revision Compared to Filed Report	Revised Report Sections
Apt. Bldg. in Fairfield	Maximum conductor height of top existing transmission line conductor (on south side of tracks) revised from 48 to 52 feet. Bottom conductor (42 feet) unchanged so phase spacing increases.	Increased existing magnetic-field level at apartment building	Pg. 29-31; Attachment E
	Minimum conductor height of proposed transmission line revised from 79'-4" to 75'-3"	Increased proposed magnetic-field level at apartment building	
Apt. Complex in Bridgeport	Vertical spacing of conductors on proposed transmission line (on south side of tracks) revised from 14' to 15'	Increased proposed magnetic-field level at apartment building	Pg. 31-35; Attachment E
Playground within Bridgeport Apt. Complex	Vertical spacing of conductors on proposed line (on north side of tracks) decreased from 14' to 12'	Decreased proposed magnetic-field level on north side of tracks	Pg. 35-36; Attachment E
	Minimum conductor height of proposed line (on north side of tracks) revised from 91' to 99'-11"	Decreased proposed magnetic-field level at playground	
	Vertical spacing of conductors on proposed line (on south side of tracks) decreased from 14' to 13'		
Residential Areas north of	Northern easement width corrected from 36 ft to 50 ft	Decreased proposed magnetic-field levels at residences	Pg. 36; Attachment E

the CT DOT Corridor in XS-17	Distances to residences were previously incorrect and revised based upon updated easement width		

These revisions to the input data resulted in updated calculations of EMF levels as shown in revisions to Figures 9, 10, and 11 as well as figures E-1 to E-4 in Attachment E. Figure 8 also is included for ease of reference. These figures are reproduced below with the both the "ORIGINAL" figure shown first for reference and the "REVISED" figure below. Each figure number below has an appended "R" to indicate the revision, e.g., Figure 9R, 10R, 11R and Figure E-1R to E-4R in Attachment E.

While the reported magnetic-field levels for these portions of the route near the apartment buildings have changed as a result of these revisions, it is important to note that the overall conclusion of the report remains unchanged, namely that the calculated EMF levels resulting from the Project, including those above ground at apartment buildings will be a far below the reference levels recommended for the general public in international health-based standards (i.e., ICES and ICNIRP).

The text and below are copied verbatim from our original report. Changes to the text, are shown in red text for additions and redline strikethrough for deletions.

Results of Modeling at Apartment Buildings

Apartment Building in Fairfield

As described in the Apartment Buildings Section of the Introduction, the apartment building in Fairfield is approximately 63 feet tall and although the conductors of the currently-proposed transmission line will be approximately 2 feet closer to the apartment building horizontally, the vertical clearance above the building will be more than 33 feet greater. Results of the existing and proposed magnetic-field levels *at the front edge of the building* (closest to the transmission lines) at average loading are shown in Figure 9R. In this figure the magnetic-field level at every 5 feet above ground is shown for both existing (blue bars) and proposed (green bars) configurations. The net result of this change is that magnetic-field levels at the front edge of the building (closest to the transmission lines) are calculated to decrease at all stories of the building, except at the roof.

For instance, as shown in Figure 9R at average loading and a height of 45 feet above ground, the existing magnetic field is calculated to be the highest. This corresponds to the height of the existing conductors (which are between 42 and ~~48~~ 52 feet) and the magnetic field is calculated to decrease from ~~129~~ 154 mG to ~~39~~ 47 mG for the proposed configuration. At the roof of the building, magnetic-field levels are calculated to increase from ~~80~~ 105 to ~~101~~ 129 mG at the front edge of the building. Similar to all other locations along the route, magnetic-field levels decrease rapidly with distance and at the back end of the building, magnetic-field levels are calculated to be less than 3 mG before and after the proposed Project. Although before and after the Project, all EMF levels at the apartment building are calculated to be far below guideline levels established by ICNIRP or the ICES, UI is evaluating the viability of alternative designs for the rebuilt line at this location. Additional analysis is provided in Attachment E.

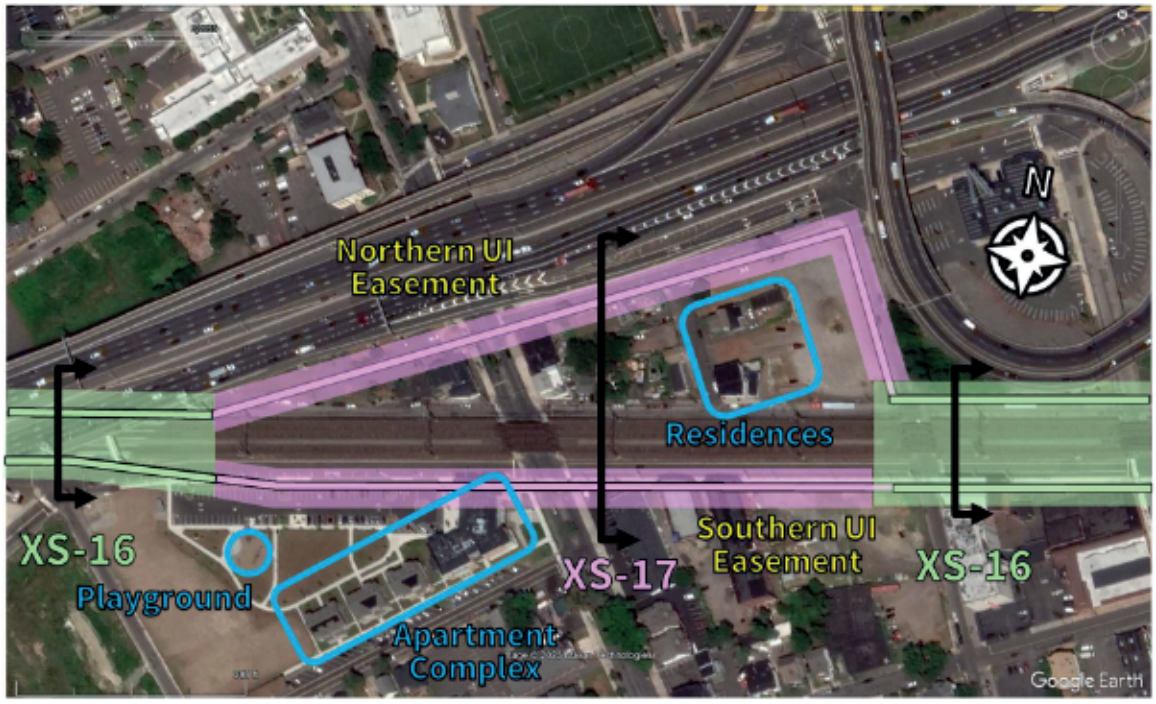


Figure 8. Aerial view showing the location of the currently proposed divergent UI easements in Bridgeport.

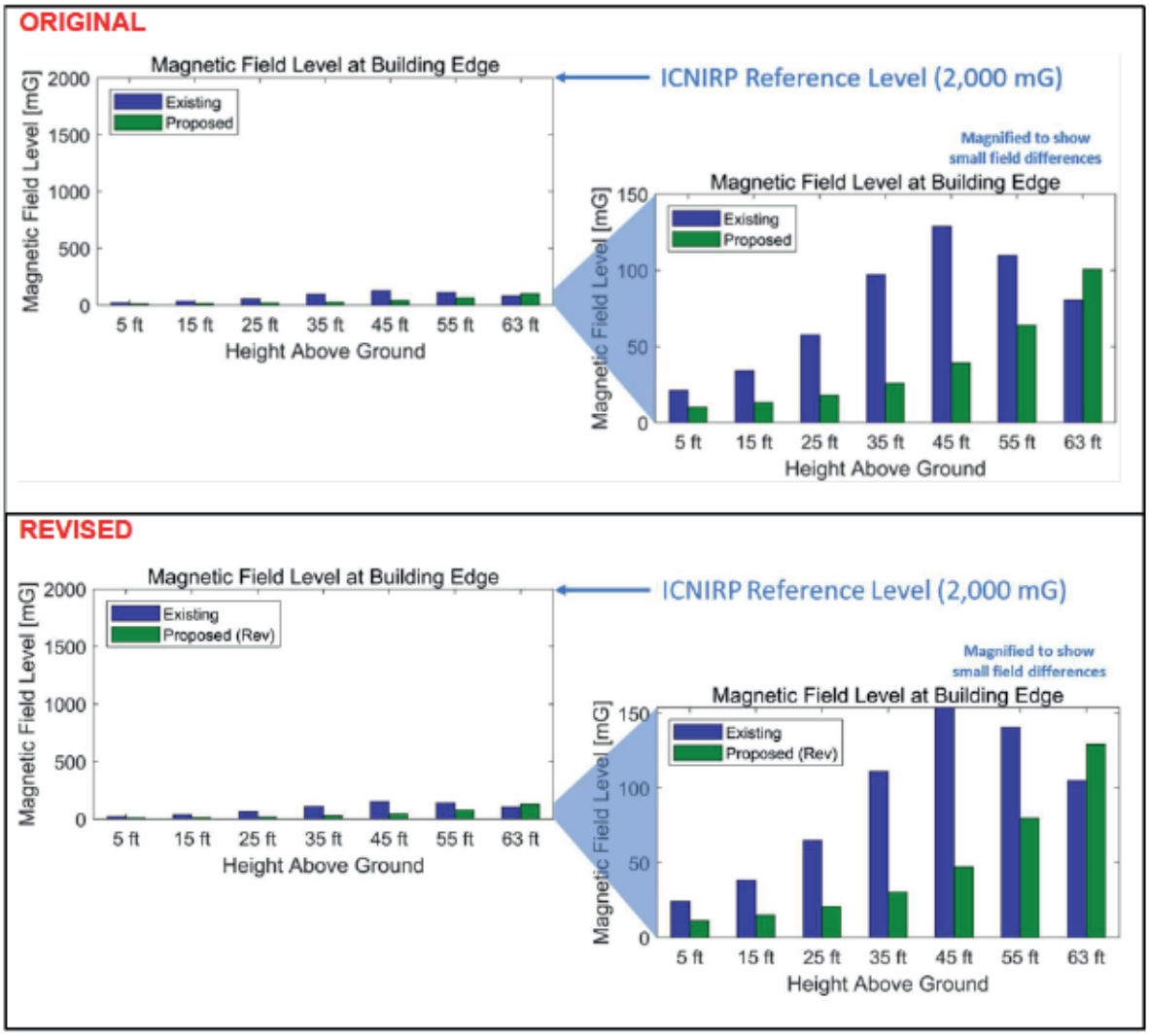


Figure 9R. Magnetic-field level at 79 Unquowa Place compared to the ICNIRP limit of 2,000 mG.

The ICES limit for magnetic fields is 9,040 mG. The scale of the graph on the right of the figure is magnified to illustrate the small differences in existing and proposed calculated field levels compared to ICNIRP limits.

The revised calculations show that the magnetic fields levels before and after the project will be quite similar. Both the original and revised calculations decrease in magnetic field levels at all heights above ground except at the roof

Apartment Complex in Bridgeport

The Windward apartment complex is shown by the blue rectangle in Figure 8. The building closest to the currently proposed transmission line is 55 feet tall and is at the north-east side of the rectangle near the intersection of Railroad Avenue and Park Avenue. Although the conductors of the

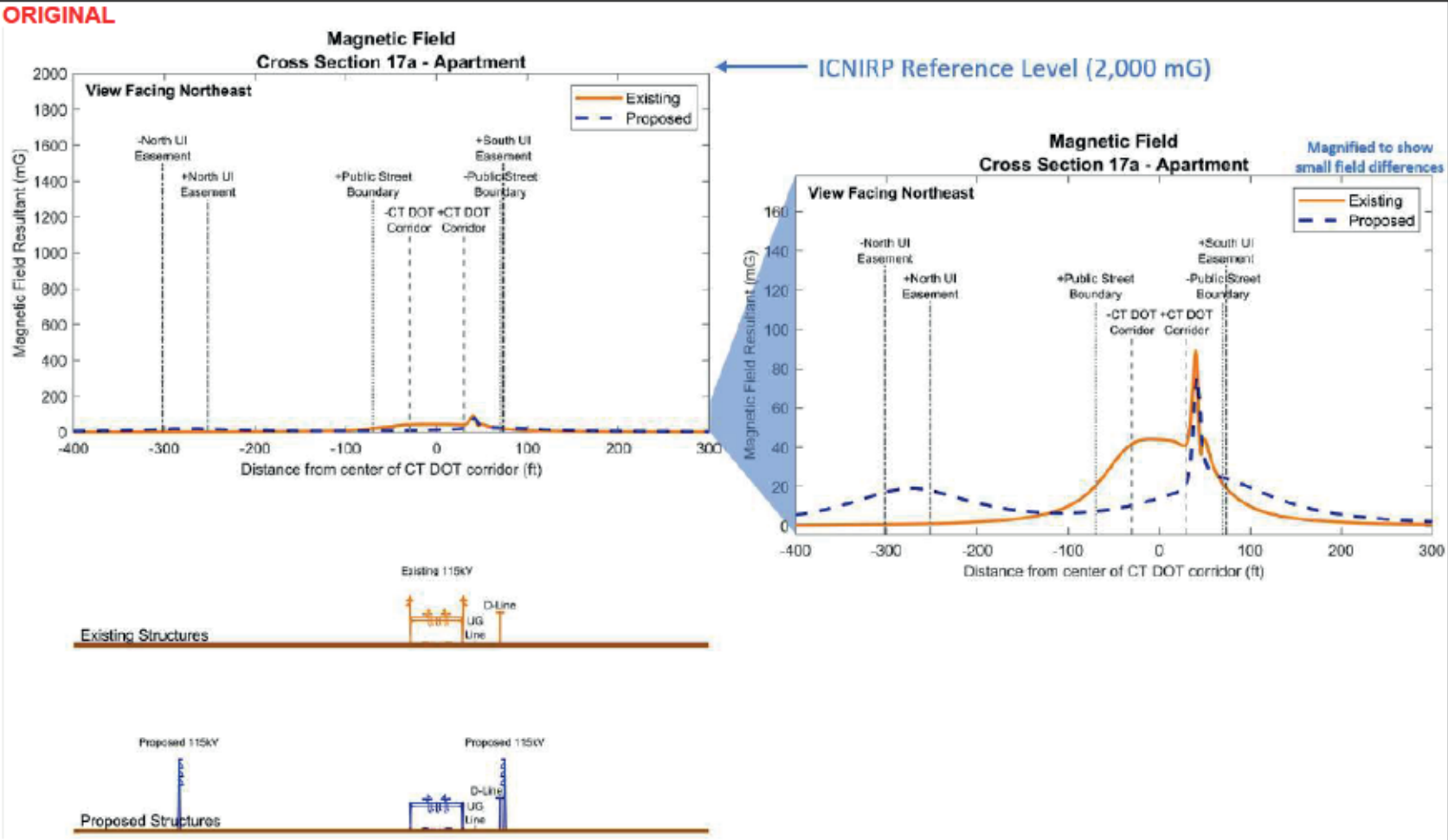
currently-proposed transmission line will be approximately 30 feet closer to the apartment building horizontally, the vertical clearance above the building will be more than 30 feet greater. Also of importance in this area is the presence of a distribution line (conductors at a height of approximately 30 feet above ground with the nearest conductor approximately 10 feet horizontally from the building) and the underground 345-kV Middletown-Norwalk transmission line that is buried approximately 3 feet beneath the road, about 30 feet from the front edge of the building. Therefore, at ground level (and the standard evaluation height of 1 meter [3.28 ft] above ground), the magnetic-field level will be primarily determined by these two existing sources, as shown in Figure 10R.[1] The figure shows that all Project-related magnetic fields are a very small fraction of ICNRIP's 2,000 mG; the inset further shows that the highest magnetic-field level before and after the project will be immediately above the underground transmission line (in the middle of Railroad Avenue).

Additional analysis, shown in Figure 11R, presents results of the existing and proposed magnetic-field levels at the front edge of the building (closest to the transmission lines) at greater heights above ground and at average loading. In this figure the magnetic-field level at every 5 feet above ground is shown for both existing (blue bars) and proposed (green bars) configurations. The net result of this change is that magnetic-field levels at the front edge of the building (closest to the transmission lines) are calculated to increase slightly as a result of the Project up to a height of about 35 feet, and then to increase more substantially at greater heights above ground, with the maximum increase at the roof of the building.

In particular, up to a height of about 35 feet above ground, the proposed Project is calculated to increase magnetic-field levels by approximately ~~5.6~~ 6.5 mG or less compared to existing levels. At 45 feet above ground the magnetic-field levels are calculated to increase from approximately 49 mG to ~~75~~ 78 mG, and at the roof magnetic-field levels are calculated to increase from about 48 mG to ~~140~~ 144 mG. Similar to all other locations along the route, as well as the apartment building in Fairfield, magnetic-field levels decrease rapidly with distance, so at the back end of the building, magnetic-field levels are calculated to be ~~less than~~ approximately 5 mG or less before and after the proposed Project. Although before and after the Project, all EMF levels at the apartment building are calculated to be far below guideline levels established by ICNIRP and ICES, UI is evaluating the viability of alternative designs for the rebuilt line at this location. Additional analysis is provided in Attachment E.

[1] Note that the modeling adjacent to the Bridgeport apartment building is part of XS-17, but the results are quite different than those shown in Attachment C, Figure C-17 and Figure C-35 because of the existing distribution and 345-kV transmission line. In addition, the actual transmission line conductor heights at this location, which are far greater than the minimum value assumed in the standard modeling approach, were used for the model to calculate EMF.

ORIGINAL



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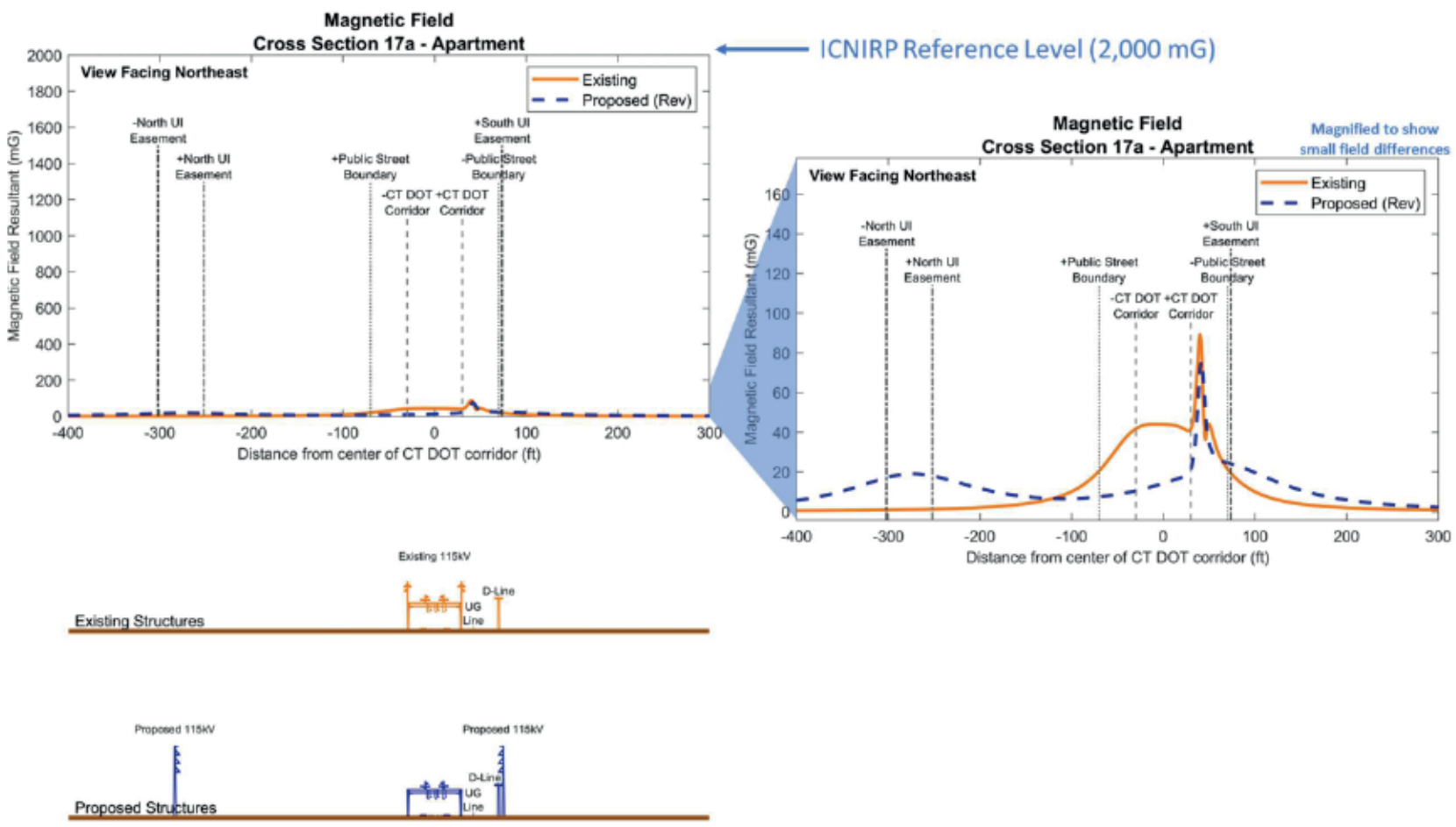


Figure 10R. Magnetic-field levels at the apartment building in Bridgeport (at a height of 1 meter [3.28 ft] above ground) compared to the ICNIRP limit of 2,000 mG.

The ICES limit for magnetic fields is 9,040 mG. The scale of the graph on the right of the figure is magnified to illustrate the small differences in existing and proposed calculated field levels compared to ICNIRP limits.

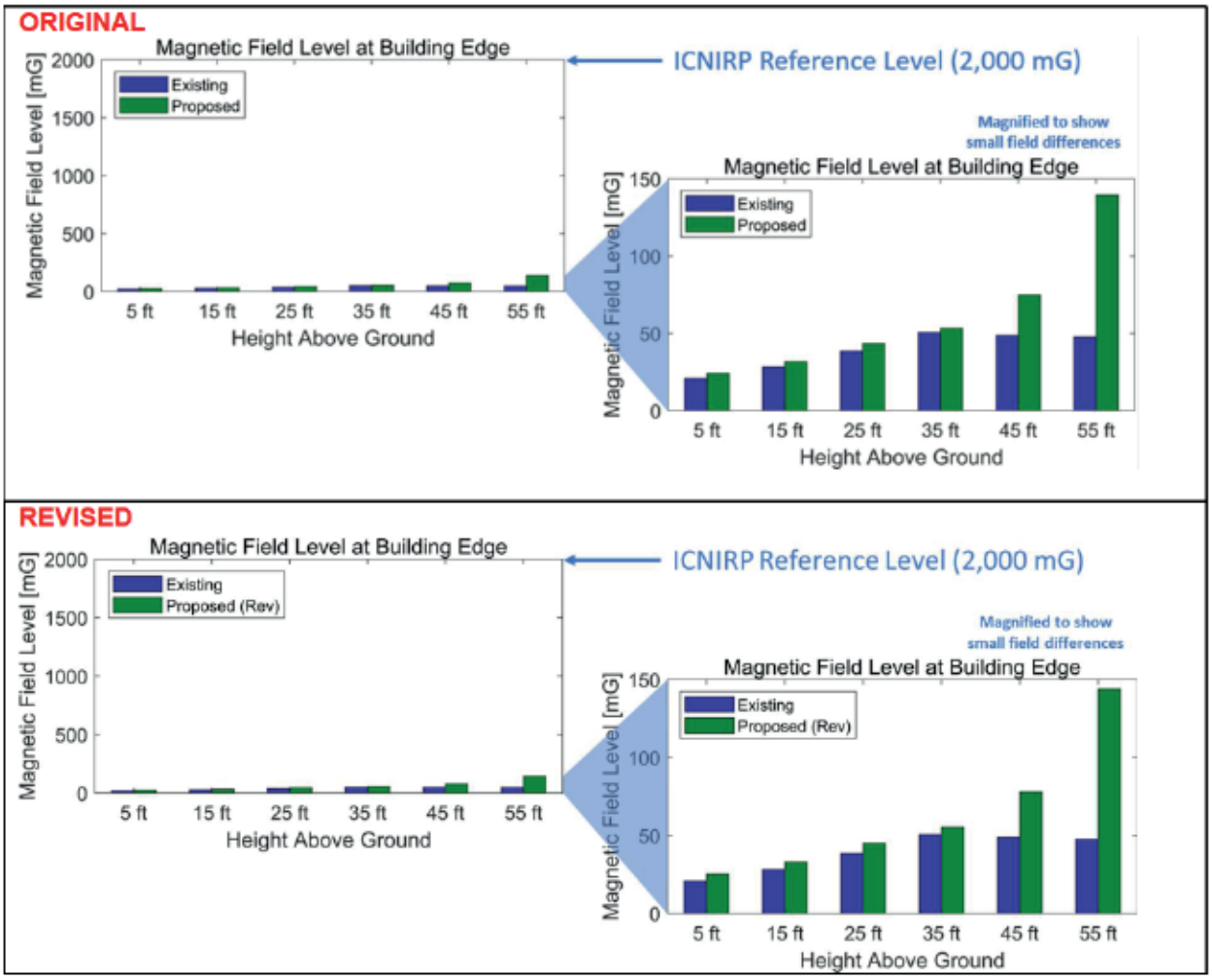


Figure 11R. Magnetic-field level at the Windward apartment building near the intersection of Railroad Avenue and Park Avenue in Bridgeport compared to the ICNIRP limit of 2,000 mG.

The revised calculations still show that the magnetic fields levels before and after the project will be quite similar. Both the original and revised calculations show higher magnetic field, with the greatest change at heights above 45 feet.

Playground Within the Apartment Complex in Bridgeport

In the analysis of the new Windward apartment complex in Bridgeport, a new playground was identified, as shown by the blue circle in Figure 8. Modeling using the same approach as described above in relation to the apartment buildings (i.e., with actual existing and proposed conductor heights) show that the proposed Project will result in a relatively small change in magnetic-field levels at the playground.

Results of this modeling show that magnetic-field levels are calculated to increase by approximately ~~1.3~~ 1.2 mG to ~~3.2~~ 2.5 mG at the playground (depending on location in the playground) and that before and after the project magnetic-field levels will be about ~~6.5~~ 5.8 mG

or less. These calculated values are within the range of magnetic-field field levels measured near this location before the Project (*see* location R19 in Attachment D, Table D-2) which ranged from 2.6 mG to 97 mG (with an average of 11 mG). As in other portions of the route, all EMF levels at the playground are calculated to be far below guideline levels established by ICNIRP and ICES.

Residential Areas North of the CT DOT Corridor in XS-17

In the area north of the CT DOT corridor in XS-17, UI identified two residential buildings. These buildings are shown by the blue square in Figure 8 and applicable magnetic-field modeling results are shown on the left side of Figure 10R (i.e., the north side of the CT DOT corridor). North of the CT DOT corridor, along West Avenue between the CT DOT corridor and the new proposed permanent UI easements along South Frontage Road, there is one residence where the magnetic-field level is calculated to increase by approximately ~~13~~ 6.4 mG to ~~17~~ 11 mG (depending on the location within the building). One additional building, located at the intersection of West Avenue and Railroad Avenue within a mixed development zoning designation, is used for both residential and commercial purposes. At this building the magnetic-field level is calculated to decrease by approximately ~~3~~ 12 mG or increase by up to approximately ~~5~~ 1.6 mG (depending upon the location within the building). Before and after the Project, all EMF levels at these buildings are calculated to be far below guideline levels established by ICNIRP and ICES.

Attachment E

Magnetic Field Calculations at Apartment Buildings

Magnetic Field Calculations at Apartment Buildings

As described in the body of the report, at two locations along the proposed Project route, the rebuilt 115-kV lines, as presently designed, would be in close proximity to recently constructed and now occupied multi-story apartment buildings. The apartment buildings are constructed very close to the edge of the existing CT DOT corridor and the multi-story buildings present a situation where residents will have ready access to locations significantly above ground level in relatively close proximity to the Project's transmission lines. The Section titled Results of Modeling at Apartment Buildings in the body of the report describe magnetic-field levels at the nearest edge of the apartment buildings at average loading. The discussion below provides additional context of magnetic-field levels at peak loading throughout the whole area near the transmission lines as well as at peak loading.

Apartment Building in Fairfield

A two-dimensional model of magnetic-field levels (at average loading) is shown below in Figure E-1R. The top and bottom plots show the 2-dimensional magnetic field for the existing and currently-proposed configurations, respectively. The model extends several hundred feet to both sides of the CT DOT corridor and from ground level up to a height of 150 feet above ground. The colors in the figure shows the strength of the magnetic field on a logarithmic scale where yellow shows areas where the magnetic field is greater than 1,000 mG (i.e., only in very close proximity to the individual conductors) and the dark blue shows areas where the magnetic field is less than 1 mG.

Comparison of the existing and proposed plots show that the conductors of the currently-proposed transmission line are very slightly closer to the edge of the building (by approximately 2 feet) but are substantially higher above ground. Specifically, the proposed conductors would be at least 12 feet above the top of the building compared to about 11 feet below the top of the building. The net result is that the currently-proposed Project would reduce magnetic-field levels at the front of the building at most heights above ground, but would slightly increase magnetic-field levels at the roof of the building.

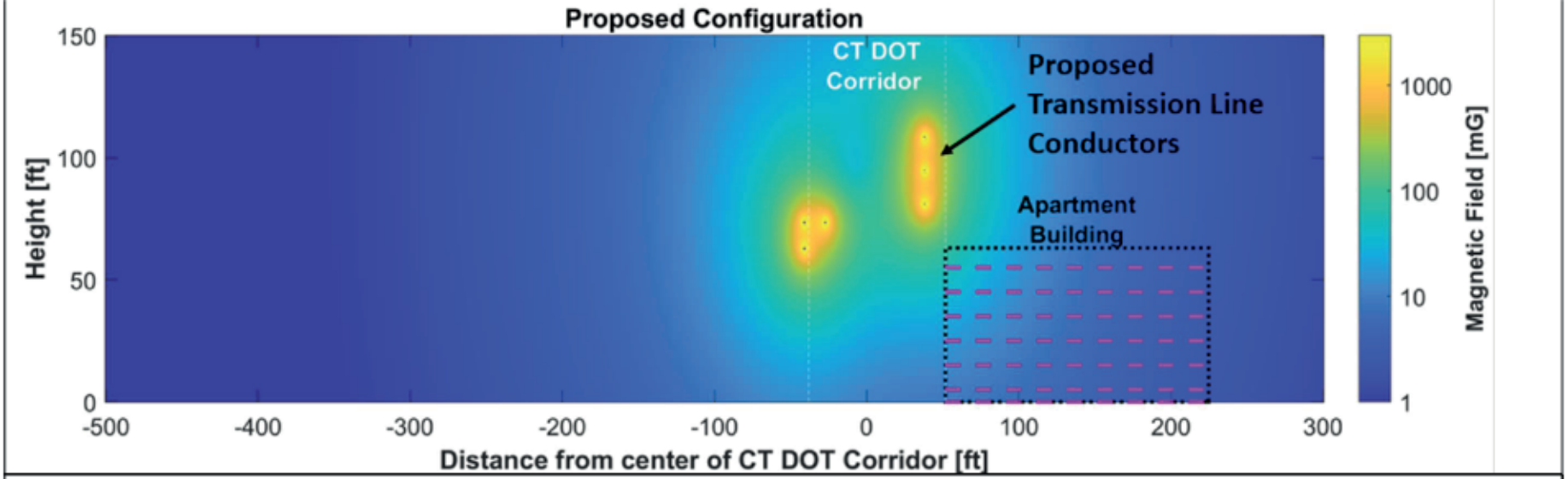
Similar to Figure 9R in the body of the report (for average loading), Figure E-2R shows results of the existing and proposed magnetic-field levels at the front edge of the building (closest to the transmission lines) at greater heights above ground at *peak* loading. Similar to the results at average loading, the magnetic-field levels at the front edge of the building (closest to the

transmission lines) are calculated to *decrease* at all levels of the building, except at the roof. At the front edge of the building on the roof, magnetic-field levels are calculated to increase from ~~90~~ 116 mG to ~~111~~ 143 mG. Similar to all other locations along the route, magnetic-field levels decrease rapidly with distance, and at the back end of the building, magnetic-field levels are calculated to be 3.2 mG before and after the proposed Project.

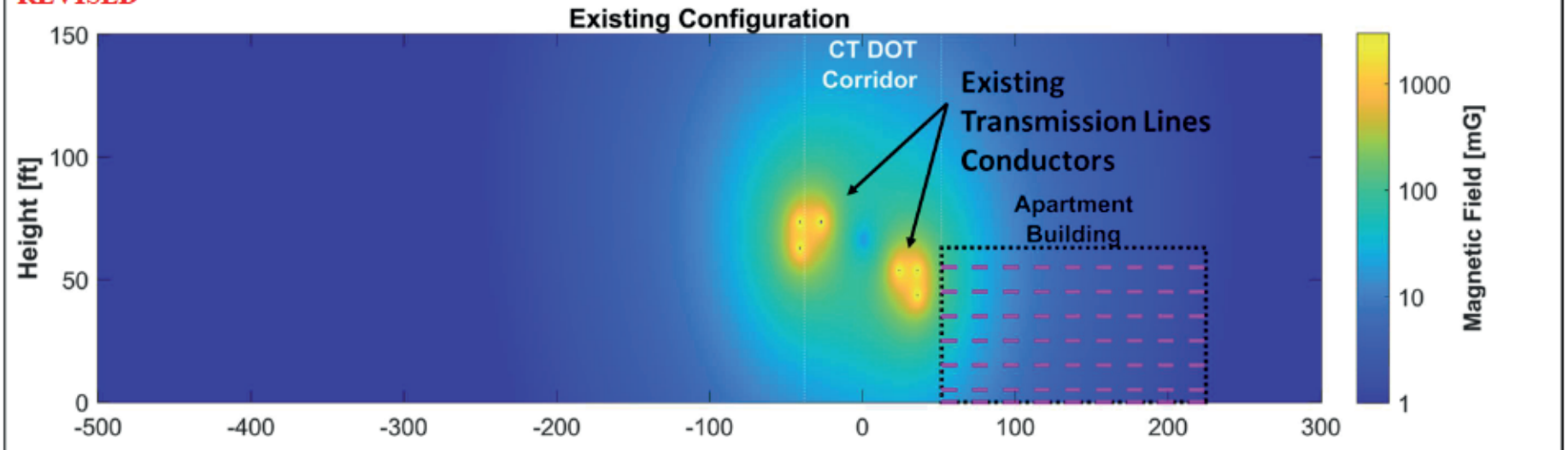
Apartment Building in Bridgeport

A two-dimensional model of magnetic-field levels (at average loading) is shown below in Figure E-3R, similar in format to Figure E-1R. Comparison of the existing and proposed plots show that the conductors of the currently-proposed transmission line are approximately 30 feet closer to the edge of the building and approximately 30 feet higher above ground (43 feet-9 inches for the existing conductors compared to 75 feet-2 inches for the proposed conductors). The net result of this change is that magnetic-field levels at the front edge of the building (closest to the transmission lines) are calculated to increase slightly as a result of the Project up to a height of about 35 feet, and then increase more substantially at greater heights above ground, with the maximum increase at the roof of the building.

Similar to Figure 11R in the body of the report (for average loading), Figure E-4R shows results of the existing and proposed magnetic-field levels at the front edge of the building (closest to the transmission lines) at greater heights above ground at *peak* loading. As shown in Figure E-4R, up to a height of about 35 feet above ground, the proposed Project is calculated to increase the magnetic-field levels by approximately ~~6~~ 7.8 mG or less compared to existing levels. At 45 feet above ground, the magnetic-field level is calculated to increase from approximately 58 mG to ~~84~~ 88 mG, and at the roof, magnetic-field levels are calculated to increase from about 56 mG to ~~160~~ 165 mG. Similar to all other locations along the route, magnetic-field levels decrease rapidly with distance, and at the back end of the building, magnetic-field levels are calculated to be ~~less than~~ 6 mG or less before and after the proposed Project.


Proposed Configuration
CT DOT
Corridor
Proposed
Transmission Line
Conductors
Apartment
Building
Height [ft]
150
100
50
0
-500
-400
-300
-200
-100
0
100
200
300
Distance from center of CT DOT Corridor [ft]
1000
100
10
1
Magnetic Field [mG]

REVISED


Existing Configuration
CT DOT
Corridor
Existing
Transmission Lines
Conductors
Apartment
Building
Height [ft]
150
100
50
0
-500
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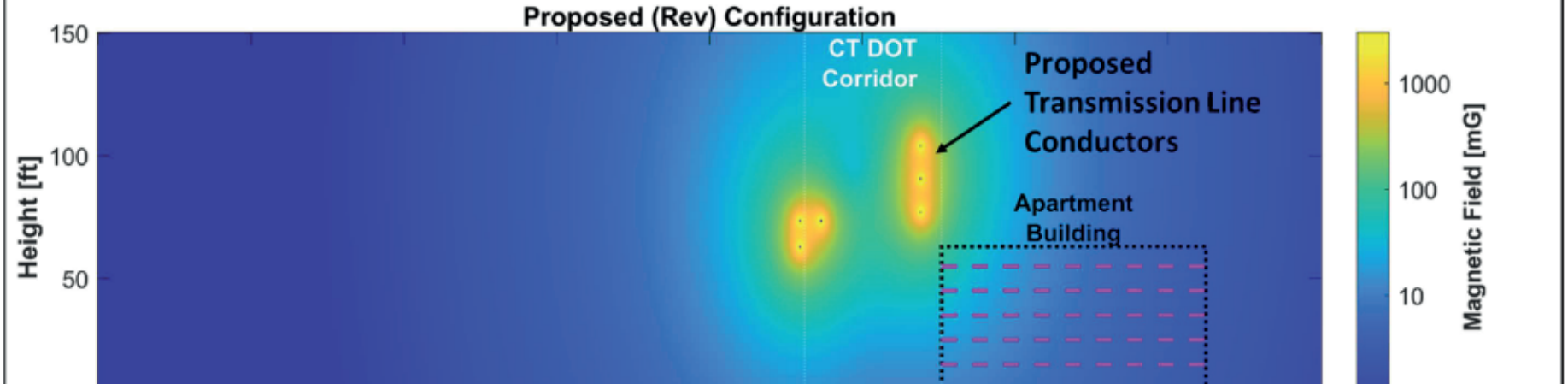
1000
100
10
1
Magnetic Field [mG]


Proposed (Rev) Configuration
CT DOT
Corridor
Proposed
Transmission Line
Conductors
Apartment
Building
Height [ft]
150
100
50
1000
100
10
Magnetic Field [mG]

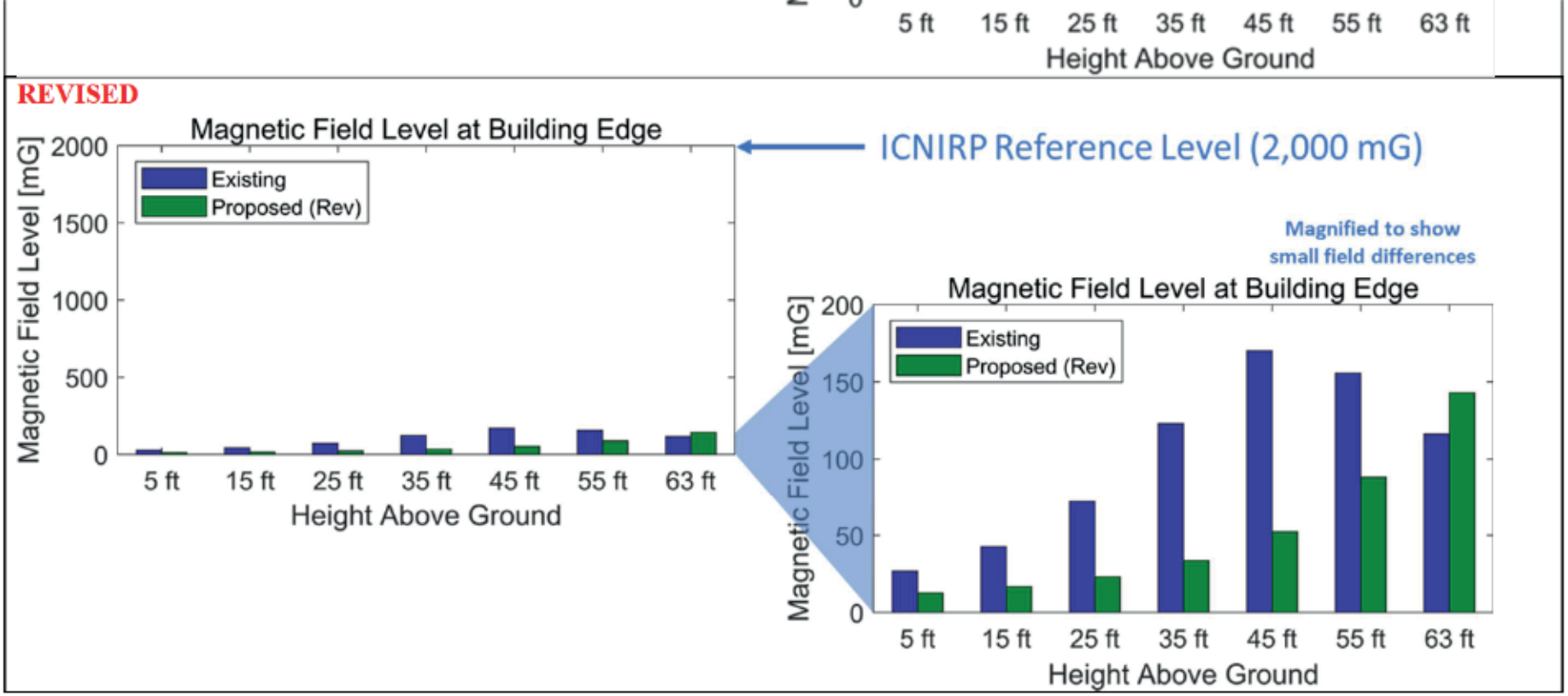
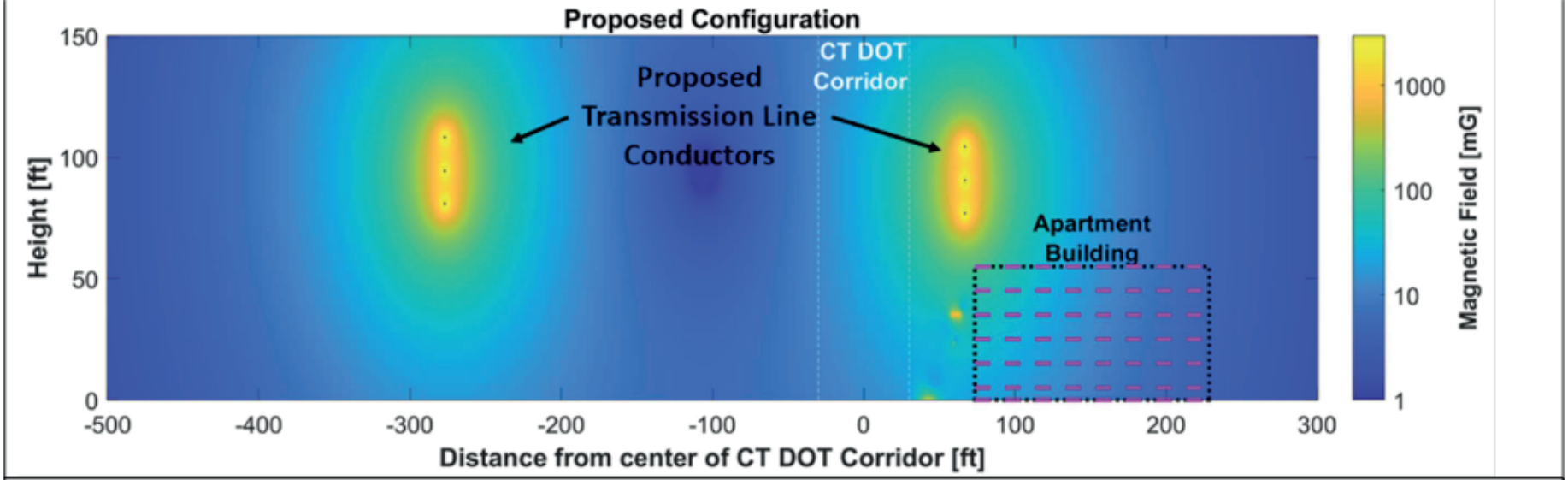
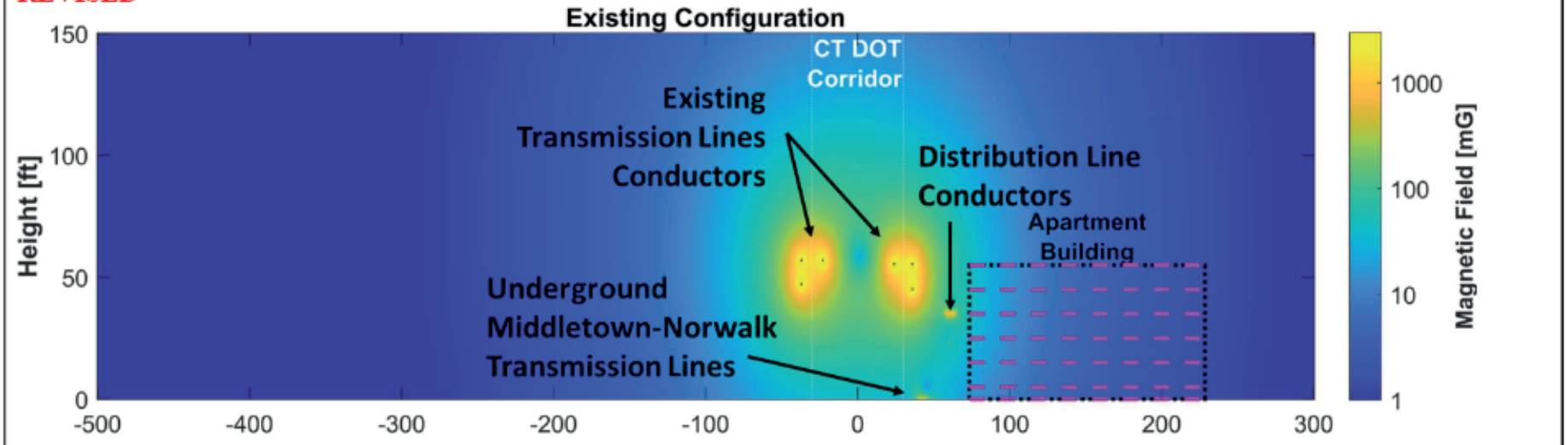


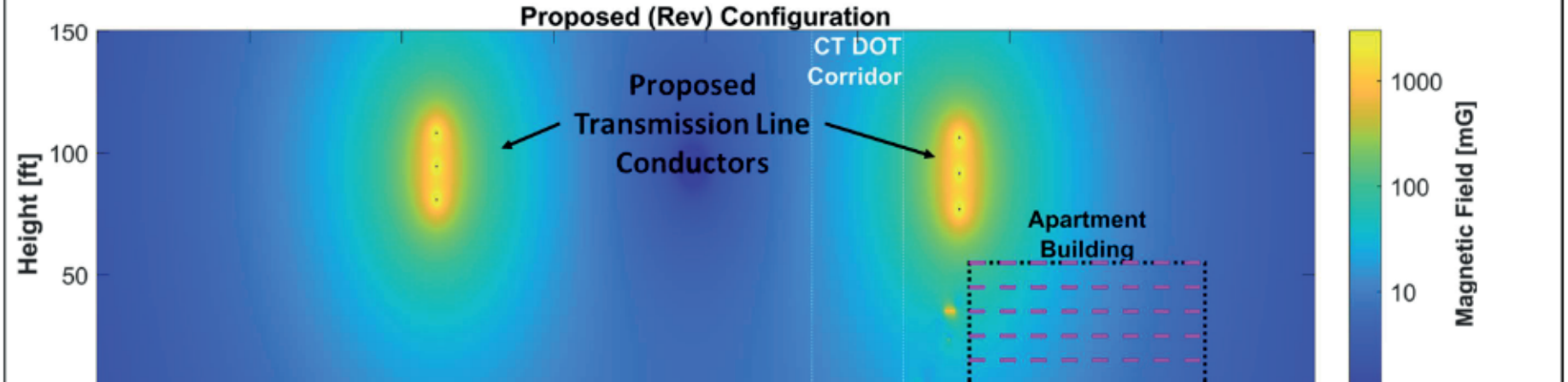
Figure E-2R. Magnetic-field level (at peak loading) at 79 Unquowa Place in Fairfield compared to the ICNIRP limit of 2,000 mG.

The ICES limit for magnetic fields is 9,040 mG. The scale of the graph on the right of the figure is magnified to illustrate the small differences in existing and proposed calculated field levels compared to ICNIRP limits. Note the changed vertical scale in the zoomed-in inset of the REVISED figure.


Proposed Configuration
Proposed
Transmission Line
Conductors
CT DOT
Corridor
Apartment
Building
Height [ft]
Distance from center of CT DOT Corridor [ft]
Magnetic Field [mG]

REVISED


Existing Configuration
Existing
Transmission Lines
Conductors
CT DOT
Corridor
Distribution Line
Conductors
Apartment
Building
Underground
Middletown-Norwalk
Transmission Lines
Height [ft]
Magnetic Field [mG]


Proposed (Rev) Configuration
Proposed
Transmission Line
Conductors
CT DOT
Corridor
Apartment
Building
Height [ft]
Magnetic Field [mG]

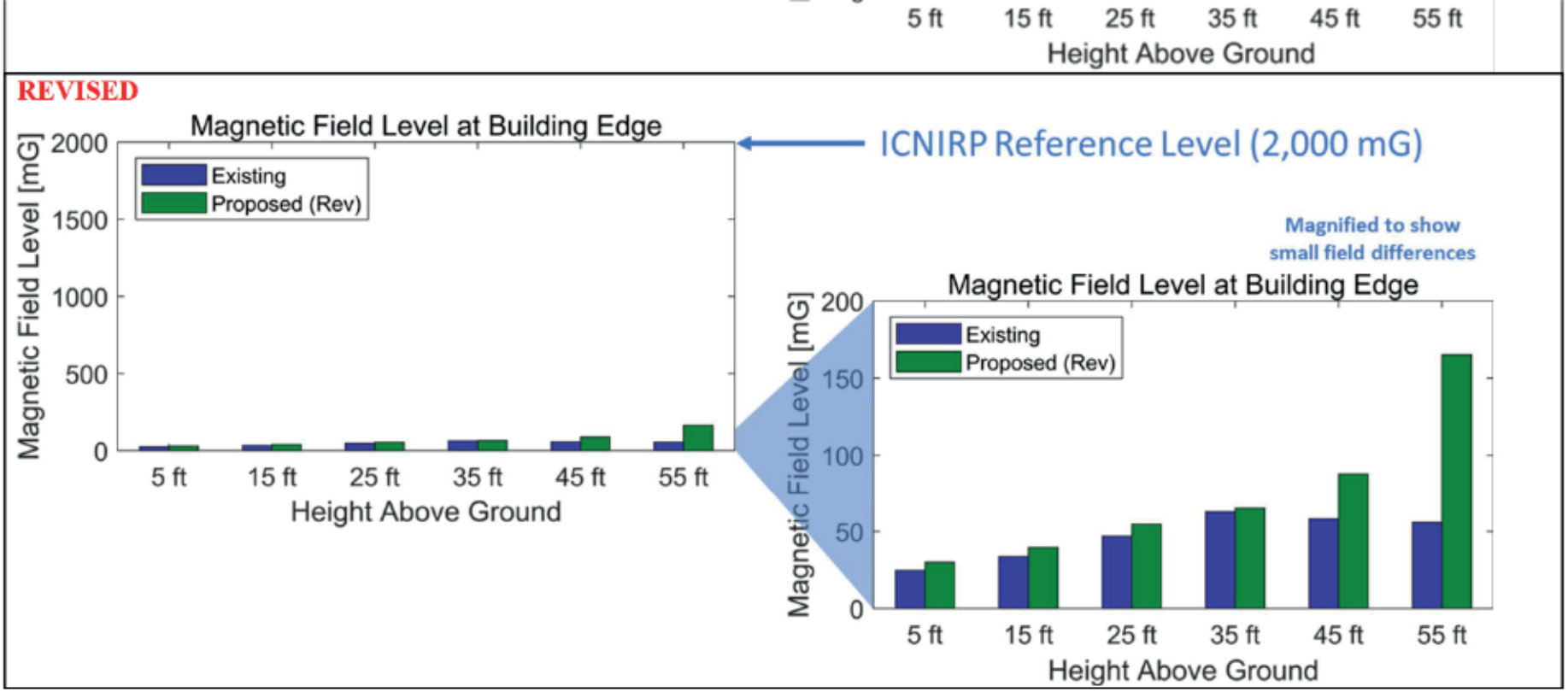


Figure E-4R. Magnetic-field level (at peak loading) at Windward apartment building in Bridgeport compared to the ICNIRP limit of 2,000 mG.

The ICES limit for magnetic fields is 9,040 mG. The scale of the graph on the right of the figure is magnified to illustrate the small differences in existing and proposed calculated field levels compared to ICNIRP limits. Note the changed vertical scale in the zoomed-in inset of the REVISED figure.

Notice

At the request of The United Illuminating Company (UI), Exponent, Inc., modeled the electric and magnetic fields associated with the rebuild of 115-kilovolt transmission lines that extend within the Connecticut Department of Transportation railroad corridor from Catenary Structure B648S in the Town of Fairfield east to UI's Congress Street Substation in the City of Bridgeport, as well as within UI's right-of-way that connects the transmission lines along the railroad corridor to UI's Ash Creek Substation—all in Fairfield County, Connecticut (the Project). This memorandum summarizes revised work to date and presents the findings resulting from that work. 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 (CEII) restrictions. CEII loading data have been redacted from this report. 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 report 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 report, and any re-use of this report 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.

Electrical Engineering & Computer Science Practice

Exponent®

Fairfield to Congress Railroad Transmission Line 115-kV Rebuild Project

Magnetic Field Calculations for Redesigned Structures near Apartment Buildings in Fairfield and Bridgeport, Connecticut

Exponent

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

Prepared for

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Bowie, MD 20715

May 30, 2023

2004472.000 – 8199

Contents

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
in.	Inches
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
ROW	Right-of-way
UI	United Illuminating

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 span the Metro-North Railroad (MNR) tracks 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. In several portions of the report related to apartment buildings in close proximity to the proposed transmission lines, the EMF report notes:

> Although before and after the Project, all EMF levels at the apartment building are calculated to be far below guideline levels established by ICNIRP [International Committee on Non-Ionizing Radiation Protection] or the ICES [International Committee on Electromagnetic Safety], UI is evaluating the viability of alternative designs for the rebuilt line at this location.[1]

The purpose of this report is to present the magnetic-field levels for the alternative designs of the proposed transmission line currently under evaluation by UI in the context of the CSC's "EMF Best Management Practices for the Construction of Electric Transmission Lines in Connecticut" (BMP).[2] The BMP directs utilities to investigate low-cost features to reduce magnetic-field levels with the aim of a magnetic-field reduction of 15% or more at the edge of the right-of-way.[3] Two apartment

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1 Exponent, Inc. Appendix E of UI's Application for a Certificate of Environmental Compatibility and Public Need for the Fairfield to Congress Railroad Transmission Line 115-kV Rebuild Project(Docket 516) (Exponent EMF Modeling Report). Bowie, MD: Exponent, 2023a.

2 Connecticut Siting Council (CSC). Electric and Magnetic Fields Best Management Practices for the Construction of Electric Transmission Lines in Connecticut. New Britain, CT: CSC, 2014. Available at https://portal.ct.gov/-/media/CSC/Guides/2016Guides/ElecSubApplicationGuide616pdf.pdf.

3 In a memorandum submitted to UI, Exponent qualitatively and quantitatively described the changes in magnetic-field levels associated with revisions to the design of the existing and proposed transmission lines near apartment buildings in Fairfield and Bridgeport (Exponent, Inc. Memorandum to UI, dated May 12, 2023, re: Revised Magnetic Field Calculations Near Apartment Buildings in Fairfield and Bridgeport. Bowie, MD: Exponent, 2023b). This report builds upon those revised analyses with additional calculations and results associated with a redesign of the proposed transmission lines in those portions of the route.

buildings in particular were flagged in this process: 79 Unquowa Place in Fairfield and the Windward apartment building complex in Bridgeport.

Fairfield

UI evaluated a redesign of the proposed transmission line rebuild at the apartment building at 79 Unquowa Place in Fairfield that both increased the conductor height of the rebuilt transmission line and reduced the vertical phase spacing of the conductors.

Bridgeport

UI considered three redesign options at the Windward apartment building complex in Bridgeport near the intersection of Railroad Avenue and Park Avenue in Bridgeport. Option 1 would increase the conductor height of the proposed transmission line on the southern side of the Connecticut Department of Transportation (CT DOT) corridor. Option 2 would re-route the proposed transmission line on the southern side of the CT DOT corridor to the north side of the CT DOT corridor. For this option, both rebuilt transmission lines would be supported by the same vertical monopole in a double-circuit configuration on the north side of the CT DOT corridor from just east of existing Catenary Structure 756 to just west of existing Catenary Structure 762. Option 3 would re-route the proposed transmission line on the southern side of the CT DOT corridor to the north side of the CTDOT corridor. For this option, both rebuilt transmission lines would be located on the north side the CT corridor from between existing Catenary Structures 752 and 753 to just west of existing Catenary Structure 762. The eastern and western portions of this re-route will have both transmission lines supported by the same vertical monopole in a double-circuit configuration, while the middle portion of this re-route will have one transmission line located in an underground duct bank while the second transmission line would remain overhead.

The reduction in magnetic field for each redesign option, along with the estimated cost is summarized in the table below.

Summary of magnetic-field reduction at apartment buildings in Fairfield and Bridgeport

Location	Redesign Option	Reduction at 1 meter (3.28 feet) above ground	Reduction at the Roof	Estimated Cost*
79 Unquowa Place in Fairfield	Option 1†	30%	47%	$36,000
Windward Apartment Building Complex in Bridgeport	Option 1‡	9%	27%	$31,000
	Option 2§	88%	97%	$7,480,000
	Option 3¶	Similar to Option 2	Similar to Option 2	$41,765,000

* Estimated cost provided by UI (Overhead design options are +/-25% accuracy, Underground option is a conceptual grade estimate (+200%/-50% accuracy).

† Increase the minimum conductor height to from 75 ft-2 in. to 84 ft-5 in., and decrease the phase spacing from 14 ft to 12 ft.

‡ Increase the minimum conductor height to from 75 ft-2 in. to 80 ft-2 in.

§ Reroute the transmission line in a double-circuit configuration north of the CT DOT corridor.

¶ Install the transmission line in an underground duct bank north of CT DOT corridor.

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 span the Metro-North Railroad (MNR) tracks 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.[4] In several portions of the report related to apartment buildings in close proximity to the proposed transmission lines, the EMF report notes:

> Although before and after the Project, all EMF levels at the apartment building are calculated to be far below guideline levels established by ICNIRP [the International Commission on Non-Ionizing Radiation] or the ICES [International Committee on Electromagnetic Safety],[5] UI is evaluating the viability of alternative designs for the rebuilt line at this location.[6]

The purpose of this report is to present the magnetic-field levels for the alternative designs currently under evaluation by UI.

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[4] In a memorandum submitted to UI, Exponent qualitatively and quantitatively described the changes in magnetic-field levels associated with revisions to the design of the existing and proposed transmission lines near apartment buildings in Fairfield and Bridgeport (Exponent, Inc. Memorandum to UI, dated May 12, 2023, re: Revised Magnetic Field Calculations Near Apartment Buildings in Fairfield and Bridgeport. Bowie, MD: Exponent, 2023b). This report builds upon those revised analyses with additional calculations and results associated with a redesign of the proposed transmission lines in those portions of the route.

[5] The ICNIRP limit on magnetic fields is 2,000 milligauss, while the ICES limit on magnetic fields at 9,040 milligauss. International Commission on Non-Ionizing Radiation PI. 2010. ICNIRP Statement - Guidelines for Limiting Exposure to Electromagnetic Fields (1 Hz to 100 kHz). Health Phys 99:818-836; International Committee on Electromagnetic Safety (ICES). 2019. IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 300 GHz. IEEE Std C95.1-2019 (Revision of IEEE Std C95.1-2005/Incorporates IEEE Std C95.1-2019/Cor 1-2019). New York: IEEE.

[6] Exponent, Inc. Appendix E of UI's Application for a Certificate of Environmental Compatibility and Public Need for the Fairfield to Congress Railroad Transmission Line 115-kV Rebuild Project(Docket 516) (Exponent EMF Modeling Report). Bowie, MD: Exponent, 2023a.

CSC Best Management Practices

UI's approach to investigating alternative designs for the rebuilt transmission lines at targeted locations along the route is consistent with the CSC's "EMF Best Management Practices for the Construction of Electric Transmission Lines in Connecticut" (BMP). This BMP directs utilities to develop a base design incorporating no-cost measures to reduce magnetic fields and then modify the base design by adding low-cost features with the aim to reduce magnetic-field levels by 15% or more at the edge of the right-of-way (ROW).[7] The BMP also includes seven methods to reduce the magnetic field level:

- Distance
- Height of Support Structures
- Conductor Separation
- Conductor Configuration
- Optimum Phasing
- Increased Voltage
- Underground Installation."

[7] Connecticut Siting Council (CSC). Electric and Magnetic Fields Best Management Practices for the Construction of Electric Transmission Lines in Connecticut. New Britain, CT: CSC, 2014. Available at https://portal.ct.gov/-/media/CSC/Guides/2016Guides/ElecSubApplicationGuide616pdf.pdf.

Fairfield Redesign

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. The redesigned Line 1430 on the south side of the ROW incorporates two elements of the BMPs, conductor separation and height of the support structures. The redesign evaluates the effect of reducing the vertical phase spacing for both structures P689S and P690S from 14 feet (ft) to 12 ft and increasing the height of structure P690S by 10 ft. At the point of lowest sag between the structures, these two changes result in raising the bottom phase conductor to 84 ft-5 inches (in.) above ground compared to 75 ft-2 in. above ground (for the revised design, discussed in Exponent 2023). In this redesign, the lowest conductor will be 21 ft or more above the top of the apartment building, which is 42 feet above the lowest existing conductor that itself is 42 ft above ground.

Figure 1 illustrates the result of the redesign at a height of 1 meter (m) (3.28 ft) above ground referenced to the edges of the CT DOT corridor, providing a visual summary of the calculated magnetic field, along with representations of the existing and proposed structures, and compares these values to ICNIRP limits on magnetic fields. On the north side of the ROW, there is a negligible change in the magnetic-field level as a result of the redesign. On the south side of the ROW, at the closest portion of the apartment building (near the southern CT DOT corridor boundary), the redesign results in a magnetic-field reduction of approximately 30%.

Results of the magnetic-field level calculations *at the front edge of the building* (closest to the transmission lines) at average loading are shown in Figure 2. In this figure the magnetic-field level at every 5 ft above ground is shown for the existing configuration (orange bars), proposed (revised) configuration (blue bars), and redesigned configuration (green bars). The redesigned configuration results in a decrease in magnetic-field levels at the front edge of the building (closest to the transmission lines) at all stories of the building, including at the roof.[8]

[8] As described in Exponent (2023b), the proposed (revised) configuration results in a decrease in magnetic-field levels (compared to the existing configuration) at all floors of the building *except* at the roof.

As shown in Figure 2, at average loading and a height of 45 ft above ground, the existing magnetic field is calculated to be the highest. This corresponds to the height of the existing conductors (which are between 42 and 52 ft). At this height, the magnetic field is calculated to decrease from 154 milligauss (mG) for the existing configuration to 47 mG for the proposed (revised) configuration, and to 28 mG for the redesigned configuration. At the roof of the building, the existing magnetic-field level (105 mG) would increase to 129 mG for the proposed (revised) configuration, but would decrease to 69 mG for the redesigned configuration. Similar to all other locations along the route, magnetic-field levels decrease rapidly with distance, and at the back end of the building, magnetic-field levels are calculated to be less than 3 mG for any of the existing, proposed (revised), or redesigned configurations.

Further analysis of the data in Figure 2 shows that the redesigned configuration results in a 30% to 47% decrease in magnetic-field levels compared to the proposed (revised) configuration. The largest percent decrease is at the roof where, as described above, the calculated magnetic-field level would decrease from 129 mG to 69 mG (a 47% decrease). The results of similar calculations at peak loading are shown in Figure 3.

To further illustrate the effect of the redesign in raising conductor height and decreasing the phase spacing between conductors, a two-dimensional model of magnetic-field levels (at average loading) is shown in Figure 4. The three plots show the 2-dimensional magnetic field for the existing configuration (top), proposed (revised) configuration (middle), and redesigned configuration (bottom). The model extends several hundred feet to both sides of the CT DOT corridor and from ground level up to a height of 150 ft. The colors in the figure show the strength of the magnetic field on a logarithmic scale where yellow shows areas where the magnetic field is greater than 1,000 mG (i.e., only in very close proximity to the individual conductors) and the dark blue shows areas where the magnetic field is less than 1 mG.

Additional arrows to the proposed (revised) and redesigned configurations show the increased conductor height above the building (pink arrows) and the narrower phase spacing (green arrows) of the redesigned configuration.

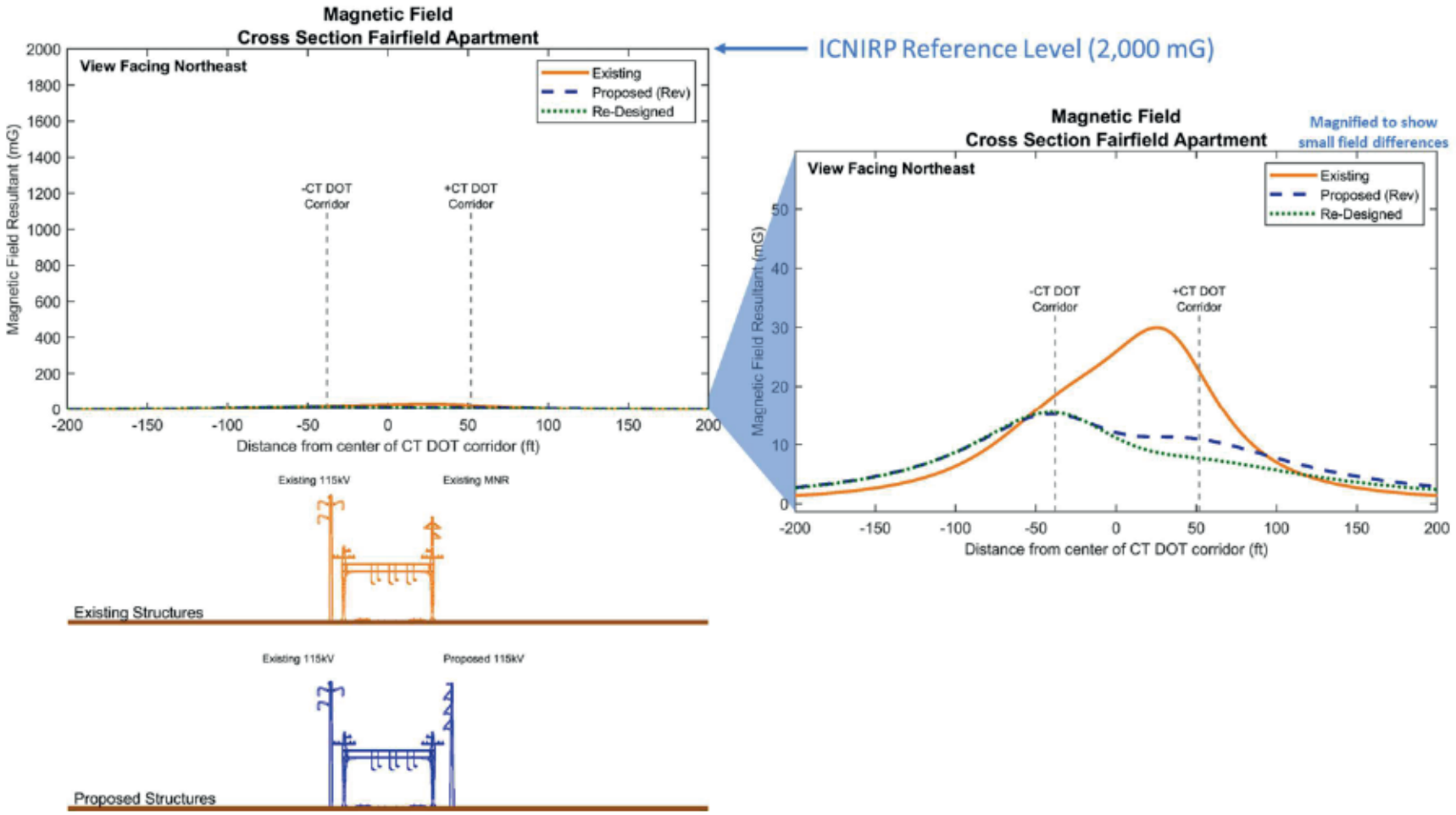


Figure 1. Magnetic-field level (mG) at a height of 1 m (3.28 ft) above ground at 79 Unquowa Place compared to the ICNIRP limit of 2,000 mG.

The inset on the right is a magnified scale that more clearly illustrates the differences among the existing, proposed (revised), and redesigned magnetic-field levels.

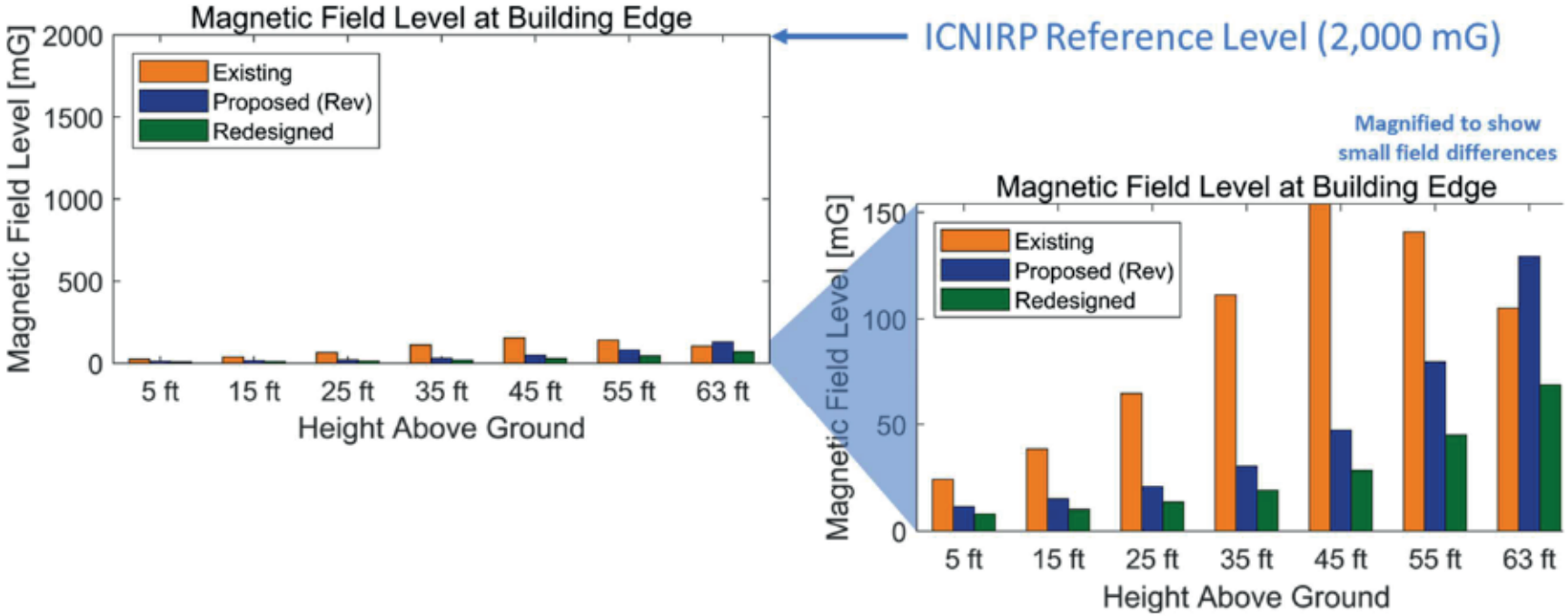


Figure 2. Magnetic-field level at <u>average</u> loading at the building edge of 79 Unquowa Place compared to the ICNIRP limit of 2,000 mG.

The inset at the right is a magnified scale that more clearly illustrates the differences among existing, proposed (revised), and redesigned magnetic-field levels.

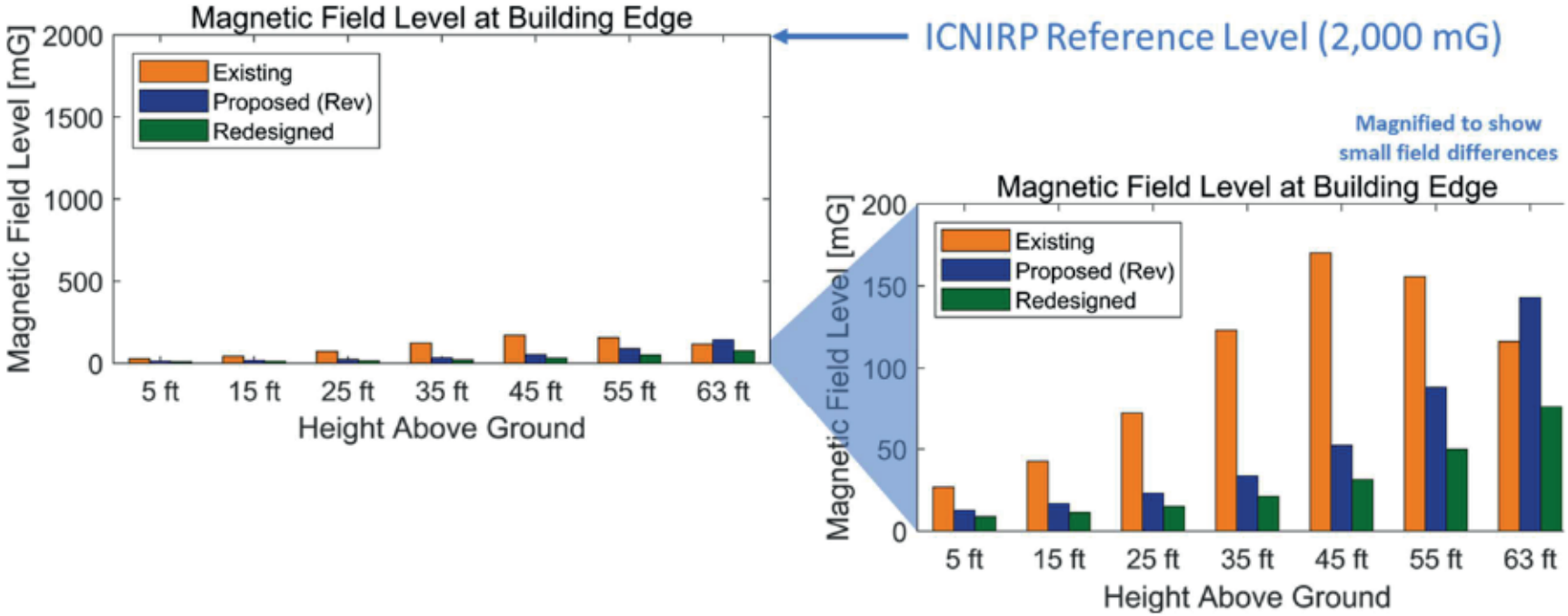


Figure 3. Magnetic-field level at peak loading at the building edge of 79 Unquowa Place compared to the ICNIRP limit of 2,000 mG.

The inset at the right is a magnified scale that more clearly illustrates the differences among existing, proposed (revised), and redesigned magnetic-field levels.

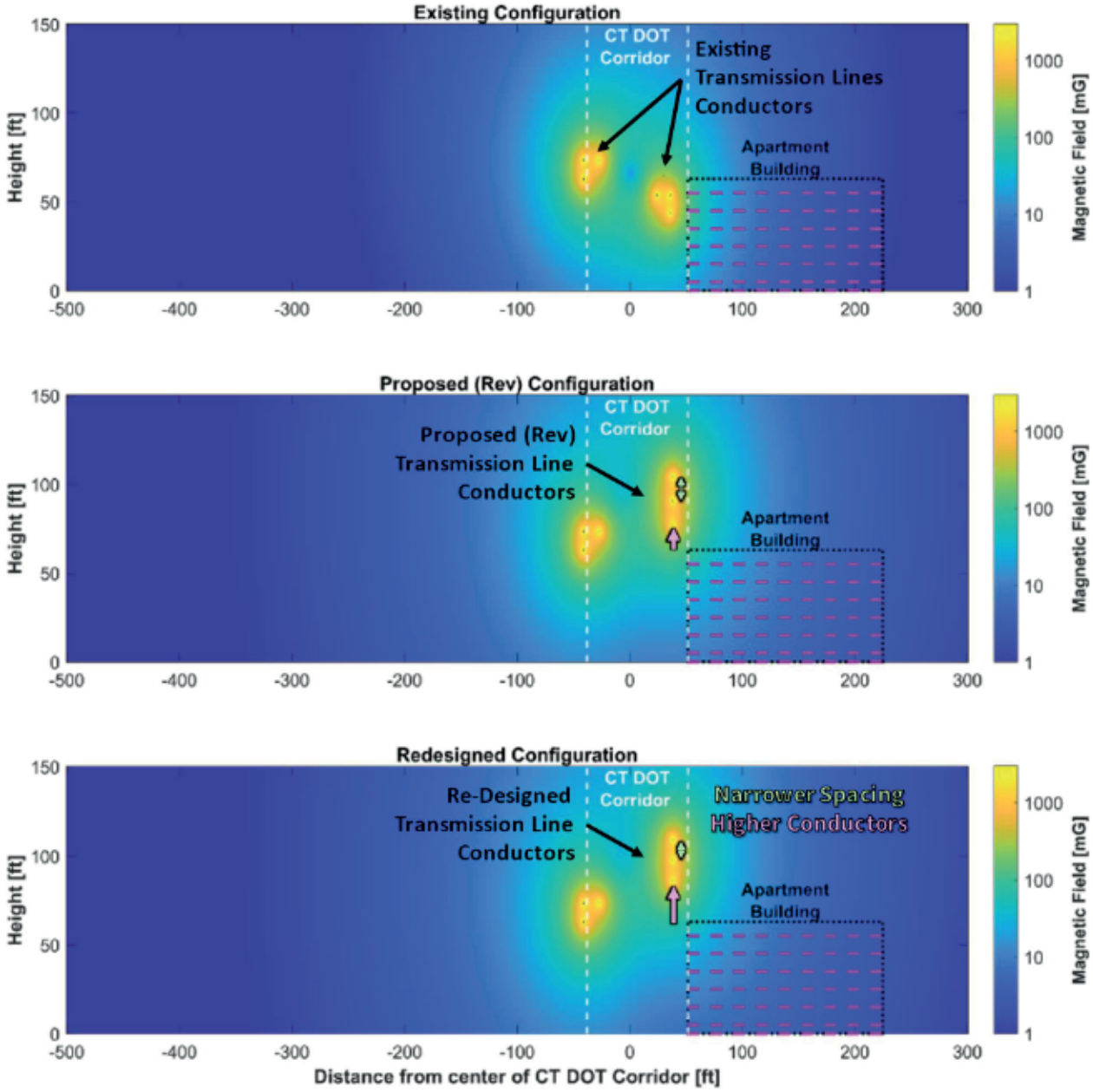


Figure 4. Two-dimensional representation of magnetic-field levels (at average loading) at 79 Unquowa Place in Fairfield for the existing configuration (top), proposed (revised) configuration (middle), and redesigned configuration (bottom).

The CT DOT corridor is shown by vertical white lines. The strength of the magnetic field is shown on a logarithmic scale; yellow (i.e., immediately around the conductors) illustrates a magnetic-field of 1,000 mG or greater and dark blue is 1 mG or less. Magenta lines show the heights of 5, 15, 25, 35, 45, 55 and 63 ft (roof) above ground.

Bridgeport Redesign

At the Bridgeport apartment complex Line 1130 and Line 91001-1 are currently supported on the north and south sides of the CT DOT catenary structures. Line 1130 is currently proposed to be constructed on monopoles on the north side of the CT DOT corridor, generally parallel to South Frontage Road. Line 91001-1 is currently proposed to be constructed on monopole structures on the south side of the CT DOT corridor, along Railroad Avenue. Three redesign options were considered at the Windward apartment building complex in Bridgeport.

1) Increasing the conductor height of the proposed transmission line on the south side of the CT DOT corridor.
2) Constructing both rebuilt transmission lines on the same vertical monopole in a double-circuit configuration on the north side of the CT DOT corridor.
3) Constructing both rebuilt transmission lines on the north side of the CT DOT corridor. The eastern and western portions of this re-route will have both transmission lines supported by the same vertical monopole in a double-circuit configuration, while the middle portion of this re-route will have one transmission line located in an underground duct bank while the second transmission line would remain overhead.

Each of these redesigns is discussed in greater detail below.

Bridgeport Redesign Option 1 – Increased Conductor Height

The first redesign option in Bridgeport incorporates the CSC BMP's method of increasing the minimum conductor height of the proposed transmission line on the south side of the CT DOT corridor, nearest to the Windward apartment building complex.

This option evaluates the effect of increasing the height of both structures supporting Line 91001-1 (P756S and P758S) by 5 ft. At the point of lowest sag between the structures, this increase raises the bottom phase conductor to 80 ft-2 in. above ground, compared to 75 ft-2 in. above ground for the proposed (revised) design. Although the conductor in the redesign option would still be approximately 30 ft closer horizontally to the apartment building than the existing design, the lowest

conductor will be more than 35 ft above the top of the apartment building, which is more than 44 ft above the lowest existing conductor that itself is approximately 44 ft above ground.

Figure 5 illustrates the result of redesign Option 1, evaluated at a height of 1 m (3.28 ft) above ground, providing a visual summary of the calculated magnetic field, along with representations of the existing and proposed structures, and compares these values to ICNIRP limits on magnetic fields. On the north side of the ROW, there is a negligible change in magnetic-field level as a result of redesign Option 1. At a height of 1 m (3.28 ft) above ground, the dominant source of magnetic fields at the Windward apartment building complex is the existing distribution line and underground Middletown-Norwalk transmission line. Because existing sources are more important to ground-level magnetic-field levels, the increased conductor height in redesign Option 1 has a smaller effect at ground level than at greater heights above ground. At a height of 1 m (3.28 ft) above ground, the redesign results in a reduction in the magnetic field of approximately 9%.

At locations higher above ground, where the existing distribution and underground transmission lines are less dominant, the percentage reduction in magnetic-field level is greater. Figure 6 shows the results of magnetic-field calculations *at the front edge of the building* (closest to the transmission lines) at average loading. The magnetic-field level at every 5 ft above ground is shown for the existing configuration (orange bars), proposed (revised) configuration (blue bars), and redesigned configuration (green bars).

Up to a height of about 35 ft above ground, the magnetic-field levels for the redesigned configuration are very similar to the existing configuration (an increase of about 2 mG at 5, 15 and 25 ft and a decrease of 4 mG at 35 ft) and are lower than for the proposed (revised) configuration. At 45 ft above ground, the magnetic-field level for the existing configuration is 49 mG, which is calculated to increase for the proposed (revised) configuration to 78 mG, and to increase to 61 mG for the redesigned configuration—less of an increase than for the proposed (revised) configuration. At the rooftop, 55 ft above ground, the results are qualitatively similar; the magnetic-field level for the existing configuration is 48 mG, which is calculated to increase for the proposed (revised) configuration to 144 mG, and to increase to 106 mG for the redesigned configuration—less of an increase than for the proposed (revised) configuration. As noted, since magnetic-field levels decrease rapidly with distance, at the back end of the building, magnetic-field levels are calculated to

be approximately 5 mG or less before and after the proposed Project for any of the three configurations evaluated.

Further analysis of the data in Figure 6 shows that the redesigned configuration results in magnetic-field levels lower than the proposed (revised) configuration at all heights above ground. Up to about 35 ft above ground, the redesigned configuration reduces magnetic-field levels by approximately 9% to 16% compared to the proposed (revised) configuration. The redesigned configuration also results in magnetic-field levels that are 22% lower at 45 ft and 27% lower at the roof than the proposed (revised) configuration. Calculations at peak loading are shown in Figure 7.

To further illustrate the effect of the redesign in raising conductor height, a two-dimensional model of magnetic-field levels (at average loading) is shown in Figure 8. The three plots show the 2-dimensional magnetic field for the existing configuration (top), proposed (revised) configuration (middle), and redesigned configuration (bottom). The model extends several hundred feet to both sides of the CT DOT corridor and from ground level up to a height of 150 ft. The colors in the figure show the strength of the magnetic field on a logarithmic scale where yellow shows areas where the magnetic field is greater than 1,000 mG (i.e., only in very close proximity to the individual conductors) and the dark blue shows areas where the magnetic field is less than 1 mG.

Additional arrows to the proposed (revised) and redesigned configurations show the increased conductor height above the building (pink arrows) of the redesigned configuration.

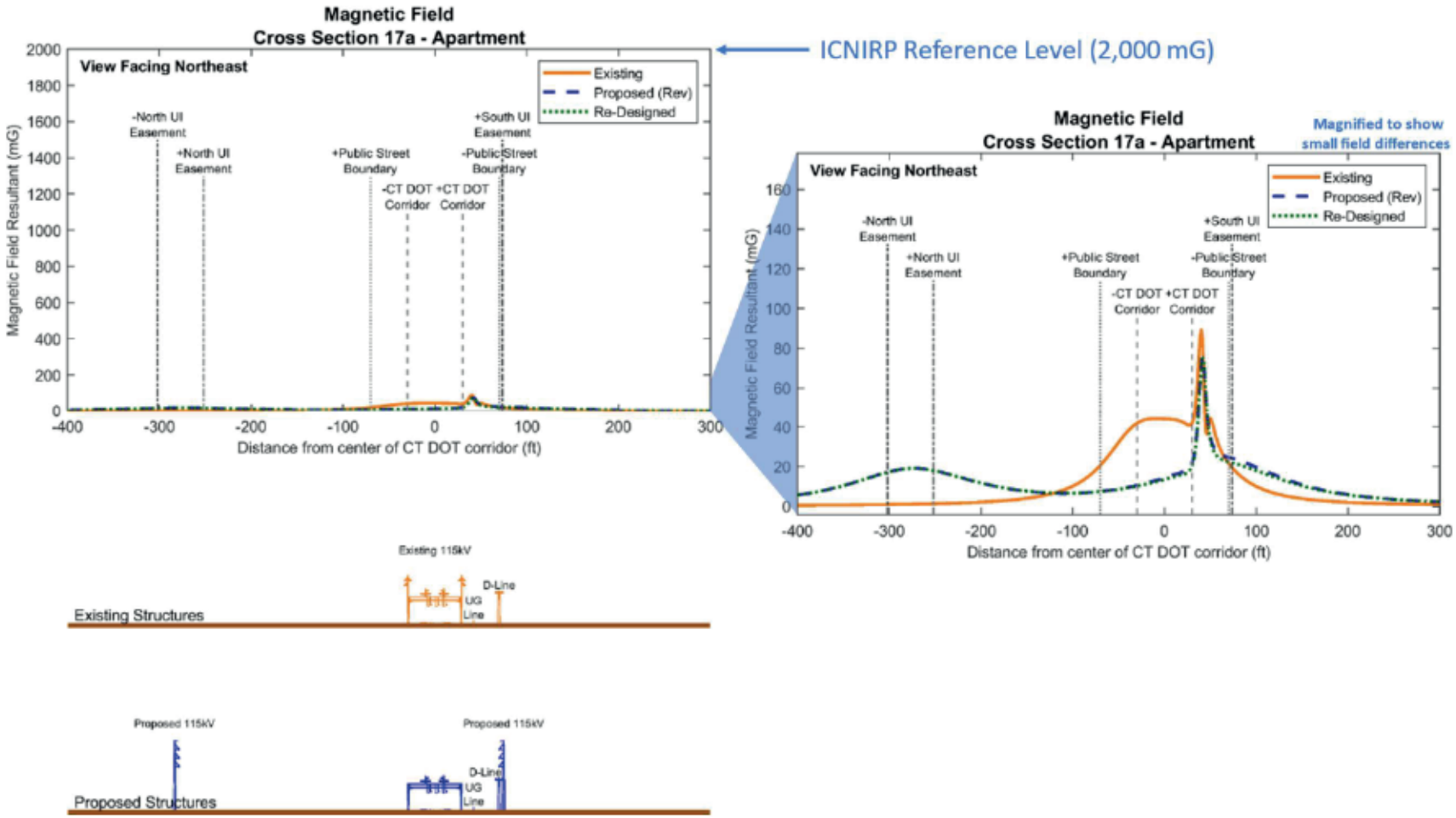


Figure 5. Magnetic field level (mG) at a height of 1 m (3.28 ft) above ground at the Windward apartment building compared to the ICNIRP limit of 2,000 mG.

The inset on the right is a magnified scale that more clearly illustrates the differences among the existing, proposed (revised), and redesigned magnetic-field levels.

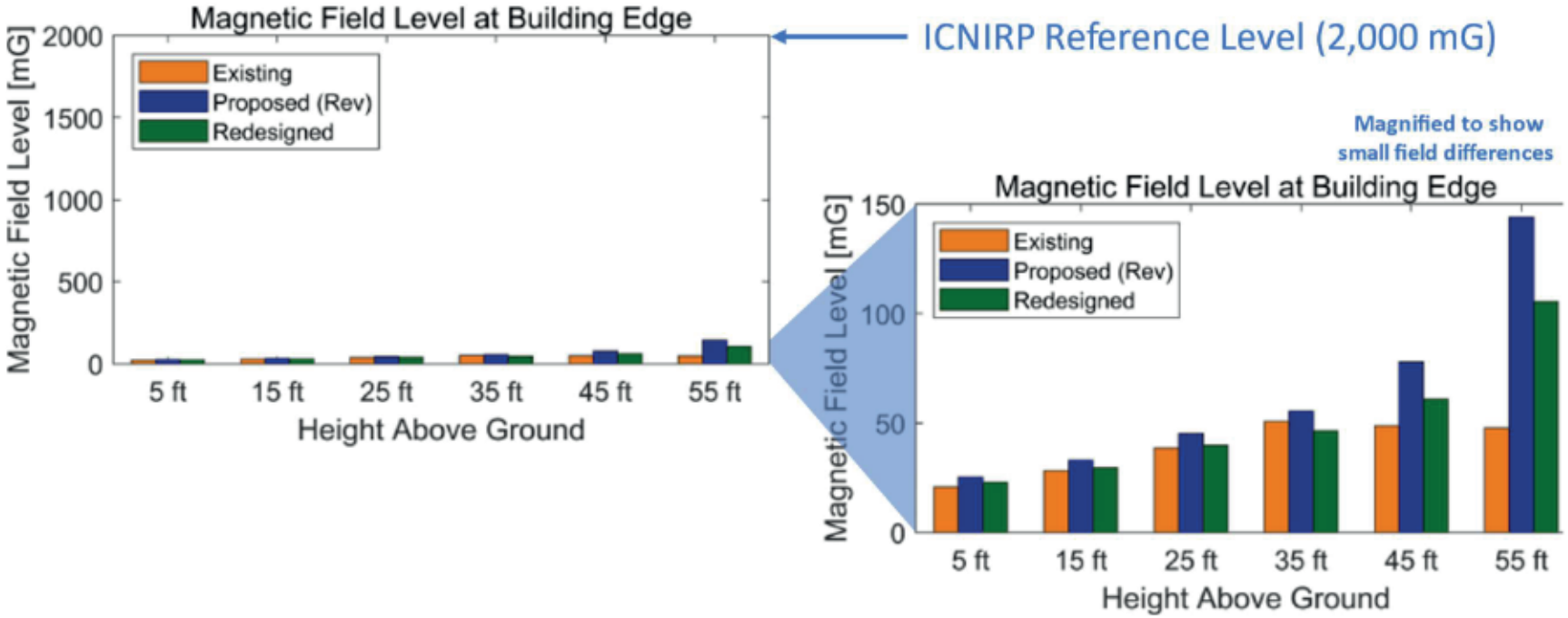


Figure 6. Magnetic-field level at <u>average</u> loading at the Windward apartment building complex in Bridgeport compared to the ICNIRP limit of 2,000 mG.

The inset at the right is a magnified scale that more clearly illustrates the differences among existing, proposed (revised), and redesigned magnetic-field levels.

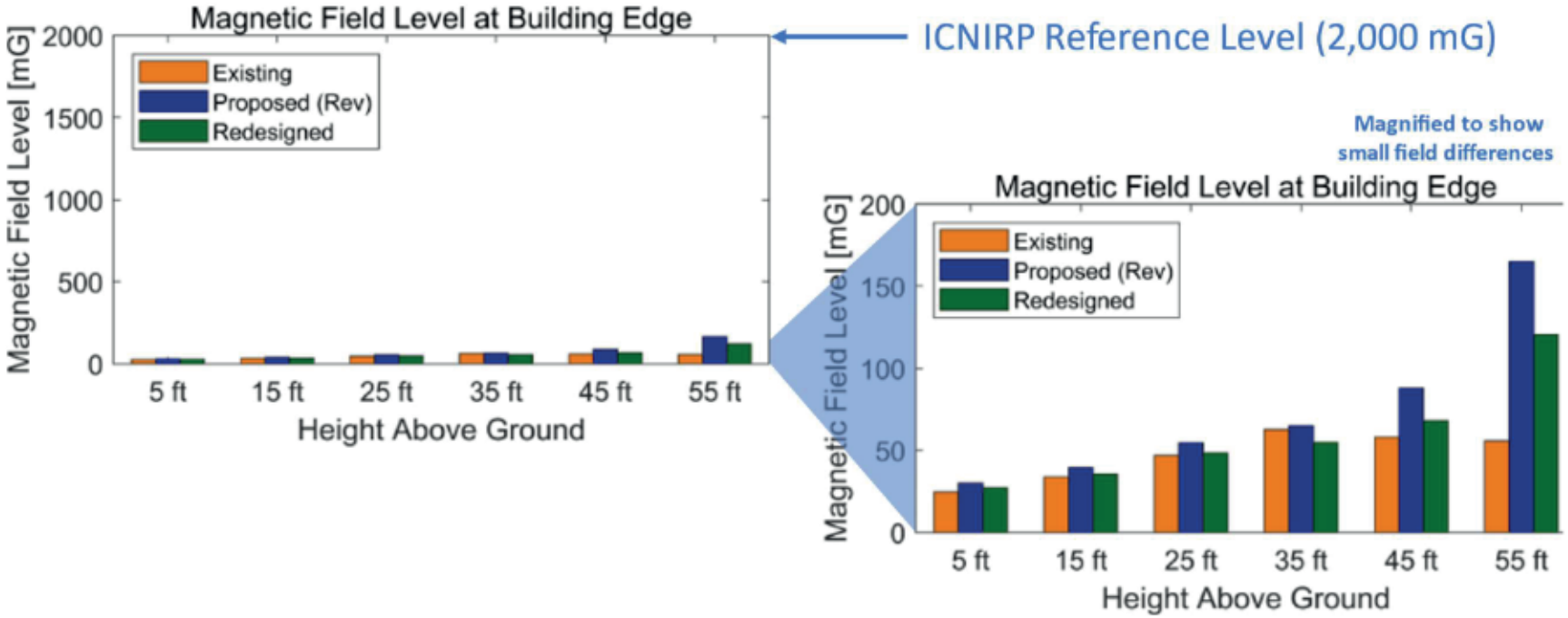


Figure 7. Magnetic-field level at peak loading at the Windward apartment building complex near the intersection of Railroad Avenue and Park Avenue in Bridgeport compared to the ICNIRP limit of 2,000 mG.

The inset on the right is a magnified scale that more clearly illustrates the differences among existing, proposed (revised), and redesigned magnetic-field levels.

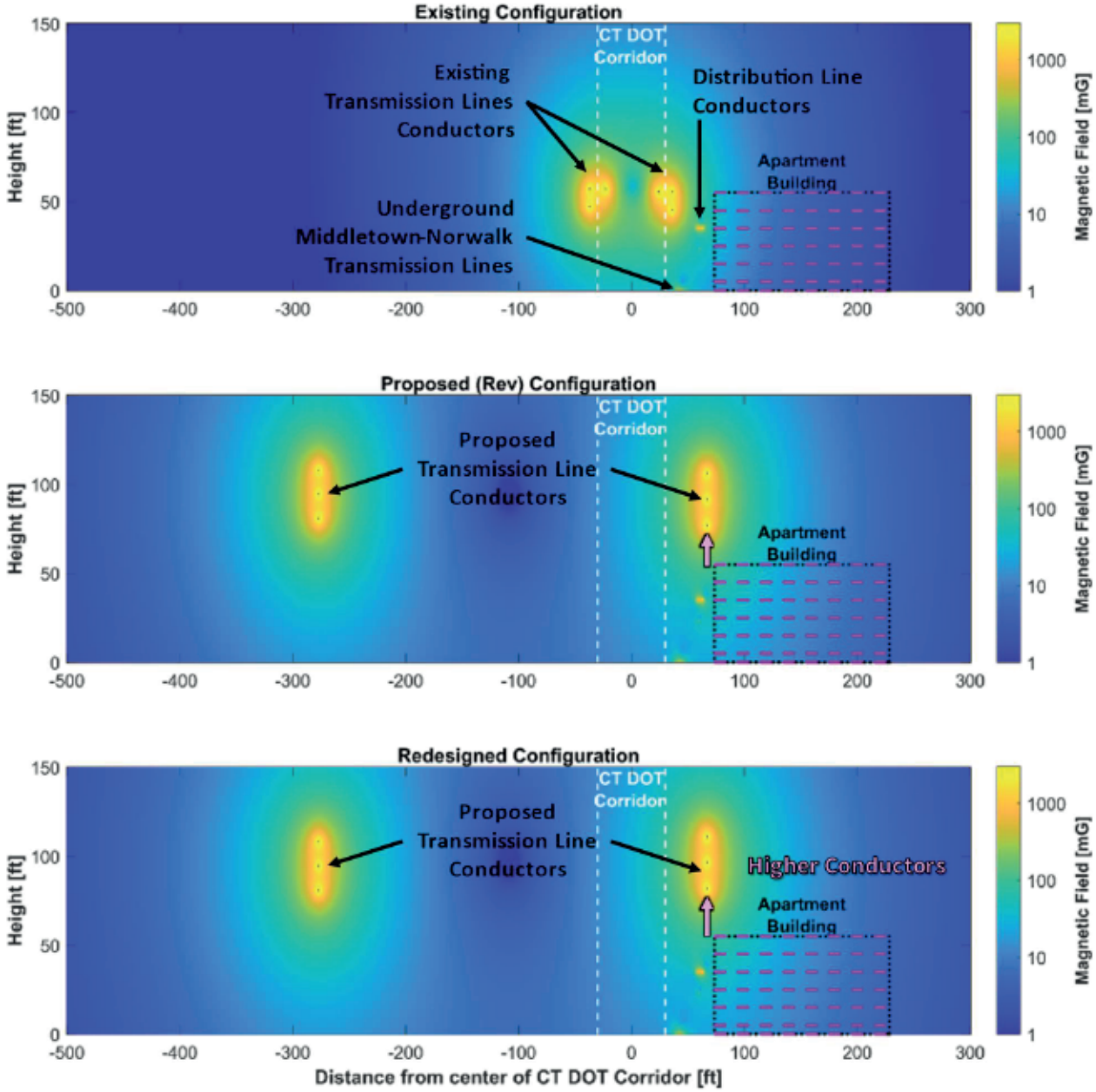


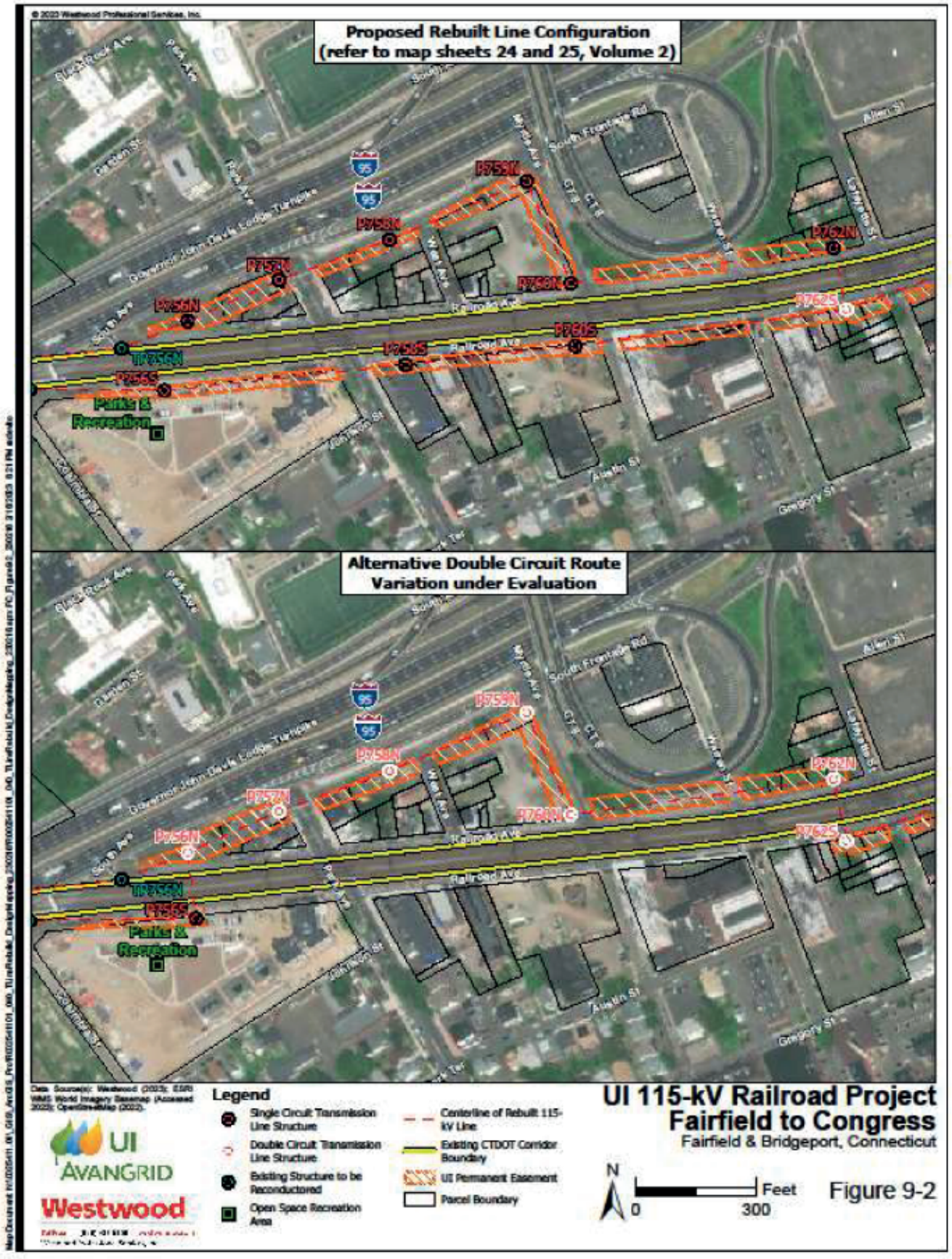
Figure 8. Two-dimensional representation of magnetic-field levels (at average loading) at the Windward apartment building complex—existing configuration (top), proposed (revised) configuration (middle) and redesigned configuration (bottom).

The CT DOT corridor is shown by vertical white lines. The strength of magnetic field is shown on a logarithmic scale with yellow (i.e., immediately around the conductors) indicating values of 1,000 mG or greater and dark blue indicating values of 1 mG or less. Magenta lines show the heights of 5, 15, 25, 35, 45, and 55 ft (roof) above ground.

Bridgeport Redesign Option 2 –Double-Circuit Configuration

Redesign Option 2 incorporates the CSC BMP's methods of distance, conductor configuration, and optimum phasing to reduce magnetic-field levels. Option 2 moves the transmission line on the south side of the CT DOT corridor to double-circuit monopoles (with optimal phasing) to the northern easement, generally parallel to South Frontage Road.

The double-circuit redesign configuration would require a wider easement north of the CT DOT Corridor—64 ft compared to 50 ft for the proposed (revised) configuration—and would construct Line 1130 (the current line that is on the north side of the MNR), on the north side of the double-circuit structures. Line 91001-1 would be rebuilt on the south side of the double-circuit structures (the current line that is on the south side of the MNR). The minimum conductor height would be 71 ft, with vertical and horizontal phase spacing of 14 ft, and optimal phasing. Figure 9 is an illustration of the proposed double-circuit structure and figure 9-2 shows the plan view of the reoute.


Proposed Rebuilt Line Configuration
(refer to map sheets 24 and 25, Volume 2)
Alternative Double Circuit Route
Variation under Evaluation
P756N
P755N
P752N
P762N
P763N
P762S
P756S
TP756N
Parks & Recreation
Legend
Single Circuit Transmission Line Structure
Double Circuit Transmission Line Structure
Existing Structure to be Reconductored
Open Space Recreation Area
Centerline of Rebuilt 115-kV Line
Existing CTDOT Corridor Boundary
UI Permanent Easement
Parcel Boundary
UI 115-kV Railroad Project
Fairfield to Congress
Fairfield & Bridgeport, Connecticut
N
0
300
Feet
Figure 9-2
UI AVANGRID
Westwood

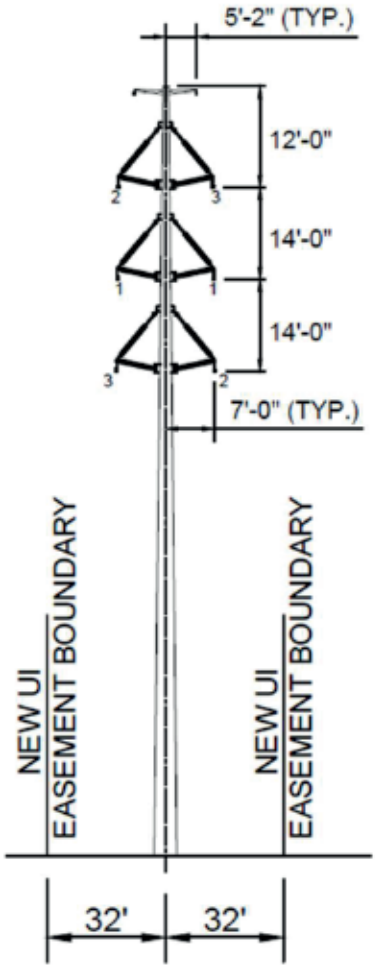


Figure 9. Double-circuit structure proposed as part of redesign Option 2.

Figure 10 shows the result of the Option 2 double-circuit configuration on the magnetic field at a height of 1 m (3.28 ft) above ground. As expected, re-routing the transmission line entirely away from the Windward apartment building complex significantly reduces magnetic-field levels at the apartment complex by approximately 88% compared to the proposed (revised) configuration. Additionally, construction of the two circuits together on double-circuit monopoles would result in a decrease in magnetic-field levels along the proposed northern easement (a reduction of approximately 54% and 62% at the north and south edges of the northern easement, respectively).

At greater heights above ground at the Windward apartment building complex, the Option 2 redesign reduces the magnetic-field level by an even greater percentage. Results of the magnetic-field level

calculations *at the front edge of the building* (closest to the transmission lines) at average loading are shown in Figure 11. In this figure the magnetic-field level at every 5 ft above ground is shown for the existing configuration (orange bars), proposed (revised) configuration (blue bars), and redesigned configuration (green bars). This figure shows that magnetic-field levels from the Option 2 redesigned configuration are lower than both the existing and proposed (revised) configuration at all heights above ground. The magnetic-field levels from the Option 2 redesigned configuration are between 88% and 97% lower than the proposed (revised) configuration. The results of similar calculations at peak loading are shown in Figure 12.

To further illustrate the effect of the redesign in relocating the transmission line and constructing them on double-circuit monopoles, a two-dimensional model of magnetic-field levels (at average loading) is shown in Figure 13. The three plots show the 2-dimensional magnetic field for the existing configuration (top), proposed (revised) configuration (middle), and redesigned configuration (bottom). The model extends several hundred feet to both sides of the CT DOT corridor and from ground level up to a height of 150 ft above ground. The colors in the figure show the strength of the magnetic field on a logarithmic scale where yellow shows areas where the magnetic field is greater than 1,000 mG (i.e., only in very close proximity to the individual conductors) and the dark blue shows areas where the magnetic field is less than 1 mG.

The figure shows that at the Windward apartment building complex, the magnetic-field levels around the apartment building are qualitatively similar between the existing and proposed (revised) configurations, but are significantly lower for the redesigned configuration, where the only meaningful magnetic-field sources at the Windward apartment building complex are the existing distribution line and the underground Middletown–Norwalk transmission line.

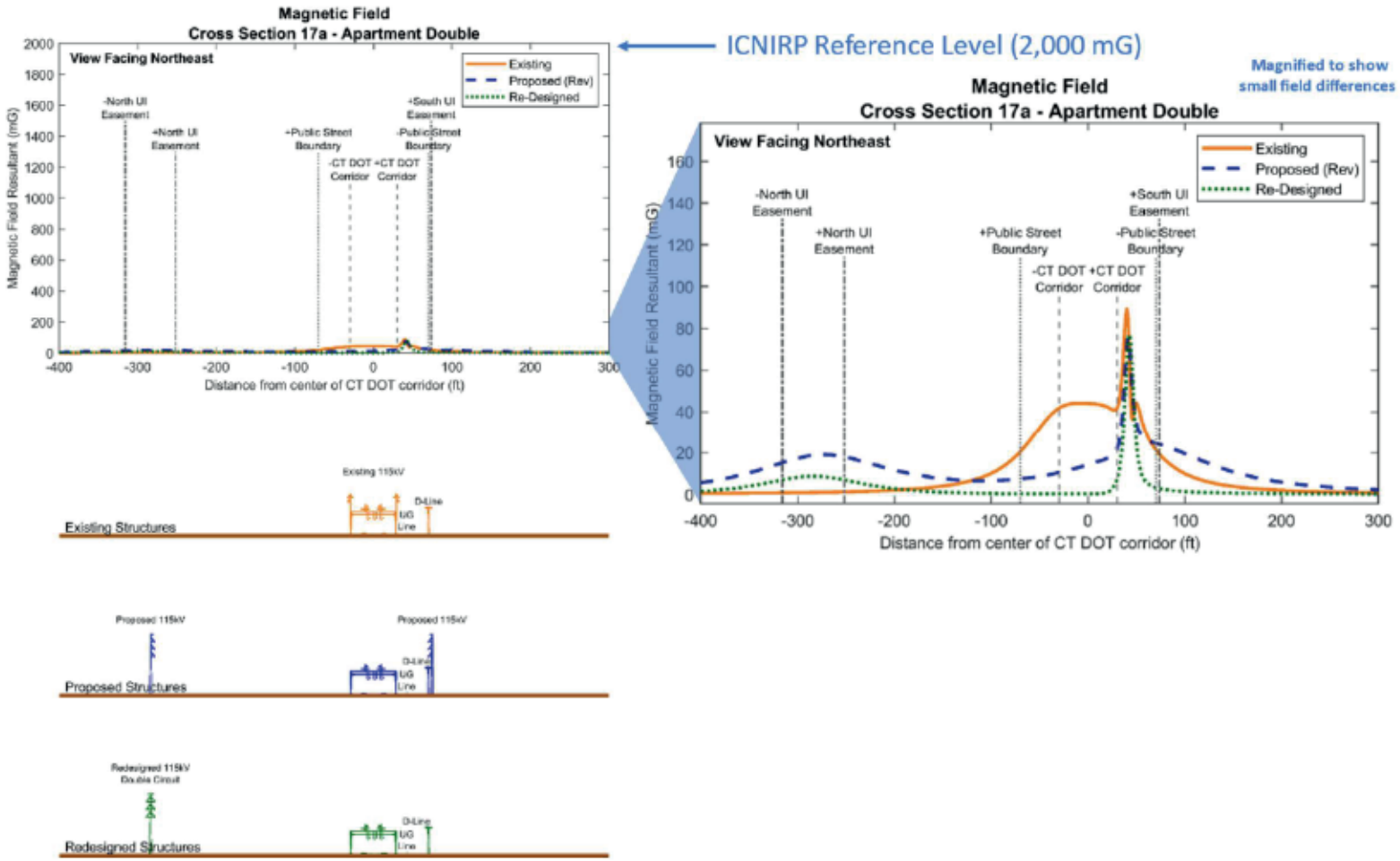


Figure 10. Magnetic field level (mG) at a height of 1 m (3.28 ft) above ground at the Windward apartment building complex in Bridgeport compared to the ICNIRP limit of 2,000 mG.

The inset on the right is a magnified scale that more clearly illustrates the differences among the existing, proposed (revised), and redesigned magnetic-field levels.

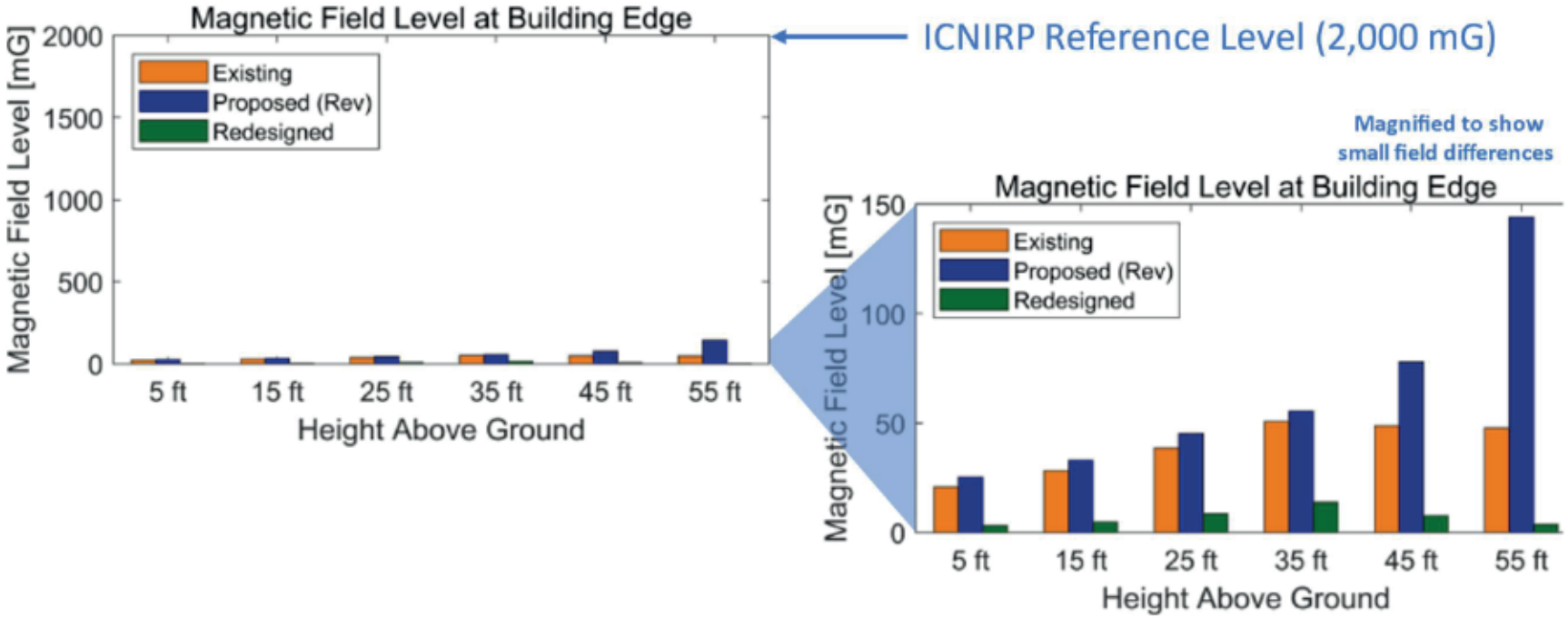


Figure 11. Magnetic-field level at <u>average</u> loading at the Windward apartment building complex near the intersection of Railroad Avenue and Park Avenue in Bridgeport compared to the ICNIRP limit of 2,000 mG.

The inset on the right is a magnified scale that more clearly illustrates the differences among existing, proposed (revised), and redesigned magnetic-field levels.

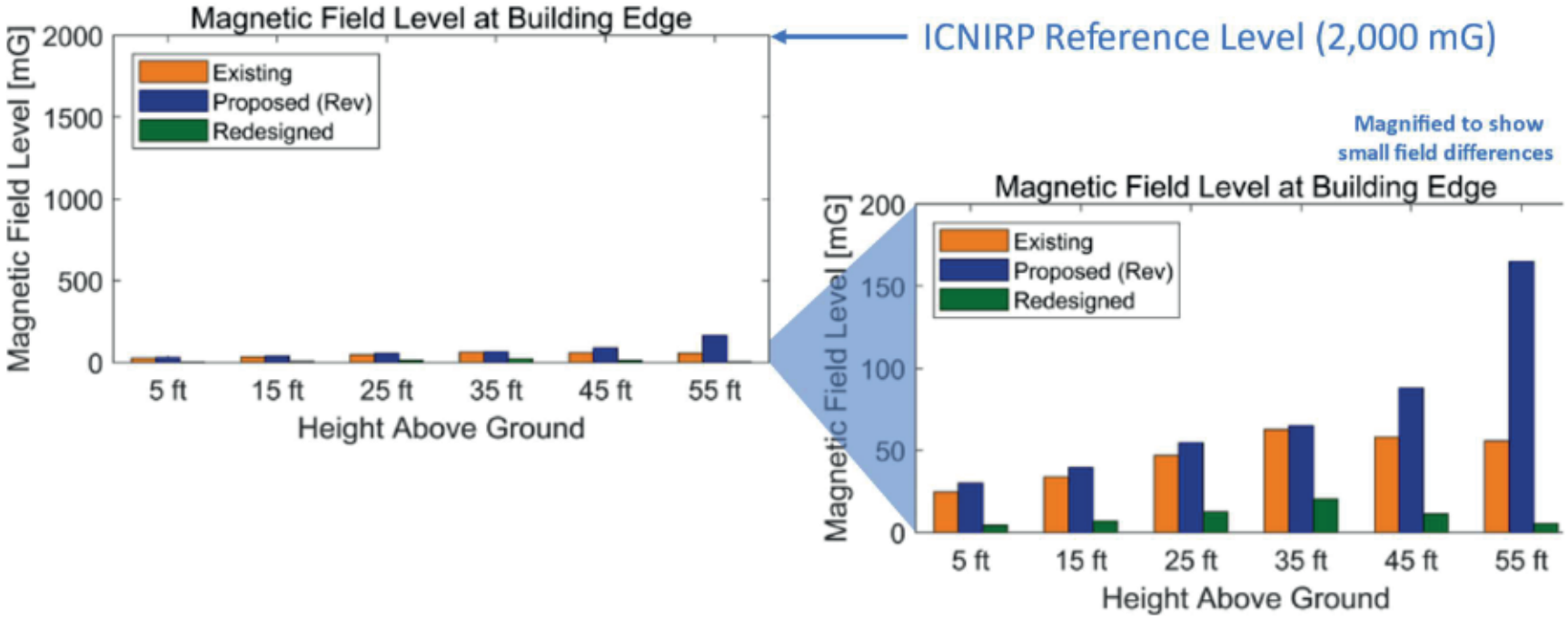


Figure 12. Magnetic-field level at peak loading at the Windward apartment building complex in Bridgeport compared to the ICNIRP limit of 2,000 mG.

The inset on the right is a magnified scale that more clearly illustrates the differences among existing, proposed (revised), and redesigned magnetic-field levels.

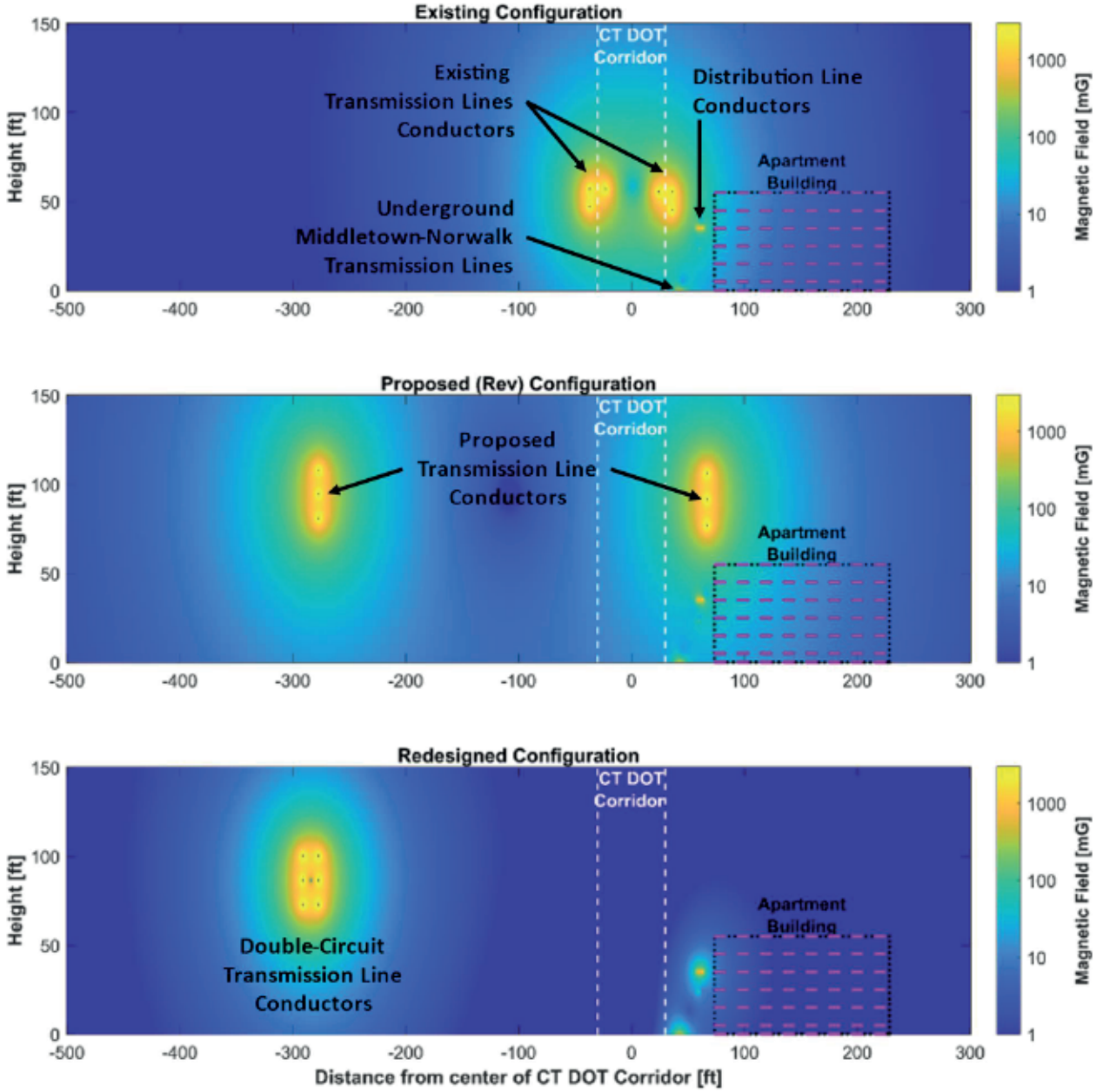


Figure 13. Two-dimensional representation of magnetic-field levels (at average loading) at the Windward apartment building complex—existing configuration (top), proposed (revised) configuration (middle) and redesigned configuration (bottom).

The CT DOT corridor is shown by vertical white lines. The strength of magnetic field is shown on a logarithmic scale with yellow (i.e., immediately around the conductors) showing values of 1,000 mG or greater and dark blue showing values of 1 mG or less. Magenta lines show the heights of 5, 15, 25, 35, 45, and 55 ft (roof) above ground.

Redesign Option 3 – Underground Duct Bank

Option 3 incorporates the CSC BMP's methods of distance and underground installation to reduce magnetic-field levels by moving Line 91001-1 to the north side of the CT DOT corridor to be constructed in an underground duct bank beneath the proposed overhead transmission line (Line 1130) on the northern easement, generally parallel to Railroad Avenue and South Frontage Road. This configuration would require a transition station at one end of the underground section as well as the additional track crossings.

No specific calculations have been performed for this option since, qualitatively, the removal of Line 91001-1 (the line currently on the south side of the CT DOT corridor) and rerouting it north of the CT DOT corridor would result in a very minimal magnetic-field levels at the Windward apartment building complex, similar to magnetic-field levels in Option 2. Magnetic-field levels along the edge of the new northern easement are anticipated to be similar to, or *somewhat* higher than, those of Option 1 because Line 1130 currently proposed to be constructed along the northern easement would not change configuration in Option 3 and the new underground Line 91001-1 would likely increase magnetic-field levels only near the center of the new UI easement, with the contribution of the new underground line at 18 ft away anticipated to be smaller than the currently-proposed overhead line.

Discussion and Summary

This report summarizes calculations of the magnetic-field levels associated with redesign configurations evaluated by UI. One of the stated goals of the CSC BMPs is to investigate low-cost features to reduce magnetic-field levels with the aim of a magnetic-field reduction of 15% or more at the edge of the ROW. These redesign configurations incorporate elements of the CSC BMPs for reducing magnetic-field levels. Each of the redesign configurations evaluated is calculated to reduce magnetic-field levels at the apartment buildings (at least at some heights above ground) by more than 15% compared to the current proposed (revised) design. A summary of those reductions is provided in Table 1.

Table 1. Summary of magnetic-field reduction at apartment buildings in Fairfield and Bridgeport

Location	Redesign Option	Reduction at 1 meter (3.28 feet) above ground	Reduction at the Roof	Estimated Cost*
79 Unquowa Place in Fairfield	Option 1†	30%	47%	$36,000
Windward Apartment Building Complex in Bridgeport	Option 1‡	9%	27%	$31,000
	Option 2§	88%	97%	$7,480,000
	Option 3¶	Similar to Option 2	Similar to Option 2	$41,765,000

* Estimated cost provided by UI.
† Increase the minimum conductor height to from 75 ft-2 in. to 84 ft-5 in., and decrease the phase spacing from 14 ft to 12 ft.
‡ Increase the minimum conductor height to from 75 ft-2 in. to 80 ft-2 in.
§ Reroute the transmission line in a double-circuit configuration north of the CT DOT Corridor.
¶ Install the transmission line in an underground duct bank north of CT DOT Corridor.

It is important to note that before and after the Project, whether incorporating these redesign configurations or not, all magnetic-field levels at the apartment buildings are calculated to be far below guideline levels established by ICNIRP (2,000 mG) or ICES (9,040 mG).[9]

[9] International Commission on Non-Ionizing Radiation PI. 2010. ICNIRP Statement - Guidelines for Limiting Exposure to Electromagnetic Fields (1 Hz to 100 kHz). Health Phys 99:818-836; International Committee on Electromagnetic Safety (ICES). 2019. IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 300 GHz. IEEE Std C95.1-2019 (Revision of IEEE Std C95.1-2005/Incorporates IEEE Std C95.1-2019/Cor 1-2019). New York: IEEE.

Notice

At the request of UI, Exponent modeled magnetic fields associated with the rebuild of 115-kV transmission lines that extends within the CT DOT corridor from catenary structure B648S in the Town of Fairfield east to UI's Congress Street Substation in the City of Bridgeport, in Fairfield County, Connecticut. This report summarizes revised work to date and presents the findings resulting from that work related to alternative design options of the rebuilt line on the south side of the CT DOT corridor at an apartment building in Fairfield and one in Bridgeport.

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 report 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 report, and any re-use of this report 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.