STATE OF CONNECTICUT

SITING COUNCIL

The Connecticut Light and Power Company application for a Certificate of Environmental Compatibility and Public Need for the Manchester Substation to Meekville Junction Circuit Separation Project in Manchester, Connecticut.	DOCKET NO. 370A April 7, 2010

PETITION OF THE CONNECTICUT LIGHT AND POWER COMPANY FOR RECONSIDERATION OF THE DENIAL OF A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE MANCHESTER TO MEEKVILLE JUNCTION CIRCUIT SEPARATION PROJECT

I. PETITION:

Pursuant to Section 4-181a(a)(1)(B) and (C) of the General Statutes, the Applicant in the above proceeding, The Connecticut Light and Power Company ("CL&P"), petitions the Connecticut Siting Council ("Council") to reconsider its denial "without prejudice" of a certificate of environmental compatibility and public need ("Certificate") for the Manchester to Meekville Circuit Junction Separation Project ("MMP") and to grant the specific further relief requested herein.

Please note that CL&P is **not** seeking reconsideration of any aspect of the Council's Decision and Order issuing a Certificate for the Connecticut portion of the Greater Springfield Reliability Project.

II. FACTS:

On October 20, 2008, CL&P applied to the Council for a Certificate for the Connecticut portion of the GSRP and for a Certificate for the MMP. On March 16, 2010, the Council voted to issue a Certificate for the Connecticut portion of the GSRP. (Docket 370; Opinion, Decision and Order - Greater Springfield Reliability Project). At the same time, the Council found that the MMP was needed in order to prevent overloads on Connecticut transmission facilities that could otherwise result from the power flows enabled by the GSRP. (*See,* Docket 370, Findings of Fact ¶¶ 43, 45, 47, 318, 319; Opinion - Manchester to Meekville Circuit Separation Project, at 1- 3.) The Council's Finding of Facts, Opinion, and Decision and Order denying the application for the MMP without prejudice were mailed to the service list on March 24, 2010.

In the course of the evidentiary hearings preceding that action, Council Member Ashton identified the MMP-V as a potential improvement to the MMP, and the Council received evidence concerning the comparative benefits and costs of these two alternate sets of transmission improvements. *See,* Tr. 7/21/09 at 172-178 (Scarfone); Tr. 7/22/09 at 114, 115 (Scarfone); Tr. 7/29/09, at 223 -238 (Carberry, Case, Mango, Scarfone); Tr. 10/27/09 at 168, 169 (Mezzanotte); Tr. 10/28/09 at 233-241 (Mezzanotte, Kowalski); *CL&P Ex. 26,* Preliminary MMP-V Analysis (inc. CEII Appendix); *CL&P Ex. 43,* Response to Q-CSC-001 - 004; *ISO-NE Ex. 6,* Response to Additional CSC Interrogatories CSC 1-4.)

However, due to the advanced state of the proceeding at the time the MMP-V was first identified as a potential alternative to the MMP, the Council did not have before it the full range of comparative information that it wished to have with respect to the MMP-

V when its decision was due. *See,* Decision and Order - Manchester to Meekville Circuit Separation Project, March 16, 2010, at 1. Indeed, the Council first identified some of the additional information that it wished to consider during its deliberations (*see,* Memorandum from Council Member Ashton dated February 5, 2010, distributed to the service list on February 18, 2010 ("Memo")); and it first identified other such information in its MMP Opinion.

With this petition, CL&P submits the additional information sought by the Council. The following table identifies the information requested by the Council, and where it is to be found in this submittal:

Information Requested	**Reference for Request**	**Information Provided**
"Confirmation of reliability benefits" including effect on transfer capability and stability	Opinion at 5; Memo at 2	Pre-filed Testimony of Allen Scarfone and Timothy Laskowski.
Clarification and details of additional MMP-V cost	Opinion at 3,5	Pre-filed Testimony of John Case
Further discussion of ISO-NE's approach to MMP-V in terms of cost allocation	Opinion at 5	Pre-filed Testimony of Allen Scarfone and Timothy Laskowski
Potential additional environmental impact of MMP-V including effects on: • Wetlands and watercourses • Wildlife • Habitat and vegetation • Visual resources • Historic and cultural resources	Opinion at 3-5	Pre-filed Testimony of Donald Biondi and Louise Mango.
Effect on EMF levels	Opinion at 5	Pre-filed Testimony of Robert E. Carberry Concerning Magnetic Fields

In addition, CL&P submits the Testimony of Robert E. Carberry Concerning Relief Upon Reconsideration of the MMP and MMP-V. In this testimony, Mr. Carberry explains the need for expedited action on this petition in order to avoid the risk of significant and costly project delay, particularly in the event that the Council should determine to issue a Certificate for the MMP-V rather than the MMP.

III. LEGAL AUTHORITY FOR RECONSIDERATION:

The requested reconsideration is warranted because additional evidence with respect to the comparable costs and benefits of the MMP and MMP-V, which was not available at the time of the Council's decision, has since been developed; and because, as the Council has recognized in its Findings of Fact in this Docket, there is an urgent need to effect the circuit separation proposed by the MMP, in order to support the Greater Springfield Reliability Project ("GSRP"), whether in the configuration originally proposed by CL&P (the MMP) or in the variant form identified by the Siting Council (the MMP-V). This need will not be addressed unless the Council grants the requested reconsideration. Accordingly, there are two independently sufficient grounds for the requested reconsideration: "[N]ew evidence has been discovered which materially affects the merits of the case and which for good reason was not presented in the agency proceeding (Conn. Gen. Stats. §4-181a(a)(1)(B)); and there is "other good cause for reconsideration." (Conn. Gen. Stats. §4-181a(a)(1)(C)).

IV. RELIEF REQUESTED:

CL&P respectfully requests that the Council: (1) open Docket 370 for the limited purpose of reconsidering CL&P's application for a Certificate of Environmental Compatibility and Public Need for the MMP; (2) promptly consider the comparative costs and benefits of the MMP and MMP-V; and (3) issue a Certificate for either the MMP or the MMP-V.

Respectfully submitted,

THE CONNECTICUT LIGHT AND POWER COMPANY

By: _____

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CERTIFICATION

This is to certify that a copy of the foregoing Petition for Reconsideration, together with the attached supporting testimony and exhibits, has been served on this 7th day of April, 2010 upon all parties and intervenors as referenced in the Connecticut Siting Council's Service List dated November 13, 2009.

Anthony M. Fitzgerald

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DIRECT TESTIMONY OF ROBERT E. CARBERRY

CONCERNING RELIEF REQUESTED UPON RECONSIDERATION OF THE MMP AND MMP-V

Q. Mr. Carberry, what action is The Connecticut Light and Power Company (CL&P) requesting in this proceeding on reconsideration?

A. CL&P's most pressing concern at this time is for prompt action by the Council in issuing a Certificate of Environmental Compatibility and Public Need ("Certificate") for either the Manchester to Meekville Junction Circuit Separation Project (the "MMP"), as originally proposed by CL&P; or for the potential variation of this project identified by the Council during the previous proceedings on Docket 370 (the "MMP-V").

Q. Why is CL&P concerned about the timing of the Council's decision on reconsideration of the MMP?

A. CL&P is concerned because any delay in this determination has the potential to cause significant and costly project delay of the entire Greater Springfield

Reliability Project ("GSRP") - in both Connecticut and Massachusetts, as well as delay in the construction of the MMP or MMP-V.

Q. Please explain why these proceedings to reconsider the Council's ruling on the MMP could delay the entire GSRP.

A. As the Council is aware, in order to build the Greater Springfield Reliability Project ("GSRP") and the MMP (or MMP-V), in addition to the requisite approvals from the Council and the Massachusetts Energy Facilities Siting Board ("EFSB"), CL&P must obtain environmental permits from the Connecticut Department of Environmental Protection ("CTDEP"), the Massachusetts Department of Environmental Protection ("MADEP"), and the United States Army Corps of Engineers ("USACE"). Indeed, Condition 7 of the Council's Decision and Order approving the GSRP provides:

> The Certificate Holder shall obtain necessary permits from the United States Army Corps of Engineers and the Connecticut Department of Environmental Protection prior to the commencement of construction.

In June, 2009, CL&P applied to the USACE for an Individual Permit required pursuant to Section 10 of the Rivers and Harbor Act and Section 404 of the Federal Clean Water Act. Because of the USACE's requirement that a single permit application be made for what it defines as a "single and complete project," the Section 10/404 permit application was necessarily filed jointly by CL&P and by Western Massachusetts Electric Company, and seeks a single permit for both the Massachusetts and Connecticut portions of GSRP and the MMP.

As a predicate to the issuance of a Section 404 permit by the USACE, CL&P and WMECO must first obtain water quality certifications pursuant to Section 401 of the

federal Clean Water Act from each of MADEP and CTDEP. CL&P filed its Section 401 application with CTDEP in June, 2009, essentially contemporaneously with its Section 10/404 application to the USACE.

CL&P and WMECO have been diligently prosecuting their environmental permit applications, with the objective of obtaining the Section 10/404 permit from the USACE in October of 2010, so as to be able to begin construction on November 15, 2010. In order to achieve this schedule, CL&P is seeking to obtain a section 401 water quality certificate from CTDEP in July, 2010. CL&P expected to be able to provide CTDEP with the final configuration of the Connecticut facilities and an analysis of their effects in May, 2010, which would have enabled CTDEP to complete its review by July. However, CL&P will now not be able to provide this information until the Council determines the final configuration of the Manchester to Meekville project. Moreover, since CL&P has based its Section 10/404 and 401 water quality certificate applications and impact analyses on the assumption that the MMP would be constructed, the Council's approval of the MMP-V would require the submittal of an amendment to its section 401 application to CTDEP; and such an amendment would require additional review and processing time on the part of the CTDEP. We estimate that this delay will likely mean a delay in the start of construction of the project beyond the currently scheduled date of November 15, 2010 unless the Council can enter its order in this supplemental proceeding by mid June, 2010.

Q. What would the consequences of delay of the start of construction be?

Of course, delay in the start of construction could delay the in-service date of the GSRP, which is needed even with today's loads. In addition, there would be significant

financial consequences. The very significant investment that has already been made and will be made in the project before the start of actual construction results in a monthly charge recovered through rates as an Allowance for Funds Used During Construction ("AFUDC"). The more the period of construction is stretched out, the higher these accumulated charges will be. At present, the AFUDC charge for GSRP and MMP is approximately $750,000 per month.

Q. Since the USACE permit requires a section 401 Water Quality Certificate from the MADEP as well as one from CTDEP, and the Massachusetts Energy Facilities Siting Board has not yet issued a ruling on the Massachusetts portion of GSRP, isn't the Massachusetts siting approval, rather than the approval of the MMP or MMP-V the critical path to the environmental permitting?

A. The final Massachusetts and Connecticut siting approvals are equally critical at this point. WMECO is expecting final siting approval of the Massachusetts facilities in August, 2010. If the configuration of the Massachusetts facilities approved then does not substantially vary from that which has been submitted to the MADEP and the USACE, WMECO and CL&P expect to be able to obtain the required environmental permits in time to support the November 15, 2010 construction start date. Of course, if the EFSB were to require a substantially different configuration than that previously submitted to the environmental permitting authorities (such as by selecting the Southern Route Alternative over the proposed Northern Route) substantial delay could result. However, WMECO and CL&P are not planning on such a delay, but rather must assume that the Massachusetts proceedings will conclude on the schedule currently envisioned.

In order to avoid delay to that schedule, a decision from the Council on the MMP/MMP-V by mid June is required.

Q. Why is a final siting decision on the MMP/MMP-V needed in mid June in order to keep the environmental permitting for the Connecticut facilities on the same schedule as that of the Massachusetts facilities, if the final siting approval for the Massachusetts facilities is not expected until August?

A. The Massachusetts and Connecticut DEP's have different procedures for processing permit applications. The Connecticut process includes a provision for a notice of a tentative decision, which has the effect of increasing the minimum time in which a permit can be issued after the agency has completed its environmental impact analysis based on a final project configuration.

Q. In his Memorandum of February 5, 2010 addressed to the other Council Members, in which he recommended that the MMP be denied without prejudice, Mr. Ashton stated that "there is no material coupling between the GSRP and MMP projects" and that "both can proceed independently of each other since they are physically and electrically separate." Was this a correct assumption?

A. No. It is certainly correct that the projects are physically and electrically separate, and that they could be constructed on independent schedules consistent with their siting approvals. However, as described above, the MMP and the GSRP are coupled because they require the same environmental permit. In addition, in order to energize the GSRP, the MMP or MMP-V will have to be ready to be energized as well; and if the MMP-V is selected, it will probably be necessary to get a new I.3.9 approval for it from ISO-NE. That review and approval process could take a few months.

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DIRECT TESTIMONY OF JOHN C. CASE

Q. Mr. Case, please describe where construction would be required to build the variation of the Manchester to Meekville Junction Circuit Separation Project identified by the Council (MMP-V), in addition to that which would be required in any event for the basic project initially proposed by CL&P (the "MMP").

A. The simplest way to do this is to start by describing the construction that is common to both configurations. The MMP is illustrated in the drawing provided as Exhibit 1 to this testimony, which is reproduced from page E-10 of CL&P's Application in this Docket. The green line shows proposed new construction, identified on the drawing as "115-kV improvements." The MMP calls for this 115-kV line segment to be constructed with conductors, spacings, and insulation suitable for 345-kV operation, so that it could be operated as a segment of 345-kV line in the future. You will note that this new construction starts just north of Manchester Substation. (In fact, the new line construction would be outside the substation fence but on the substation property.) And

the new construction ends just before the ROW makes a sharp turn to the West, before branching into two ROWs, one proceeding North and the other continuing West. We commonly refer to this short section of ROW that extends East to West before the lines separate as "Meekville Junction[1].." Adjacent to where the green line on Exhibit 1 represents new construction, the existing 345-kV circuit and one existing 115-kV circuit currently share double-circuit towers. At the end points these circuits are already on separate structures and require no work under MMP .

The same new construction proposed for the MMP would be built as part of the MMP-V. In addition, the MMP-V would require new construction at each end of the proposed MMP construction, so as to complete a new 345-kV line segment all the way from Manchester Substation to the western end of Meekville Junction.

Q. What additional construction does the MMP-V propose to the south of the MMP construction?

A. At the south end of the proposed MMP, the additional construction to complete MMP-V would consist of four new 345-kV line spans to Manchester Substation, the removal of two existing structures, and construction within the substation to accommodate a new 345-kV circuit position. The new substation facilities would include a new dedicated 345-kV line terminal structure and associated equipment (line and breaker disconnect switches, 345-kV circuit breaker, CCVTs , wave trap and associated wiring and control equipment); and the relocation of the existing 395 line terminal to the newly completed line position. The new 345-kV circuit would then be

[1] As used here, "Meekville Junction" is a geographic term. Electrically, the junction point is at Structure 20020, where the ROW turns west, two structures east of the green dot on Exhibit 1.

connected to the existing 395 line terminal in the 345-kV switchyard. The location of the new substation additions and the new line connections that would be required would be located within the existing fenceline of the substation.

In addition to the Substation work, there would be additional line structures required in order to complete the 345-kV connections into the substation. The work required at the substation for MMP-V is shown on Exhibit 2 to this testimony, entitled Manchester to Meekville Junction Circuit Separation Project, Mapsheet 1 of 2.

Q. What additional construction does the MMP-V propose north of the point where the new line construction proposed by MMP would terminate?

A. At the north end of the proposed MMP, the additional construction would include an additional 345-kV line segment for a distance of 0.4[2] miles ending about 400 feet past Meekville Junction (at structure 20027), together with the removal of some existing 115-kV line structures. To make room for the new 345-kV line segment, it would be necessary to move two spans (structures 6278 to 6275) of an existing double-circuit 115-kV line to the west within the ROW. The location of this work is illustrated on Exhibit 3,, entitled Manchester to Meekville Junction Circuit Separation Project, Mapsheet 2 of 2

[2] In the Application and prior testimony, we described the MMP as occupying approximately 2.2 miles of the 2.6-mile ROW between Manchester Substation and Meekville Jct. However, the MMP-V would actually require construction on an extra 0.5 miles of ROW - approximately 0.1 miles from the terminal structure at Manchester Substation to structure 20001; and approximately 0.4 miles from the end of the MMP segment at 115-kV structure 10008 to 345-kV structure 20027, which is about 400 feet past the westerly end of Meekville Junction.

Q. What facilities will be on the right-of-way when construction is complete?

A. If the Council were to approve the MMP, the facilities on the 2.2-mile section of ROW where construction is proposed would be those shown on XS-21 in Volume 10 of the Application. As this drawing illustrates, a new line of steel monopole structures, typically 155 feet high, would be built for a vertically configured line in a position in between two existing lattice-tower lines supporting existing transmission circuits. As illustrated on Exhibit 4 (Cross Section drawing XS-21-MMP), if the MMP-V were built, the physical facilities on this 2.2-mile section of ROW would be identical to those shown on XS-21. However, the circuit supported by the new monopole structures would be operated at 345 kV, and the 115-kV circuit segment that under MMP was to be removed from the easterly lattice tower line would remain there.

In addition, if the MMP-V were built, the new line of monopole structures would be extended along the 0.5 mile section of ROW from the endpoint of XS-21 to the west end of Meekville Junction. However, this section of ROW would have a somewhat different appearance than XS-21, because it is typically wider than the XS-21 ROW, and does not have a distribution line on it, as the southern portion of XS-21 does. Exhibit 5 is a cross section (XS-22-MMP) showing the east-west section of ROW after completion of the MMP-V.

Q. In the previous proceedings in this Docket, CL&P estimated that the incremental capital cost of the MMP-V, as opposed to the MMP, would be approximately $10.5 million. Have you reconsidered that estimate?

A. Yes, I did. I have since done a more detailed estimate, which is somewhat lower - $9,250,000. A summary of that estimate is attached as Appendix A.

Q. In their pre-filed testimony in this proceeding on reconsideration, Mr. Scarfone and Mr. Laskowski refer to 345-kV capacitor banks that are currently planned to be installed at the Ludlow Substation and say that if the MMP-V were built rather than the MMP, the additional voltage support that the MMP-V would provide would likely make it unnecessary to install these capacitors. What is the estimated cost of those capacitors?

A. Approximately $10 million.

Q. So if the construction of the MMP-V dispensed with the need for the capacitors at the Ludlow Substation, its cost would be largely offset by the savings from eliminating capacitors?

A. Yes, that could well be the case.

Manchester to Meekville Jct. - 345-kV Energization Variation (MMP-V)
2.7 Mile Transmission Line and Substation Modifications required.

Overhead Line Activity	MMP Rev 0	MMP-V ADD'L	Comments for Increase
Clearing and Access Roads	$ 3,076,099	$ 500,000	8 additional acres of clearing/restoration, and 0.4 miles of roads and matting
Structures and Foundation	$ 6,345,934	$ 3,220,000	9 additional structures - 6 x 345-kV and 3 x 115-kV steel poles
Conductor and Shield Wire/OPGW	$ 1,196,333	$ 310,000	0.5 miles additional conductor, shield wire, optical ground wire and hardware
Engineering, Prog Mgmt and Const Mgmt	$ 1,187,741	$ 410,000	Allocated as a portion of the increase in construction costs at same rate as original estimate
Removals	$ -	$ 70,000	2 additional structure removals required.
Distribution	$ 1,259,040	$ -	
NU Labor	$ 663,716	$ 240,000	
Subtotal Overhead	**$ 13,728,863**	**$ 4,750,000**	

Substation Activity	MMP Rev 0	MMP-V ADD'L	Comments for Increase
Civil -Site Work, ductbank, foundations		$ 550,000	No substation work anticipated for MMP.
Major Equipment (breakers, switches, CCVT..)		$ 1,120,000	
Steel structures (terminal, bus supports...)		$ 400,000	
Bus work, conductors, insulators		$ 260,000	
Electrical Contractor (wiring, grounding)		$ 110,000	
relay equipment (Manchester & remote)		$ 500,000	
Removals		$ 110,000	
Field Testing/Commissioning		$ 570,000	
Engineering, Prog Mgmt and Const Mgmt		$ 660,000	
NU Labor		$ 220,000	
Subtotal Substation		**$ 4,500,000**	
Total Additional Cost for MMP-V		**$ 9,250,000**	

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DIRECT TESTIMONY OF ALLEN W. SCARFONE AND TIMOTHY F. LASKOWSKI

CONCERNING THE RECONSIDERATION OF THE MANCHESTER SUBSTATION TO MEEKVILLE JUNCTION CIRCUIT SEPARATION PROJECT

Q. Mr. Scarfone, please summarize the testimony and evidence that you provided previously in this Docket concerning the comparative system benefits of the Manchester Substation to Meekville Junction Circuit Separation Project ("MMP") as originally proposed by The Connecticut Light and Power Company ("CL&P") and the variation of that proposal identified by the Council that has been given the designation "MMP-V."

A. In the main proceeding on this Docket, I developed a preliminary analysis of the system benefits of the MMP-V (*CL&P Ex. 26)*; provided answers to written interrogatories on this subject (*CL&P Ex. 43);* and answered questions in live testimony concerning the comparative benefits of the two configurations. (*See,* Tr. 7/21/09 at 172-178' Tr. 7/22/09 at 115, 115; Tr. 7/29/09, at 223-228) My conclusions at that time were:

A) Power-flow simulations did not indicate that the MMP-V is needed to comply with applicable reliability standards and criteria by eliminating simulated overloads or voltage violations.

B) However:

- In general, 2-terminal lines are preferred to 3-terminal lines because it is more challenging to design system protection that is reliable under fault conditions for three-terminal lines, and because a fault on a three-terminal line will entail the loss of a circuit connection at three, rather than two terminals. The elimination of a 3-terminal line by the creation of two 2-terminal lines represents an improvement of the system.

- In this case, the elimination of a 3-terminal 345-kV line would result in two independent 345-kV circuits, which would be mostly (between the Ludlow and Manchester Substations) on diverse rights-of-way. This configuration would provide robust support to both substations that the MMP would not provide.

- Establishing a new 345-kV connection between the North Bloomfield and Manchester Substations would reduce power flow on the 115-kV network between those substations following N-1 and N-1-1 contingency events.

- As compared to the MMP, the MMP-V is a more robust solution which provides greater operating flexibility especially during maintenance periods and following N-1 and N-1-1 contingency events.

- The long-term expansion plans for Connecticut include the construction of 345-kV loops to enhance system reliability. This is a general transmission planning philosophy used throughout New England. This approach is inconsistent with the construction of any new 345-kV 3-terminal bulk-power circuits for long-term reliability purposes; and consistent with the removal of existing 3-terminal circuits that limit power transfers and hinder more efficient operation of the bulk power network.

- The MMP-V might modestly increase the Connecticut import capability. Although ISO-NE had not performed the detailed studies required to assess the impact of these improvements on transfer capacity, preliminary analyses performed by CL&P and by ISO-NE indicated that the import capability may be increased by between 20 and 120 MW.

- If the GSRP were built as proposed, there would be two 345-kV connections between Connecticut and western Massachusetts. If the Barbour Hill-North Bloomfield-Manchester 395 circuit were to trip, the single connection to Manchester from Barbour Hill and North Bloomfield would be interrupted, thus defeating one of the benefits of having a looped system.

- CL&P plans to eliminate this condition by the construction of the Central Connecticut Reliability Project (CCRP), a future NEEWS project. If the CCRP does not go forward, CL&P would be required to formulate another plan, which could very likely be the construction proposed by the MMP-V.

- ISO-NE is currently re-evaluating the need for and the timing of the CCRP, in light of developments since the Needs Report was completed.

C) Notwithstanding the greater system benefits of the MMP-V, because the power flow simulations did not demonstrate that it was needed to eliminate criteria violations, its estimated $10 million excess cost, as compared to that of the MMP, was not likely to be regionalized, in which case Connecticut load would be responsible for 100% of the excess cost, rather than approximately 27%.

Q. Since you learned of the Council's deliberations concerning the MMP and the MMP-V, what additional work have you and your colleagues in the NUSCO Planning Department done to further evaluate the MMP-V in comparison to the MMP?

A. We have carefully reviewed the Memorandum from Mr. Ashton dated February 5, 2010 that was addressed to the other Council members and distributed to the service list on February 18, 2010 (Ashton Memo); we reviewed the various draft Opinions concerning the MMP and, of course, the final Opinion and Decision and Order; and in accordance with our understanding of those documents, we:

- Performed additional power-flow analyses to test and confirm the conclusions based on the preliminary analysis that appears in the record as *CL&P Ex. 26;*

- Performed a transfer analysis in order to estimate the probable incremental effect on the Connecticut import capability of constructing the MMP-V rather than the MMP;

- Performed system stability analyses;

- Performed short-circuit studies; and

- Further considered the prospects for obtaining regional cost treatment for the MMP-V.

Q. Let me call your attention to Mr. Ashton's Memorandum of February 25, 2010, and, in particular, to his evaluation in that document of the comparative system benefits of the MMP and the MMP-V. Would you please comment on that evaluation?

A. In general, it is similar to my own evaluation, which is summarized above. However, there are a few aspects of the Ashton Memorandum that I think are questionable or which the detailed studies do not support.

Q. Please identify the statements concerning system benefits in that Memorandum that you question or that you believe are not supported by your work.

A. In the fourth paragraph on page 1 of the Memo, it is said that an outage on the three terminal circuit between Manchester, North Bloomfield, and Barbour Hill "disconnects all three substations." Although I am sure Mr. Ashton did not mean it this way, this statement could be thought to mean that an interruption of the circuit would result in outages at all three substations. In fact, although all three 345-kV line terminals would be disconnected, the three substations would not be disconnected from the grid and would remain in service by means of other 345-kV connections. The North Bloomfield Substation would be served from Agawam and Barbour Hill Substation from the Ludlow Substation. The Manchester Substation would be served by 345-kV transmission circuits from the Card, Millstone and Scovill Rock Substations.

The last paragraph on page 1 of the Memo states (with respect to the MMP):

> For any fault on the Manchester-North Bloomfield-Barbour Hill ("MVBBH") 345kV line, the entire 345kV Connecticut-New England interface is disrupted except for the 345kV Killingly-Rhode Island line and some 115kV weak interconnections. (original emphasis)

I believe that this overstates the case. The Connecticut Import interface has tie-lines to Rhode Island, Massachusetts and New York. So the 345-kV connections would not be entirely interrupted. In this circumstance, Connecticut would still maintain a 345-kV connection to Rhode Island via the Killingly – Sherman Road 347 circuit and a 345-kV connection to New York at the Long Mountain Switching Station; and would still maintain 345-kV connections into Barbour Hill from Ludlow and into North Bloomfield from Agawam.

That same last paragraph on page 1 goes on to say:

> If one goes a step further and postulates a second contingency (such as loss of the Killingly-Rhode Island 345kV line) the entire New England system may well be in jeopardy.

To prepare for this second contingency, operators would reduce the Connecticut import after the first contingency occurred, so as to avoid any such "jeopardy" to the New England system. The studies previously provided in the CEII Appendix to CL&P Ex. 26 assume that operator action and show that the system remains intact under the assumptions made for generation availabilities.

However, I do share Mr. Ashton's general concern that the loss of two of the three 345-kV circuits that provide major bulk power connections between Connecticut and neighboring electric systems could leave the Connecticut system vulnerable to other, unforeseen system conditions.

Q. Please describe the additional thermal power flow analyses that you performed.

A. We repeated the testing for the thermal criteria violations reported in its preliminary analysis of the system benefits of the MMP-V (*CL&P Ex. 26),* with additional cases. This testing confirmed the previously reported results. The MMP-V does not resolve any thermal reliability criteria violations for the system conditions modeled that are not also resolved by the MMP. However, establishing a new 345-kV connection with the MMP-V between the North Bloomfield and Manchester Substations reduces power flow on the 115-kV network between these substations following N-1 and N-1-1 contingency events.

Q. Please describe the additional voltage analyses that you performed.

A. We repeated the testing for voltage criteria violations previously reported in CL&P Ex. 26, and in addition performed a more extensive analysis of voltage levels with N-1-1 contingency events. This testing produced significant new information. With a transmission topology that includes the MMP, but not the two 345-kV capacitor banks presently proposed for the Ludlow Substation, system voltages on the bulk power 345-kV system for N-1-1 contingency events fall below acceptable levels. However, with the MMP-V, system voltages do not violate the 345-kV low level limit. Thus, the cost of building the MMP-V could likely be offset by a saving of the cost of the Ludlow capacitor banks. This would be true unless it were determined in the future that both the Ludlow capacitor banks and the MMP-V were desirable in order to support higher New England East-West and Connecticut Import interface transfer levels.

Q. Mr. Laskowski, have you performed a transfer analysis to determine the incremental improvement to the Connecticut import capability that would be provided by the MMP-V?

A. Yes, I have.

Q. Please describe that study and its results.

A. As we have previously testified, only ISO-NE can do authoritative transfer analyses to establish firm transfer limits. Any studies that Transmission Owners do can only try to predict what ISO's results will be. As I testified in the previous proceedings in this Docket, I performed a transfer analysis that concluded that the GSRP and MMP, without the benefit of the other Connecticut NEEWS projects, would increase the Connecticut import capability by approximately 200 MW - 300 MW for N-1 conditions, and by approximately 200 to 300 MW for N-1-1 conditions. More recently, I performed a transfer analysis to a similar level of detail to determine the incremental improvement that would be provided by the MMP-V. I used the same assumptions and methodology that I had used in the previous study, but changed the transmission topology in the model to reflect the construction of the MMP-V. The results showed only a small increase in the N-1 Connecticut Import transfer limit capability - approximately 25 MW. With respect to N-1-1 conditions, for almost all line out simulations there was a negligible improvement in the Connecticut Import interface transfer limit capability. The single exception was that with any portion of the 345-kV Barbour Hill-Manchester-North Bloomfield 395 circuit out initially, there is an increase of more than 150 MW in this limit. Thus, overall, the MMP-V does not provide a significant incremental improvement in the Connecticut Import interface capability.

Q. How do you explain these results?

A. The small N-1 Connecticut Import interface increase of MMP-V is attributable to the fact that power flowing to southwestern Connecticut now has a lower impedance independent path from Ludlow to Agawam to North Bloomfield to Manchester. With MMP the flow from North Bloomfield to Manchester has to share the same 345-kV circuit from Meekville Junction down to Manchester. An analogy of this is having two roads between Ludlow and Manchester versus having two roads only part of the way. Yes for awhile all cars can merge and take the single road but eventually the road will get congested. With this lower impedance path of MMP-V, the flow is diverted away from the 115-kV lines out of North Bloomfield which are limiting the amount of flow into Connecticut on to the 345-kV to Manchester and further south.

When one takes the 395 line out with MMP, this again forces flow onto the 115-kV system at North Bloomfield. With MMP-V, taking either of the newly created 345-kV lines out still leaves a 345-kV path to Manchester away from the limiting 115-kV system at North Bloomfield. It is this initial base case with the first line out that causes the large N-1-1 increase in Connecticut Import with MMP-V for this 395 out analysis.

For all the other N-1-1 analysis, the 115-kV exiting North Bloomfield does not limit the Connecticut import so the two alternatives showed a negligible difference.

Q. Mr. Scarfone, please describe the stability study that was done recently under your supervision and its results.

A. Three-phase normally cleared faults (normal contingencies), single-line-to-ground faults with delayed clearing due to a stuck circuit-breaker (normal contingencies), and three-phase

faults with delayed clearing (extreme contingencies) were tested to monitor system dynamic performance. The results of these stability studies indicate that there is no appreciable difference is system dynamic performance between MMP and MMP-V.

Q. What were the results of the short-circuit analyses that you performed?

A. We performed short circuit tests for each of the MMP and MMP-V. There were no criteria violations with either configuration.

Q. Mr. Scarfone, you said earlier in your testimony that you have given further consideration to the prospects for obtaining regional cost treatment for the entire cost of the MMP-V. Please share those thoughts with the Council.

A. I believe that both the ISO-NE witnesses and I testified previously that, if the MMP-V was not shown to be required to eliminate criteria violations, its incremental cost was highly unlikely to be regionalized. The additional tests demonstrating that the MMP-V could eliminate voltage violations that would otherwise require installation of the Ludlow capacitor banks now might make the project eligible for regionalization.

In addition, after speaking with Transmission Operations staff, we believe MMP-V will allow the 345-kV 395 circuit to be taken out of service for maintenance under a much wider range of system conditions while minimizing the potential for causing congestion and operating complexity. Transmission Operations has indicated that maintenance requests for the existing 345-kV 395 circuit have previously been rejected by operations due to reliability concerns and thus maintenance requests need to be more closely coordinated with generation outages in Connecticut and transmission outages in neighboring electric systems. The expanded window of

opportunity that MMP-V provides for scheduling and performing maintenance provides a system benefit that could also help qualify the MMP for regional cost treatment. There are precedents in which increased flexibility to perform system maintenance has been considered in determinations of regionalizing the cost of a transmission improvements. Of course, I cannot predict with any certainty what the transmission cost allocation process for the MMP-V would ultimately be.

Q. Mr. Scarfone, what is your own position with respect to the MMP-V as opposed to the MMP?

A. It is essentially the same as that to which I testified in the main proceeding in this Docket. As a planner, I do not like 3-terminal lines. I prefer 2-terminal lines. I prefer the MMP-V to the MMP. The MMP-V results in a more robust, more reliable system, and provides more Connecticut Import interface capability in an N-1-1 condition. Now, in addition, I also see that the MMP-V could provide an alternate to the Ludlow capacitor banks for providing needed voltage support, and I have become more hopeful about the prospects of regionalizing the cost of the MMP-V. However, I remain concerned about the additional cost and the allocation of that cost by ISO-NE. I am also concerned about the prospect of project delay if we change the design now due to the urgent reliability needs that GSRP is designed to address. Although the MMP has been through the ISO-NE planning process and has received I.3.9 approval, the MMP-V has not. CL&P would have to obtain a new I.3.9 approval for the MMP-V, which would require reviews by the NEPOOL Reliability Committee and ISO-NE.

STATE OF CONNECTICUT

SITING COUNCIL

Docket 370A: The Connecticut Light and Power Company application for a Certificate of Environmental Compatibility and Public Need for the Manchester Substation to Meekville Junction Circuit Separation Project in Manchester, Connecticut.	DOCKET 370 PROCEEDINGS ON RECONSIDERATION April 7, 2010

DIRECT TESTIMONY OF DONALD BIONDI AND LOUISE F. MANGO

CONCERNING ENVIRONMENTAL COMPARISON OF THE MMP AND MMP-V

Q. What is the purpose of your testimony for The Connecticut Light and Power Company (CL&P) in this proceeding on reconsideration?

A. As part of its Docket 370 Application to the Connecticut Siting Council (Council), CL&P included detailed environmental data concerning its proposed Manchester to Meekville Junction Circuit Separation Project (the "MMP"). A potential variation of the MMP (referred to as the "MMP-V") was identified by the Council during the Docket 370 proceedings. The purpose of this testimony is first to describe the environmental resource characteristics and impacts of the MMP-V and then to compare the MMP and MMP-V from an environmental impact perspective.

Q. Please describe how the MMP-V would affect different environmental resources than those described for the MMP.

A. Essentially, the MMP-V would require modifications to the Manchester Substation and to 345-kV transmission line interconnects to the north end of the substation, as well as the development of a new 345-kV transmission line that would be 0.5 miles longer than the proposed MMP line (approximately 0.1 miles at the south end near Manchester Substation and approximately 0.4 miles at the north end near Meekville Junction.)

Specifically, the MMP would involve the reconfiguration of an existing 115-kV circuit along an approximately 2.2-mile portion of CL&P's existing 2.7-mile right-of-way (ROW) between Manchester Substation and Meekville Junction, in the Town of Manchester. Along this 2.2-mile segment (extending from a point north of Manchester Substation to Structure 10088), CL&P proposes to place the conductors of one existing 115-kV circuit on separate monopole structures, which would be pre-built to accommodate operation as a segment of a 345-kV circuit if needed in the future. Beginning at Structure 10088 and extending north, the 115-kV circuit is already located on a separate set of structures. As a result, along this approximately 0.4-mile segment of ROW, no construction would be required and no environmental resources would be affected.

In contrast, the MMP-V would involve the construction and operation of a new 345-kV line along the entire 2.7 miles between Manchester Substation and Meekville Junction[1]. This would require the construction of new transmission line structures along the entire 2.7-mile ROW, including the approximately 0.4 miles of ROW between

[1] The MMP-V would extend approximately 400 feet past the western end of Meekville Junction to connect to existing line at existing structure 20027, just south of Chapel Road.

Structure 10088 and the west end of Meekville Junction, and the relocation of two spans of a double-circuit 115-kV line closer to the west edge of the ROW.

In addition, for the MMP-V, the Manchester Substation would have to be modified to interconnect the new 345-kV line, resulting in the placement of some new 345-kV line structures and four new line spans along approximately 0.1 mile of the ROW leading into the substation at locations that would not be affected by the planned MMP 115-kV circuit reconfiguration. To accommodate entrance into the 345-kV interconnect within the Manchester Substation, portions of the 345-kV line and associated structures will be located within the Federal Emergency Management Agency (FEMA) designated floodway of Hop Brook. These structures will result in additional impacts to the flood storage capacity of the Hop Brook floodway.

Apart from these two locations on the south and north ends of the Manchester Substation to Meekville Junction route, the MMP-V would be located in the same ROW and would affect the same environmental resources as described for the MMP.

Q. Did CL&P perform studies of the environmental resources along the additional 0.5 miles of ROW that would be required for the MMP-V?

A. Yes. Environmental studies, including wetland delineations, were conducted along the additional 0.5 miles of ROW as part of the analyses for MMP. For the MMP, these studies were performed along the entire ROW between Manchester Substation and Meekville Junction. For example, the 0.4-mile ROW segment near Meekville Junction was studied as part of MMP because CL&P proposes to reach certain MMP construction areas via both existing and planned access roads that would extend

south along the ROW from Meekville Junction.[2] Therefore, the dominant environmental resources along the additional 0.5 miles of ROW are depicted on the 1"=400' and 1"=100' mapsheets included as Volumes 9 and 11 of CL&P's Application to the Council.

Q. Since the submission of the Application, has CL&P made any modifications to the proposed MMP that should be considered in the comparison to the MMP-V?

A. Yes. Based on the results of additional constructability reviews performed after the submission of the Application, CL&P has incorporated minor design modifications, generally to avoid or minimize the effects of the MMP on water and biological resources. These minor modifications, which consist principally of adjustments to proposed access-road and crane-pad locations, have been taken into account in preparing the tables of comparative effects that are provided in this testimony.

Q. In the MMP-V design, has CL&P similarly attempted to locate transmission facilities to avoid or minimize adverse environmental effects?

A. Yes. For those portions of the MMP-V that differ from the MMP, CL&P has attempted to align the MMP-V structure locations and associated construction support areas (such as crane pads and access roads) so as to minimize adverse environmental effects to the extent possible. Exhibits 6 and 7 show the alignment of the additional MMP-V facilities in relation to environmental resources. The bases of these 1" = 200' scale mapsheets are those showing the MMP-V facilities, about which Mr. Case testified (Exhibits 2 and 3). They differ in that these sheets depict environmental resources as well.

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[2] These access roads would interconnect to the public road network at Burnham Street and Chapel Road and would extend through Meekville Junction, and then south along the ROW. (Refer to Mapsheet 3 of 3, Volume 9 of CL&P's Application to the Council).

Q. Has CL&P prepared any other illustrations of the potential MMP and MMP-V projects as they would relate to environmental resources?

A. Yes. CL&P has prepared revised 1"=400' mapsheets that show the alignment of the MMP and MMP-V routes within CL&P's ROW, in relation to environmental resources such as wetlands, watercourses, vegetation types, and land uses. These mapsheets can be submitted to the Council in this proceeding, if desired.

Q. Please describe the environmental characteristics and land uses along the approximately 0.4-mile segment of the MMP-V route that would extend north of the MMP alignment.

A. Along the approximately 0.4 miles between Structure 10088 and Meekville Junction, four new 345-kV transmission line structures and two new double-circuit 115-kV line structures would be required. In addition, work would be required to connect the new 345-kV line segment to the existing line segment at Structure 20027.

In general, along this 0.4-mile segment, the 350-foot-wide MMP-V ROW traverses terrain with limited topographic relief. The ROW segment encompasses a mix of vegetation communities, including upland shrub and forested areas, as well as palustrine forested (PFO) and palustrine scrub-shrub (PSS) wetlands. The scrub-shrub vegetation characterizes the portions of the ROW that are presently maintained for the operation of the existing 115-kV and 345-kV transmission lines and a distribution line. The forested vegetation is located within the ROW between these maintained areas, as well as along the edges of the ROW.

The 0.4 miles of ROW also traverses one intermittent, Class A, stream and associated wetland (designated by CL&P as stream S15-207 and wetland W15-516), as

well as two other wetlands (W15-517 and W15-518). All three of these wetlands are characterized principally by scrub-shrub vegetation. However, along the boundaries of the ROW, small portions of wetland W15-518 also consist of open water and palustrine forested vegetation. None of the three wetlands is classified as a vernal pool.

W15-516 is a narrow linear wetland that extends across the ROW, whereas W15-517 is a small, isolated wetland located beneath the existing 345-kV transmission line on the eastern portion of the ROW. On the other hand, W15-518 is a large wetland that encompasses the width of the ROW for a length of approximately 800 feet in the vicinity of Meekville Junction.

The MMP-V ROW segment is bordered by commercial and industrial uses near Structures 10088 to 10090, and is near single-family residences along Burnham Street, Botticello Drive, and Mary Drive (all near Meekville Junction). Portions of the ROW immediately southeast of Meekville Junction, including near the residences, traverse property owned in fee by Northeast Utilities. In this area, four single-family homes are situated within approximately 300 feet of the potential alignment of the MMP-V transmission line. CL&P's existing 345-kV line (i.e., the 395 Line) is located closer to these residences, along the eastern side of the ROW between the homes and the proposed MMP-V.

The visual environment along and in the vicinity of this 0.4-mile segment of ROW is influenced by CL&P's existing overhead transmission lines, as well as by the commercial and industrial land uses and transportation corridors in the vicinity. The existing 115-kV and 345-kV transmission lines in this area are on lattice-steel structures that typically range in height from 130 to 155 feet.

This MMP-V ROW segment does not traverse any public roads. However, along portions of the ROW, there are existing CL&P access roads.

No threatened or endangered species habitat, or amphibian breeding habitat, is located along the 0.4-mile ROW segment. Similarly, the MMP-V ROW does not traverse and is not located in the immediate vicinity of any federal, state, or locally designated recreational areas or any state wildlife management areas.

Baseline cultural resource studies were conducted of the 0.4-mile ROW segment as part of the overall MMP investigations[3]. The results of these studies reveal that no documented archaeological sites exist within the 0.4-mile ROW. However, the southern portions of the 0.4-mile segment may be potentially sensitive for the location of archaeological sites. There are no structures presently listed on or potentially eligible for the National or State Registers of Historic Places (NRHP / SRHP) within 0.25 mile of the 0.4 miles of additional ROW for MMP-V.

Q. For the MMP-V, the Manchester Substation would have to be modified to accommodate the new 345-kV line, and approximately 0.1 mile of new 345-kV line would be required along CL&P's existing ROW, extending from the terminals inside the substation to the beginning of the MMP. Would these modifications affect environmental resources?

A. Yes. The modifications to the substation would be performed within the footprint of the existing Manchester Substation site, but would entail new 345-kV line connection points within the substation. For these 345-kV line connections and an undercrossing 115-kV line, new MMP-V structures not needed for the MMP would be located along approximately 0.1 mile of the ROW to the northeast of the substation.

[3] Refer to the Application, Volume 3, Ex. 2.

Specifically, MMP-V would require three different structure sites (two 345-kV line structures and one 115-kV line structure) within wetland W15-201. This wetland is located within the floodplain of Hop Brook (also known as the South Fork of the Hockanum River). All of these MMP-V structures would have to be placed closer to the brook than the MMP structures, and two would be located within the FEMA-designated floodway along the brook[4].

Thus, the modifications to the Manchester Substation and the 0.1 mile of additional ROW required for MMP-V would affect wetlands and water resources. No threatened or endangered species, or cultural resources would be affected. One structure eligible for the NRHP (i.e., the Charles Bunce House) is located about 0.25 mile to the south of the substation. However, cultural resource investigations performed for the MMP determined that, due to intervening land uses and vegetation, the Project would have no adverse effect on this potentially historic property.

Q. Please compare the environmental characteristics of the MMP and the MMP-V, and summarize the difference in environmental impacts that would be associated with the development of each option.

A. The MMP and MMP-V will follow the same alignment, with the exception of the additional transmission facilities that would be required for the MMP-V at and in the vicinity of Manchester Substation (involving approximately 0.1 mile of ROW and the substation modifications) and along the approximately 0.4 miles of ROW

[4] FEMA's regulations (24 CFR 55.2(b)(4)): *Floodway* means that portion of the floodplain which is effective in carrying flow, where the flood hazard is generally the greatest, and where water depths and velocities are the highest. The term "floodway" as used here is consistent with "regulatory floodways" as identified by FEMA.

near Meekville Junction. Thus, the 2.2-mile MMP and 2.7-mile MMP-V would share the same alignment for approximately 2.1 miles.

Table 1 provides a comparative analysis of the environmental effects of the MMP and the MMP-V. As this table shows, compared to the MMP, the longer MMP-V will result in greater temporary and permanent impacts to wetlands, floodways, and floodplains. The MMP-V also will result in additional forested vegetation clearing and more overall construction disturbance to the ROW.

A majority of the upland forested vegetation clearing (2.4 acres of the additional 3.1 acres) for MMP-V would occur along the 0.4 miles of ROW near Meekville Junction and would be associated with both the development of the new 345-kV line and shifts of the existing 115-kV double-circuit line within the ROW to accommodate the new 345-kV line. Further, along the entire 2.7-mile ROW, an additional 10 feet of vegetation would have to be cleared on both sides of the new MMP-V line because the conductors would be energized at 345 kV and thus, compared to the 115-kV MMP line, greater clearances between the conductors and vegetation would be required

The MMP-V would follow the same alignment as the MMP across the Hockanum River Stream Channel Encroachment Line (SCEL), but would involve different structure locations within the Hop Brook floodplain near Manchester Substation. The locations of the MMP-V structures near Hop Brook may potentially affect the hydrology of the floodway and the flood-storage capacity within the floodplain, requiring additional compensatory flood-storage mitigation.

Table 2 provides a detailed summary of the differences between the MMP and MMP-V in terms of effects on water resources and forested vegetation clearing. This

table identifies the water resource and clearing impacts presented for MMP in the Application, as well as impacts assuming the incorporation of CL&P's MMP design modifications to minimize adverse direct and indirect effects to wetlands and watercourses. The additional water resource effects and forested vegetation clearing along the 0.5-mile portions of MMP-V are tallied, along with the total impacts that would occur along the 2.7-mile MMP-V.

The MMP-V would require the clearing of about 0.17 miles of upland forested vegetation that is presently located within the ROW in the area of the residences along Mary Drive and Botticello Drive. However, the impacts of the MMP and MMP-V on other environmental and cultural resources would be similar, since – apart from the 0.5-mile additional ROW segments and the Manchester Substation-related modifications - both alternatives would involve the use of the same alignment along the ROW.

Table 1
Environmental Comparison: MMP vs. MMP-V

Feature / Resource	MMP	MMP-V
Route Characteristics		
Length (Miles)	2.2	2.7
ROW Common to Both Routes (Miles)	2.1	2.1
New ROW Acquisition (Acres)	0.055	0.055
Biological Resources		
Watercourses		
• Stream Crossings (No.)	6 (5 perennial, 1 intermittent)	7 (5 perennial, 2 intermittent)
• Principal Streams Crossed	Hop Brook Hockanum River	Hop Brook Hockanum River
• Stream Channel Encroachment Line Crossings (No.)	1 (Hockanum River)	1 (Hockanum River)
Wetlands		
• Number within ROW (Total)	10	13
• Vernal Pools (Number)	3	3
• Temporary Impacts (Crane pads, roads)	168,793 sq. ft. (3.9 acres)	210,470 sq. ft. (4.8 acres)
• Permanent Impacts (Fill)	2,221 sq. ft. (0.05 acre)	2,786 sq. ft. (0.06 acre)
Forested Vegetation Clearing		
• Forested Wetland Clearing	43,568 sq. ft. (1 acre)	65,273 sq. ft. (1.5 acres)
• Forested Upland Clearing	74,502 sq. ft. (1.7 acres)	207,889 sq. ft. (4.8 acres)
• Total Forested Clearing	2.7 acres	6.3 acres
Threatened and Endangered Species		
Potential Habitat near ROW (No.)	1	1
Land Use, Recreation, and Transportation		
Principal Land Uses Near ROW	Urban and suburban development intermixed with undeveloped floodplain areas	Urban and suburban development intermixed with undeveloped floodplain areas
Recreational Areas (Nearby or Traversed by ROW)	James N. Leber Field Hiking trails Hockanum River	James N. Leber Field Hiking trails Hockanum River
Road Crossings (No.)	6 (US Route 6, I-84)	6 (US Route 6, I-84)
Cultural Resources		
• Areas of Potential High Archaeological Sensitivity (miles)	0.3	0.3
• NRHP Sites within 0.25 Miles	1 (Charles Bunce House)	1 (Charles Bunce House)

Table 2
Summary of Temporary and Permanent Water Resource Impacts and Forested Vegetation Clearing: MMP vs. MMP-V

Direct and Indirect Water Resource Impacts	MMP		MMP-V	
	Application[5]	Updated Design[6]	Additional 0.5 miles ROW	Total (0.5 miles + MMP Updated)
Temporary				
Crane Pads (acres)	3.2	3.0	1.0	4.0
Access Roads (acres	2.5	0.8	0.1	0.9
Total (acres)		**3.8**	**1.1**	**4.9**
Permanent				
Structure Foundations (acres)	0.03	0.05	0.01	0.06
Access Roads (acres)	-*	0.1	0.03	0.13
Total (acres)		**0.15**	**0.04**	**0.19**
Forested Vegetation Clearing				
Wetland (PFO) (acres)	1.4	1.0	0.5	1.5
Upland (acres)	3.7	1.7	3.1	4.8
Total (acres)	**5.1**	**2.7**	**3.6**	**6.3**

* Access road impacts not defined separately as permanent or temporary in Application.

[5] Water resource impacts identified in Table N-2 of the Application.

[6] Design modifications to minimize water resource impacts, as reflected in CL&P's application to the U.S. Army Corps of Engineers, June 2009.

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DIRECT TESTIMONY OF ROBERT E. CARBERRY CONCERNING ELECTRIC AND MAGNETIC FIELDS

Q. Mr. Carberry, have you prepared a comparative analysis of the electric and magnetic fields (EMF) that would be associated with the Manchester Substation to Meekville Junction Circuit Separation Project Variation (the "MMP-V") identified by the Council, as compared with those that would be associated with the circuit separation project initially proposed by CL&P (the "MMP")?

A. Yes, I have, with the assistance of Burns & McDonnell and Exponent.

Q. In performing this comparative analysis, did you use the same assumptions for modeling magnetic field (MF) levels that you used in the modeling about which you provided evidence in the previous proceedings in this Docket?

A. Yes, we did.

Q. For the Council's benefit, please briefly review these assumptions.

A. As described in Section O of CL&P's Application at page O-12 and in my pre-filed testimony in the main proceeding in this Docket, CL&P estimated (1) annual peak load (APL) conservatively from ISO – NE's projected 90/10 system peak loads, (2) peak daily average loads (PDAL) over 24 hours based on the 90/10 peak-load days and (3) annual average loads (AAL) based on a 61% annual load factor on the New England Transmission system.. The "pre-project" conditions included transmission system changes approved by ISO-NE and included in their system reliability models as of April 30, 2008, which have expected in-service dates before 2012, and system loads forecasted for 2012. The "post project" conditions for modeling the new and reconfigured lines assumed a 2017 system topology, including the construction of not just GSRP and MMP but also the other NEEWS projects. That assumption was made so as to reflect the higher line loadings – and thus higher levels of magnetic fields - that the completed NEEWS projects could enable. The assumptions for generation dispatch, Connecticut imports, Connecticut East-West flows and typical midspan conductor heights above ground that were used for MMP in the Application, as described in section O.4.3 and Section III of Appendix O-1, were used in this analysis.

Q. How have you presented the results of this modeling in this testimony?

A. Consistent with the presentations in prior testimony, in the Application, and in the Field Management Design Plans that have been presented, this testimony, will present calculations of magnetic field levels at 25-foot intervals for each base design, and for the proposed BMP design, at annual average load (AAL), annual peak load (APL) and peak-day average load (PDAL), together with associated electric field levels. AAL, APL,

PDAL MF values, as well as EF values, are presented together in the Appendix to this testimony, designated Appendix O-5.1 and O-5.2, in sequence with the Appendices previously submitted to Section O of the Application. We consider the AAL case to be most useful reference for predicting field levels for any 'typical' day. Accordingly, we used these levels to develop the profiles and tables presented in the text of the Application, and the comparisons made in this testimony.

Q. How would you characterize the nature of the estimated calculations for MF?

A. As was the case with the estimates presented in the main proceeding, the choice of load levels and the choice of import levels and generation dispatches, the MF calculations will yield conservatively high estimates.

Q. Before presenting the detailed results of the modeling, can you describe how edge-of-ROW magnetic fields associated with the two projects (for the AAL case) compare overall?

A. Yes. They are similar. For both projects, the post-construction edge of ROW magnetic fields will be generally *lower than* the pre-construction levels. For the common 2.2-mile segment of ROW, the MMP would achieve a much greater reduction than the MMP-V would achieve along one side of the ROW. On the other hand, along a section of ROW where no construction would take place with the MMP, the MMP-V would achieve a dramatic reduction of MF on one side of the ROW. For a more detailed discussion of these results, it is necessary to understand that the MMP involves physical changes to the configuration of facilities on one segment of the ROW, or "Cross Section", whereas the MMP-V involves changes in two Cross Sections.

Q. Please identify the two cross sections for which separate EMF calculations were required.

A. The two Cross Sections are identified as Cross Sections 21 and 22. Cross Section 21 extends from a point on the ROW north of the Manchester Substation, where structure 20003 is shown on Exhibit 2, to the point where the 115-kV circuit departs from common structures with the 395 circuit at existing structure 20018. This is where the MMP was originally proposed, and the facilities on the ROW will be physically identical to those proposed for MMP, shown as Cross Section 21 in the original application. Cross Section 22 is the short "jog" where the ROW turns to the west (the short section of ROW that we sometimes refer to as "Meekville Junction.") It would extend from existing structure 20020 to existing structure 20022 where the Barbour Hill and North Bloomfield legs of the 395 circuit split apart. The connection point of the three legs of the 3-terminal 395 circuit is at structure 20020.

The configuration of each cross section is shown on Exhibits 4 and 5, which also include a key map showing their general locations. The locations of the specific structures referenced in this answer are shown on the Mapsheets provided as Exhibits 2 and 3.

Q. Do these two "Cross Sections" cover the entire length of ROW where new construction will take place?

A. No, there are some short gaps, because we do not attempt to model EMF where line conductors are transitioning from a substation to line structures, or are transitioning from one configuration to another on a ROW.

Q. Let's start with Cross Section 21, where the MMP is proposed. In the main proceeding, we learned that the MMP would lower edge-of-ROW magnetic fields, even with the assumed relatively higher CT imports and east-west transfers . What was the reason for this?

A. The first reason was that, with the completion of the GSRP, the new 345-kV circuit between North Bloomfield and Agawam would be supplying southwest CT load via another NEEWS 345-kV line from North Bloomfield to Frost Bridge, so that less of this demand would be drawn over 345-kV lines interconnecting at Manchester Substation. So the current loading of the existing 395 line segment from Meekville Junction to Manchester would be reduced. In addition, re-using one set of conductors on the former double-circuit line on the east side of the ROW would create a "split-phase" configuration for the existing 345-kV line, further reducing the magnetic fields associated with that line segment dramatically.

Q. If the MMP-V is built, will these factors still result in a reduction of the magnetic fields at the edges of the Cross Section 21 ROW?

A. Only some of these factors will be available for the MMP-V. The current loading on the 395 line will still be reduced, thus lowering magnetic fields. However, this reduction will be less than that produced by the MMP. The reason for this is that power flow from the north on the 395 line that turns west at Meekville Junction to North Bloomfield Substation with the MMP configuration changes direction with the MMP-V. With the MMP-V, this power must first flow south to Manchester Substation, and then back north to Meekville Junction on the new MMP-V line to get to North Bloomfield Substation. Also, because segments of the 345-kV circuit #395 and the115-kV circuit

#1448 will continue to share a line of common structures on the east side of the ROW, the opportunity to split-phase that segment of the 395 circuit will be lost. The new 345-kV line will be best phased and constructed in the interior of the ROW, however, the aforementioned factors on the easterly line will result in much less MF reduction at the east ROW edge in Cross Section 21.

Q. Will there be any practical opportunities for implementing BMP designs for Cross Section 21 if the MMP-V is built?

A. Other than best phasing of the new line with respect to the adjacent lines, no.

Q. What are the projected AAL electric and magnetic fields along Cross Section 21, before and after construction, for the MMP-V, as compared to those for the MMP?

A. The projected edge-of-ROW values for the AAL case for Cross Section 21 are set forth in the following Table 1:

Table 1: Summary of pre-NEEWS (2012) and post-NEEWS (2017) EMF Levels at the edge of the ROW at annual average loading (AAL) — Cross Section 21

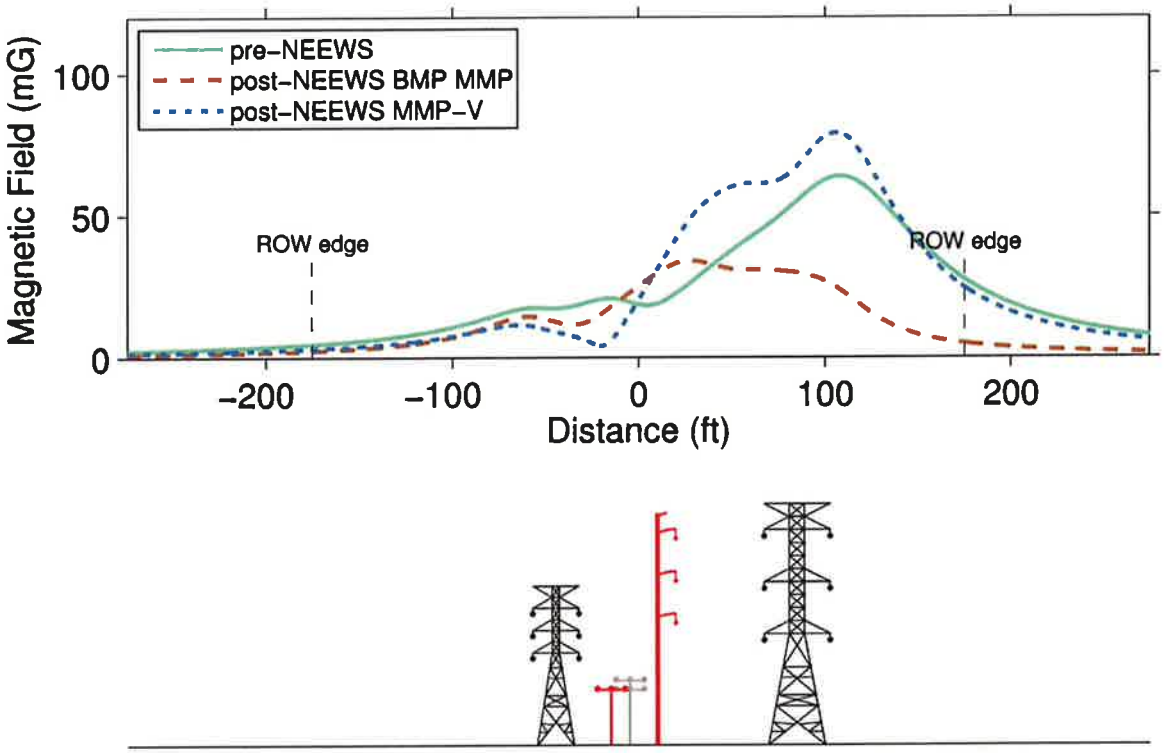
CROSS SECTION 21				
	Magnetic Field (mG)		Electric Field (kV/m)	
Cross Section	West/South ROW	East/North ROW	West/South ROW	East/North ROW
Pre Project	4.6	27.4	0.06	0.15
Post MMP	3.0	12.2	0.07	0.15
Post MMP-BMP	2.3	4.8	0.05	0.14
Post MMP-V	3.0	24.5	0.08	0.16

Please note that some of the "Post MMP" and "Post MMP-BMP" values differ slightly (by 0.1 or 0.2 mG) from those presented in the Application and in previous testimony.

This is because of an error in modeling the load on the distribution line on the ROW that was identified later.

A graphic representation of the profiles of the magnetic fields within and beyond the ROW edges of Cross Section 21, with the AAL case, pre-NEEWS in 2012, after construction of the MMP (assuming the BMP configuration) and NEEWS in 2017, and after construction of the MMP-V and NEEWS in 2017 is provided in Figure 1 below:

Figure 1: Profile XS-21: Existing Structure 20003 to Existing Structure 20018 – Magnetic fields under pre-NEEWS (2012) and post-NEEWS (2017) conditions at AAL



Existing and New Lines (Structures not drawn to scale)

The same information provided in Figure 1 in graphic form is provided in chart form in the Appendices to this testimony (Table A5.1-1 and Table A5.2-1 AAL)

Q. If the MMP-V were built, would there be any opportunities for a BMP design for Cross Section 22?

A. Yes. In this ROW segment, there will be an opportunity to split phase the 395 line because the existing conductors on the south side of the towers will not otherwise be needed.

Q. What are the projected AAL electric and magnetic fields along Cross Section 22, before and after construction, for the MMP-V, as compared to those you previously reported for the MMP?

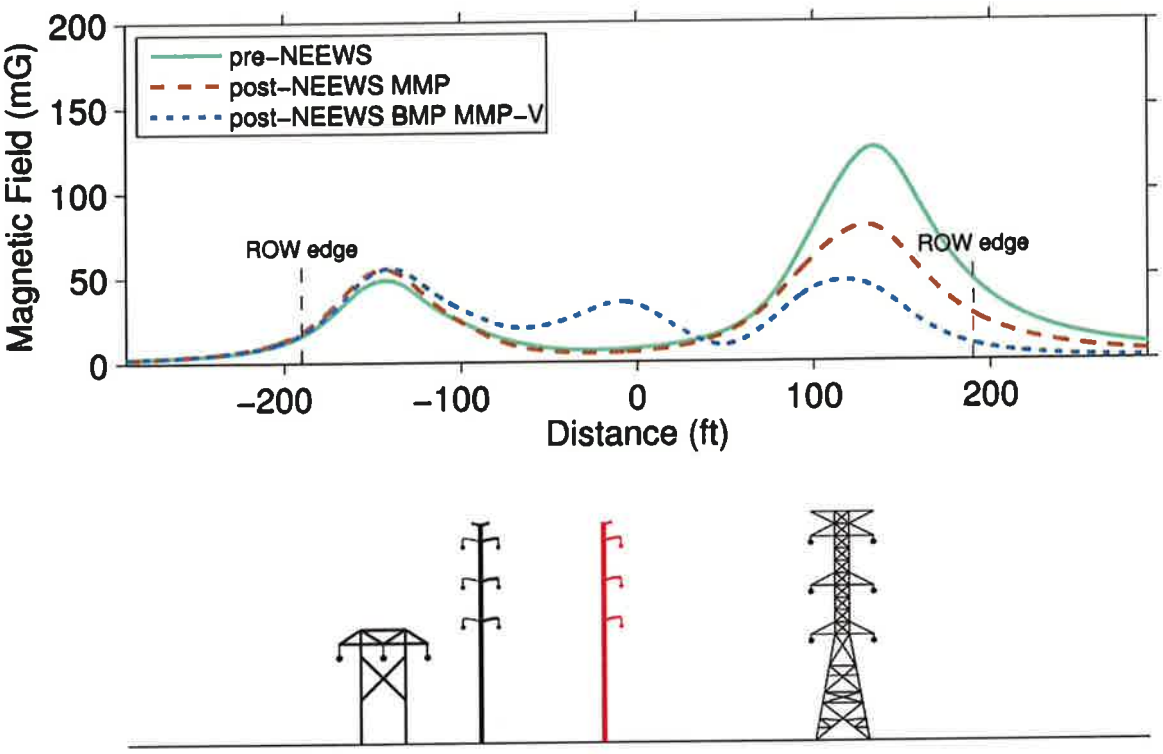
A. The projected edge-of-ROW values for the AAL case for Cross Section 22 are set forth in the following Table 2:

Table 2: Summary of pre-NEEWS (2012) and post-NEEWS (2017) EMF Levels at the edge of the ROW at annual average loading (AAL) –Cross Section 22

CROSS SECTION 22				
	Magnetic Field (mG)		Electric Field (kV/m)	
Cross Section	West/South ROW	East/North ROW	West/South ROW	East/North ROW
Pre Project	16.2	47.4	0.63	0.20
Post MMP	18.1	27.1	0.63	0.20
Post MMP-V	18.2	29.7	0.61	0.27
Post MMP-V BMP	17.0	9.5	0.63	0.20

A graphic representation of the profiles of the magnetic fields within and beyond the ROW edges along Cross Section 22, pre-NEEWS in 2012, and after construction of each of the NEEWS projects (assuming the BMP configuration for MMP-V) in 2017 is provided in Figure 2 below:

Figure 2: Profile XS-22: Existing Structure 20020 to Existing Structure 20022 – Magnetic Fields under pre-NEEWS (2012) and post-NEEWS (2017) conditions at AAL



Existing and New Lines (Structures not drawn to scale)

The same information provided in Figure 2 in graphic form is provided in chart form in the Appendices to this testimony (Table A5.1-1 and Table A5,2-1 AAL)

Q. Have you given any consideration as to how the statutory presumption of Section 16-50p(i) of the General Statutes might apply to the MMP and the MMP-V.

A. Yes. Since the MMP proposes a 115-kV line, and the presumption applies only to lines of 345 kV and above, there was no need to consider the presumption when the MMP was proposed. However, the presumption must be considered for the MMP-V, which proposes a line that will be operated at 345 kV. As previously reported to the

Council, there are three "statutory facilities" in the vicinity of Cross Section 21, all to the east of the ROW. These facilities were identified in Table O-19 of CL&P's Application, which is reproduced below. The table also provides spot measurements taken in the vicinity of these facilities and their distances from the proposed new 115-kV line. Those distances would be the same to the centerline of the new MMP-V line.

Measured electric and magnetic fields for the Manchester to Meekville Junction Circuit Separation Project (XS-21) in the vicinity of 'Statutory' Facilities

Location Name/Address	Town	Location Label	Cross-Section	Arial Segment #	Magnetic Field (mG)	Electric Field (kV/m)	Distance from CL of new 115-kV circuit (ft)
Manchester – Meekvillle Circuit Separation Project							
Howell Cheney Vocational Training School		SC	XS-21	Manchester Substation to Meekville Jct. Mapsheet 01 of 03	1.8	--	OH - 547
Leber Field/Playground		PG	XS-21	Manchester Substation to Meekville Jct. Mapsheet 01 of 03	5.4 – 7.3**	0.01 – 0.02**	OH - 203
East Catholic High School		SC	XS-21	Manchester Substation to Meekville Jct. Mapsheet 02 of 03	0.3	--	OH-900

-- Shielding by vegetation prevented the collection of measurable electric field levels at this location from existing sources, e.g., distribution lines and service drops.
** Range of measurements taken at this location

All of these facilities are "adjacent to" an existing 345-kV line. The new line would be installed in the interior of the ROW, on the far side of the existing 345-kV line. Two of the three facilities are so distant from the new line that magnetic fields from the line

would be undetectable; and the third (the Leber Field) would not be any greater than the pre-construction fields.

Along the Cross Section 22 segment of the ROW, where the MMP-V calls for construction but the MMP would not, there are four homes to the north of the ROW, which are shown on Exhibit 3 to this testimony. These homes will not be exposed to an increase in the pre-NEEWS AAL MF levels. Moreover, they are "adjacent to" the existing 345-kV line, and not the new 345-kV line, which will be built in the interior of the ROW.

Since neither the statutory facilities nor the four residences will experience an elevation of average magnetic field levels, and since constructing a new 345-kV line underground between Manchester Substation and Meekville Junction would quite obviously be economically impractical, we have not proposed an underground alternative to the MMP-V.

Q. Mr. Ashton's February 18, 2009 Memorandum says, in part (at page 2) that the MMP-V could provide an environmental benefit because "there is no need for a third line of structures from the 115-kV relocation between Manchester and Meekville Junction. Just two lines would be needed. Is this point correct?

A. No. A new segment of structures in the interior of the ROW will be necessary for either the MMP or the MMP-V, leaving the ROW with three transmission lines (at least one of which will be a double-circuit line). The only differences are that: (a) more structures will be needed for the MMP-V because it will be a longer line segment; and (b) the circuit segment on the new structures will be operated at 115 kV under the MMP plan and at 345 kV under the MMP-V plan.

Q. The Council's March 9, 2010 Opinion with respect to the MMP says in part, at page 4: "[I]f the MMP is installed and the #395 circuit is reconfigured in a split-phase configuration, the MMP-V (or any similar project) could be more difficult and more expensive to construct in the future." Do you believe that this statement is correct?

A. No. The extra work required to "undo" the MMP split-phase configuration in the event that the MMP was later extended to construct the MMP-V would not be significant. It would only be a matter of removing cross connections so that one set of the conductors on those structures could again be operated as a 115-kV line.

Q. Are there any other EMF considerations related to the MMP and MMP-V that you would like to bring to the attention of the Council?

A. Yes. I should note that the previous comparative discussion of the MMP and MMP-V glossed over one difference between them that affects magnetic field levels. The power-flow assumptions used in the AAL case, which I have described, result with the MMP configuration in a flow directly west from Meekville Junction to North Bloomfield on one branch of the 395 3-terminal circuit. However, with the MMP-V, that power flow goes instead south to Manchester Substation on the 395 circuit, then doubles back to Meekville Junction, and on to North Bloomfield Substation on the new 345-kV line. The longer path for power from Ludlow to North Bloomfield via Manchester also means that some power will shift over to the new Agawam to North Bloomfield line. This difference in the flow is responsible for some of the difference in the magnetic fields associated with the two different configurations. Moreover, this increase in the current on new Agawam to North Bloomfield line (GSRP) increases the magnetic fields

associated with that line by about 2.3% as compared to those projected by the modeling reported in the previous proceedings.

APPENDIX O-5.1

TABULAR SUMMARIES OF MAGNETIC FIELDS AT AAL, APL, AND PDAL LOADINGS AND ELECTRIC FIELDS FOR MANCHESTER – MEEKVILLE JUNCTION CIRCUIT SEPARATION PROJECT (MMP)

Table A5.1-1 AAL

Line Section	Configuration	Magnetic Field (mG) at distances relative to ROW centerline (ft)																								-ROW edge	+ROW edge
		-300	-275	-250	-225	-200	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	100	125	150	175	200	225	250	275	300		
XS-21 - Manchester S/S to Existing Str 20020	pre-NEEWS	2.0	2.3	2.6	3.1	3.7	4.6	5.9	7.8	10.8	15.3	17.4	20.0	18.7	24.9	37.6	49.5	62.6	58.0	40.9	27.4	18.8	13.4	10.0	7.7	6.1	4.6	27.4
	post-NEEWS MMP	1.2	1.4	1.6	2.0	2.4	3.0	4.0	5.6	8.3	12.6	11.5	9.0	17.9	29.0	26.9	26.7	30.4	26.3	18.1	12.2	8.5	6.1	4.6	3.6	2.8	3.0	12.2
XS-21BMP Manchester S/S to Existing Str 20020	post-NEEWS MMP	0.8	1.0	1.2	1.4	1.8	2.3	3.1	4.5	7.2	12.2	13.5	13.4	25.2	33.9	31.2	30.3	26.6	15.3	7.9	4.8	3.3	2.5	1.9	1.5	1.3	2.3	4.8
XS-22 Existing Str 20020 to Existing Str 20022	pre-NEEWS	2.2	2.8	4.0	6.4	11.9	26.6	47.1	40.1	23.9	13.5	8.3	6.9	8.1	11.1	17.8	36.8	79.9	121.1	109.2	65.7	38.6	24.2	16.2	11.5	8.5	16.2	47.4
	post-NEEWS MMP	2.1	2.8	4.2	6.9	13.2	30.1	53.3	44.2	23.7	11.3	6.3	5.2	6.1	9.1	16.7	34.2	61.0	78.9	65.0	37.8	21.9	13.6	9.1	6.4	4.7	18.1	27.1

Table A5.1-2 APL

Line Section	Configuration	Magnetic Field (mG) at distances relative to ROW centerline (ft)																								-ROW edge	+ROW edge
		-300	-275	-250	-225	-200	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	100	125	150	175	200	225	250	275	300		
XS-21 - Manchester S/S to Existing Str 20020	pre-NEEWS	1.4	1.6	1.8	2.1	2.5	3.0	3.6	4.6	6.4	9.9	15.9	25.8	20.4	26.4	40.6	46.5	50.5	45.5	31.8	21.1	14.4	10.3	7.6	5.9	4.6	3.0	21.1
	post-NEEWS MMP	1.6	1.9	2.1	2.5	2.9	3.4	4.0	4.8	5.8	9.9	23.0	32.5	37.6	44.0	26.2	25.3	39.5	39.4	28.9	19.9	14.0	10.2	7.7	6.0	4.7	3.4	19.9
XS-21BMP Manchester S/S to Existing Str 20020	post-NEEWS MMP	0.8	1.0	1.1	1.3	1.6	1.9	2.4	3.0	4.0	7.3	16.4	23.9	31.7	43.9	36.7	28.4	29.3	21.8	13.2	8.4	5.7	4.1	3.1	2.4	1.9	1.9	8.4
XS-22 Existing Str 20020 to Existing Str 20022	pre-NEEWS	3.0	4.2	6.4	10.7	20.8	47.6	82.0	62.4	30.0	17.7	8.8	5.1	5.7	9.5	18.9	41.4	79.3	107.2	90.3	52.7	30.4	18.8	12.4	8.6	6.3	28.6	37.6
	post-NEEWS MMP	3.0	4.2	6.3	10.5	20.2	46.0	79.6	61.1	32.1	22.8	13.0	10.0	12.2	18.5	31.7	56.7	79.8	85.1	65.2	37.6	22.2	14.0	9.4	6.7	4.9	27.6	27.2

Table A5.1-3 PDAL

Line Section	Configuration	Magnetic Field (mG) at distances relative to ROW centerline (ft)																									-ROW edge	+ROW edge
		-300	-275	-250	-225	-200	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	100	125	150	175	200	225	250	275	300		
XS-21 - Manchester S/S to Existing Str 20020	pre-NEEWS	1.4	1.5	1.8	2.0	2.4	2.8	3.2	3.8	4.7	7.4	16.2	27.1	22.2	24.2	36.2	41.9	47.6	43.7	31.0	20.8	14.3	10.2	7.6	5.9	4.6	2.8	20.8
	post-NEEWS MMP	1.3	1.5	1.8	2.1	2.4	2.9	3.6	4.4	5.5	7.8	15.3	23.3	28.1	36.0	23.6	19.4	27.4	27.1	20.0	13.9	9.9	7.2	5.5	4.3	3.4	2.9	13.9
XS-21BMP Manchester S/S to Existing Str 20020	post-NEEWS MMP	0.8	0.9	1.1	1.3	1.5	1.9	2.4	3.0	3.9	5.4	10.8	18.7	27.0	37.7	30.8	21.6	20.4	15.0	9.3	6.2	4.3	3.2	2.4	1.9	1.5	1.9	6.2
XS-22 Existing Str 20020 to Existing Str 20022	pre-NEEWS	2.4	3.4	5.2	8.6	16.7	37.8	64.6	49.1	19.6	6.8	2.0	1.6	3.3	6.5	13.8	33.9	73.7	105.0	90.6	53.1	30.6	18.9	12.4	8.7	6.4	22.9	37.9
	post-NEEWS MMP	2.5	3.5	5.3	8.8	17.0	38.9	67.3	52.1	24.8	14.8	8.1	6.5	8.2	12.6	22.1	41.4	63.3	72.4	56.4	32.3	18.7	11.6	7.7	5.4	4.0	23.4	23.1

Table A5.1-4 Electric

Line Section	Configuration	Electric Field (kV/m) at distances relative to ROW centerline (ft)																									-ROW edge	+ROW edge
		-300	-275	-250	-225	-200	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	100	125	150	175	200	225	250	275	300		
XS-21 - Manchester S/S to Existing Str 20020	pre-NEEWS	0.03	0.03	0.04	0.04	0.05	0.06	0.08	0.08	0.09	0.66	1.76	1.10	0.16	0.33	0.57	0.59	1.95	1.62	0.60	0.15	0.08	0.10	0.09	0.08	0.07	0.06	0.15
	post-NEEWS MMP	0.04	0.04	0.05	0.05	0.06	0.07	0.08	0.07	0.06	0.65	1.73	0.95	0.44	1.26	0.95	1.32	2.31	1.69	0.58	0.15	0.15	0.16	0.14	0.12	0.10	0.07	0.15
XS-21BMP Manchester S/S to Existing Str 20020	post-NEEWS MMP	0.02	0.02	0.02	0.03	0.04	0.05	0.06	0.07	0.10	0.67	1.73	0.96	0.27	0.71	2.99	2.95	2.39	2.02	0.59	0.14	0.08	0.08	0.07	0.06	0.05	0.05	0.14
XS-22 Existing Str 20020 to Existing Str 20022	pre-NEEWS	0.04	0.05	0.07	0.15	0.42	1.07	0.69	0.90	1.48	1.38	0.23	0.21	0.30	0.23	0.61	2.93	5.34	4.77	2.95	0.67	0.21	0.31	0.30	0.25	0.21	0.63	0.20
	post-NEEWS MMP	0.04	0.05	0.07	0.15	0.42	1.07	0.69	0.90	1.48	1.38	0.23	0.21	0.30	0.23	0.61	2.93	5.34	4.77	2.95	0.67	0.21	0.31	0.30	0.25	0.21	0.63	0.20

APPENDIX O-5.2

TABULAR SUMMARIES OF MAGNETIC FIELDS AT AAL, APL, AND PDAL LOADINGS AND ELECTRIC FIELDS FOR MANCHESTER – MEEKVILLE JUNCTION CIRCUIT SEPARATION PROJECT VARIATION (MMP-V)

Table A5.2-1 AAL

Line Section	Configuration	Magnetic Field (mG) at distances relative to ROW centerline (ft)																								-ROW edge	+ROW edge
		-300	-275	-250	-225	-200	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	100	125	150	175	200	225	250	275	300		
XS-21 - Manchester S/S to Existing Str 20020	pre-NEEWS	2.0	2.3	2.6	3.1	3.7	4.6	5.9	7.8	10.8	15.3	17.4	20.0	18.7	24.9	37.6	49.5	62.6	58.0	40.9	27.4	18.8	13.4	10.0	7.7	6.1	4.6	27.4
	post-NEEWS MMP-V	1.3	1.5	1.7	2.0	2.4	3.0	3.9	5.3	7.5	10.8	9.8	5.2	20.4	46.4	59.9	62.1	77.7	65.7	40.0	24.5	15.9	11.0	8.0	6.0	4.7	3.0	24.5
XS-22 Existing Str 20020 to Existing Str 20022	pre-NEEWS	2.2	2.8	4.0	6.4	11.9	26.6	47.1	40.1	23.9	13.5	8.3	6.9	8.1	11.1	17.8	36.8	79.9	121.1	109.2	65.7	38.6	24.2	16.2	11.5	8.5	16.2	47.4
	post-NEEWS MMP-V	2.2	3.0	4.2	6.7	12.5	28.2	52.5	48.8	31.7	21.5	22.4	31.2	33.8	18.9	9.8	23.2	43.0	46.4	31.0	14.8	7.3	4.0	2.5	1.7	1.3	17.0	9.5

Table A5.2-2 APL

Line Section	Configuration	Magnetic Field (mG) at distances relative to ROW centerline (ft)																								-ROW edge	+ROW edge
		-300	-275	-250	-225	-200	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	100	125	150	175	200	225	250	275	300		
XS-21 - Manchester S/S to Existing Str 20020	pre-NEEWS	1.4	1.6	1.8	2.1	2.5	3.0	3.6	4.6	6.4	9.9	15.9	25.8	20.4	26.4	40.6	46.5	50.5	45.5	31.8	21.1	14.4	10.3	7.6	5.9	4.6	3.0	21.1
	post-NEEWS MMP-V	0.9	1.0	1.2	1.3	1.5	1.8	2.2	2.9	4.7	9.9	20.4	23.8	36.0	66.3	77.0	70.7	82.0	69.0	41.5	25.1	16.1	11.1	8.0	6.0	4.6	1.8	25.1
XS-22 Existing Str 20020 to Existing Str 20022	pre-NEEWS	3.0	4.2	6.4	10.7	20.8	47.6	82.0	62.4	30.0	17.7	8.8	5.1	5.7	9.5	18.9	41.4	79.3	107.2	90.3	52.7	30.4	18.8	12.4	8.6	6.3	28.6	37.6
	post-NEEWS MMP-V	3.6	4.8	6.9	10.8	19.8	43.9	77.1	65.3	40.9	36.0	38.5	53.5	59.1	36.7	21.0	27.7	45.6	48.6	32.2	15.1	7.5	4.4	3.0	2.2	1.8	26.8	9.8

Table A5.2-3 PDAL

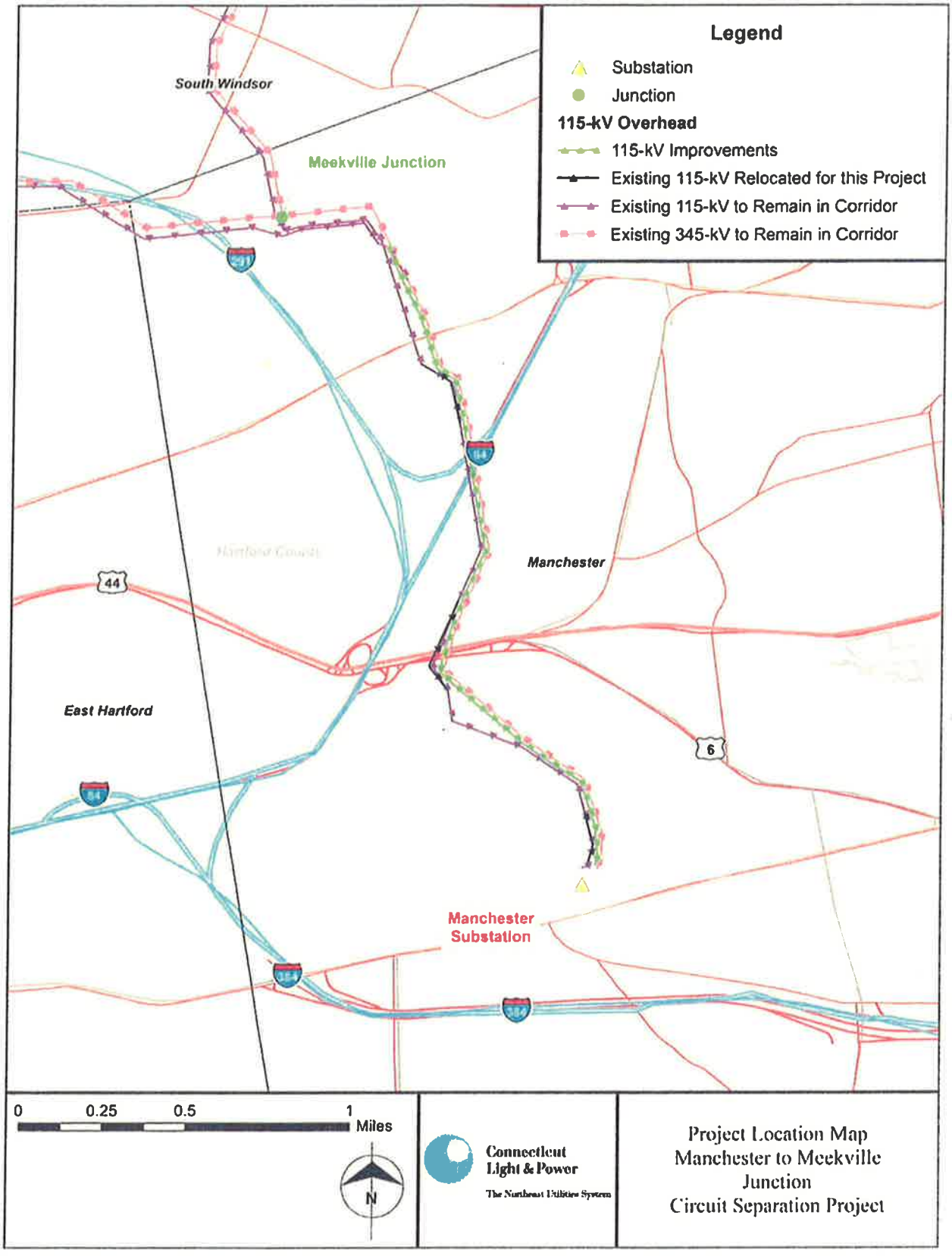
Line Section	Configuration	Magnetic Field (mG) at distances relative to ROW centerline (ft)																								-ROW edge	+ROW edge
		-300	-275	-250	-225	-200	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	100	125	150	175	200	225	250	275	300		
XS-21 - Manchester S/S to Existing Str 20020	pre-NEEWS	1.4	1.5	1.8	2.0	2.4	2.8	3.2	3.8	4.7	7.4	16.2	27.1	22.2	24.2	36.2	41.9	47.6	43.7	31.0	20.8	14.3	10.2	7.6	5.9	4.6	2.8	20.8
	post-NEEWS MMP-V	0.8	0.9	1.0	1.2	1.3	1.6	1.9	2.4	3.5	6.2	12.3	12.4	23.2	52.1	65.4	61.2	70.9	59.7	35.9	21.7	14.0	9.5	6.9	5.1	4.0	1.6	21.7
XS-22 Existing Str 20020 to Existing Str 20022	pre-NEEWS	2.4	3.4	5.2	8.6	16.7	37.8	64.6	49.1	19.6	6.8	2.0	1.6	3.3	6.5	13.8	33.9	73.7	105.0	90.6	53.1	30.6	18.9	12.4	8.7	6.4	22.9	37.9
	post-NEEWS MMP-V	3.0	4.0	5.7	9.0	16.7	37.1	65.3	55.8	32.9	25.8	27.9	39.3	43.0	25.7	13.6	21.5	38.6	41.9	27.9	13.1	6.4	3.6	2.3	1.7	1.3	22.6	8.4

Table A5.2-4 Electric

Line Section	Configuration	Electric Field (kV/m) at distances relative to ROW centerline (ft)																								-ROW edge	+ROW edge
		-300	-275	-250	-225	-200	-175	-150	-125	-100	-75	-50	-25	0	25	50	75	100	125	150	175	200	225	250	275	300		
XS-21 - Manchester S/S to Existing Str 20020	pre-NEEWS	0.03	0.03	0.04	0.04	0.05	0.06	0.08	0.08	0.09	0.66	1.76	1.10	0.16	0.33	0.57	0.59	1.95	1.62	0.60	0.15	0.08	0.10	0.09	0.08	0.07	0.06	0.15
	post-NEEWS MMP-V	0.04	0.04	0.05	0.06	0.07	0.08	0.10	0.09	0.06	0.64	1.73	0.99	0.59	1.34	0.53	0.75	3.06	2.12	0.55	0.16	0.17	0.16	0.13	0.11	0.09	0.06	0.16
XS-22 Existing Str 20020 to Existing Str 20022	pre-NEEWS	0.04	0.05	0.07	0.15	0.42	1.07	0.69	0.90	1.48	1.38	0.23	0.21	0.30	0.23	0.61	2.93	5.34	4.77	2.95	0.67	0.21	0.31	0.30	0.25	0.21	0.63	0.20
	post-NEEWS MMP-V	0.04	0.05	0.08	0.16	0.42	1.06	0.68	0.90	1.49	1.47	1.12	3.29	4.89	1.90	0.48	2.67	3.59	1.84	2.37	0.75	0.15	0.10	0.11	0.10	0.09	0.63	0.30

TESTIMONY EXHIBIT 1

Figure E-4 Manchester to Meekville Junction Circuit Separation Project



TESTIMONY EXHIBIT 2

Index Map

- Proposed Transmission Pole (MMP)
- Proposed Transmission Pole (MMP-V)
- Existing Line Structure to Remain
- Existing Line Structure To Be Removed (MMP or MMP-V)
- Existing Line Structure To Be Removed (MMP-V Only)
- Existing Transmission Line
- New Construction (MMP)
- New Construction (MMP-V)
- Northeast Utilities Property
- Right-of-Way (Existing)
- Right-of-Way (Expanded)
- Construction Envelope
- Potential Access Road

Data Source: CT NAIP 2006 Imagery, 2007 Aerials, and Burns & McDonnell Engineering.

1:2,400

0 200 400 Feet

Greater Springfield Reliability Project

Manchester to Meekville Junction Circuit Separation Project

Mapsheet 1 of 2

Connecticut Light & Power

The Northeast Utilities System

Burns & McDonnell

Date: April 2010 (Updated)

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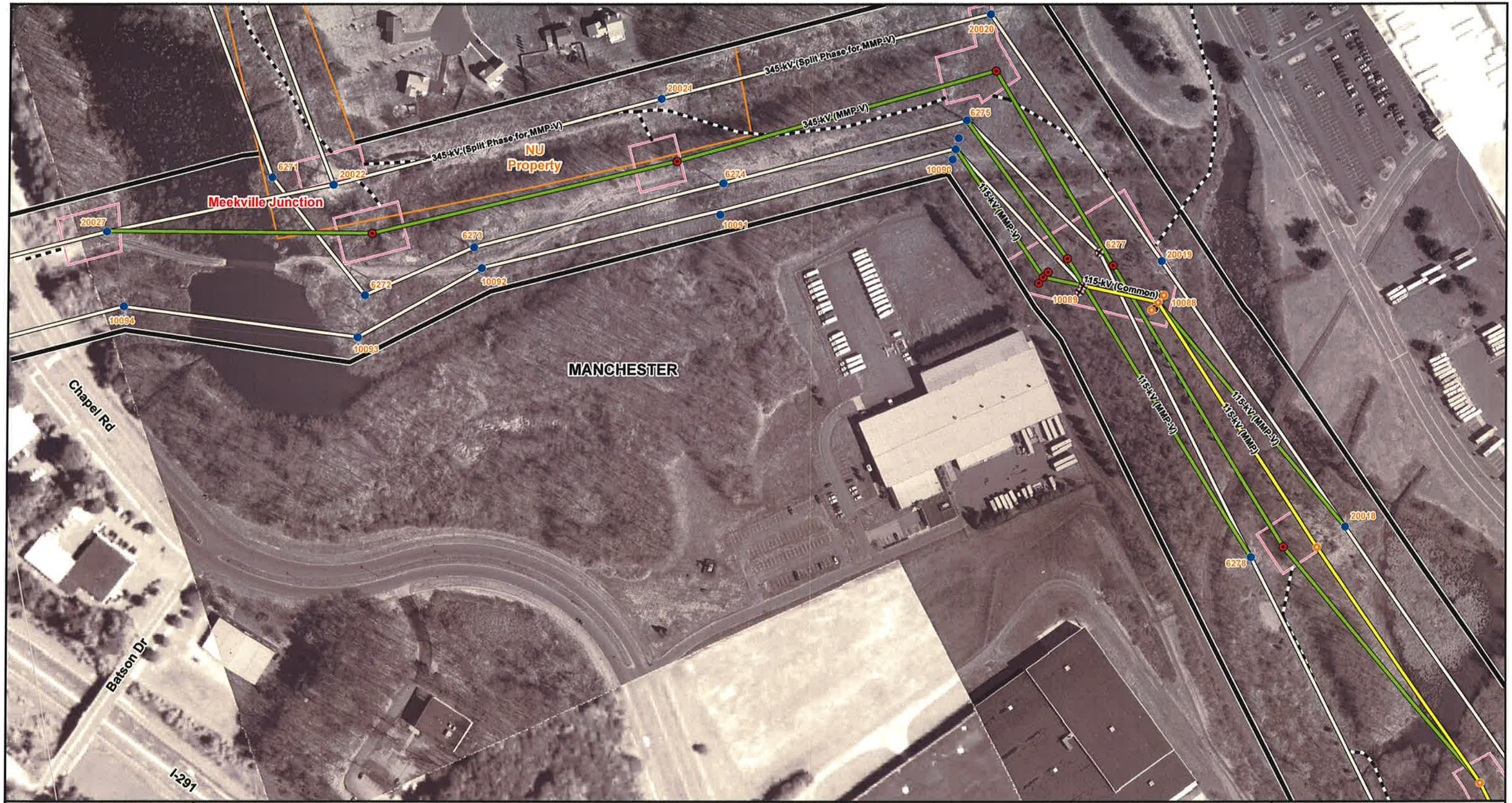
TESTIMONY EXHIBIT 3



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N, W, E, S

1:2,400

0 200 400 Feet

Data Source: CT NAIP 2006 Imagery, 2007 Aerials, and Burns & McDonnell Engineering.

Greater Springfield Reliability Project

Manchester to Meekville Junction Circuit Separation Project

Mapsheet 2 of 2

Connecticut Light & Power
The Northeast Utilities System

Burns & McDonnell SINCE 1898

Date: April 2010 (Updated)

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TESTIMONY EXHIBIT 4

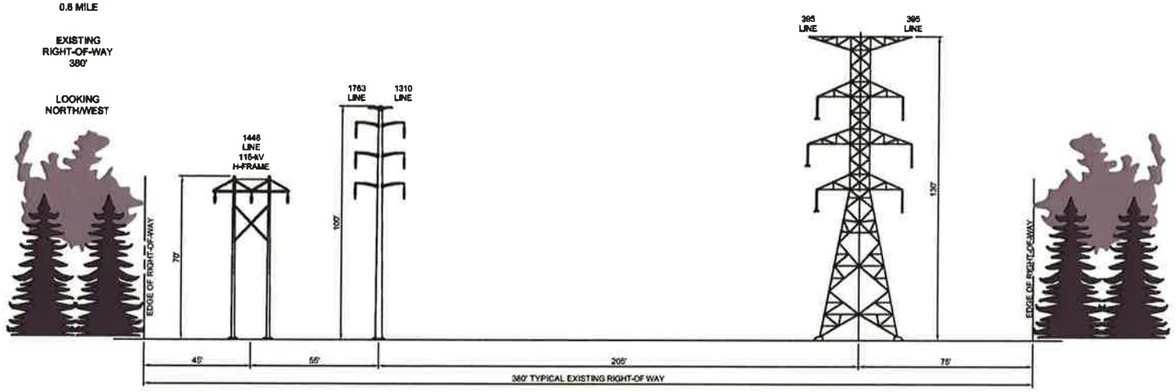
XS-22 - MMP-V

EXISTING STR. 20020
TO
EXISTING STR. 20022

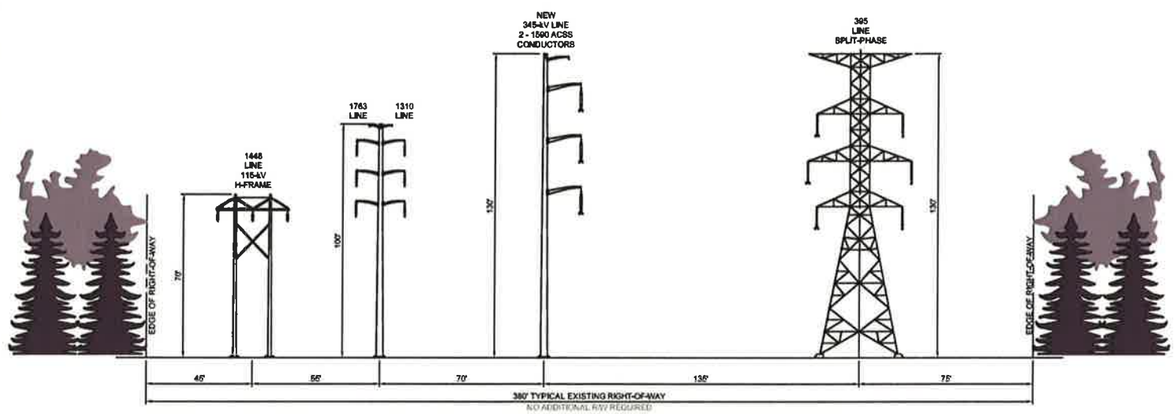
APPROXIMATELY
0.8 MILE

EXISTING
RIGHT-OF-WAY
380'

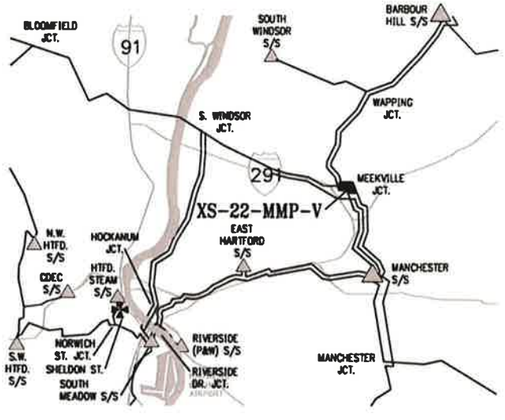
LOOKING
NORTH/WEST



EXISTING LAYOUT



PROPOSED LAYOUT FOR MMP-V



KEY MAP
NOT TO SCALE

NOTES:

1. PROPOSED STRUCTURE HEIGHTS WERE DETERMINED FROM TYPICAL EXPECTED BPANS. PROPOSED STRUCTURE HEIGHTS ARE SUBJECT TO CHANGE WITH THE COMPLETION OF FINAL DESIGN.
2. STREAMS, BUILDINGS AND OTHER OBSTRUCTIONS MAY REQUIRE VARIANCES FROM TYPICAL CROSS SECTION.
3. DISTRIBUTION SHOULD BE CONSTRUCTED UTILIZING SPACER CABLE FOR COMPACT LAYOUTS.
4. EXISTING STRUCTURE HEIGHTS ARE TYPICAL.
5. EXISTING DISTRIBUTION LOCATION IS TYPICAL AND MAY VARY ALONG THE RIGHT-OF-WAY.

PRELIMINARY -
SUBJECT TO CHANGE

Northeast Utilities System

TITLE GREATER SPRINGFIELD RELIABILITY PROJECT
MMP VARIATION CROSS SECTIONS
MANCHESTER S/S TO MEEKVILLE JCT.

BY J. LIGHTNER	CHKD P.M. WILLIAMS	APP	APP
DATE 4/5/10	DATE	DATE	DATE
SCALE NONE	MICROFILM DATE	DWG. NO. XS-22 - MMP-V	
P.A. #			

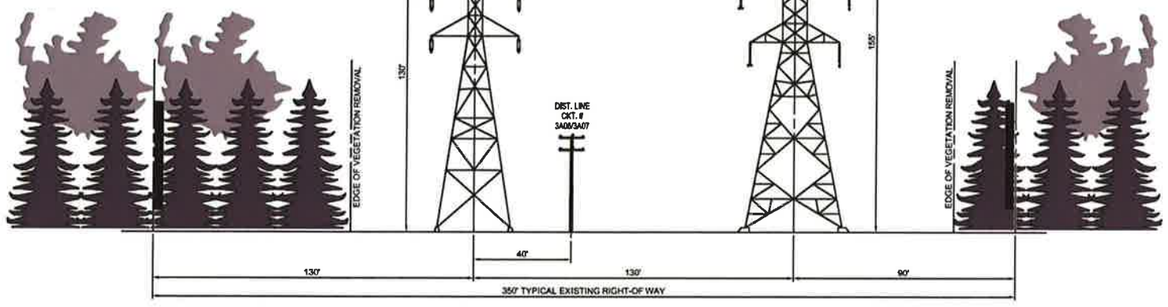
TESTIMONY EXHIBIT 5

XS-21 - MMP-V
EXISTING STR. 20003
TO
EXISTING STR. 20018

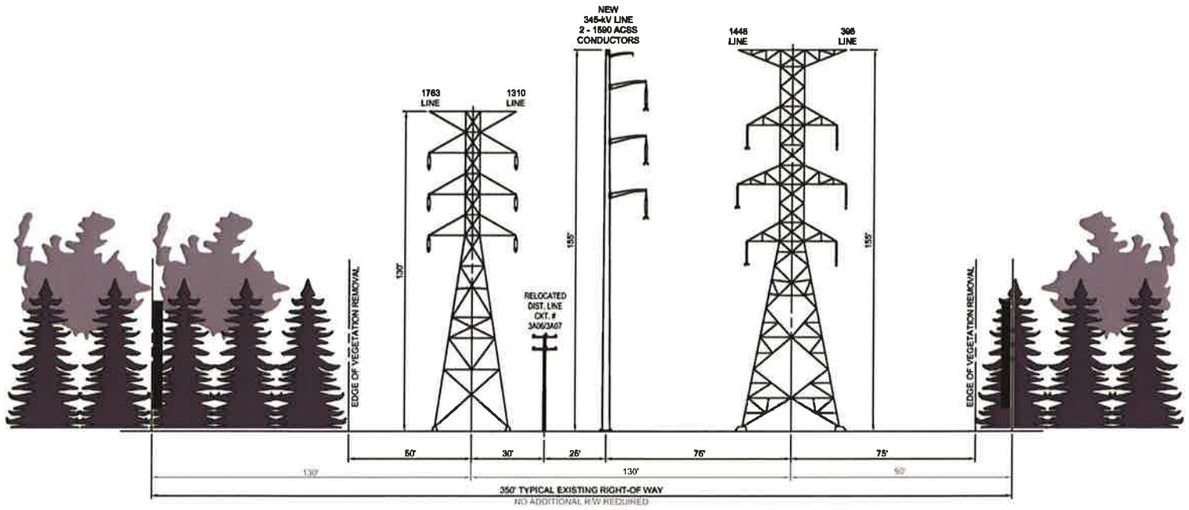
APPROXIMATELY
2.1 MILES

EXISTING
RIGHT-OF-WAY
350'

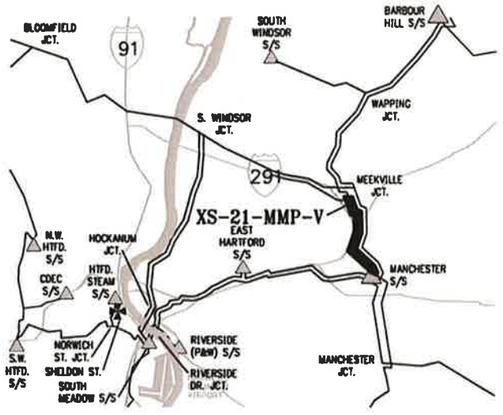
LOOKING
NORTH



EXISTING LAYOUT



PROPOSED LAYOUT FOR MMP-V



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NOT TO SCALE

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1. PROPOSED STRUCTURE HEIGHTS WERE DETERMINED FROM TYPICAL EXPECTED SPANS. PROPOSED STRUCTURE HEIGHTS ARE SUBJECT TO CHANGE WITH THE COMPLETION OF FINAL DESIGN.
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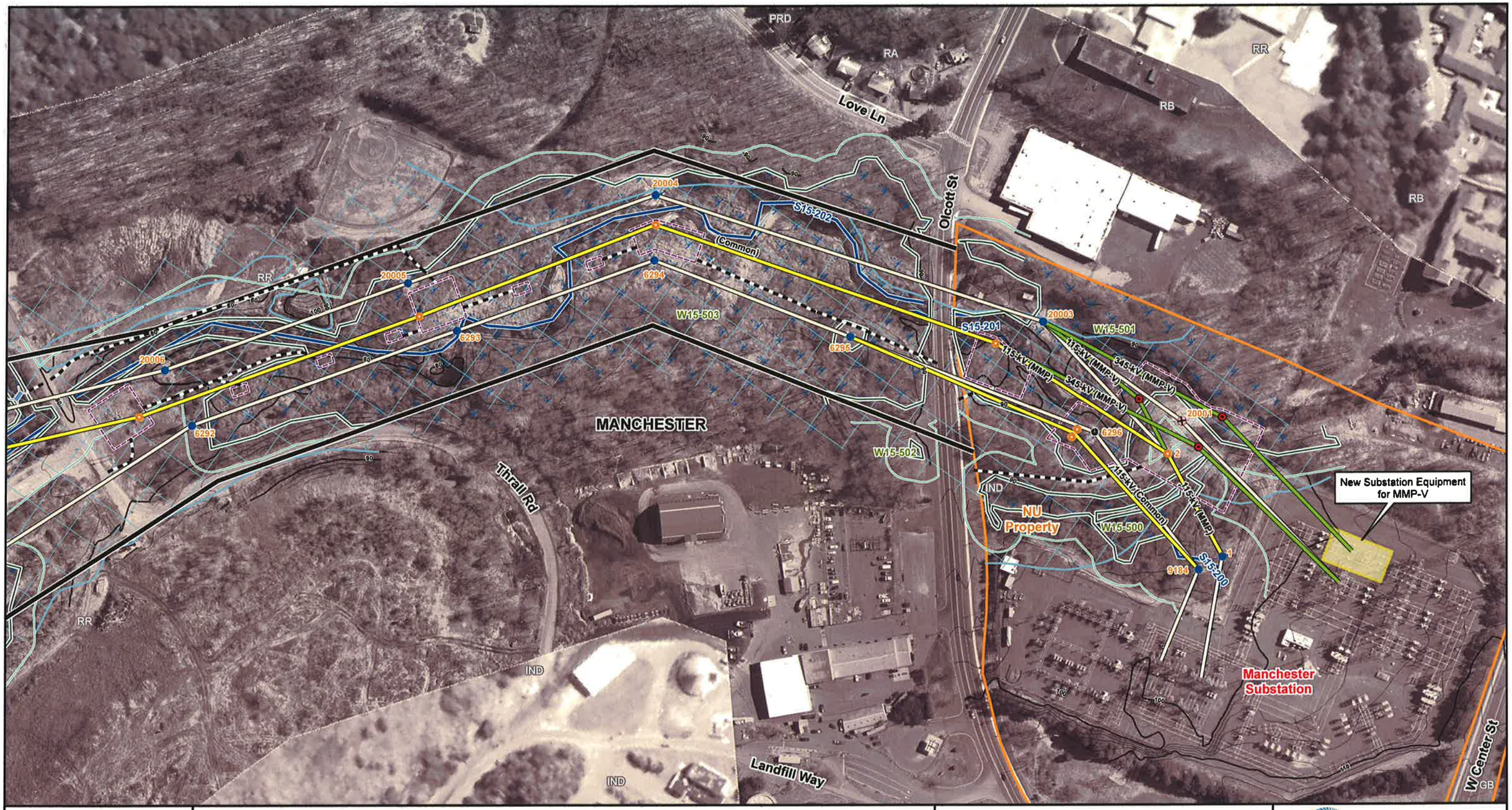
PRELIMINARY - SUBJECT TO CHANGE

Northeast Utilities System

TITLE GREATER SPRINGFIELD RELIABILITY PROJECT
MMP VARIATION CROSS SECTIONS
MANCHESTER S/S TO MEEKVILLE JCT.

BY J. LIGHTNER	CHKD P.M. WILLIAMS	APP	APP
DATE 4/5/10	DATE	DATE	DATE
SCALE NONE	MICROFILM DATE	DWG. NO. XS-21 - MMP-V	
P.A. #			

TESTIMONY EXHIBIT 6



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- Wetland/Watercourse Buffer
- Watercourse
- Confirmed Vernal Pool
- Potential Access Road
- Wetland Area
- 100 Year Flood Zone
- Construction Envelope
- Existing Culvert
- Proposed Culvert

Data Source: CT NAIP 2006 Imagery, 2007 Aerials, and Burns & McDonnell Engineering.

1:2,400

0 200 400 Feet

Greater Springfield Reliability Project

Manchester to Meekville Junction Circuit Separation Project

Mapsheet 1 of 2

Connecticut Light & Power
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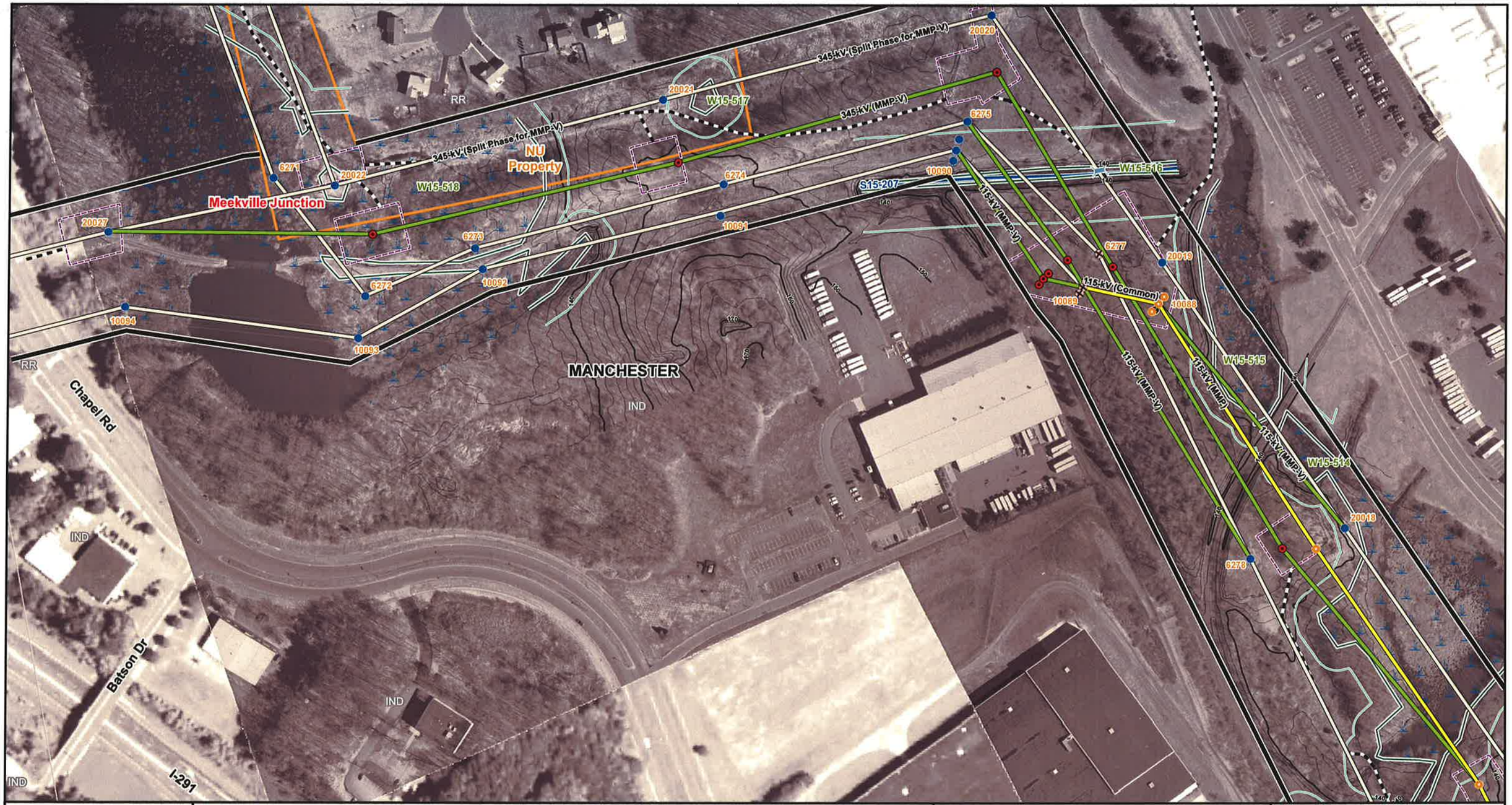
TESTIMONY EXHIBIT 7



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1:2,400

0 200 400 Feet

Greater Springfield Reliability Project

Manchester to Meekville Junction Circuit Separation Project

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