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June 8, 2022

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

Re: Docket No. 508 - The United Illuminating Company Application for a Certificate of Environmental Compatibility and Public Need for the Milvon to West River Railroad Transmission Line 115-kV Rebuild Project

Dear Ms. Bachman:

Enclosed for filing with the Connecticut Siting Council ("Council") is The United Illuminating Company's Late Filed Exhibit, as requested by the Council in the memorandum dated May 25, 2022.

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

Should you have any questions regarding this letter, please do not hesitate to contact me.

Very truly yours,



Bruce L. McDermott

Enclosures

cc: Service List

Murtha Cullina LLP
265 Church Street
New Haven, CT 06510
T 203.772.7700
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UI MILVON WEST RIVER TRANSMISSION LINE REBUILD PROJECT (D508) - COST TABLE

Option	Project Component	Section Length in Linear Miles	Transmission Line Costs (A)	Distribution Related Costs (B)	Substation Costs (C)	Transition Station Costs (D)	HDD Costs (E)	Jack & Bore Costs (F)	Misc. Costs (e.g. bonnet decommissioning) (G)	Total Cost Estimate (H)* =[A+B+C+D+E+F+G]	Proposed Project Cost for this Section or Alternative (I)	Cost Delta (H-I)
A	Overhead Transmission Line, north side of RR ROW (proposed)	9.5	\$222,550,000	\$1,250,000	\$3,850,000	\$0	\$0	\$0	\$67,350,000	\$295,000,000	\$295,000,000	\$0
B	Overhead Transmission Line, south side of RR ROW	9.5	\$265,475,000	\$3,125,000	\$3,850,000	\$0	\$0	\$0	\$67,350,000	\$339,800,000	\$295,000,000	\$44,800,000
C	Overhead Transmission Line, north side of RR ROW, Milford Alternative (reduced structure heights from 905N to 914N)	9.5	\$223,400,000	\$1,400,000	\$3,850,000	\$0	\$0	\$0	\$67,350,000	\$296,000,000	\$295,000,000	\$1,000,000
D	Overhead Transmission Line, north side of RR ROW, shifted to south side of RR ROW from 905N to 914N	9.5	\$234,250,000	\$1,250,000	\$3,850,000	\$0	\$0	\$0	\$67,350,000	\$306,700,000	\$295,000,000	\$11,700,000
E	Underground Transmission Line, north side of RR ROW	9.5	\$1,122,954,000	\$0	\$21,388,000	\$0	\$19,871,000	\$0	\$67,350,000	\$1,231,563,000	\$295,000,000	\$936,563,000
F	Underground Transmission Line, south side of RR ROW	11.5	\$1,291,748,000	\$0	\$11,458,000	\$0	\$27,540,000	\$6,328,000	\$67,350,000	\$1,404,424,000	\$295,000,000	\$1,109,424,000
G	Underground Transmission Line within streets	9.5	\$289,822,000	\$1,250,000	\$3,850,000	\$1,522,000	\$0	\$590,000	\$67,350,000	\$364,384,000	\$295,000,000	\$69,384,000
H	Underground Transmission Line, Milford Alternative (from 905N to 914N)	9.5	\$281,547,000	\$1,250,000	\$3,850,000	\$1,522,000	\$1,492,000	\$0	\$67,350,000	\$357,011,000	\$295,000,000	\$62,011,000
I	Underground Transmission Line, Morissette Alternative (from 900N to 914N)	9.5	\$308,912,000	\$1,250,000	\$3,850,000	\$1,522,000	\$1,492,000	\$0	\$67,350,000	\$384,376,000	\$295,000,000	\$89,367,000

*These costs are for the total Project, including the Option described
 Per ISO-NE PP4, Appendix D, option B-C costs are "Project Initiation" type estimates (-50%/+200% accuracy)
 Please see attached Notes and Assumptions documents for further details

**UI Milvon West River Transmission Line Rebuild Project
(D508)**

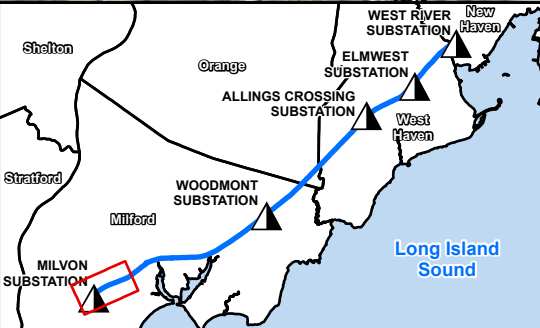
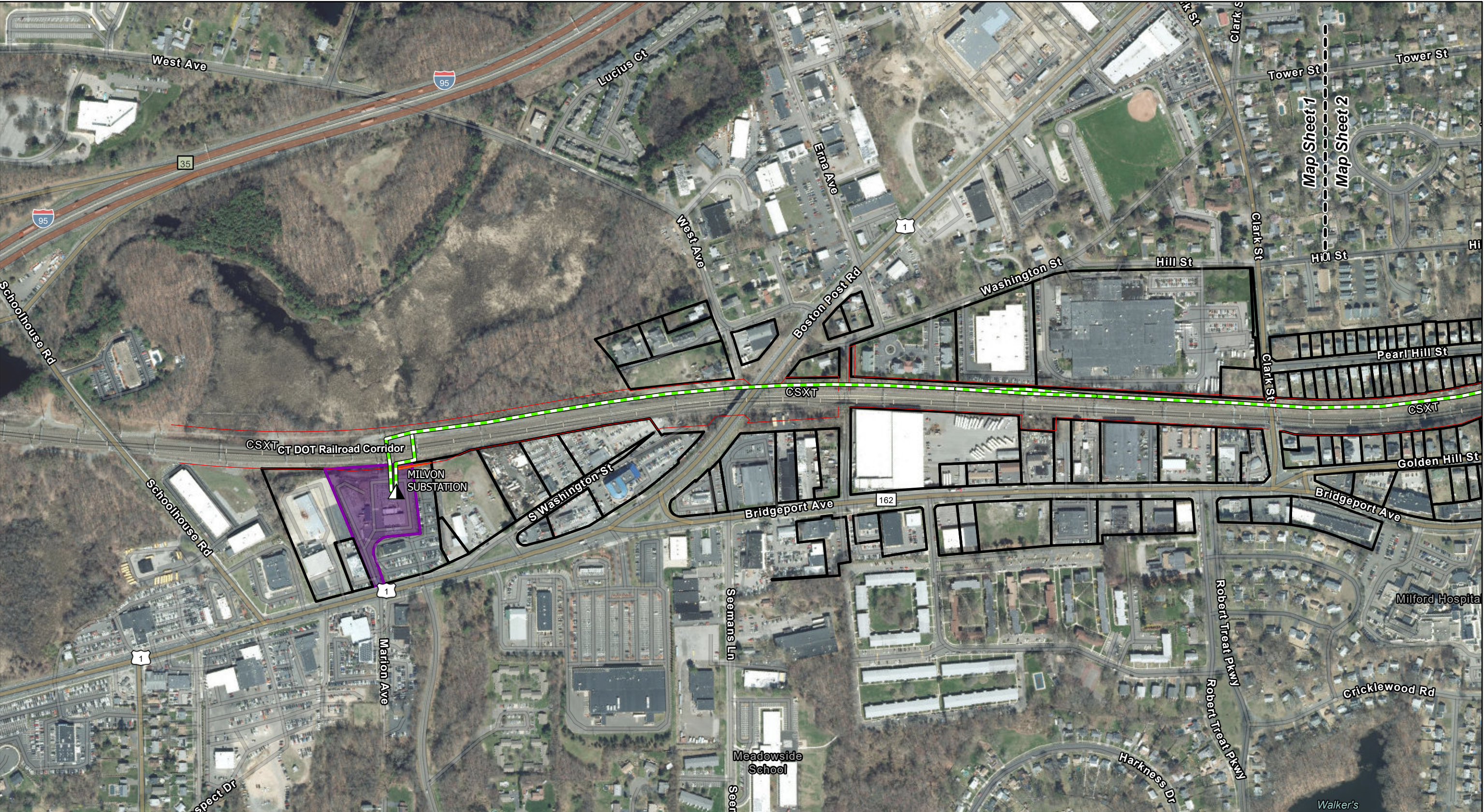
CSC LF-2 Cost Table Assumptions and Notes

Option A

Overhead Transmission Line, north side of RR ROW (Proposed Project)

Proposed Project constructed completely overhead between Milvon Substation to West River Substation primarily on the north side of the tracks

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Map Legend

- Option A -- Rebuilt 115-kV Overhead Lines -- North
- █ Substation
- CT DOT Corridor Boundary
- Proposed UI Permanent Easement
- Parcel Boundary
- UI Owned Property
- Municipal Boundary

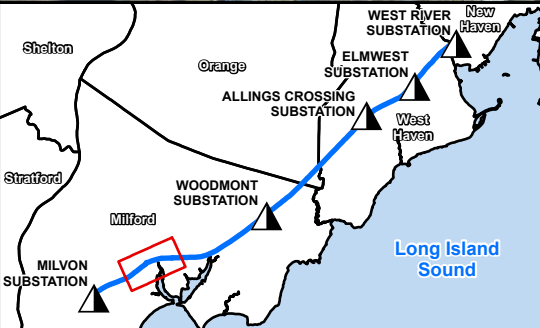
UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
Overhead Route Option A
Proposed Project - North Side of RR ROW

Coordinate System:
NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
Linear Units: Foot US

1" = 400' Revised: 06/03/2022

OH Option A Map 1 of 9

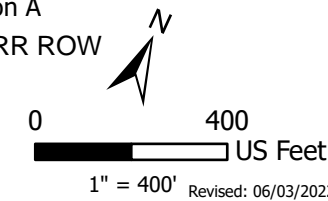
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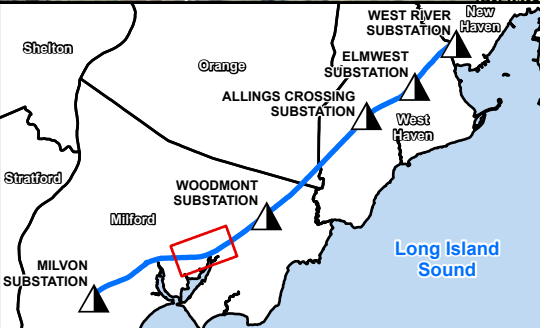
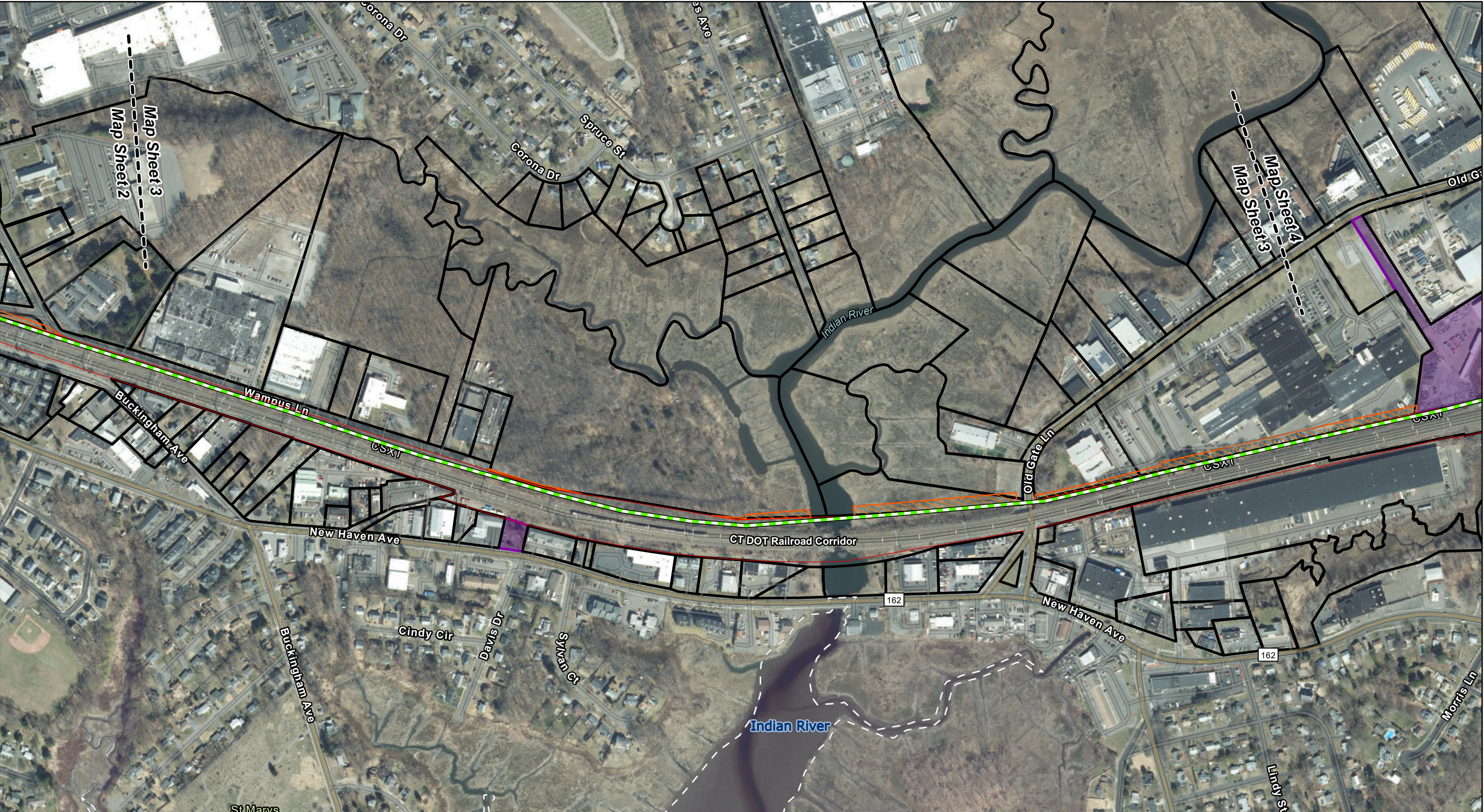
- Map Legend**
- Option A -- Rebuilt 115-kV Overhead Lines -- North
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UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option A
 Proposed Project - North Side of RR ROW

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Map Legend

- Option A -- Rebuilt 115-kV Overhead Lines -- North
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UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
Overhead Route Option A
Proposed Project - North Side of RR ROW

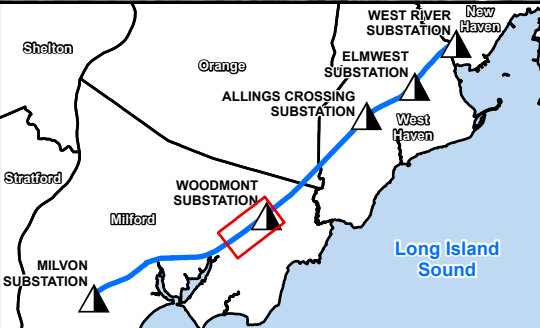
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Westwood

OH Option A Map 3 of 9

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Map Legend

- Option A -- Rebuilt 115-kV Overhead Lines -- North
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- CT DOT Corridor Boundary
- UI Owned Property
- Municipal Boundary

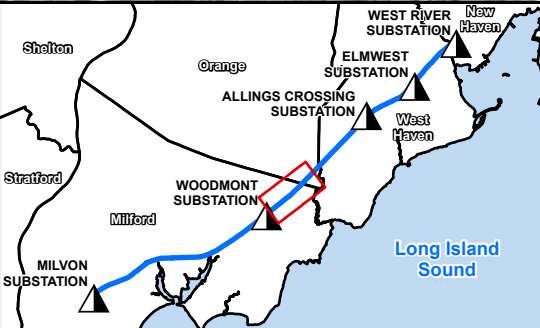
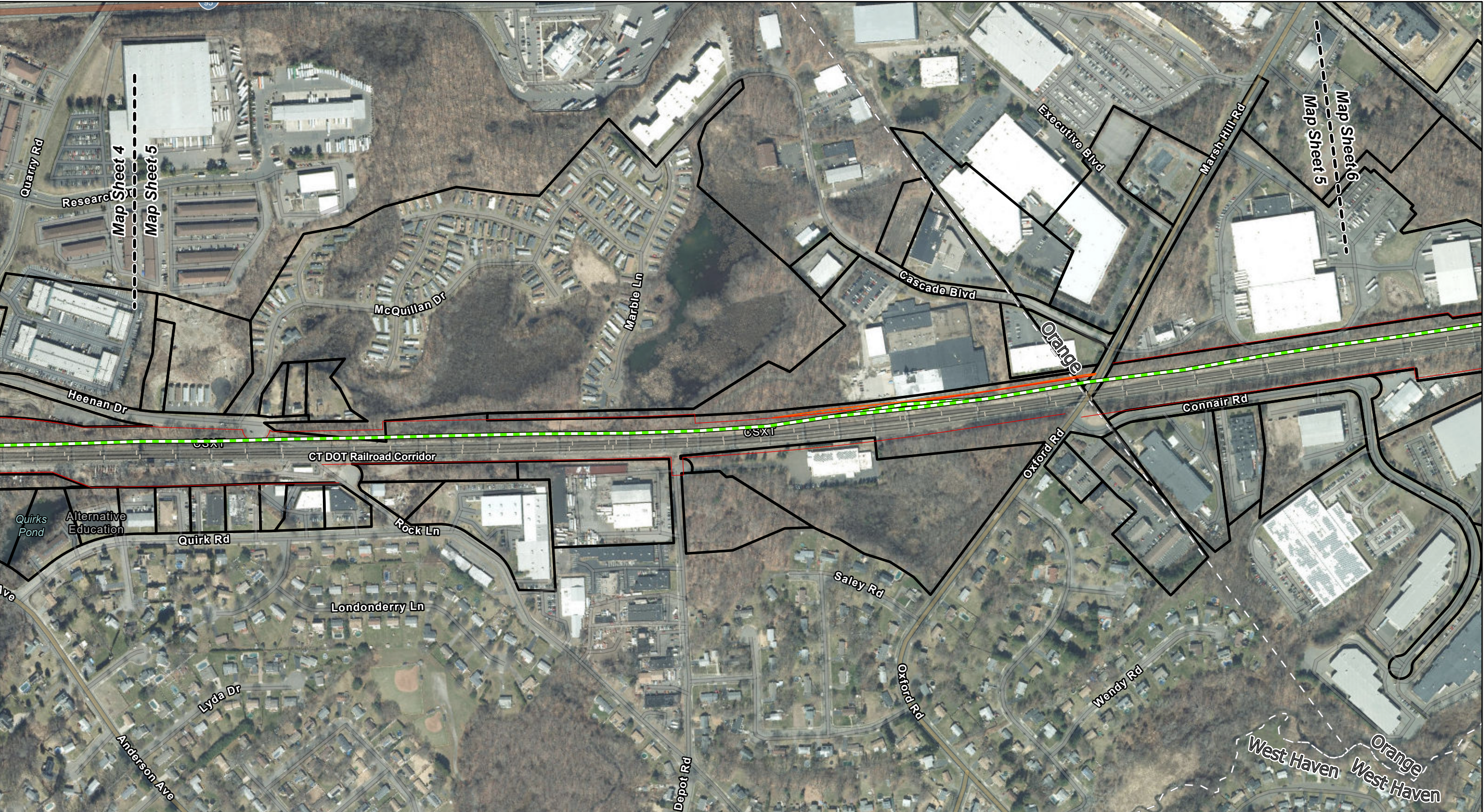
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OH Option A Map 4 of 9

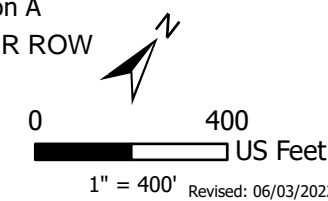
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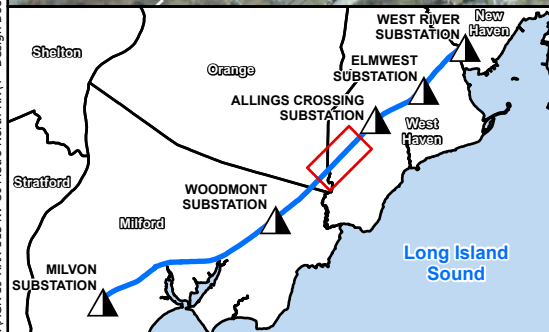
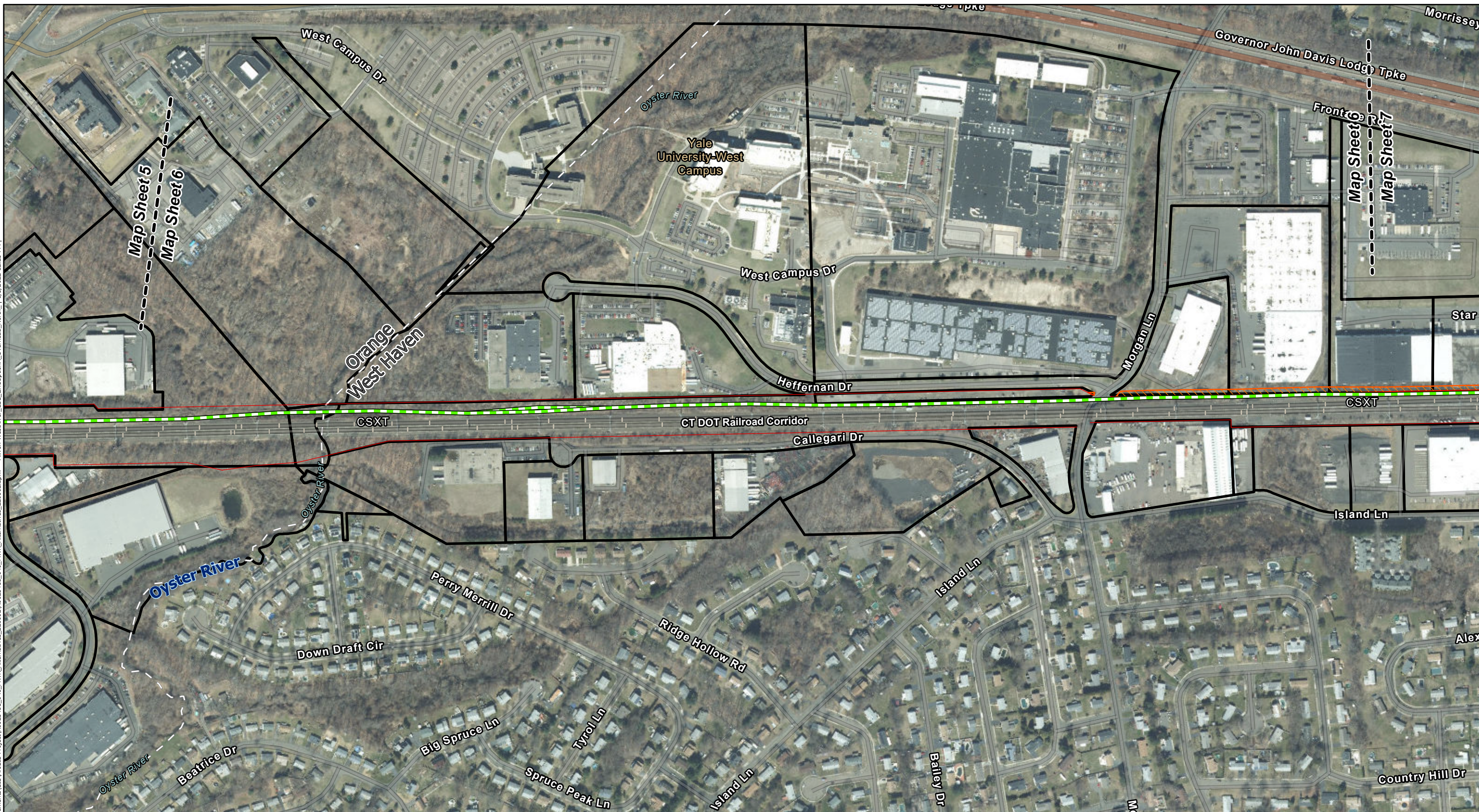
- Map Legend**
- Option A -- Rebuilt 115-kV Overhead Lines -- North
 - CT DOT Corridor Boundary
 - Proposed UI Permanent Easement
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UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option A
 Proposed Project - North Side of RR ROW

Coordinate System:
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Map Legend

- Option A -- Rebuilt 115-kV Overhead Lines -- North
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- Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option A
 Proposed Project - North Side of RR ROW

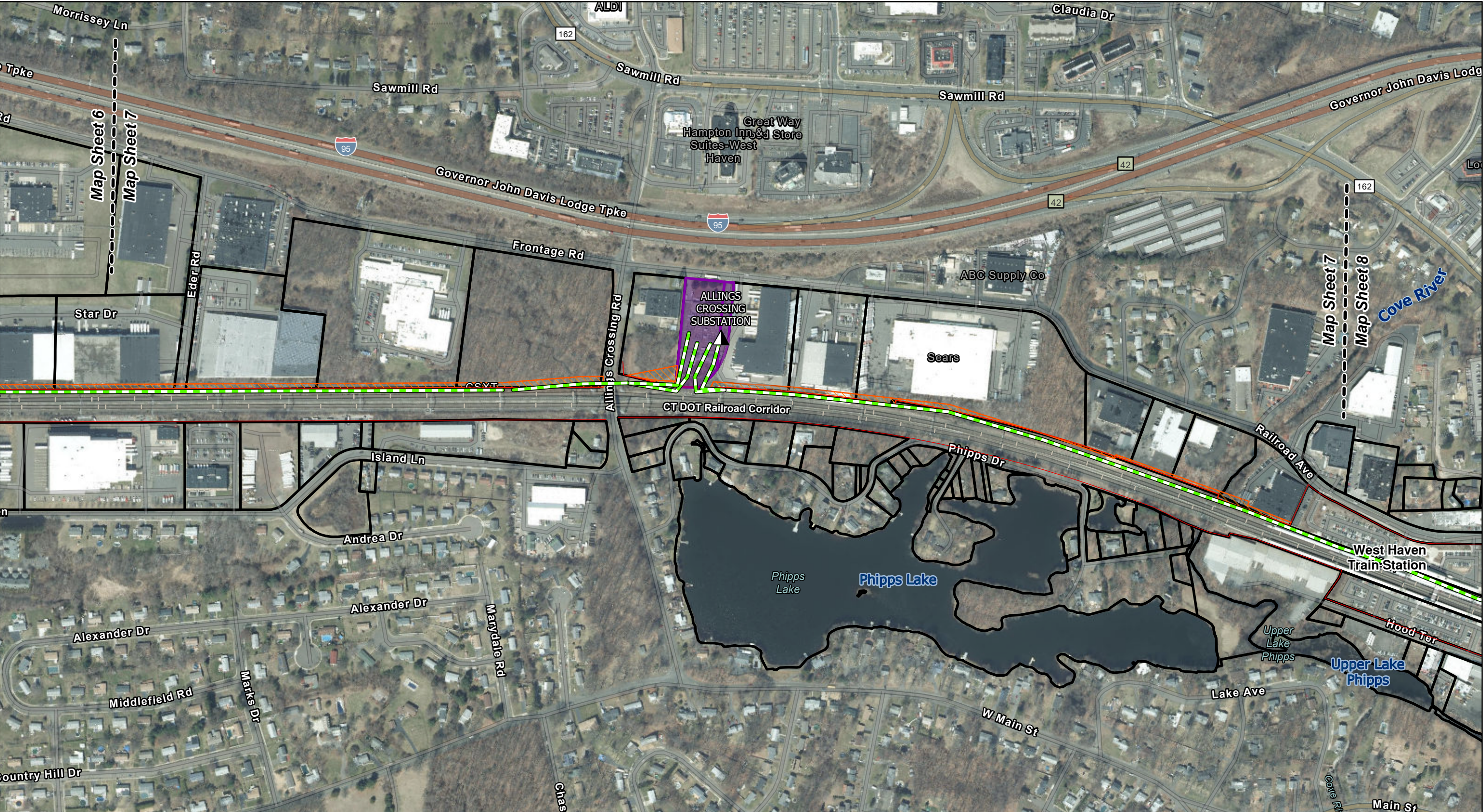
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OH Option A Map 6 of 9

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Map Legend

Option A -- Rebuilt 115-kV Overhead Lines -- North	Proposed UI Permanent Easement
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option A
 Proposed Project - North Side of RR ROW

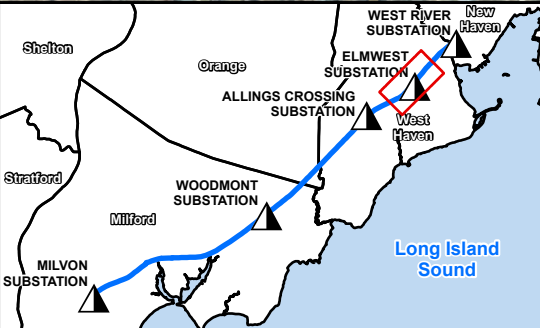
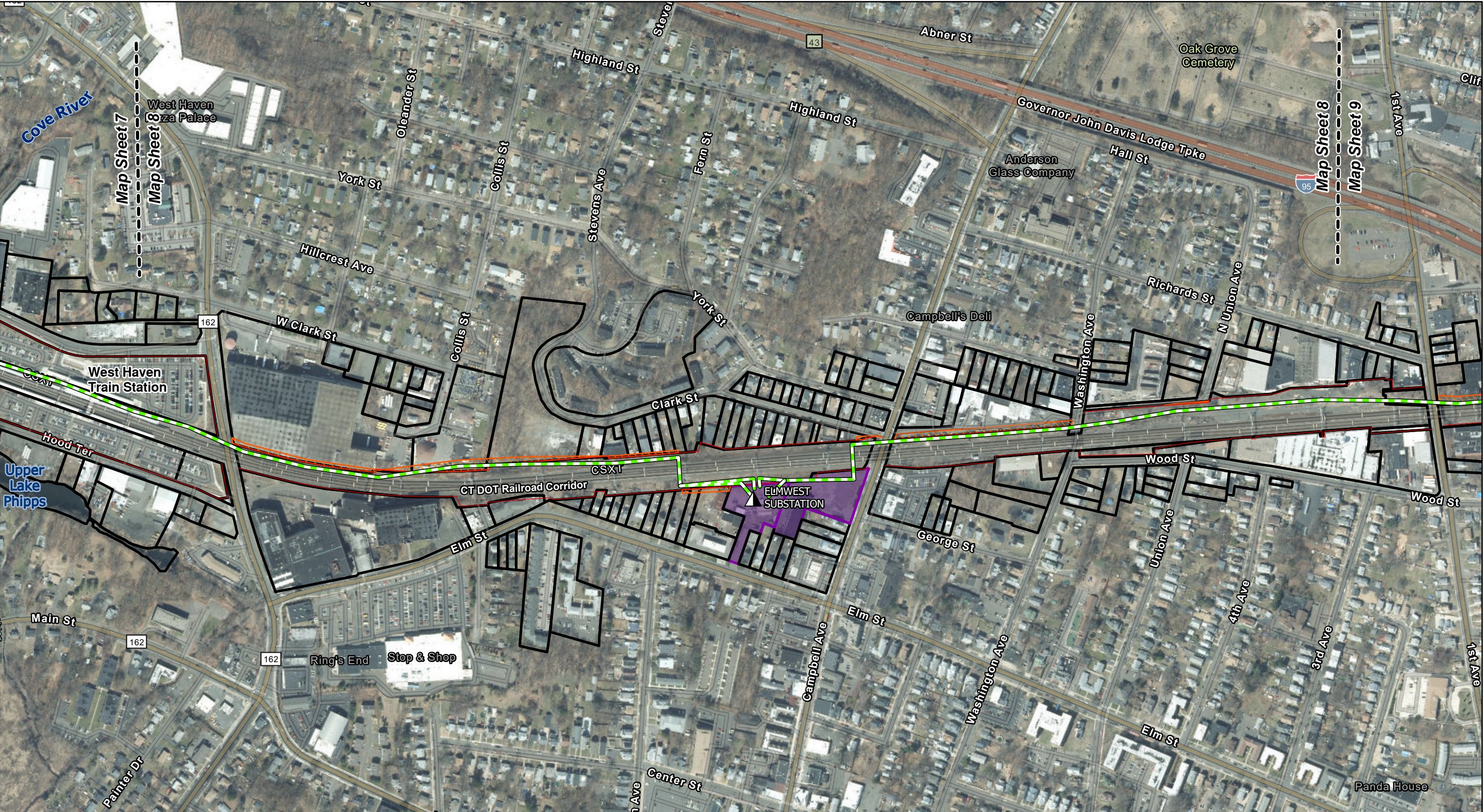
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OH Option A Map 7 of 9

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Map Legend

- Option A -- Rebuilt 115-kV Overhead Lines -- North
- Proposed UI Permanent Easement
- Parcel Boundary
- ▲ Substation
- CT DOT Corridor Boundary
- UI Owned Property
- Municipal Boundary

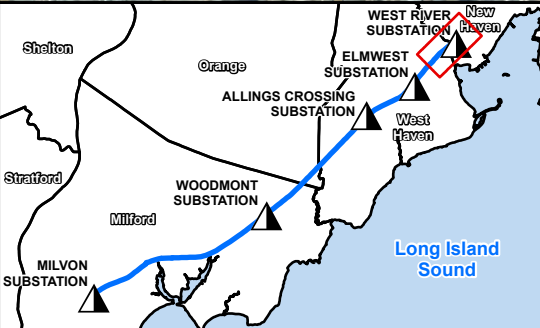
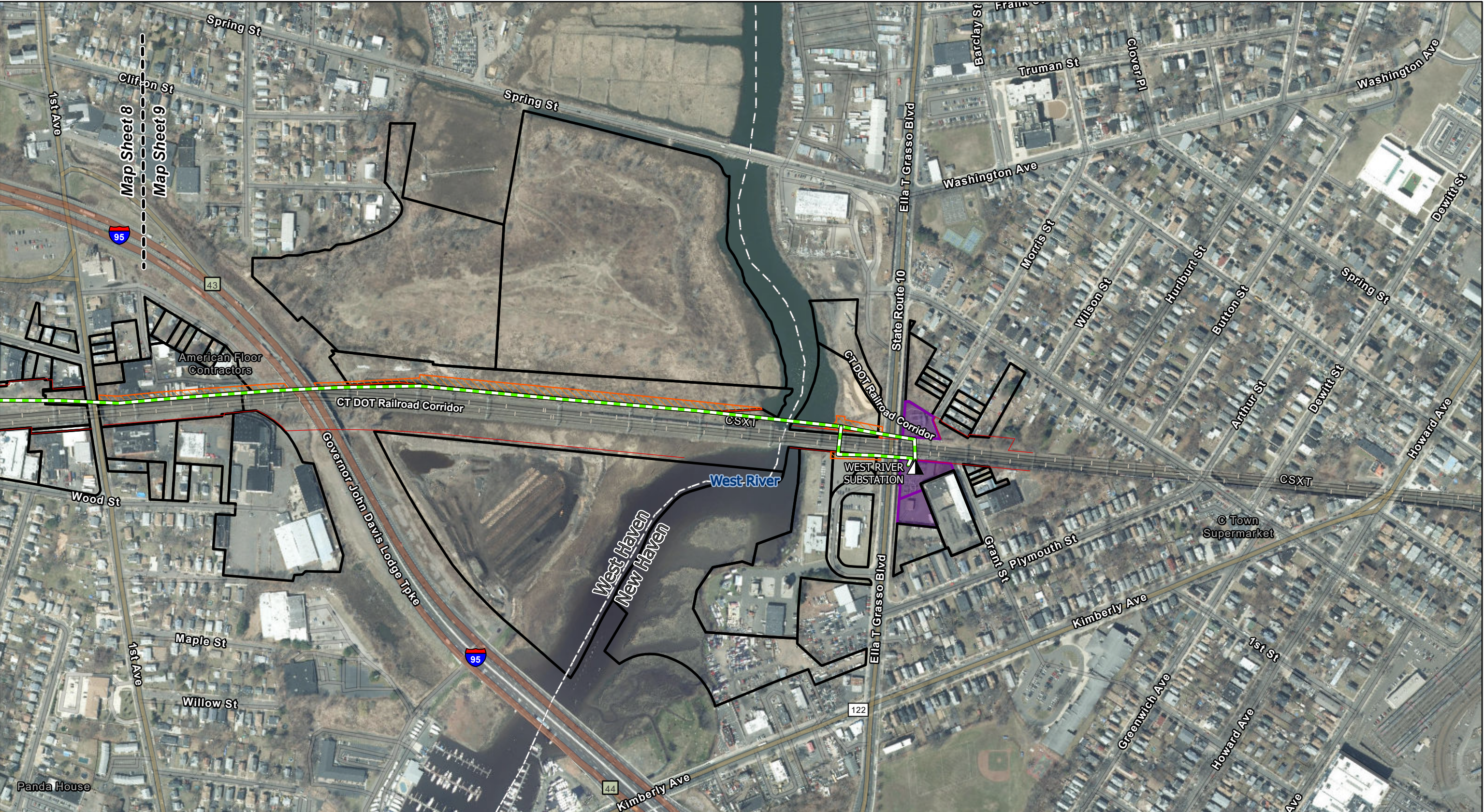
UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option A
 Proposed Project - North Side of RR ROW

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Coordinate System:
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Option A Map 8 of 9

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Map Legend

- Option A -- Rebuilt 115-kV Overhead Lines -- North
- Proposed UI Permanent Easement
- Parcel Boundary
- Municipal Boundary
- CT DOT Corridor Boundary
- UI Owned Property
- ▲ Substation

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option A
 Proposed Project - North Side of RR ROW

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OH Option A Map 9 of 9

Cost Estimate – Furnish and Install

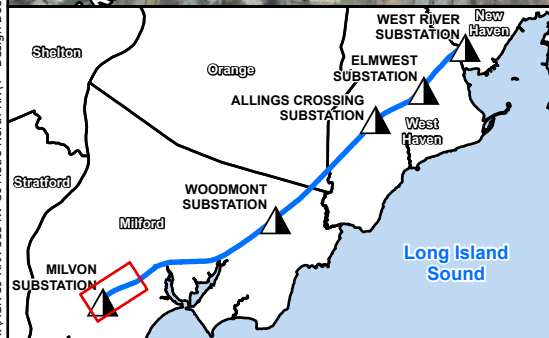
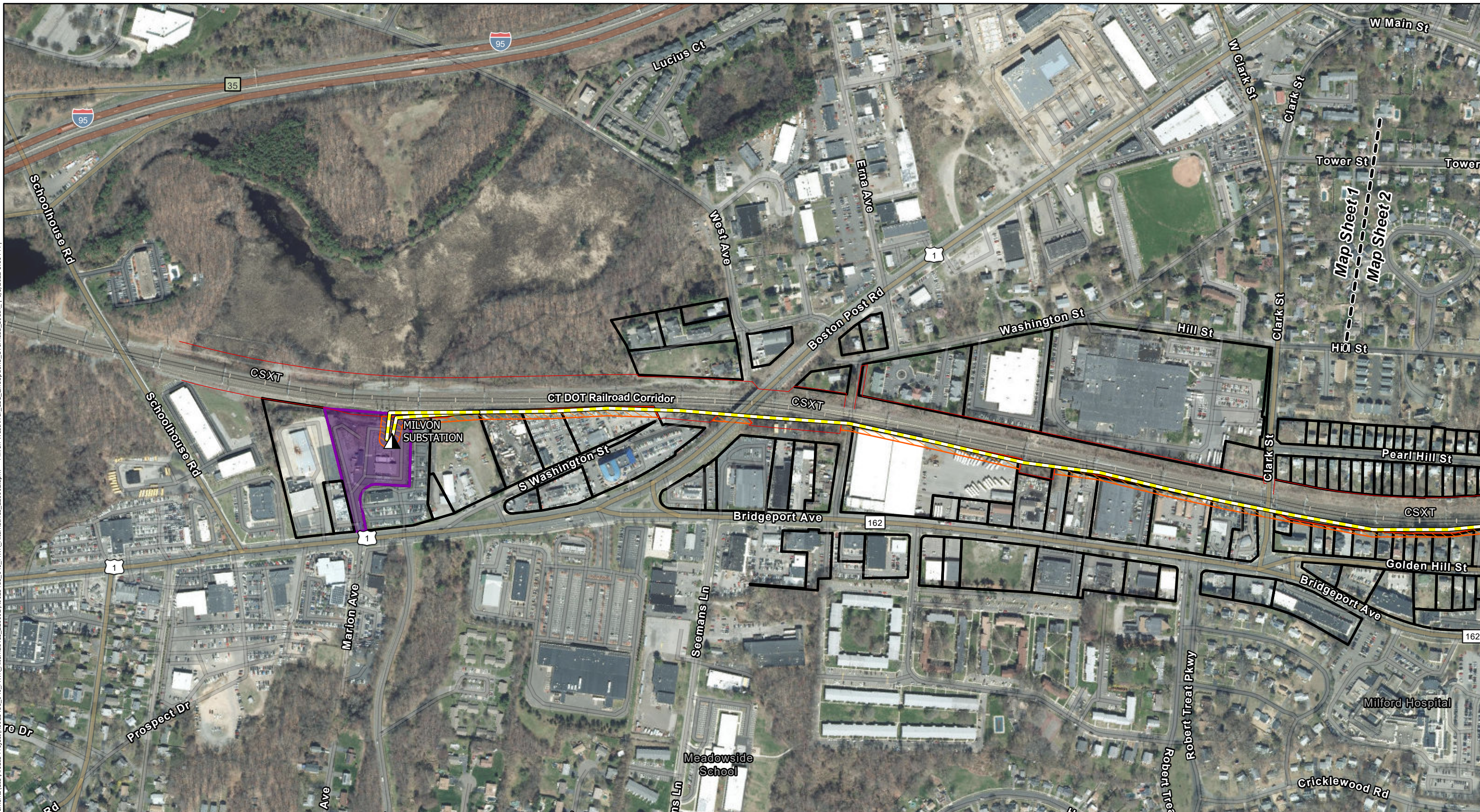
Item	Quantity	Estimate
Engineering & Indirects		\$43,400,000
Steel Poles, Foundations, and Attachment Hardware	158	\$46,250,000
OPGW and Conductors		\$28,500,000
Removals		\$17,500,000
Other Construction Requirements (Mobilization, Laydown Yards, Commissioning of Line, etc)		\$10,900,000
Distribution Work		\$400,000
Substation Work	-	\$1,200,000
Land Rights	18 acres	\$12,950,000
Environmental Controls (Matting, Clearing, etc)		\$35,450,000
Flagmen/Police Support		\$13,400,000
AFUDC		\$40,650,000
Contingency (30%)		\$44,400,000
Option A Total Cost		\$295,000,000

Option B

Overhead Transmission Line, south side of RR ROW

Proposed Project constructed completely overhead between Milvon Substation to West River Substation primarily on the south side of the tracks

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Map Legend

- Option B -- Rebuilt 115-kV Overhead Lines -- South
- Proposed UI Permanent Easement
- Substation
- Parcel Boundary
- CT DOT Corridor Boundary
- UI Owned Property
- Municipal Boundary

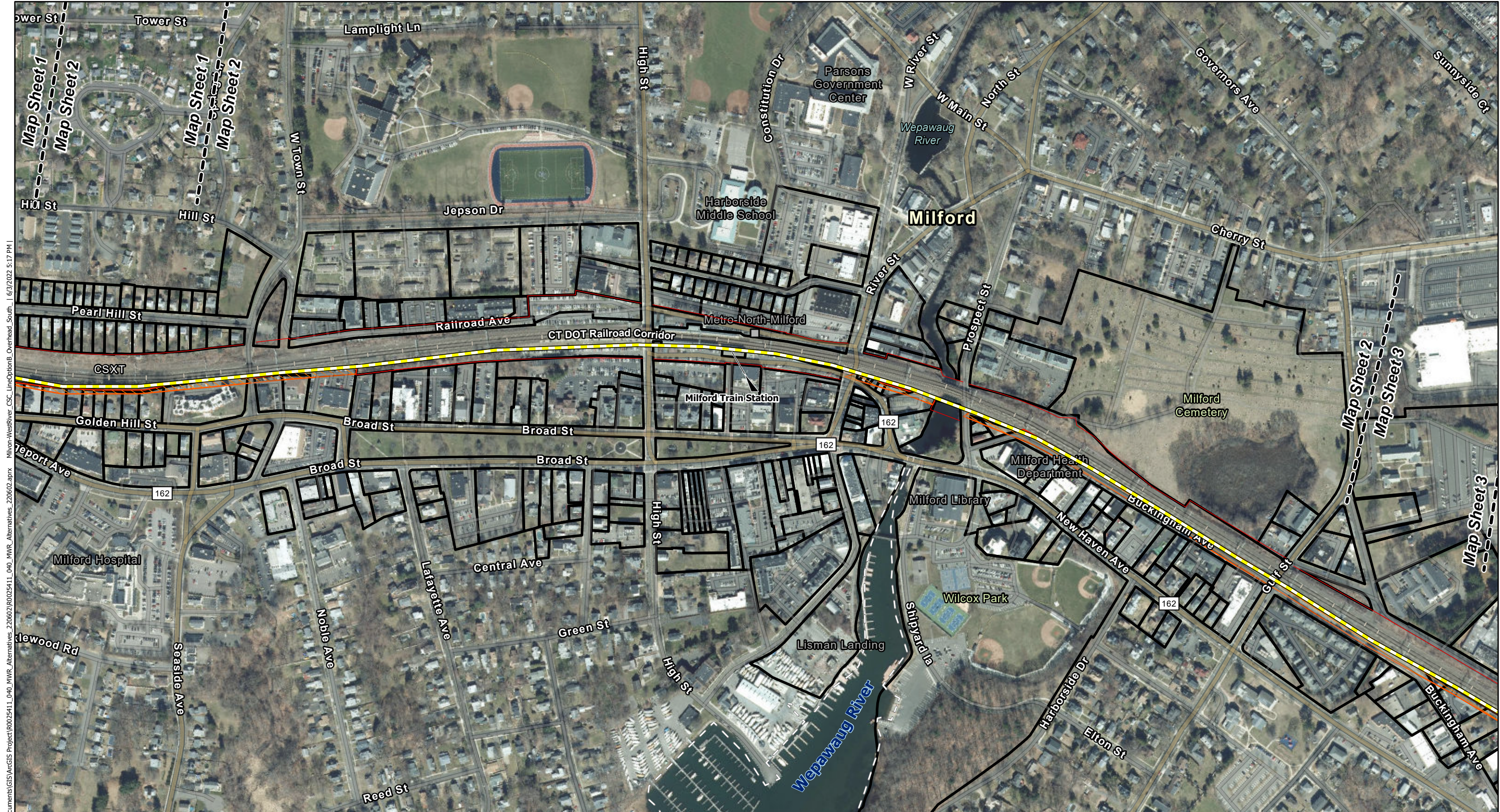
UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option B
 CONCEPT ROUTE - South Side of RR ROW

Coordinate System:
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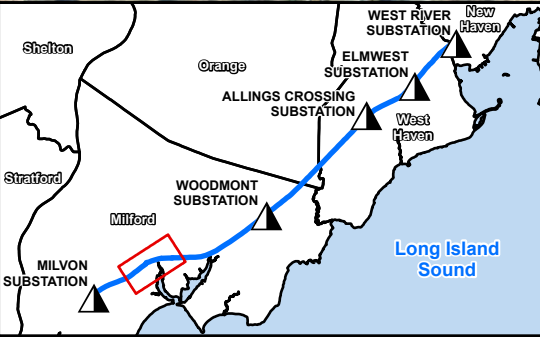
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OH Option B Map 1 of 9



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Map Legend

Option B -- Rebuilt 115-kV Overhead Lines -- South	Proposed UI Permanent Easement
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option B
 CONCEPT ROUTE - South Side of RR ROW

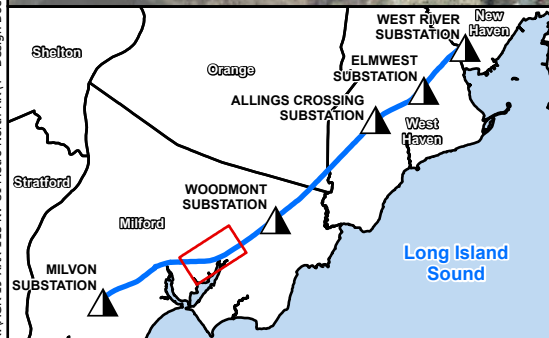
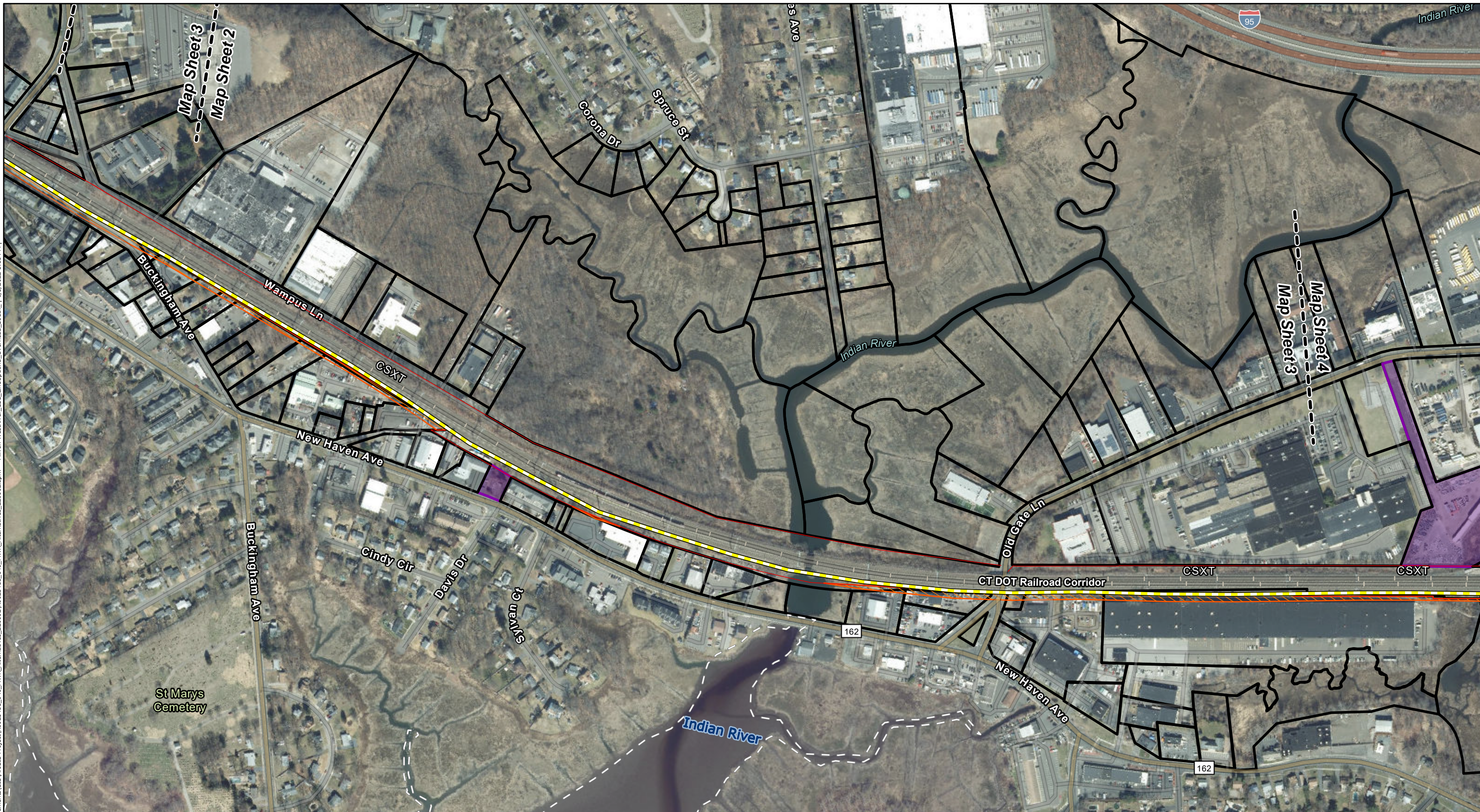
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OH Option B Map 2 of 9

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Map Legend

- Option B -- Rebuilt 115-kV Overhead Lines -- South
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- Substation
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- Municipal Boundary

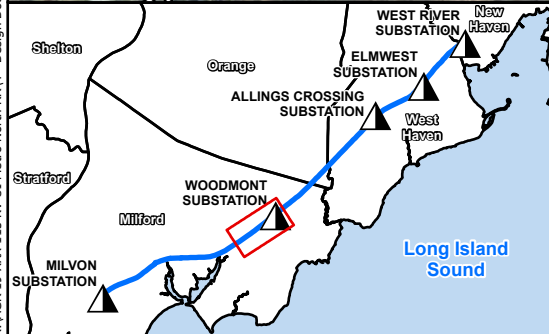
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OH Option B Map 3 of 9

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Map Legend

- Option B -- Rebuilt 115-kV Overhead Lines -- South
- Proposed UI Permanent Easement
- Parcel Boundary
- UI Owned Property
- Municipal Boundary
- Substation
- CT DOT Corridor Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
Overhead Route Option B
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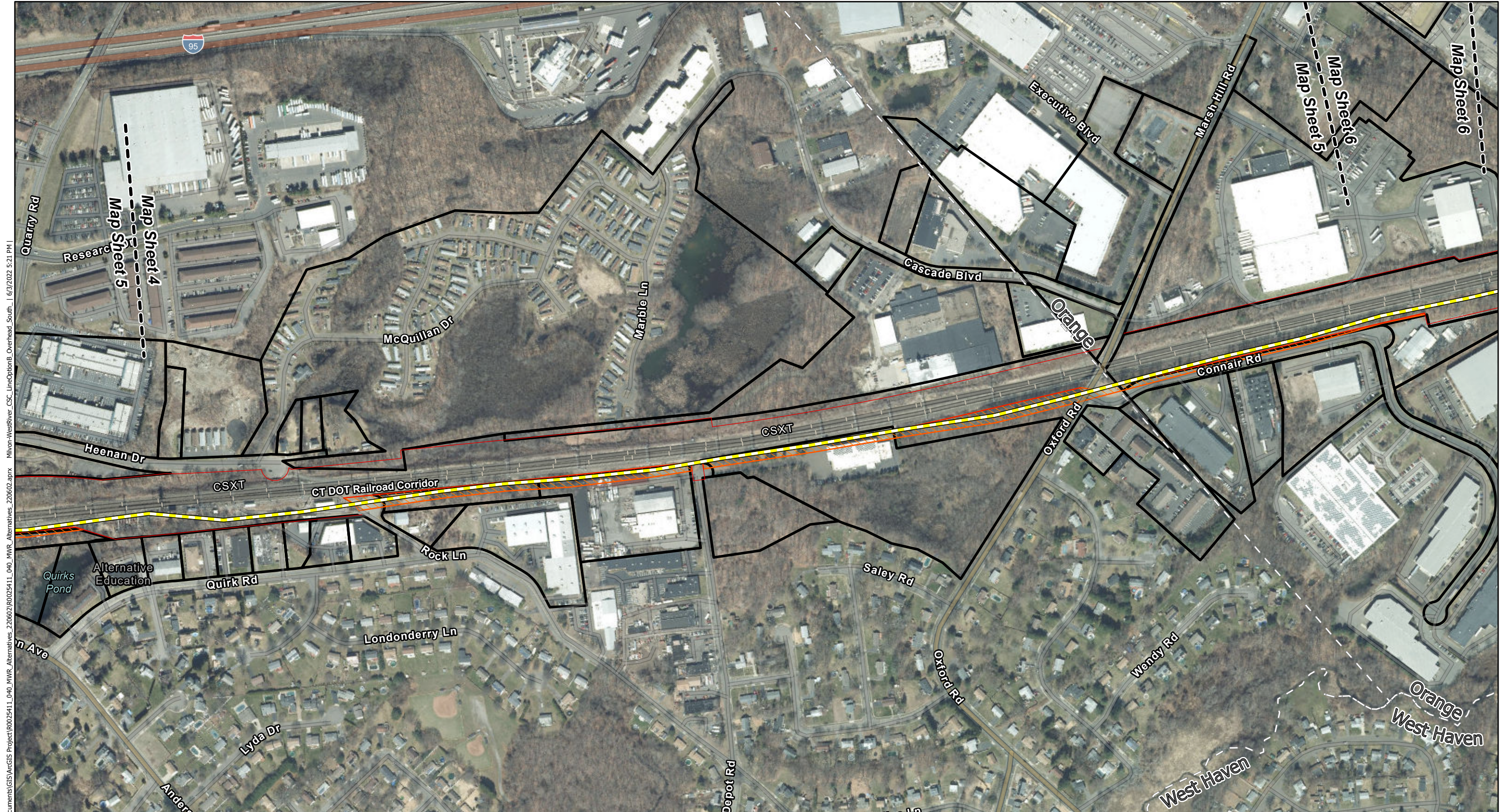


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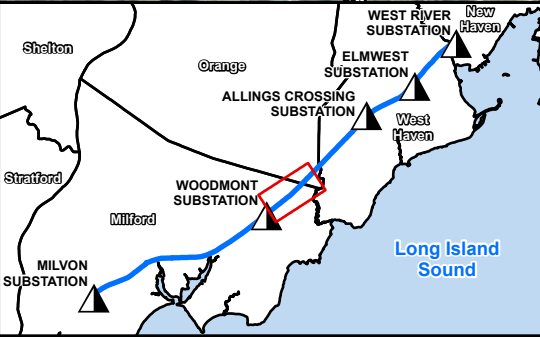


Westwood

OH Option B Map 4 of 9



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Map Legend

Option B -- Rebuilt 115-kV Overhead Lines -- South	Proposed UI Permanent Easement
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
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OH Option B Map 5 of 9


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Map Legend

- Option B -- Rebuilt 115-kV Overhead Lines -- South
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- UI Owned Property
- Substation
- CT DOT Corridor Boundary
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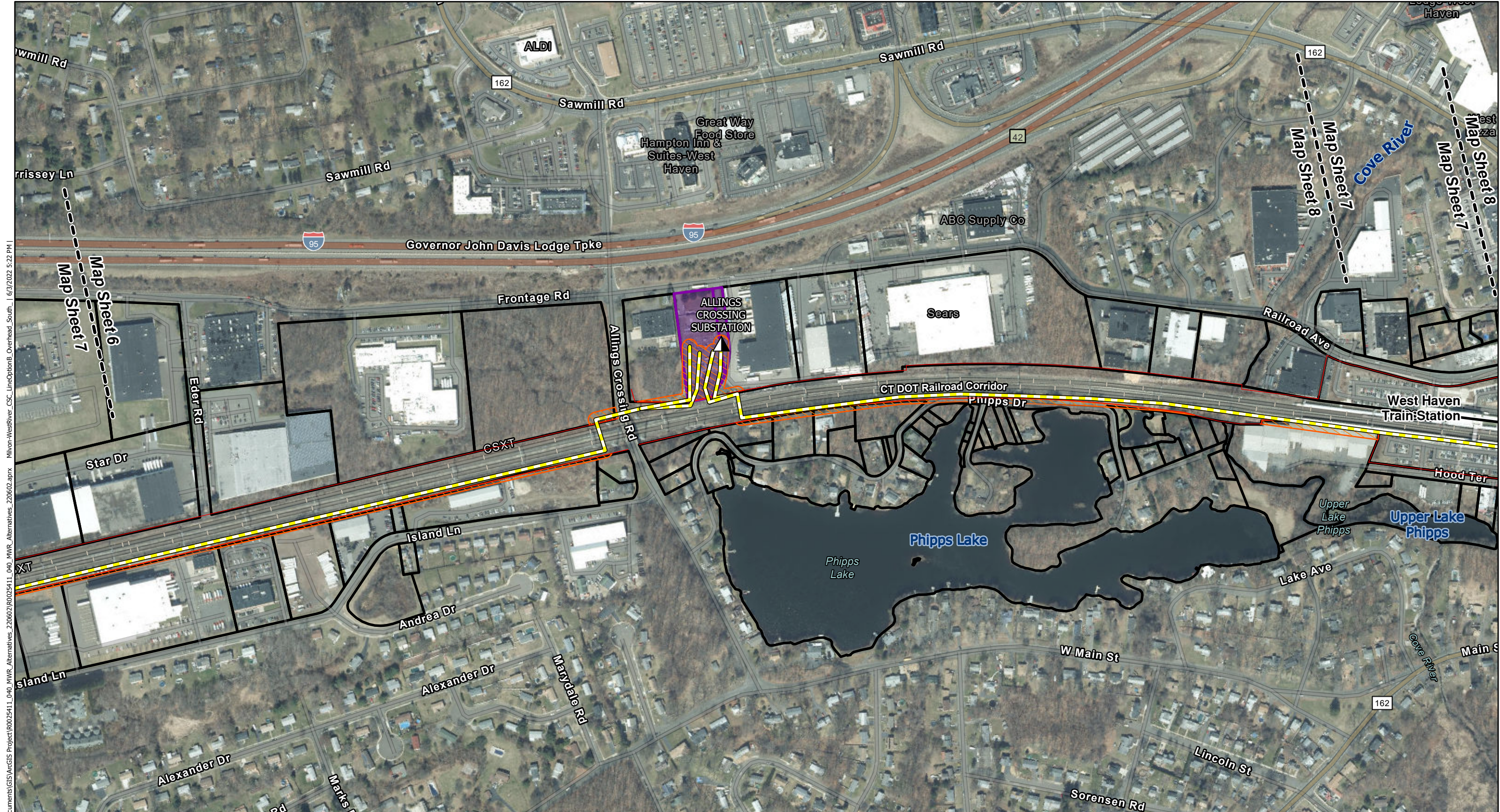

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NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
Linear Units: Foot US

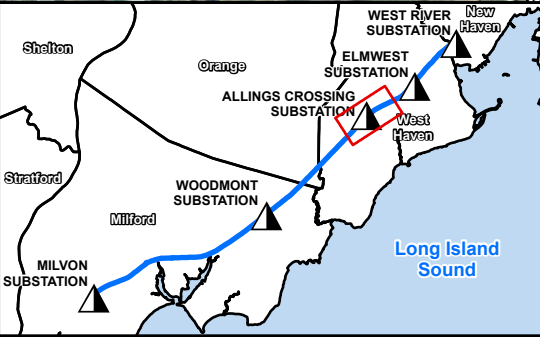


Westwood

OH Option B Map 6 of 9



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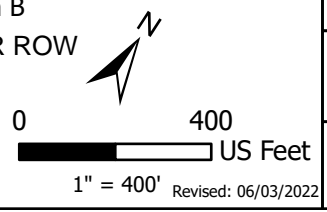
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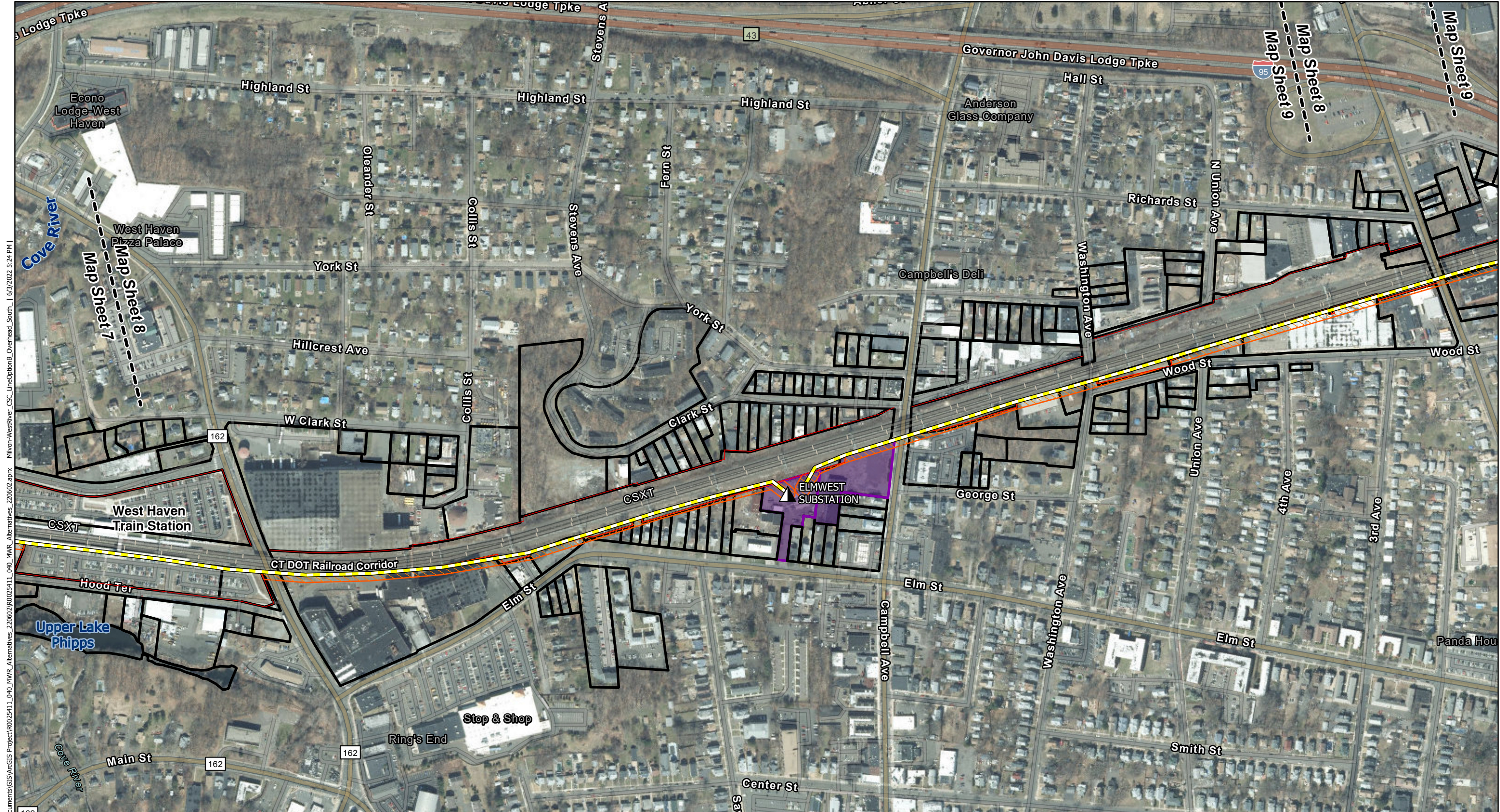
- Option B -- Rebuilt 115-kV Overhead Lines -- South
- Proposed UI Permanent Easement
- Parcel Boundary
- UI Owned Property
- CT DOT Corridor Boundary
- Municipal Boundary
- Substation

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option B
 CONCEPT ROUTE - South Side of RR ROW

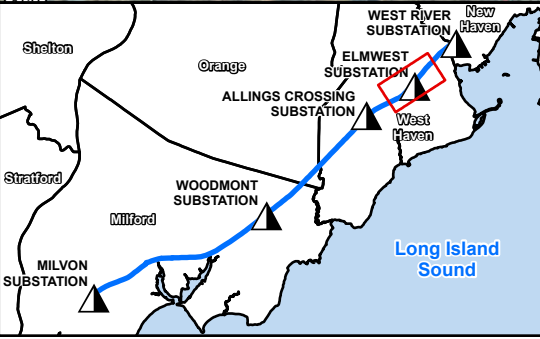
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 Linear Units: Foot US

OH Option B Map 7 of 9





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Map Legend

Option B -- Rebuilt 115-kV Overhead Lines -- South	Proposed UI Permanent Easement
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option B
 CONCEPT ROUTE - South Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

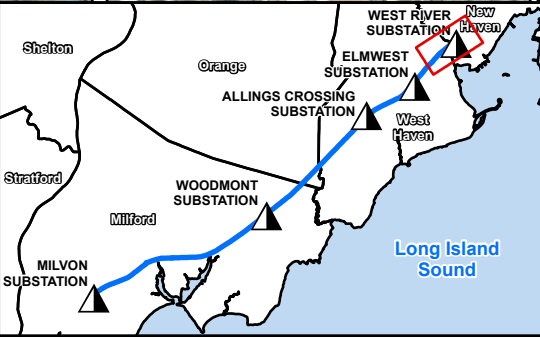
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 1" = 400' Revised: 06/03/2022

Westwood

OH Option B Map 8 of 9



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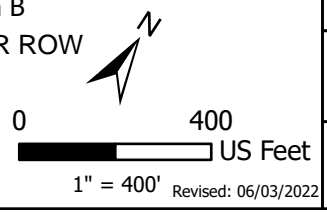
Map Legend

Option B -- Rebuilt 115-kV Overhead Lines -- South	Proposed UI Permanent Easement
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Overhead Route Option B
 CONCEPT ROUTE - South Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

OH Option B Map 9 of 9



Cost Estimate – Furnish and Install

Item	Quantity	Estimate
Engineering & Indirects		\$70,600,000
Steel Poles, Foundations, and Attachment Hardware	155	\$46,250,000
OPGW and Conductors		\$28,600,000
Removals		\$17,500,000
Other Construction Requirements (Mobilization, Laydown Yards, Commissioning of Line, etc)		\$10,900,000
Distribution Work		\$1,000,000
Substation Work	-	\$1,200,000
Land Rights	24 acres	\$17,850,000
Environmental Controls (Matting, Clearing, etc)		\$39,650,000
Flagmen/Police Support		\$13,400,000
AFUDC		\$46,650,000
Contingency (30%)		\$46,200,000
Option B Total Cost		\$339,800,000

General Overall Design Constraints

The following items were considered in the design of the proposed project.

- The rebuilt line should be parallel and adjacent to the RR tracks.
- Conductors shall not cross over buildings.
- Site grading shall be limited to the maximum extent possible.
 - Structures shall be spotted at the bottom of the slope up to the RR tracks or at the top of the slope down to the RR tracks, to the maximum extent possible.
- Poles shall be placed within the CTDOT Railroad Corridor to the maximum extent possible.
- Pole shall be placed in locations to minimize to support MNR signal and/or feeder wires.
- Minimize all construction impacts to private residential properties to the maximum extent possible.
- Pole placement and wire pulling sites should be located in locations of sufficient size for the work required.
- Impacts from pole placement in wetlands, watercourses and the cemetery shall be minimized to the maximum extent possible

Assumptions Option B

Design/Engineering/Scope

- No underground subsurface utility survey has been performed
- No geotechnical investigations have been performed, which dictate pole foundation sizing in addition to soil and groundwater environmental characterization and disposal volume estimates
- Pole heights have not been determined
- No field verification of pole placement or wire pulling locations has been performed
- Pole placement was based on what has been investigated for the proposed project in terms of the work pads for removal activities.
- Poles are placed within the CTDOT Railroad Corridor to the maximum extent possible.
 - However, approximately 30 poles may have to be located on private property for this option while, while only 13 poles are located on private property for the proposed project.
 - This results in more permanent easements required
- Where possible, poles are located a sufficient distance away from the existing catenary structures to not have to support MNR signal and/or feeder wires.

- However, up to 20 poles may have to support MNR signal and/or feeder wires
- The line is parallel and adjacent to the RR tracks, primarily on the south side of tracks, except for where the line must connect to Woodmont, Allings Crossing, and West River Substations.
- Due to the tight corridor and the proximity of existing buildings to the existing catenary structures, this option will require conductors to span across buildings.
 - In some locations, this can be mitigated by placing poles on the top of the slope up to the RR tracks. Required site grading, matting, and necessary environmental controls will be significantly increased in these locations.
- Due to constructability concerns, two spans of over 1,000' are proposed. Spans of this length require the use of a special conductor type, and significantly taller poles
- Significant Impacts can and will happen on private residential properties (either poles on private property or significant vegetation clearing and conductor overhang)
- EMF impacts have not been assessed
- Potential archeological impacts have not been assessed on the south side of the corridor (check with David)
- The extent of wetland and watercourse impacts have not been reviewed, specifically with respect to permanent impacts and permitting.

Access routes for construction have not been fully vetted

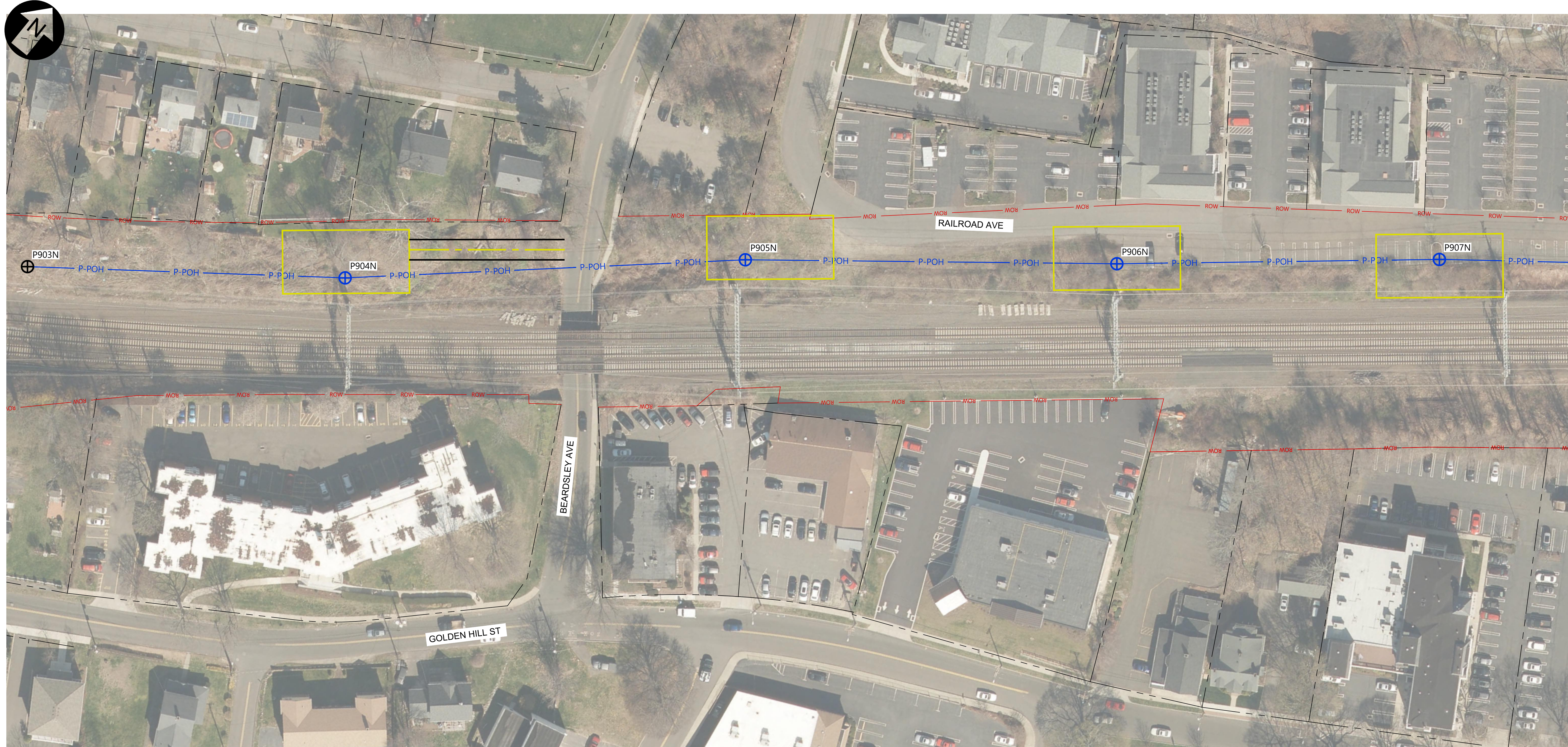
Cost Estimate

- ISO-PP4 Appendix D assumptions:
 - This is a "Project Initiation" type estimate (-50%/+200% accuracy)
 - Contingency for this type of estimate is 30%-50%
 - This estimate used 30% contingency
- Per Acreage Costs for Land Rights are assumed to be \$750,000/acre
- Escalation is calculated at 1.75% per year
- Four flagmen per day (2 crews) have been allocated for the duration of the construction schedule

Option C

Overhead Transmission Line, north side of RR ROW (Proposed Project with Reduced Structure Heights from P905N to P914N)

Proposed Project constructed completely overhead between Milvon Substation to West River Substation primarily on the north side of the tracks with Reduced Structure Heights from P905N to P914N



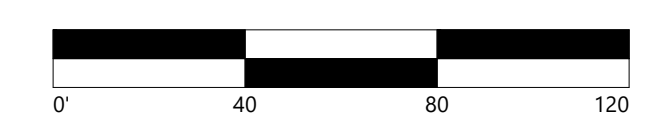
PLAN	SURVEYED	REVIEWED	ROW	CHKD
NOTEBOOK NO.				
BY	DATE			

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BY	DATE	

- LEGEND**
- OPTION C CONCEPT STRUCTURE LOCATIONS
 - UI PROPOSED 115-KV TRANSMISSION LINE STRUCTURE
 - P-POH OPTION C CONCEPT OVERHEAD ALIGNMENT
 - ROW EXISTING CT DOT CORRIDOR BOUNDARY
 - EXISTING PROPERTY LINE
 - ACCESS ROAD
 - WORK PAD

DOWNTOWN MILFORD CONCEPT PLAN



CADD Drawing. DO NOT REVISE MANUALLY.

UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE	YR. CONST.	W/O	PE Stamp
TENSION	TENSION	TENSION	TENSION	NOTES: 1. PRELIMINARY, NOT FOR CONSTRUCTION		
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	REV.	DATE	BY

DESCRIPTION	APP.

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APP.	MSP			
DATE:				

UI 115-kV RR PROJECT MILVON TO WEST RIVER			
OPTION C - OH REDUCED STR. HEIGHTS			
1 OF 3			
REV.	0		

PLAN	SURVEYED	REVIEWED	DATE
NOTEBOOK NO.	ROW	CHKD	

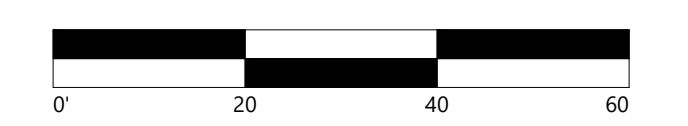
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NOTEBOOK NO.	NOTES REDUCED	



- LEGEND**
- OPTION C CONCEPT STRUCTURE LOCATIONS
 - UI PROPOSED 115-KV TRANSMISSION LINE STRUCTURE
 - P-POH OPTION C CONCEPT OVERHEAD ALIGNMENT
 - ROW EXISTING CT DOT CORRIDOR BOUNDARY
 - EXISTING PROPERTY LINE
 - ACCESS ROAD
 - WORK PAD

DOWNTOWN MILFORD CONCEPT PLAN



CADD Drawing. DO NOT REVISE MANUALLY.

UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE	YR. CONST.	W/O	PE Stamp	AVANGRID ENGINEERING CONFIDENTIAL, PROPRIETARY and TRADE SECRET INFORMATION Property of AVANGRID		UI 115-KV RR PROJECT MILVON TO WEST RIVER OPTION C - OH REDUCED STR. HEIGHTS 3 OF 3
TENSION	TENSION	TENSION	TENSION	NOTES:	1. PRELIMINARY, NOT FOR CONSTRUCTION				
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	REV.	DATE	BY	DESCRIPTION	APP.	REV.

Cost Estimate – Furnish and Install

Item	Quantity	Estimate
Engineering & Indirects		\$43,650,000
Steel Poles, Foundations, and Attachment Hardware	161	\$46,650,000
OPGW and Conductors		\$28,500,000
Removals		\$17,500,000
Other Construction Requirements (Mobilization, Laydown Yards, Commissioning of Line, etc)		\$10,900,000
Distribution Work		\$450,000
Substation Work	-	\$1,200,000
Land Rights	18 acres	\$13,000,000
Environmental Controls (Matting, Clearing, etc)		\$35,475,000
Flagmen/Police Support		\$13,400,000
AFUDC		\$40,775,000
Contingency (30%)		\$44,500,000
Option C Total Cost		\$296,000,000

Assumptions

Design/Engineering/Scope

- No underground subsurface utility survey has been performed on the south side of the railroad tracks or at relocated structure locations
- No geotechnical investigation has been performed on the south side of the railroad tracks or at relocated structure locations which dictate pole foundation sizing in addition to soil and groundwater environmental characterization and disposal volume estimates
- 5 Additional Steel Poles and Foundations Needed in Comparison to the Proposed Project, increasing viewshed impacts and likelihood of impacting archaeological resources due to more foundations
- Additional Vegetation Clearing and Land Rights Needed in Comparison to the Proposed Project
- No field verification of pole placement or wire pulling locations has been performed
- Due to the tight corridor and the proximity of existing buildings to the existing catenary structures, this option will require conductors to span across buildings.
- Two additional track crossings will be required which will require more track outages and delay construction

Cost Estimate

- ISO-PP4 Appendix D assumptions:
 - This is a “Project Initiation” type estimate (-50%/+200% accuracy)
 - Contingency for this type of estimate is 30%-50%
 - This estimate used 30% contingency
- Escalation is calculated at 1.75% per year
- Four flagmen per day (2 crews) have been allocated for the duration of the construction schedule

Option D

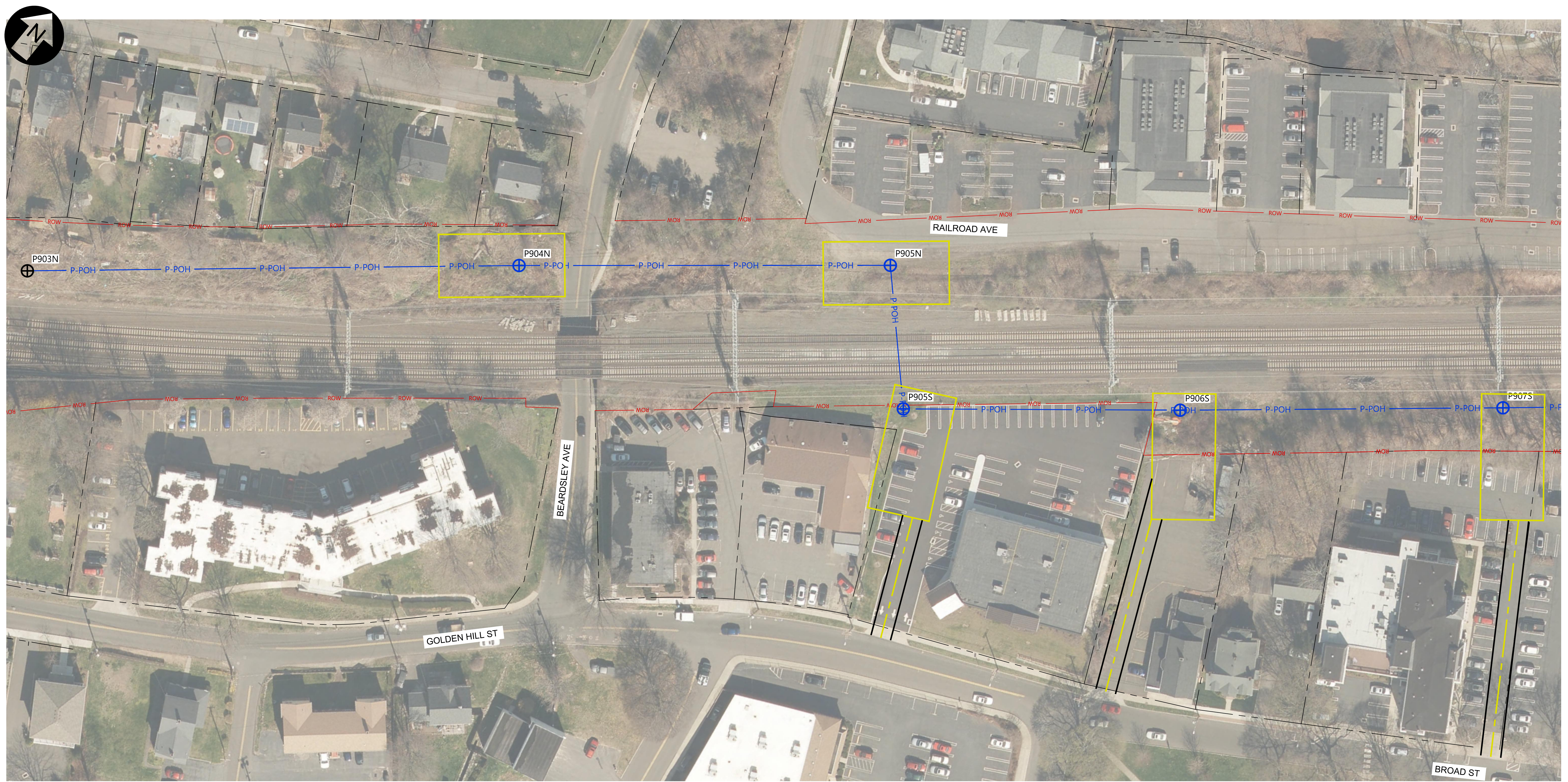
Overhead Transmission Line, north side of RR ROW (Proposed Project Shifted to South Side from P905N to P914N)

Proposed Project constructed completely overhead between Milvon Substation to West River Substation primarily on the north side of the tracks with the line routed to the south side of the tracks between P905N to P914N

PLAN	SURVEYED	BY	DATE
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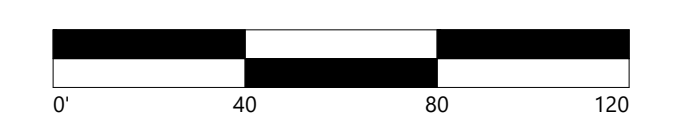
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NOTEBOOK NO.	REVIEWED		
	NOTES REDUCED		



- LEGEND**
- OPTION D CONCEPT STRUCTURE LOCATIONS
 - UI PROPOSED 115-KV TRANSMISSION LINE STRUCTURE
 - P-POH OPTION D CONCEPT OVERHEAD ALIGNMENT
 - ROW EXISTING CT DOT CORRIDOR BOUNDARY
 - EXISTING PROPERTY LINE
 - ACCESS ROAD
 - WORK PAD

DOWNTOWN MILFORD CONCEPT PLAN



CADD Drawing, DO NOT REVISE MANUALLY.

UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE	YR. CONST.	W/O	PE Stamp
TENSION	TENSION	TENSION	TENSION	NOTES: 1. PRELIMINARY, NOT FOR CONSTRUCTION		
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DESCRIPTION	APP.

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UI 115-kV RR PROJECT MILVON TO WEST RIVER
 OPTION D - OVERHEAD SOUTH OF RR TRACKS

1 OF 3

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NOTEBOOK NO.	REVIEWED ROW CHKD		

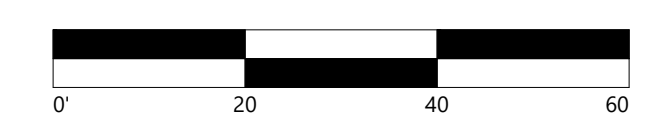
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NOTEBOOK NO.	REVIEWED NOTES REDUCED		



- LEGEND**
- OPTION D CONCEPT STRUCTURE LOCATIONS
 - UI PROPOSED 115-KV TRANSMISSION LINE STRUCTURE
 - P-POH OPTION D CONCEPT OVERHEAD ALIGNMENT
 - ROW EXISTING CT DOT CORRIDOR BOUNDARY
 - EXISTING PROPERTY LINE
 - ACCESS ROAD
 - WORK PAD

DOWNTOWN MILFORD CONCEPT PLAN



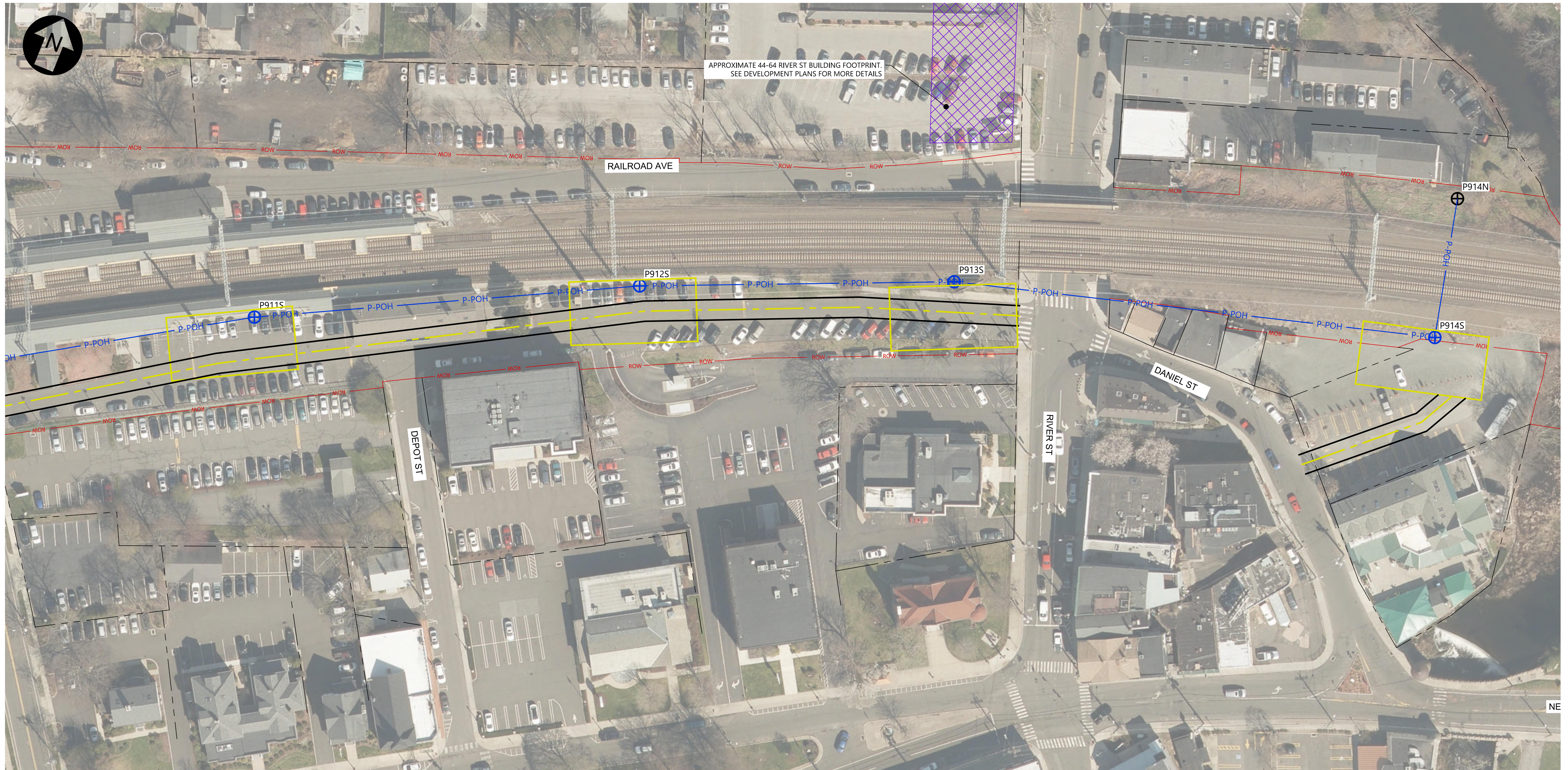
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TENSION	TENSION	TENSION	TENSION	NOTES: 1. PRELIMINARY, NOT FOR CONSTRUCTION		DR. SFB CK. JRD APP. MSP			
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	REV.	DATE	BY	DESCRIPTION	APP.	DATE

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NOTEBOOK NO.	ROW	CHKD	
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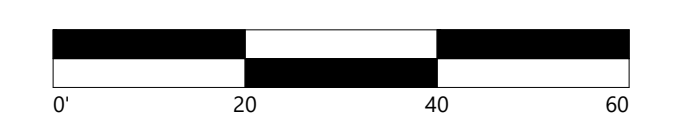
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- LEGEND**
- OPTION D CONCEPT STRUCTURE LOCATIONS
 - UI PROPOSED 115-KV TRANSMISSION LINE STRUCTURE
 - P-POH OPTION D CONCEPT OVERHEAD ALIGNMENT
 - EXISTING CT DOT CORRIDOR BOUNDARY
 - EXISTING PROPERTY LINE
 - ACCESS ROAD
 - WORK PAD

DOWNTOWN MILFORD CONCEPT PLAN



CADD Drawing. DO NOT REVISE MANUALLY.

UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE	YR. CONST.	W/O	PE Stamp	AVANGRID ENGINEERING CONFIDENTIAL, PROPRIETARY and TRADE SECRET INFORMATION Property of AVANGRID		UI 115-kV RR PROJECT MILVON TO WEST RIVER OPTION D - OVERHEAD SOUTH OF RR TRACKS 3 OF 3
TENSION	TENSION	TENSION	TENSION	NOTES:	1. PRELIMINARY, NOT FOR CONSTRUCTION				
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	REV.	DATE	BY	DESCRIPTION	APP.	REV.

Cost Estimate – Furnish and Install

Item	Quantity	Estimate
Engineering & Indirects		\$44,500,000
Steel Poles, Foundations, and Attachment Hardware	163	\$47,600,000
OPGW and Conductors		\$32,550,000
Removals		\$17,500,000
Other Construction Requirements (Mobilization, Laydown Yards, Commissioning of Line, etc)		\$11,250,000
Distribution Work		\$400,000
Substation Work	-	\$1,200,000
Land Rights	18 acres	\$13,250,000
Environmental Controls (Matting, Clearing, etc)		\$35,700,000
Flagmen/Police Support		\$13,400,000
AFUDC		\$42,450,000
Contingency (30%)		\$46,900,000
Option D Total Cost		\$306,700,000

Assumptions

Design/Engineering/Scope

- No underground subsurface utility survey has been performed either new structure locations or relocated structure locations
- No geotechnical investigation has been performed either new structure locations or relocated structure locations which dictate pole foundation sizing in addition to soil and groundwater environmental characterization and disposal volume estimates
- Both 115kV Lines can be out of service at the same time for 3 to 4 weeks
- 3 Additional Steel Poles and Foundations Needed in Comparison to the Proposed Project, increasing viewshed impacts and likelihood of impacting archaeological resources due to more foundations
- 6 Poles of 160 with Lowered Pole Heights in Comparison to the Proposed Project
- Additional Vegetation Clearing and Land Rights Needed in Comparison to the Proposed Project
- Heights for the poles located on the south side of the tracks have not been determined but are assumed to range between 100' and 120' in height.
- The billboard by Catenary B913S can be removed.
- Conductors

Cost Estimate

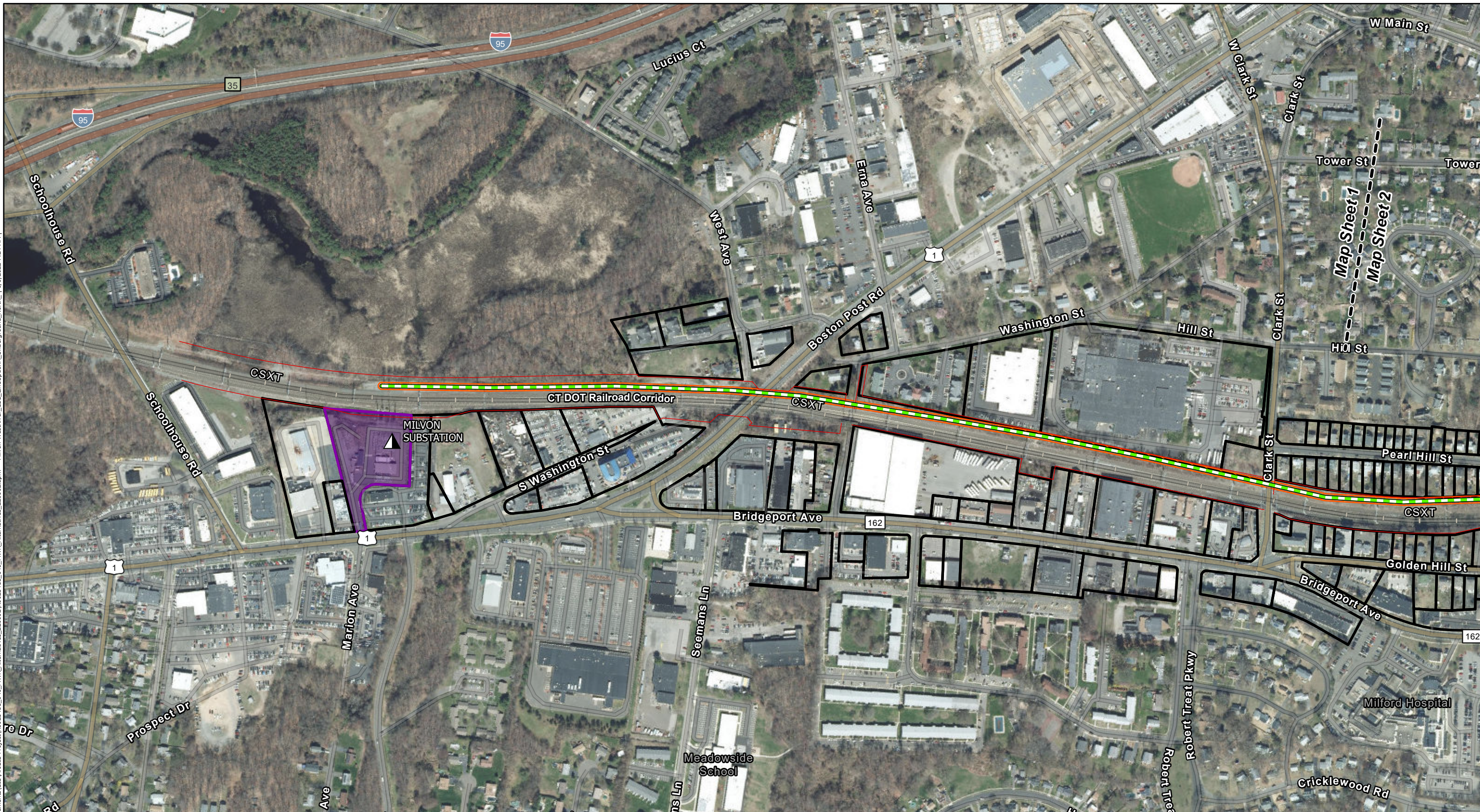
- ISO-PP4 Appendix D assumptions:
 - This is a "Project Initiation" type estimate (-50%/+200% accuracy)
 - Contingency for this type of estimate is 30%-50%
 - This estimate used 30% contingency
- Escalation is calculated at 1.75% per year
- Four flagmen per day (2 crews) have been allocated for the duration of the construction schedule

Option E

Underground Transmission Line, north side of RR ROW

Proposed Project area constructed completely underground between Milvon Substation to West River Substation, within the RR ROW (where feasible) on the north side of the tracks

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Map Legend

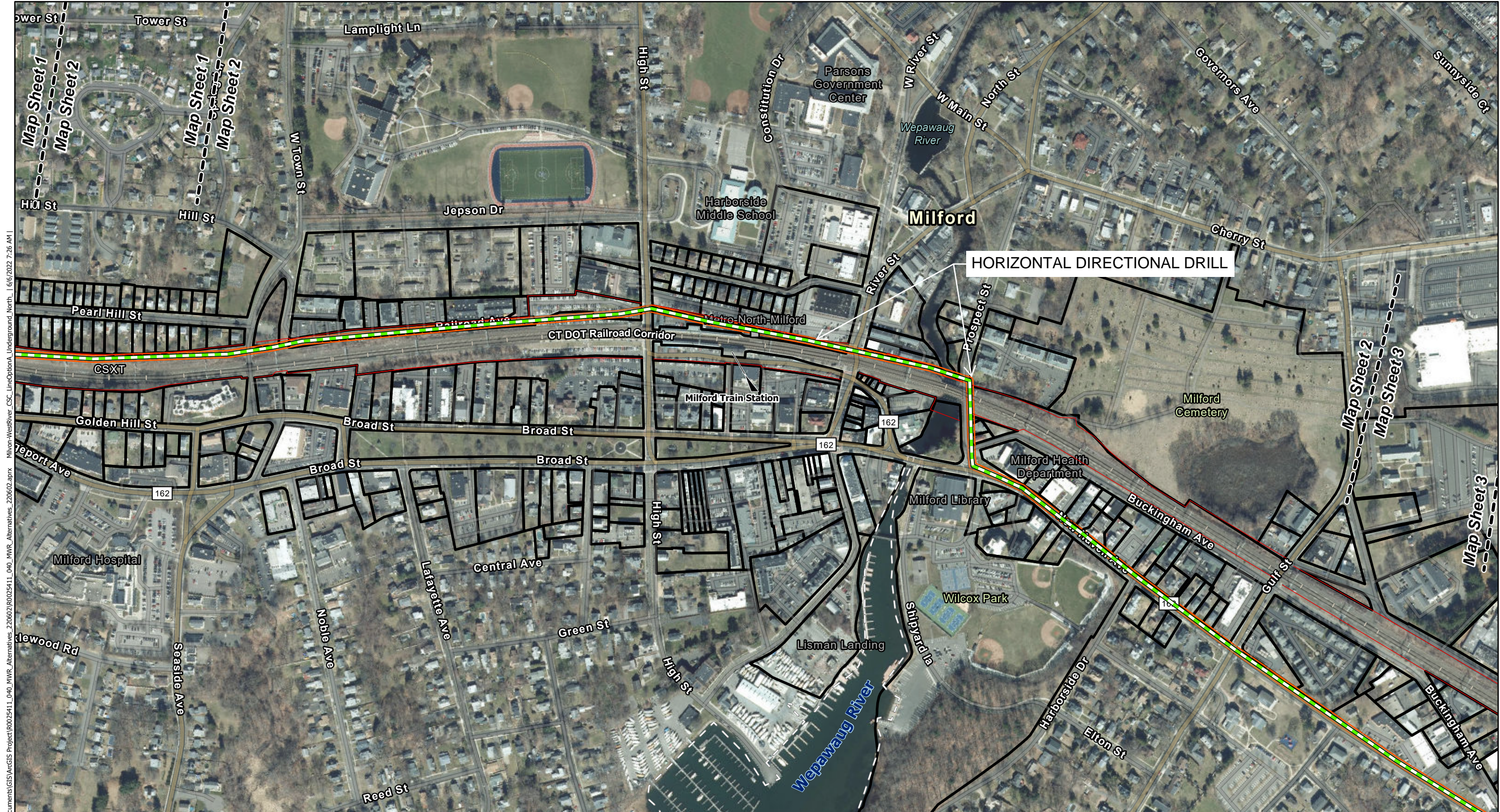
- Option E -- Rebuilt 115-kV Underground Lines -- North
- Approximate Work Area
- Parcel Boundary
- ▲ Substation
- UI Owned Property
- CT DOT Corridor Boundary
- Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
Underground Route Option E
CONCEPT ROUTE - North Side of RR ROW

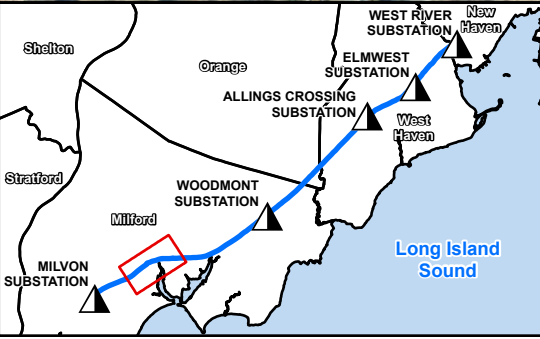
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Coordinate System:
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Linear Units: Foot US

UG Option E Map 1 of 9



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Map Legend

Option E -- Rebuilt 115-kV Underground Lines -- North	Approximate Work Area
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option E
 CONCEPT ROUTE - North Side of RR ROW

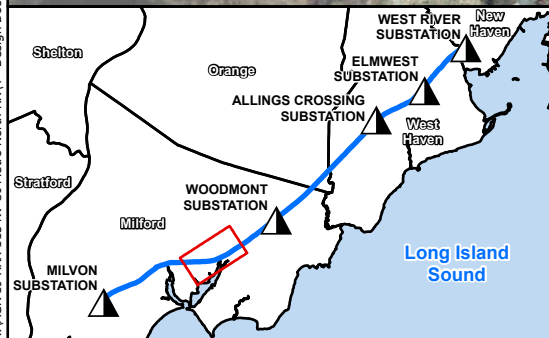
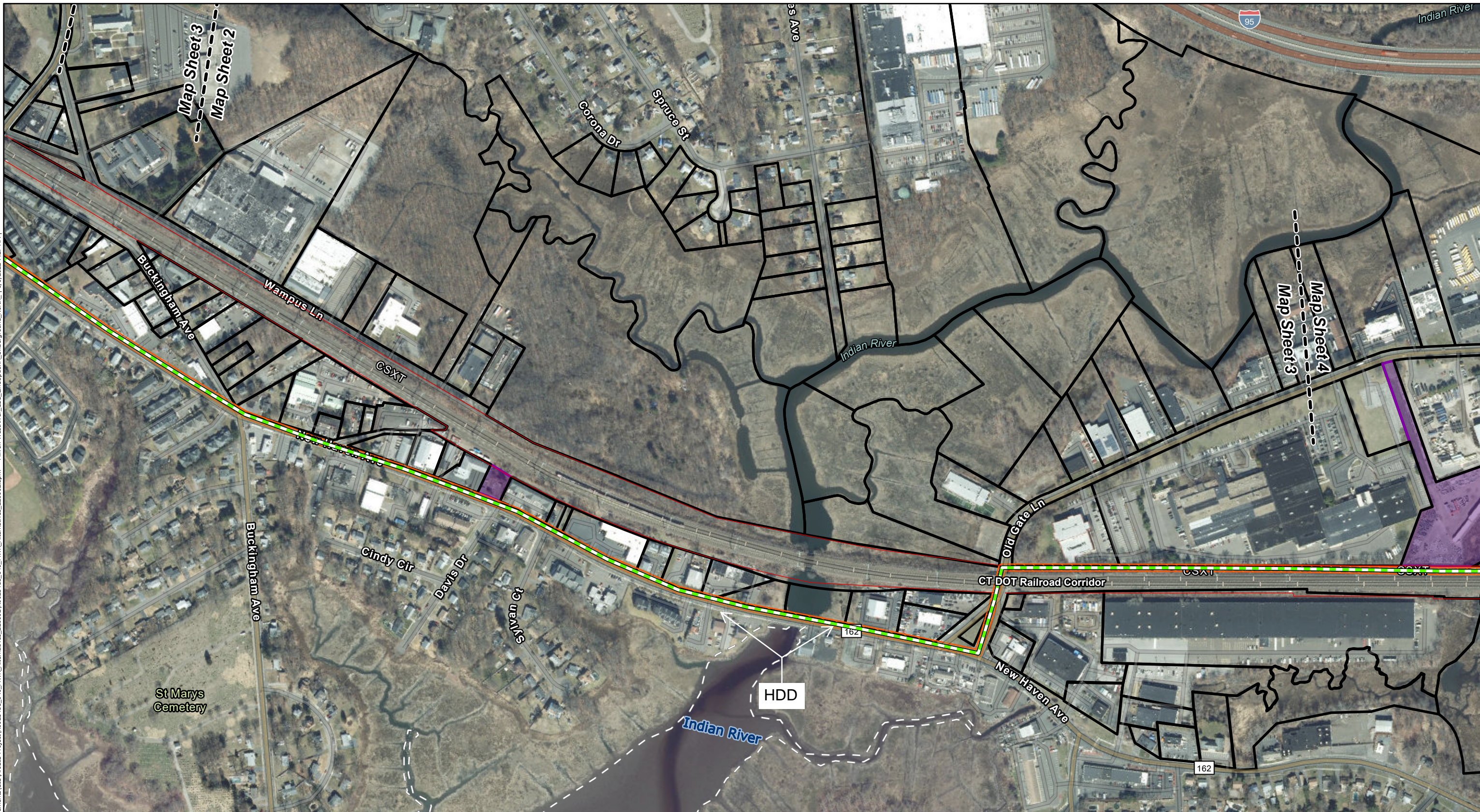
Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

0 400 US Feet
 1" = 400' Revised: 06/06/2022

Westwood

UG Option E Map 2 of 9

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Map Legend

- - - Option E -- Rebuilt 115-kV Underground Lines -- North
- Approximate Work Area
- Parcel Boundary
- UI Owned Property
- Substation
- CT DOT Corridor Boundary
- Municipal Boundary

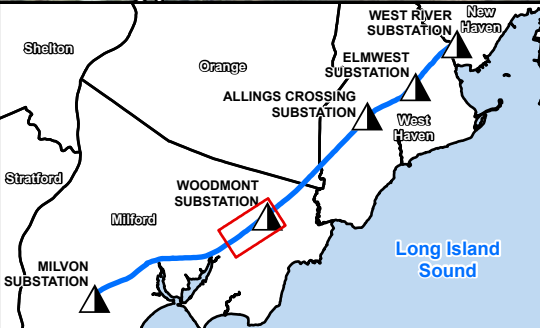
UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option E
 CONCEPT ROUTE - North Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

0 400
 US Feet
 1" = 400' Revised: 06/06/2022



 UG Option E Map 3 of 9

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Map Legend

- Option E -- Rebuilt 115-kV Underground Lines -- North
- Approximate Work Area
- Parcel Boundary
- UI Owned Property
- CT DOT Corridor Boundary
- Municipal Boundary
- ▲ Substation

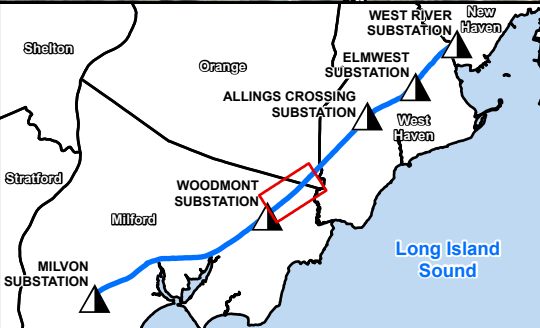
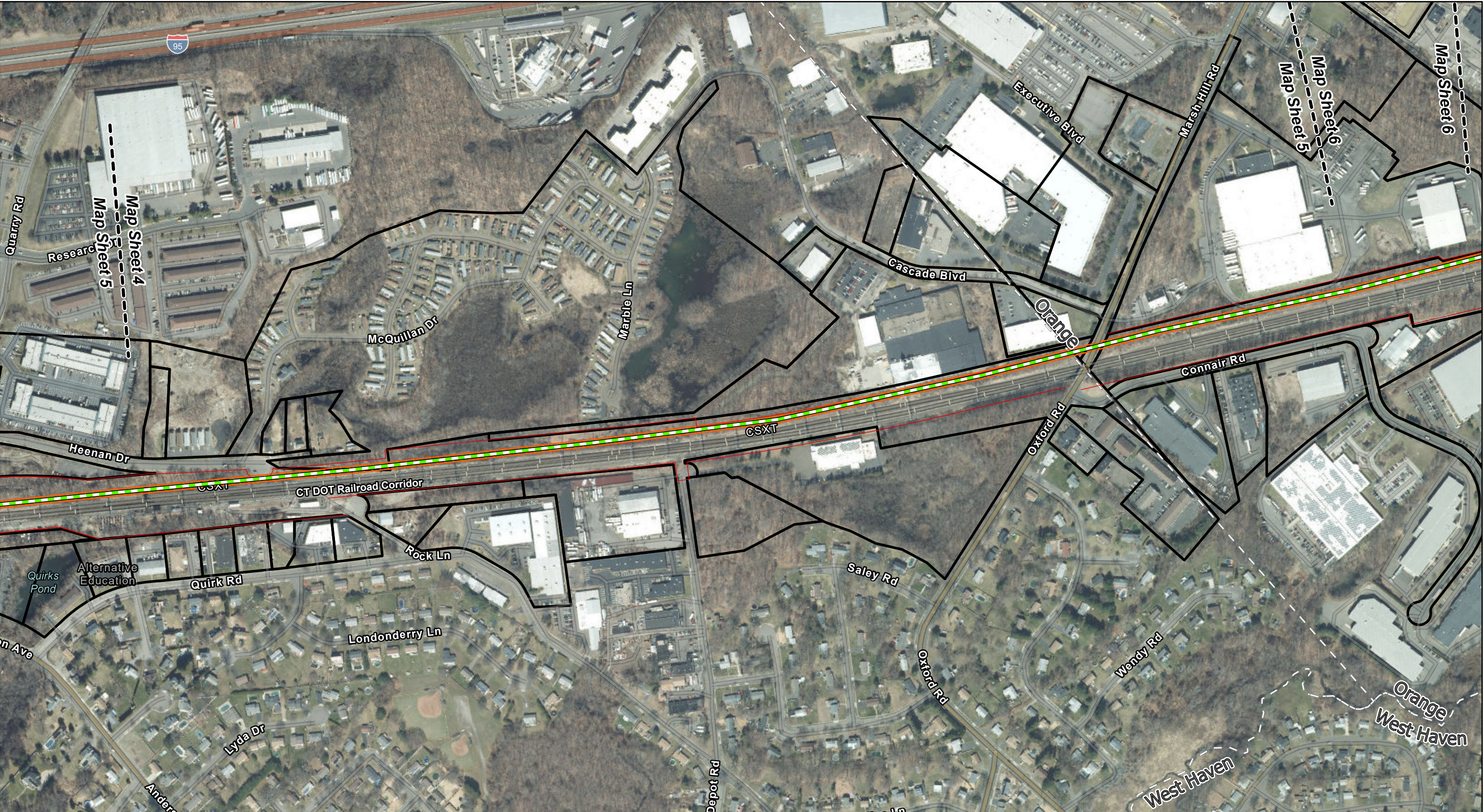
UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option E
 CONCEPT ROUTE - North Side of RR ROW

0 400
 US Feet
 1" = 400' Revised: 06/06/2022

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

UG Option E Map 4 of 9

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 Milvon\WestRiver_CSC_LineOptionA_Underground_North_1_6/16/2022 7:31 AM





Map Legend

Option E -- Rebuilt 115-kV Underground Lines -- North	Approximate Work Area
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option E
 CONCEPT ROUTE - North Side of RR ROW

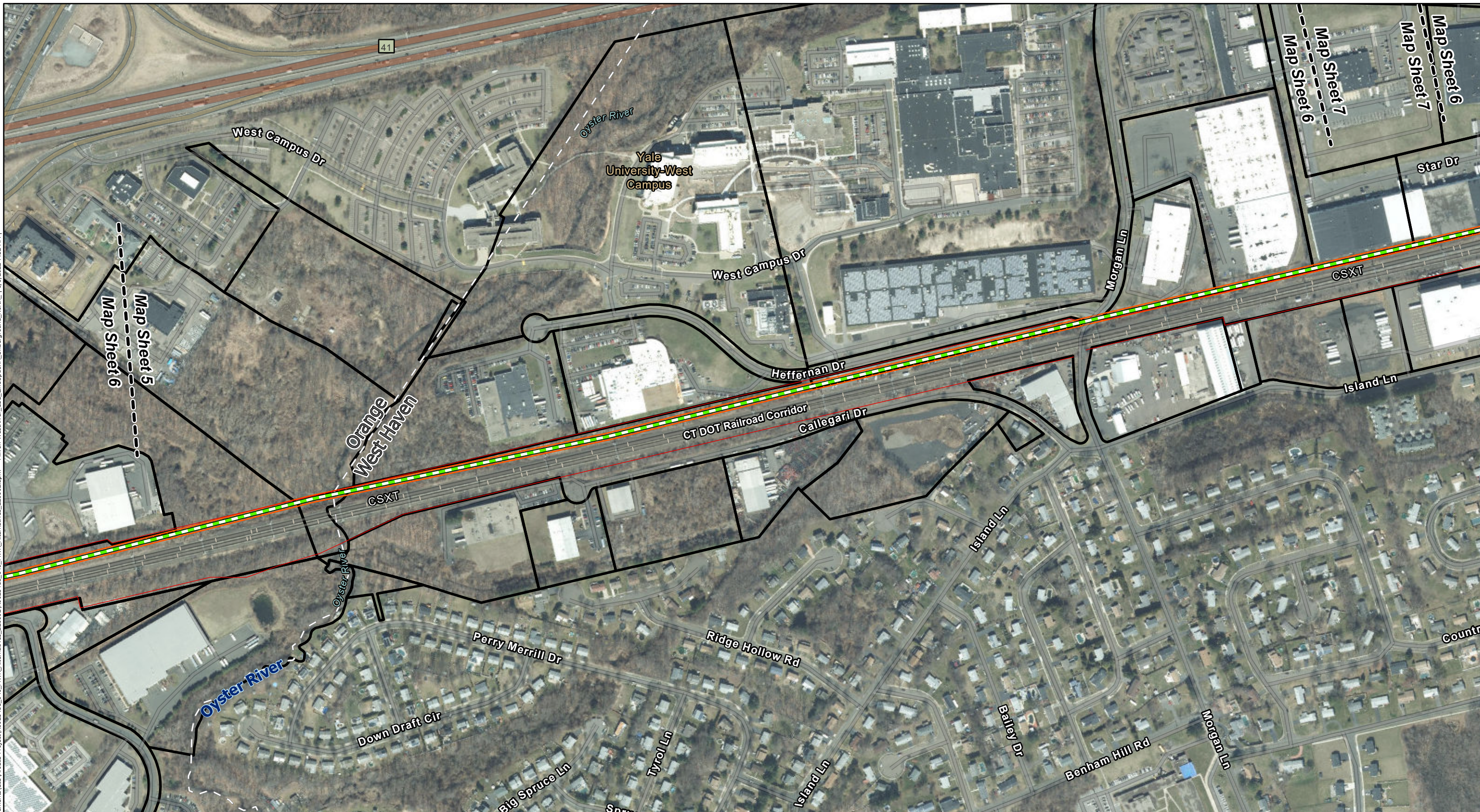
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UG Option E Map 5 of 9

X:\AGP-19-XXX 115 KV UI Metro North RR V4 - Design Documents\GIS\ArcGIS Project\0025411_040_MWR_Alternatives_220602.aprx Milvon\WestRiver_CSC_LineOptionA_Underground_North_1 6/16/2022 7:32 AM



Map Legend

- Option E -- Rebuilt 115-kV Underground Lines -- North
- CT DOT Corridor Boundary
- Substation
- Approximate Work Area
- Parcel Boundary
- UI Owned Property
- Municipal Boundary

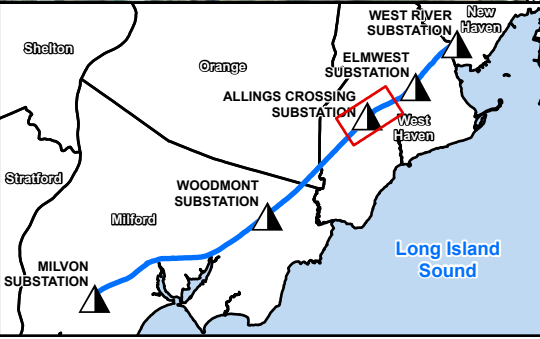
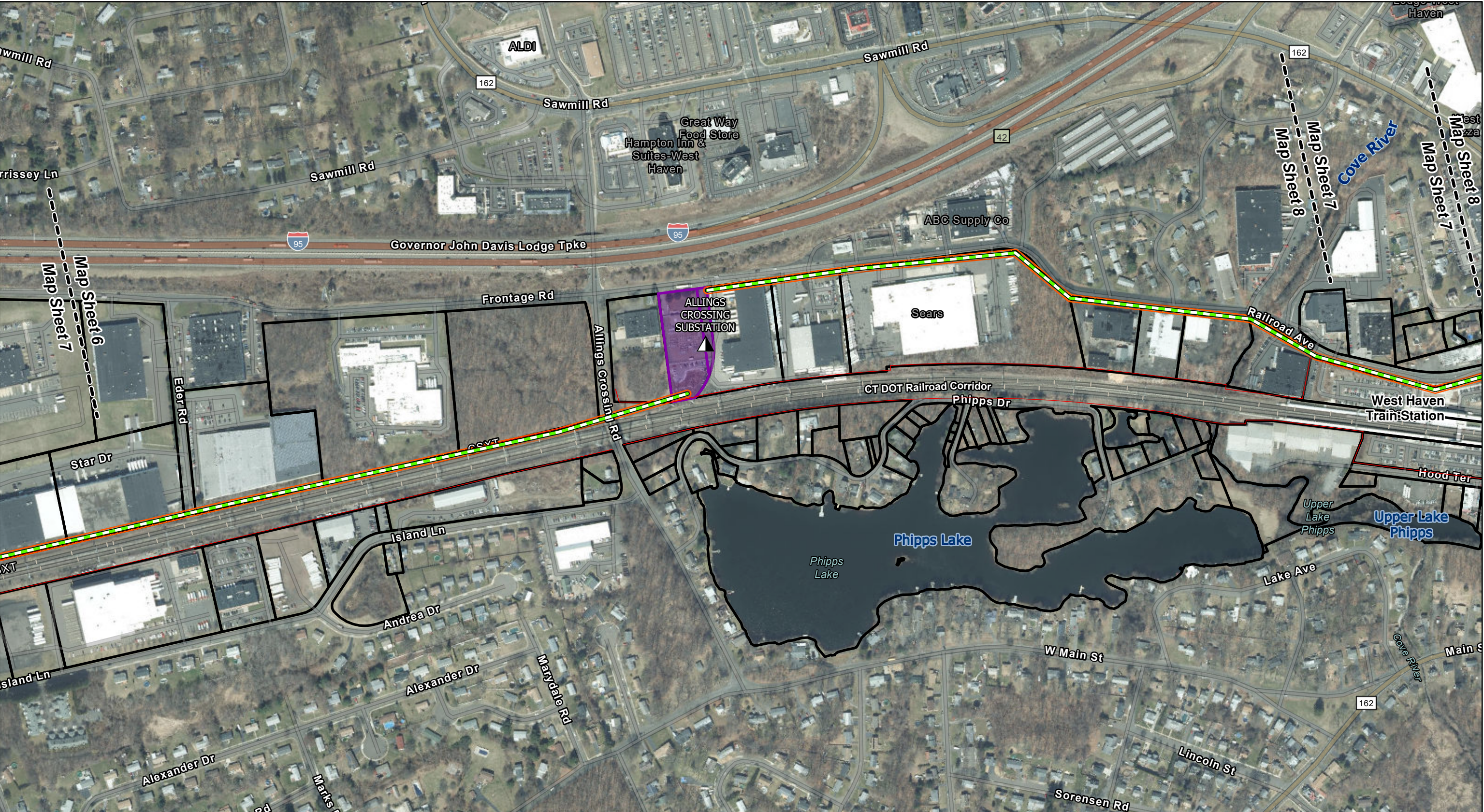
UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option E
 CONCEPT ROUTE - North Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

0 400 US Feet
 1" = 400' Revised: 06/06/2022

UG Option E Map 6 of 9

X:\AGR-19-XXX 115 KV UI Metro North RR V - Design Documents\GIS\ArcGIS Project\0025411_040_MWR_Alternatives_220602.aprx - Milvon-WestRiver_CSC_LineOptionA_Underground_North_1 6/16/2022 7:34 AM |



Map Legend

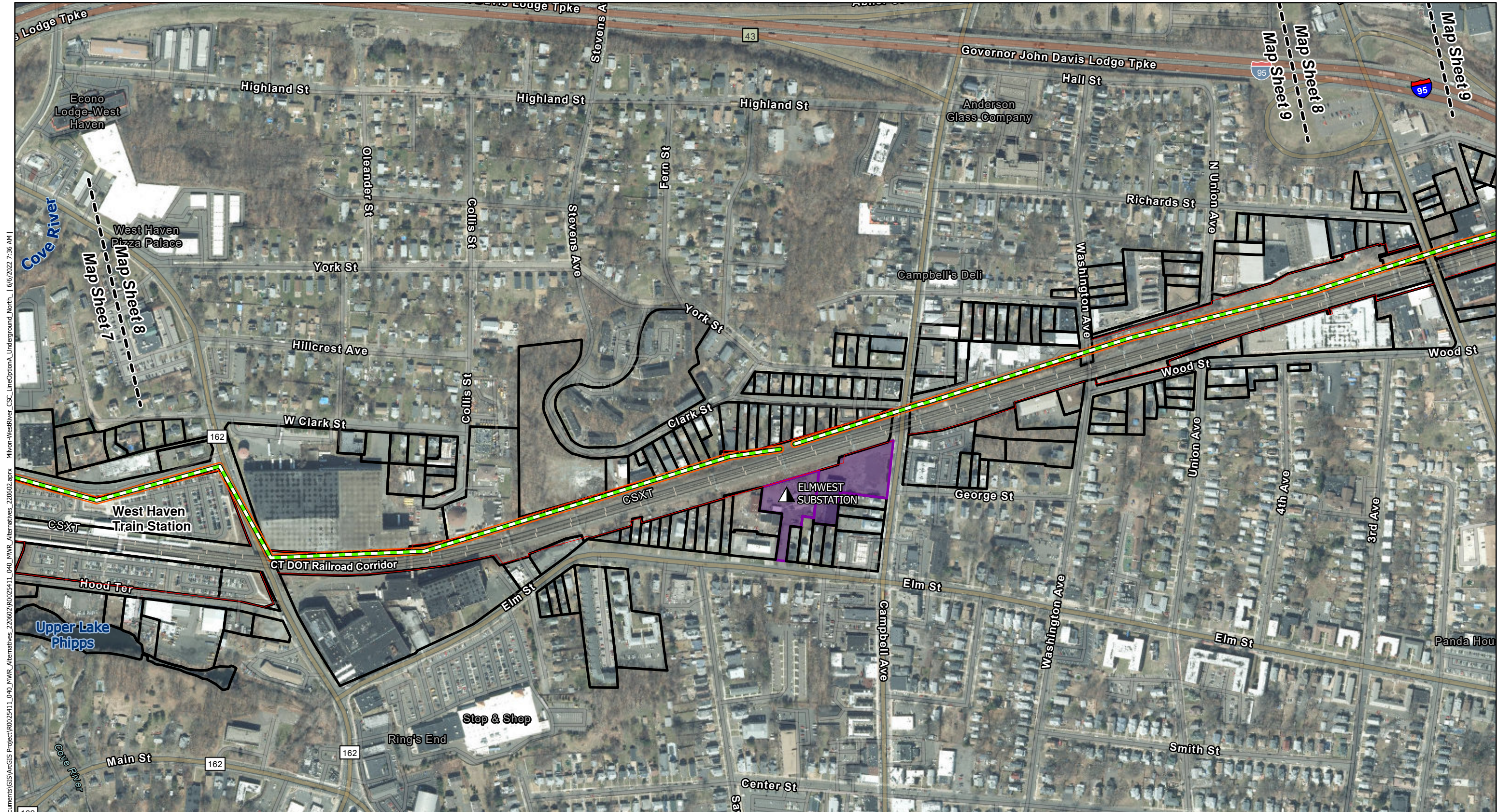
- Option E -- Rebuilt 115-kV Underground Lines -- North
- Parcel Boundary
- UI Owned Property
- Municipal Boundary
- CT DOT Corridor Boundary
- Approximate Work Area
- ▲ Substation

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option E
 CONCEPT ROUTE - North Side of RR ROW

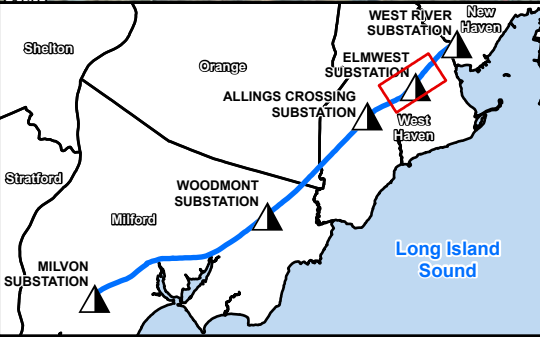
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 1" = 400' Revised: 06/06/2022

Coordinate System:
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 Linear Units: Foot US

UG Option E Map 7 of 9



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 Milvon-WestRiver_CSC_LineOptionA_Underground_North_1_6/16/2022 7:36 AM |



Map Legend

Option E -- Rebuilt 115-kV Underground Lines -- North	Approximate Work Area
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option E
 CONCEPT ROUTE - North Side of RR ROW

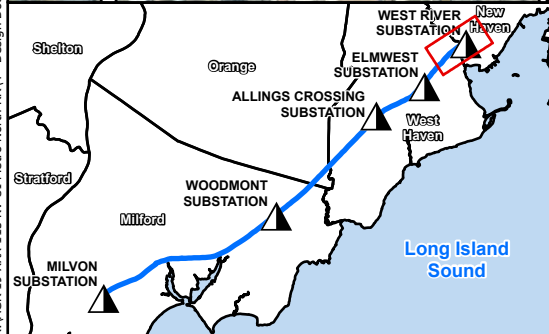
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 Linear Units: Foot US

0 400 US Feet
 1" = 400' Revised: 06/06/2022

Westwood

UG Option E Map 8 of 9

X:\MGR-19-XXX 115 KV UI Metro North RR V4 - Design Documents\GIS\ArcGIS Project\1802541_1_040_MWR_Alternatives_2206021\0025411_040_MWR_Alternatives_220602.aprx Milvon-WestRiver_CSC_LineOptionA_Underground_North_1_6/16/2022 7:38 AM



Map Legend

- Option E -- Rebuilt 115-kV Underground Lines -- North
- Approximate Work Area
- Parcel Boundary
- Substation
- UI Owned Property
- CT DOT Corridor Boundary
- Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option E
 CONCEPT ROUTE - North Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

0 400 US Feet
 1" = 400' Revised: 06/06/2022

Westwood

UG Option E Map 9 of 9

Cost Estimate – Furnish and Install

Item	Quantity	Estimate
Engineering & Indirects		\$177,723,000
Cable installation, accessories and commissioning ¹		\$242,084,000
Duct bank installation	50,860'	\$259,071,000
HDD	9,000'	\$19,871,000
Jack and Bore		-
Substation Work		\$21,388,000
Land Rights	28 acres	\$21,150,000
Environmental		\$18,341,000
AFUDC		\$249,089,000
Contingency (30%)		\$222,819,000
Option E Total Cost		\$1,231,536,000

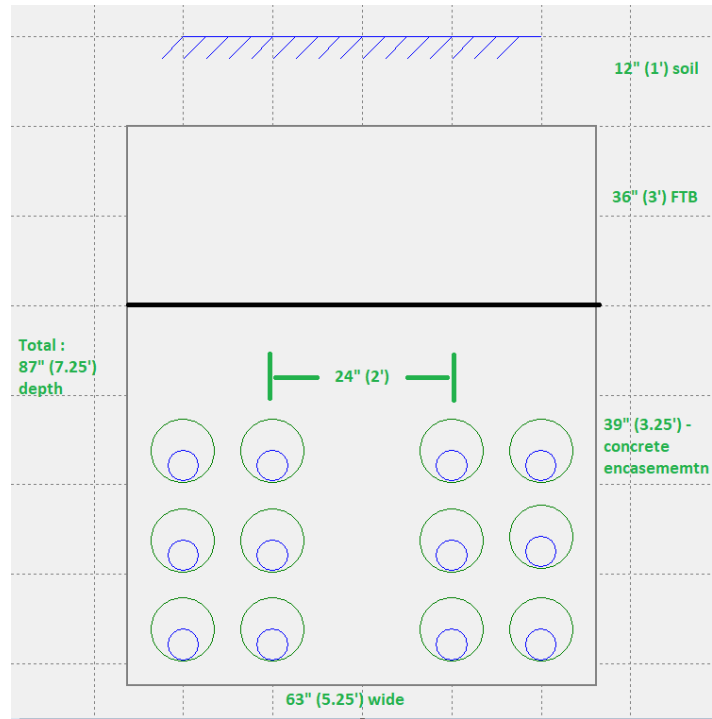
¹ The following quantities were used in this estimate: Cable – 1,445,208' Terminations 96, Splices: 420

Assumptions

Design/Engineering/Scope

- Approval by CTDOT to install the 115kV underground facilities in the railroad corridor
- Transmission center line shown on the drawings is based on above grade visual inspection of the area and is subject to change based on completion of below grade survey
- Changes to the typical cross section depth may result in increased cable size or other design parameters to achieve required ampacity
- Potential archeological impacts have not been assessed on the south side of the corridor. This option poses a higher likelihood of impacting archeological resources.
- The transition from UG line to substation has yet to be determined. If required to be pursued further, this would be determined during the detailed design phase. The cost estimates assumed a couple of the substations would be rebuilt to accommodate an underground entrance and the remainder would remain with UG to OH riser structures being located adjacent to the substation
- For this estimate It is assumed that substation upgrades will include:
 - New terminal structures to support cable terminations
 - New line terminal switches
 - New surge arrestors
 - New CT/PTs
 - New steel structures to support above equipment
 - Riser structures to connect underground cable to overhead wires
- Cable system consists of 2 cables per phase – 3,500 kcmil to achieve required ampacity
- Assumed duct bank cross section²:

² Typical single cable per phase, double circuit duct bank: ~3.16' width, with smaller FTB envelope. Cross section does not show spare or communications ducts for clarity.



Cost Estimate

- ISO-PP4 Appendix D assumptions:
 - This is a "Project Initiation" type estimate (-50%/+200% accuracy)
 - Contingency for this type of estimate is 30%-50%
 - This estimate used 30% contingency
- Does not include taxes
- Any estimates on rock or foreign utilities are based on surface level observations
- Land right costs are preliminary. Final acreage will be determined once final route is selected
- Escalation is calculated at 1.75% per year
- Soil and groundwater disposal costs have been estimated based on soil analysis along the route which was performed in preparation for the proposed solution, which will be substantially higher for this option
- Permanent impacts to wetlands and watercourses have not been assessed and therefore environmental permitting costs have been estimated
- Multiple HDDs will be required for this option (this may be given)
- No costs have been included for mitigation for potential direct or indirect impacts to cultural resources.
- Four flagmen per day (2 crews) have been allocated for the duration of the construction schedule

Schedule

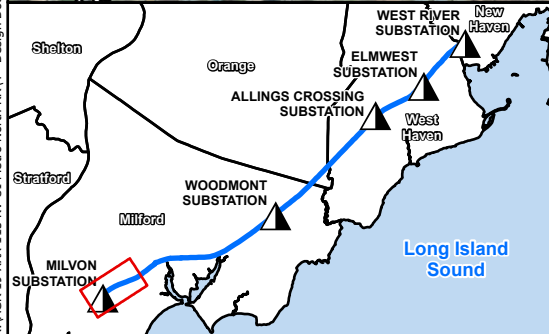
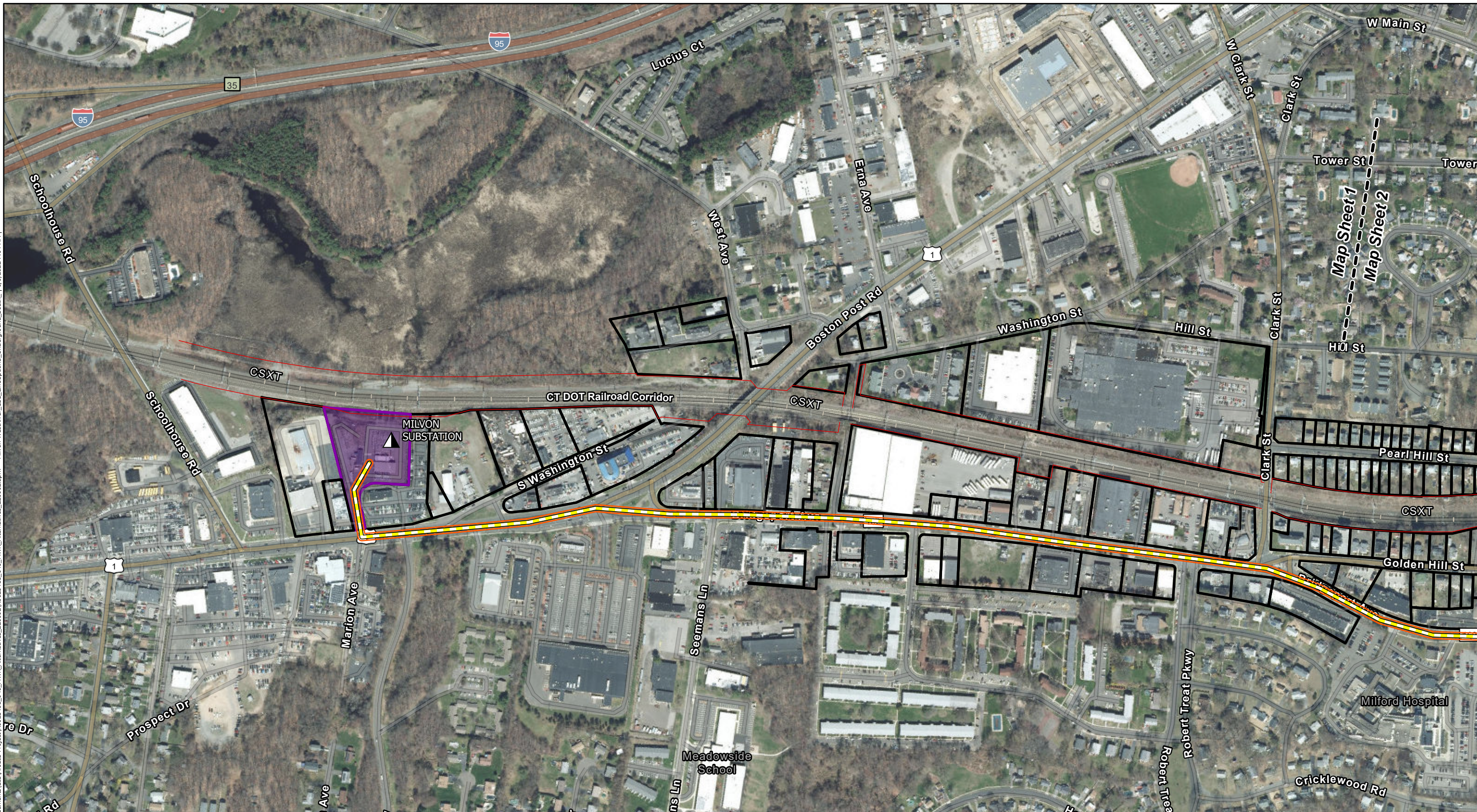
- Detailed engineering of the project will commence Q1 2024
- Conceptual level schedule is based on duct bank installation at 40'/day, and 20'/day in public roads
- Cable pulling, termination, and splicing is based on past project: ~1 year for 8 miles, 1 cable per phase, 1 circuit
- One year of Procurement is assumed in the schedule
- MNR can provide sufficient flaggers to cover the construction and survey work (2 crews)
- Timely review and approval of detailed design drawings by CDOT/MNR
- It is anticipated that construction for this option will extend into 2034 or beyond

Option F

Underground Transmission Line, south side of RR ROW

Proposed Project area constructed completely underground between Milvon Substation to West River Substation, within the RR ROW (where feasible) on the south side of the tracks

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Map Legend

- Option F -- Rebuilt 115-kV Underground Lines -- South
- Parcel Boundary
- UI Owned Property
- CT DOT Corridor Boundary
- Substation
- Municipal Boundary
- Approximate Work Area

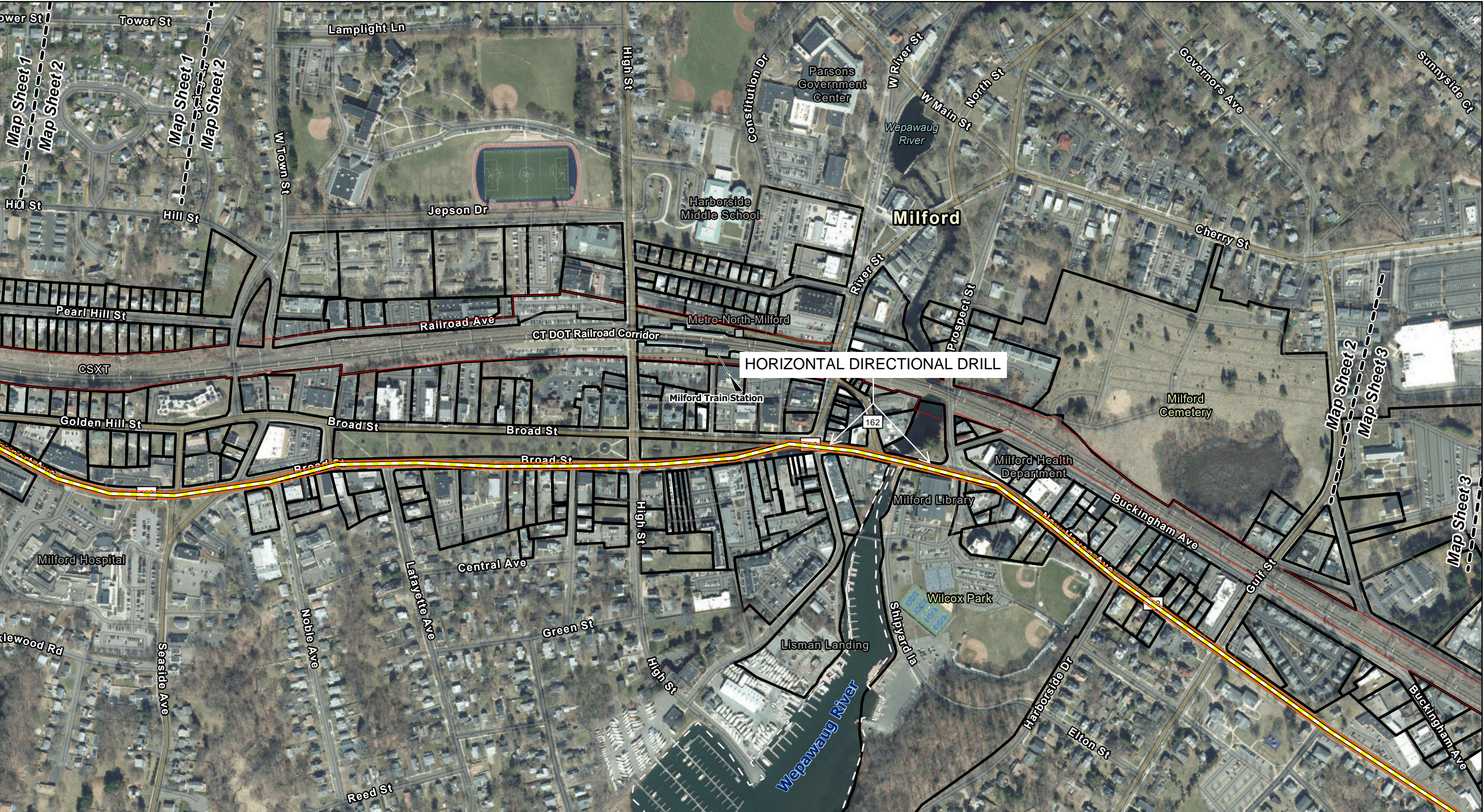
UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option F
 CONCEPT ROUTE - South Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

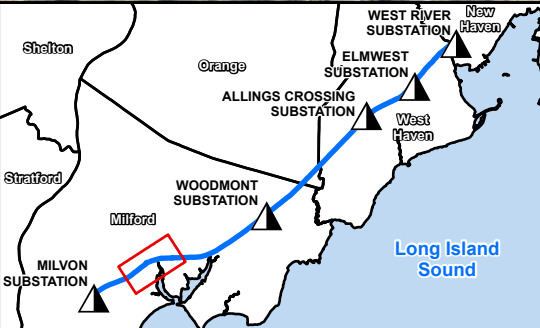
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UG Option F Map 1 of 9

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HORIZONTAL DIRECTIONAL DRILL



Map Legend

- Option F -- Rebuilt 115-kV Underground Lines -- South
- Parcel Boundary
- Substation
- CT DOT Corridor Boundary
- Approximate Work Area
- Parcel Boundary
- UI Owned Property
- Municipal Boundary

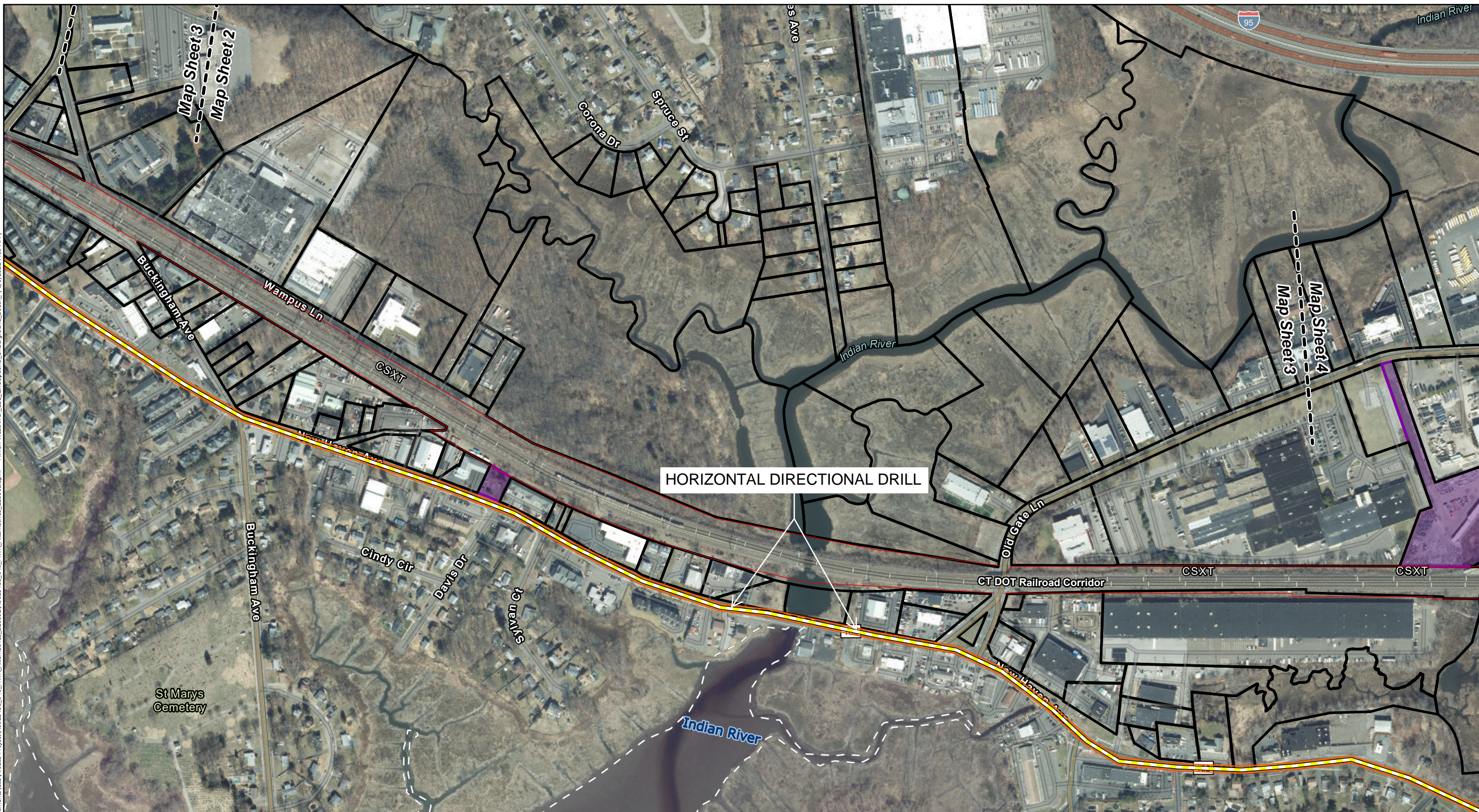
UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option F
 CONCEPT ROUTE - South Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

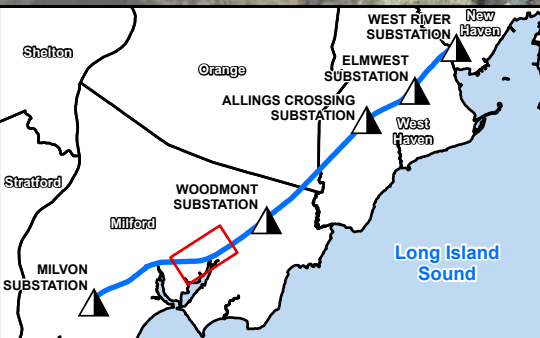
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UG Option F Map 2 of 9

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HORIZONTAL DIRECTIONAL DRILL





Map Legend

Option F -- Rebuilt 115-kV Underground Lines -- South	Approximate Work Area
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option F
 CONCEPT ROUTE - South Side of RR ROW

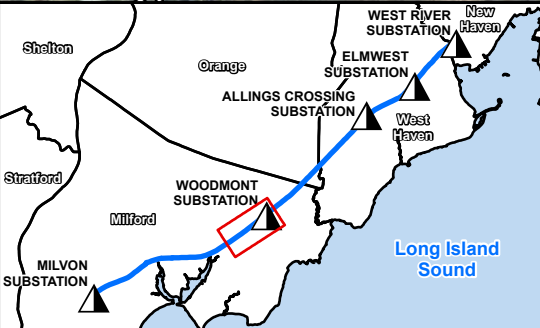
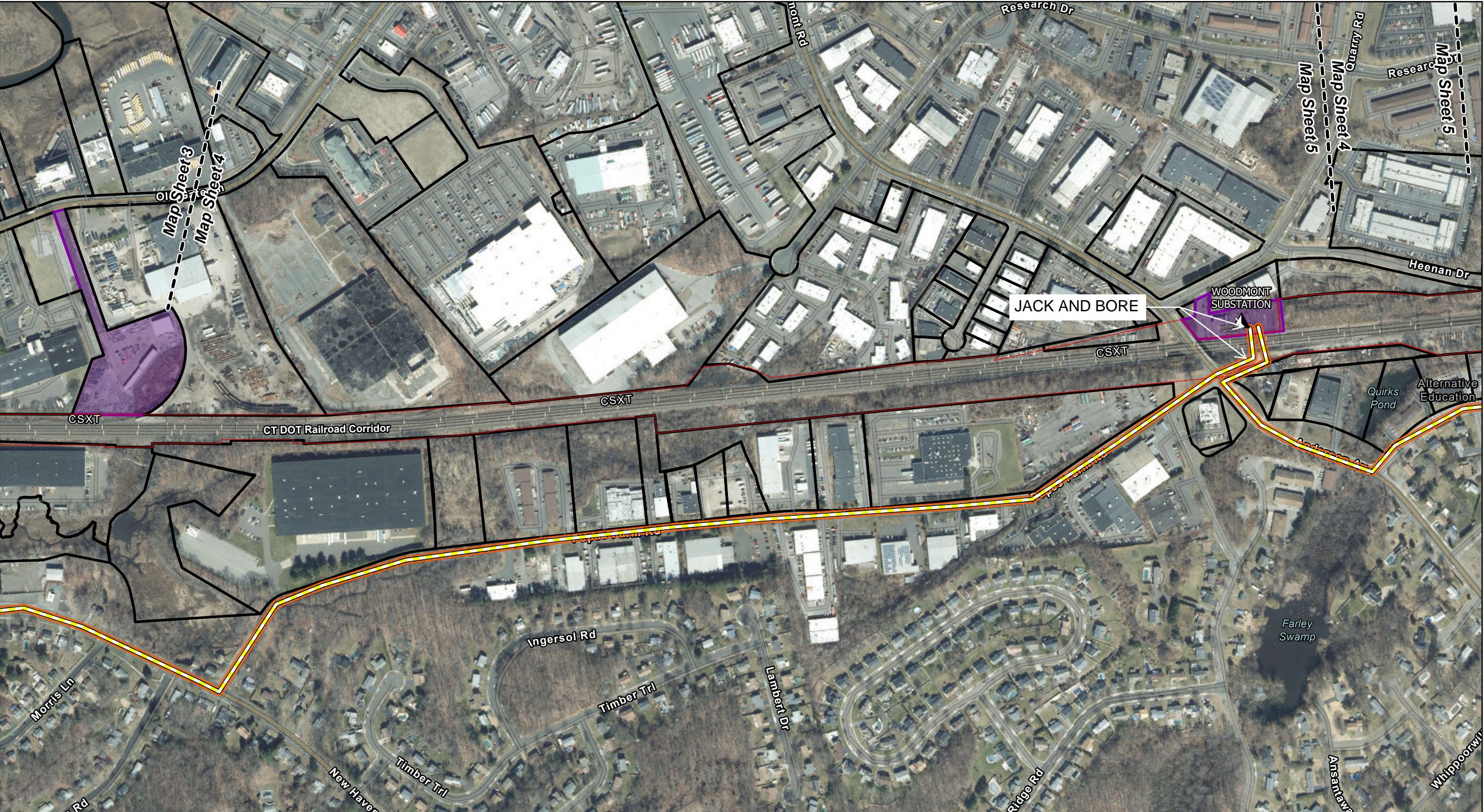
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 Linear Units: Foot US

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UG Option F Map 3 of 9

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Map Legend

Option F -- Rebuilt 115-kV Underground Lines -- South	Approximate Work Area
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

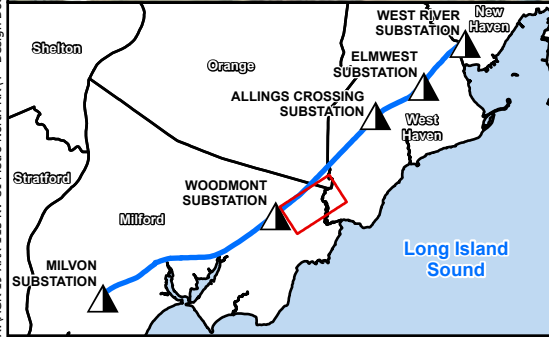
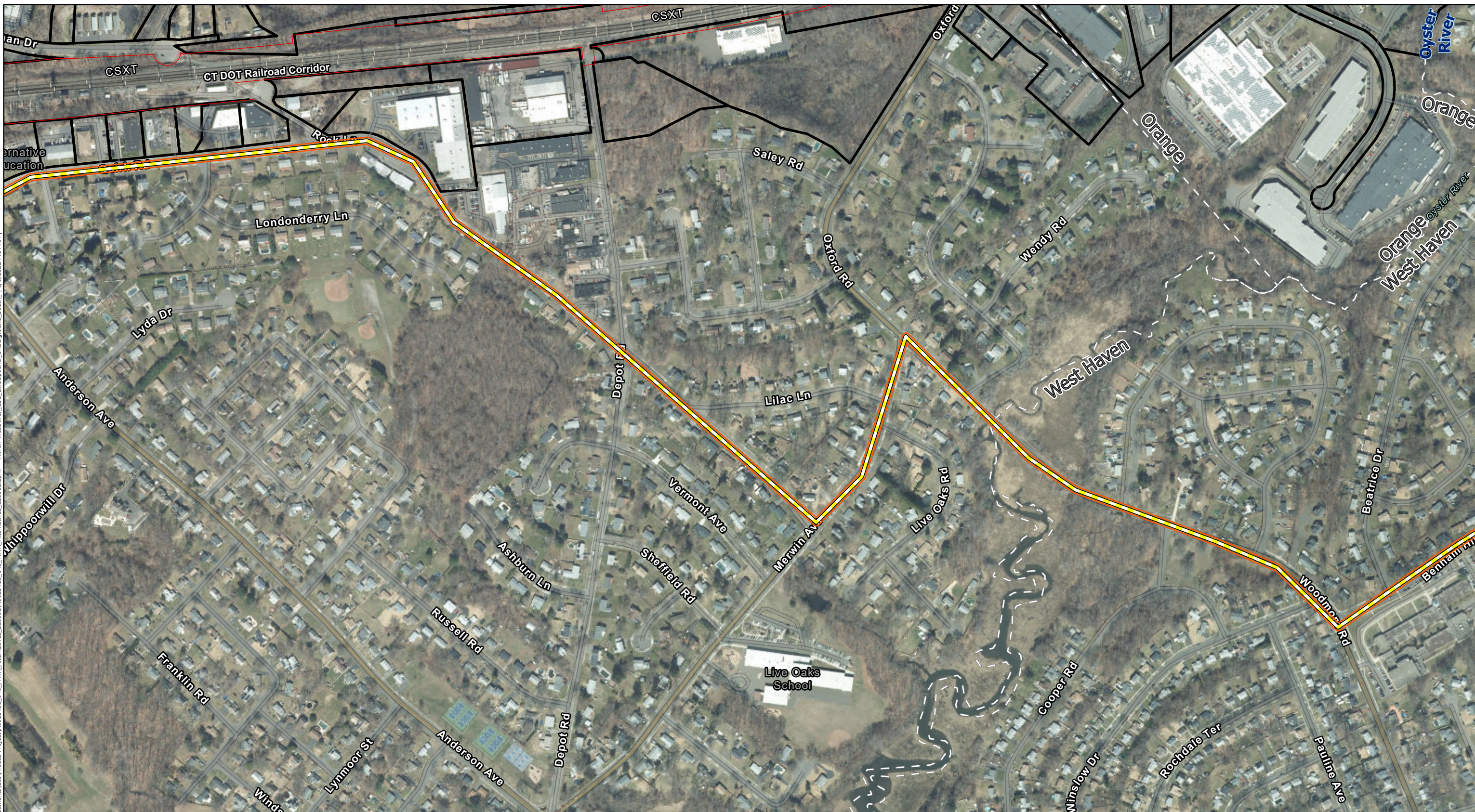
UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option F
 CONCEPT ROUTE - South Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

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 1" = 400' Revised: 06/06/2022

UG Option F Map 4 of 9

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Map Legend

Option F -- Rebuilt 115-kV Underground Lines -- South	Approximate Work Area
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

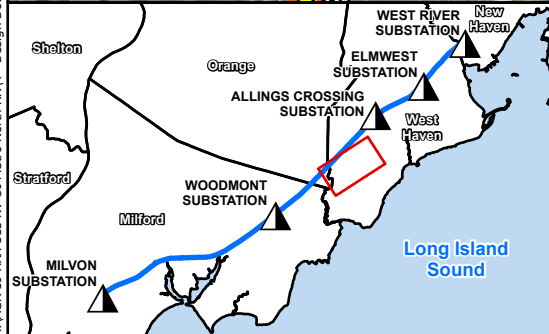
UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option F
 CONCEPT ROUTE - South Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

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 1" = 400' Revised: 06/06/2022

UG Option F Map 5 of 9

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Map Legend

Option F -- Rebuilt 115-kV Underground Lines -- South	Approximate Work Area
Parcel Boundary	UI Owned Property
Substation	Municipal Boundary
CT DOT Corridor Boundary	

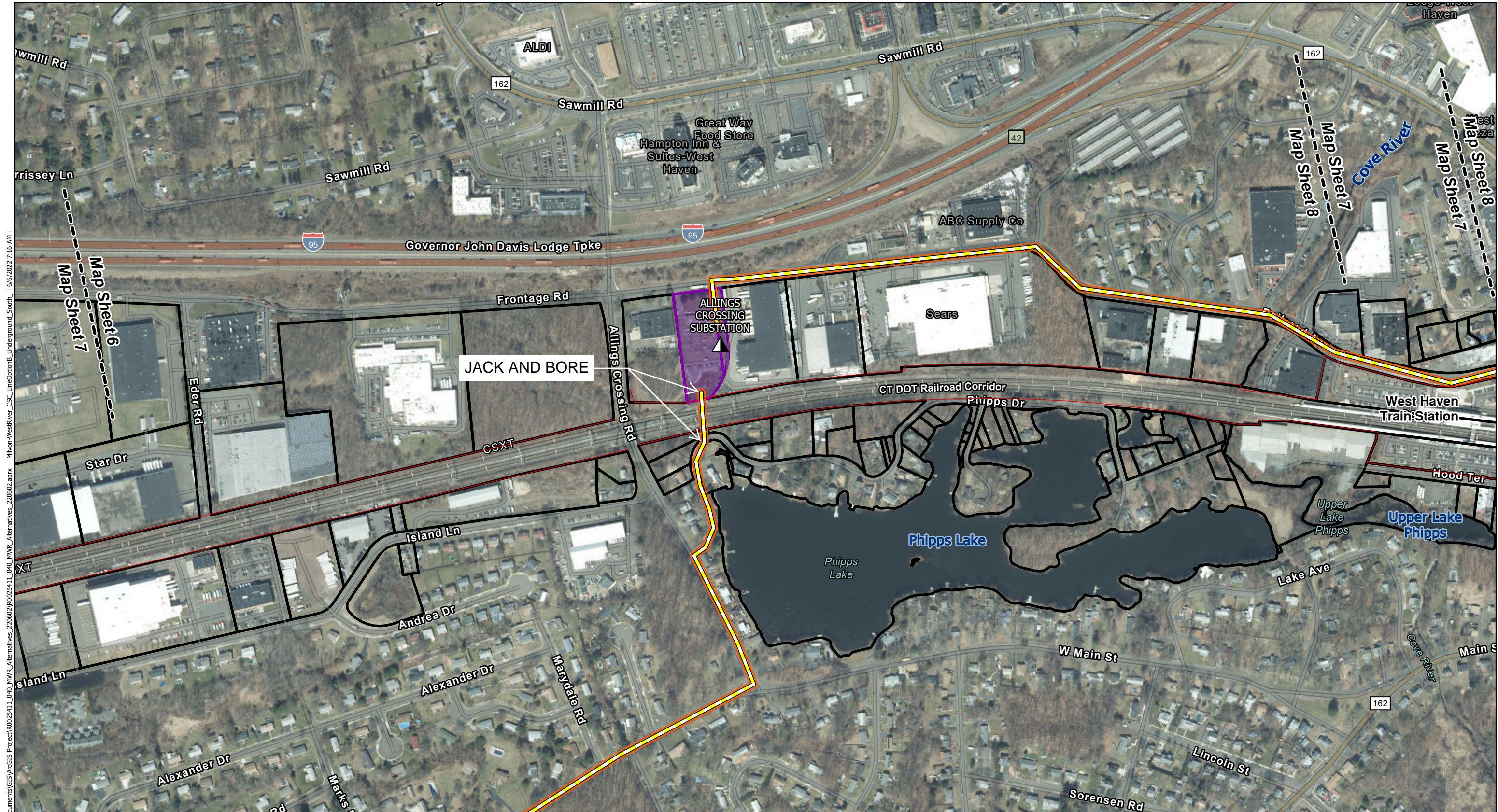
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 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option F
 CONCEPT ROUTE - South Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

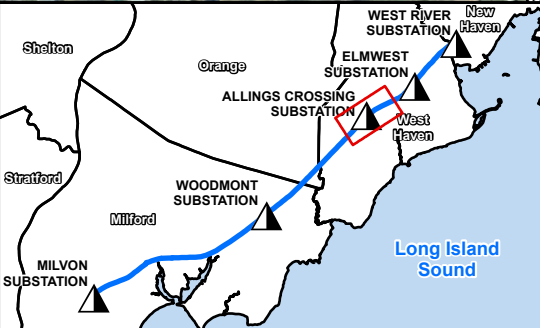
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UG Option F Map 6 of 9



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Map Legend

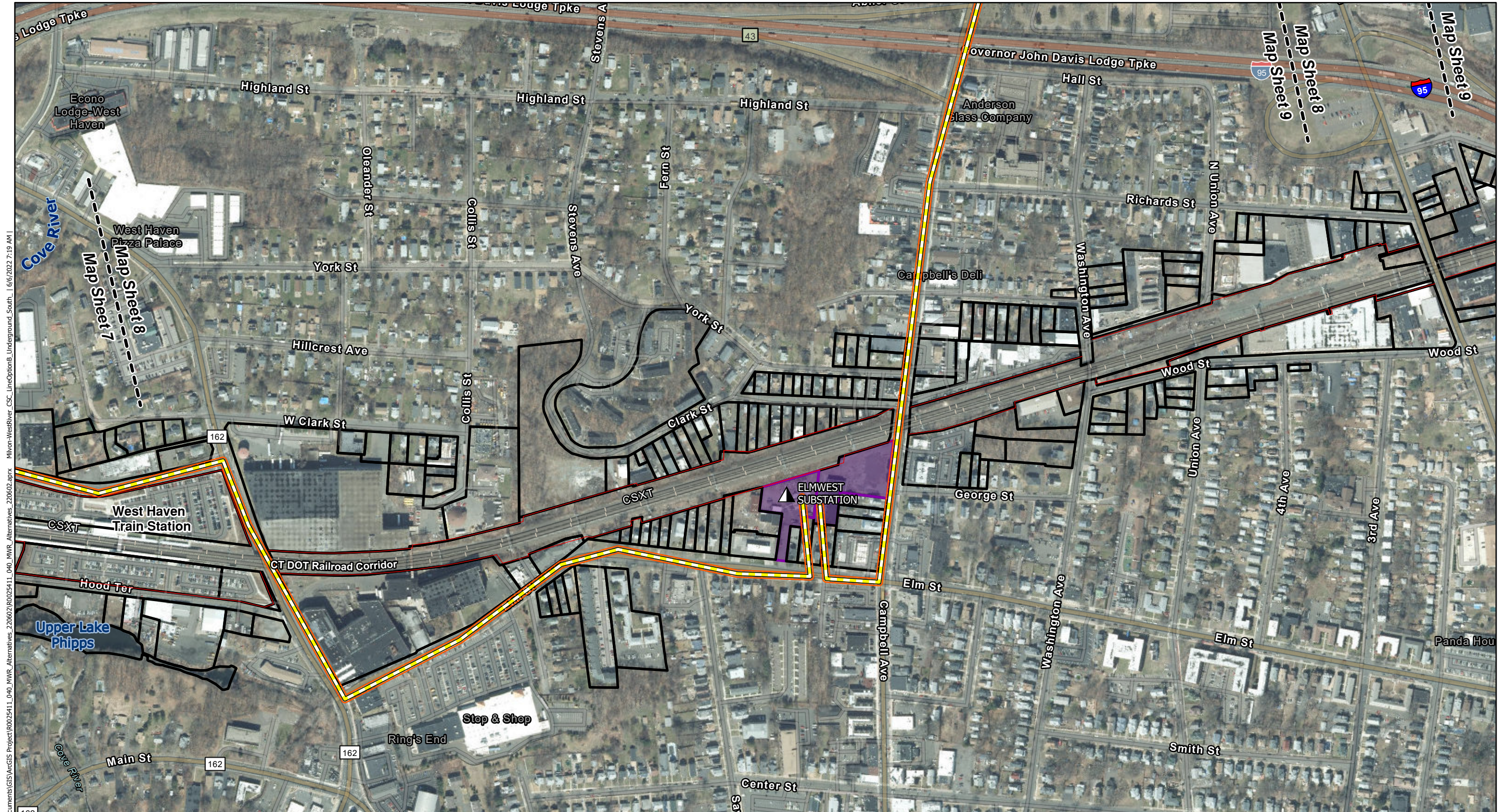
Option F -- Rebuilt 115-kV Underground Lines -- South	Approximate Work Area
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option F
 CONCEPT ROUTE - South Side of RR ROW

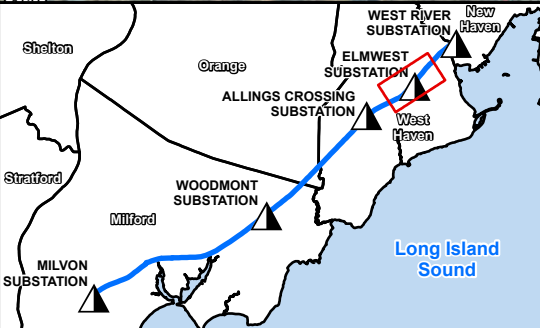
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UG Option F Map 7 of 9



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Map Legend

Option F -- Rebuilt 115-kV Underground Lines -- South	Approximate Work Area
Substation	Parcel Boundary
CT DOT Corridor Boundary	UI Owned Property
	Municipal Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option F
 CONCEPT ROUTE - South Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

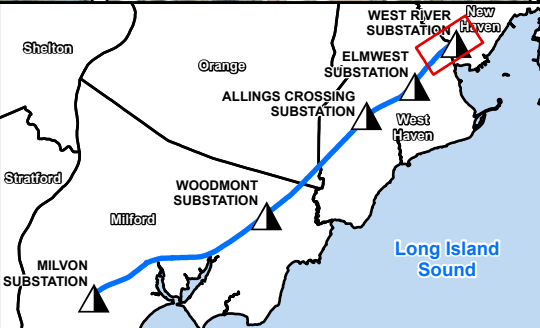
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UG Option F Map 8 of 9

HORIZONTAL DIRECTIONAL DRILL

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Map Legend

- Option F -- Rebuilt 115-kV Underground Lines -- South
- Approximate Work Area
- Parcel Boundary
- UI Owned Property
- Municipal Boundary
- Substation
- CT DOT Corridor Boundary

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
 MILFORD, ORANGE, WEST HAVEN, & NEW HAVEN, CT
 Underground Route Option F
 CONCEPT ROUTE - South Side of RR ROW

Coordinate System:
 NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
 Linear Units: Foot US

0 400 US Feet
 1" = 400' Revised: 06/06/2022

Westwood

UG Option F Map 9 of 9

Cost Estimate-Furnish and Install

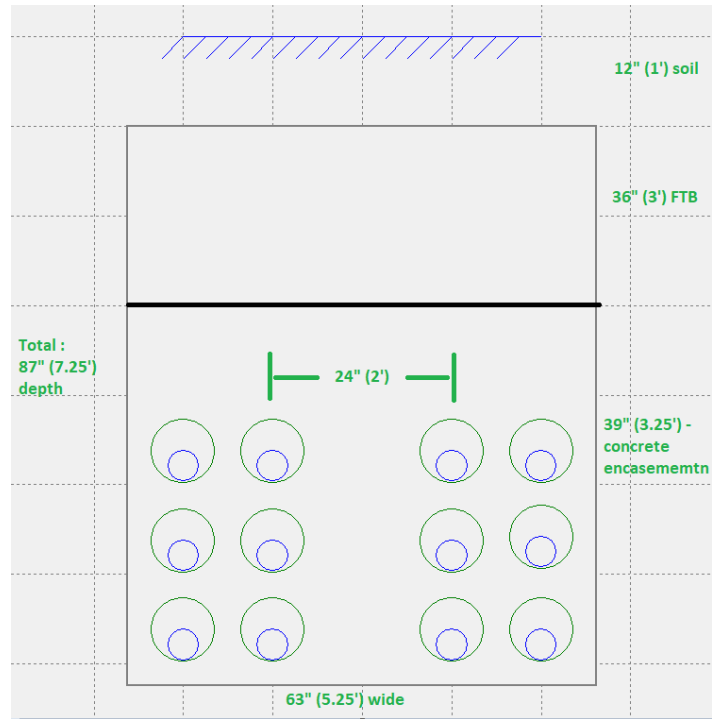
Item	Quantity	Estimate
Engineering & Indirects		\$193,640,000
Cable installation, accessories and commissioning ³		\$293,531,000
Duct bank installation	61,361'	\$300,938,000
HDD	11,500'	\$27,540,000
Jack and Bore	2,000	\$6,328,000
Substation Work		\$11,458,000
Land Rights	14 acres	\$10,725,000
Environmental		\$18,791,000
AFUDC		\$288,541,000
Contingency (30%)		\$252,932,000
Option F Total Cost		\$1,404,424,000

³ The following quantities were used in this estimate: Cable – 1,445,208' Terminations 96, Splices: 420

Assumptions

Design/Engineering

- Based on the narrow railroad corridor to the south of the tracks, this option is located within the public streets with the most direct route selected
- Transmission center line shown on the drawings is based above grade visual inspection of the area and is subject to change based on completion of below grade survey
- Any estimates on rock or foreign utilities are based on surface level observations
- Changes to the typical cross section depth may result in increased cable size or other design parameters to achieve required ampacity
- No P&C work has been included
- Potential archeological impacts have not been assessed on the south side of the corridor. This option poses a higher likelihood of impacting archeological resources.
- The transition from UG line to substation has yet to be determined. If required to be pursued further, this would be determined during the detailed design phase. The cost estimates assumed a couple of the substations would be rebuilt to accommodate an underground entrance and the remainder would remain with UG to OH riser structures being located adjacent to the substation
- For this estimate it is assumed that substation upgrades will include:
 - New terminal structures to support cable terminations
 - New line terminal switches
 - New surge arrestors
 - New CT/PTs
 - New steel to support above equipment
 - Riser poles at substations to connect underground cables to overhead wires
- Cable system consists of 2 cables per phase – 3,500 kcmil
- Assumed duct bank cross section:



Cost Estimate

- ISO-PP4 Appendix D assumptions:
 - This is a "Project Initiation" type estimate (-50%/+200% accuracy)
 - Contingency for this type of estimate is 30%-50%
 - This estimate used 30% contingency
- Does not include taxes
- Escalation is calculated at 1.75% per year
- Land right costs are preliminary. Final acreage will be determined once final route is selected
- Soil and groundwater disposal costs have been estimated based on soil analysis along the route, which was performed in preparation for the proposed solution, which will be substantially higher for this option
- Permanent impacts to wetlands and watercourses have not been assessed and therefore environmental permitting costs have been estimated

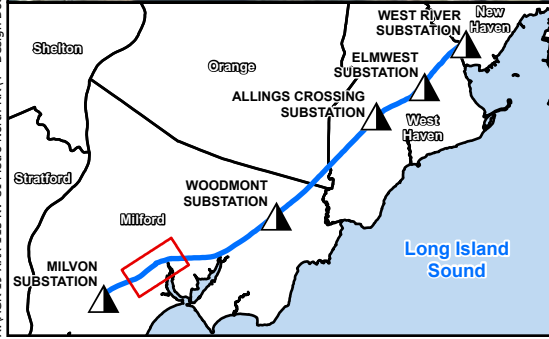
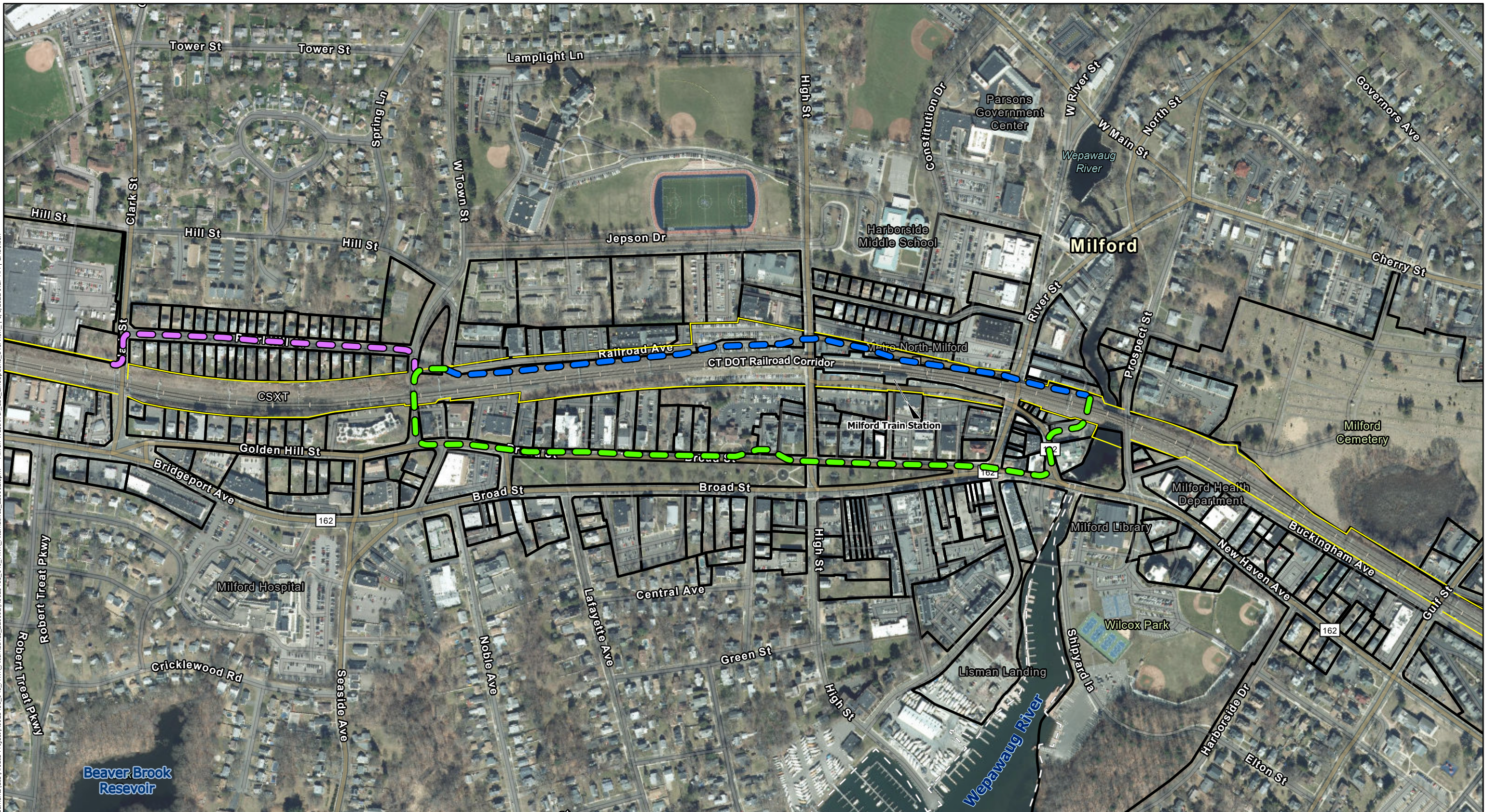
Schedule

- Detailed engineering will commence Q1 2023
- Conceptual level schedule is based on duct bank installation at 20'/day
- Cable pulling, termination, and splicing is based on past project: ~1 year for 8 miles, 1 cable per phase, 1 circuit
- It is anticipated construction for this alternative will extend into 2036 or beyond

Construction

- It is anticipated for this option there will be significant impacts to local traffic, business, and public during construction activities. Both cable pulling and splicing as well as duct bank excavation

X:\AGP-19-XXX-115 KV UI Metro North RR V4 - Design Documents\GIS\ArcGIS Project\002541_1_040_MWR_Alternatives_220602\002541_1_040_MWR_Alternatives_220602.aprx Milvon-WestRiver_CSC_LineOptions_Overview_16/8/2022 9:27 AM | EMBoisen



Map Legend

Substation	Route Options
CT DOT Corridor Boundary	Option G
Parcel Boundary	Option H
UI Owned Property	Option I
Municipal Boundary	

UI 115 KV RAILROAD PROJECT – MILVON TO WEST RIVER
MILFORD, CT
Downtown Milford Underground Concept Routes

Coordinate System:
NAD 1983 (2011) State Plane Connecticut FIPS 0600 (US Feet)
Linear Units: Foot US

0 400
US Feet
1" = 400' Revised: 06/08/2022

Option G

Underground Transmission Line, P905N-P914N, within public streets

Proposed Project area between P905N and P914N constructed completely underground, within the public roads

CADD Drawing, DO NOT REVISE MANUALLY.

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NOTEBOOK NO.	ROW	CHKD	
BY			

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 Fax: (952) 937-5822
 Toll Free: (888) 937-5150
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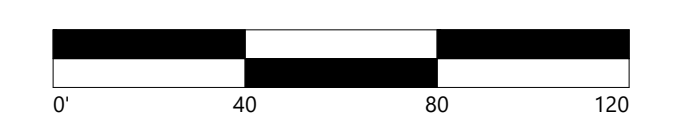
PROFILE	SURVEYED	REVIEWED	DATE
NOTEBOOK NO.	NOTES REDUCED		
BY			



LEGEND

- RISER POLE
- OPTION G CONCEPT UNDERGROUND ALIGNMENT
- TREE CLEARING AREA
- SPLICE CHAMBER
- P-POH
- OVERHEAD TRANSMISSION CENTER LINE
- EXISTING CT DOT CORRIDOR BOUNDARY
- EXISTING PROPERTY LINE
- APPROXIMATE WORK AREA

DOWNTOWN MILFORD CONCEPT PLAN



UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE
TENSION	TENSION	TENSION	TENSION
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.

YR. CONST.	W/O			
NOTES:	1. PRELIMINARY, NOT FOR CONSTRUCTION			
REV.	DATE	BY	DESCRIPTION	APP.

PE Stamp

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UI 115-kV RR PROJECT MILVON TO WEST RIVER
 OPTION G - UNDERGROUND IN STREETS

1 OF 3

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APP.	MSP			
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REV. 0

CADD Drawing, DO NOT REVISE MANUALLY.

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	ROW CHKD		

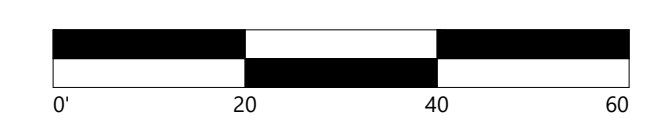
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	NOTES REDUCED		



- LEGEND**
- RISER POLE
 - OPTION G CONCEPT UNDERGROUND ALIGNMENT
 - TREE CLEARING AREA
 - SPLICE CHAMBER
 - P-POH OVERHEAD TRANSMISSION CENTER LINE
 - EXISTING CT DOT CORRIDOR BOUNDARY
 - EXISTING PROPERTY LINE
 - APPROXIMATE WORK AREA

DOWNTOWN MILFORD CONCEPT PLAN



UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE
TENSION	TENSION	TENSION	TENSION
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.

YR. CONST.	W/O			
NOTES: 1. PRELIMINARY, NOT FOR CONSTRUCTION				
REV.	DATE	BY	DESCRIPTION	APP.

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REV.	DATE	BY	DESCRIPTION	APP.

UI 115-kV RR PROJECT MILVON TO WEST RIVER
 OPTION G - UNDERGROUND IN STREETS

2 OF 3

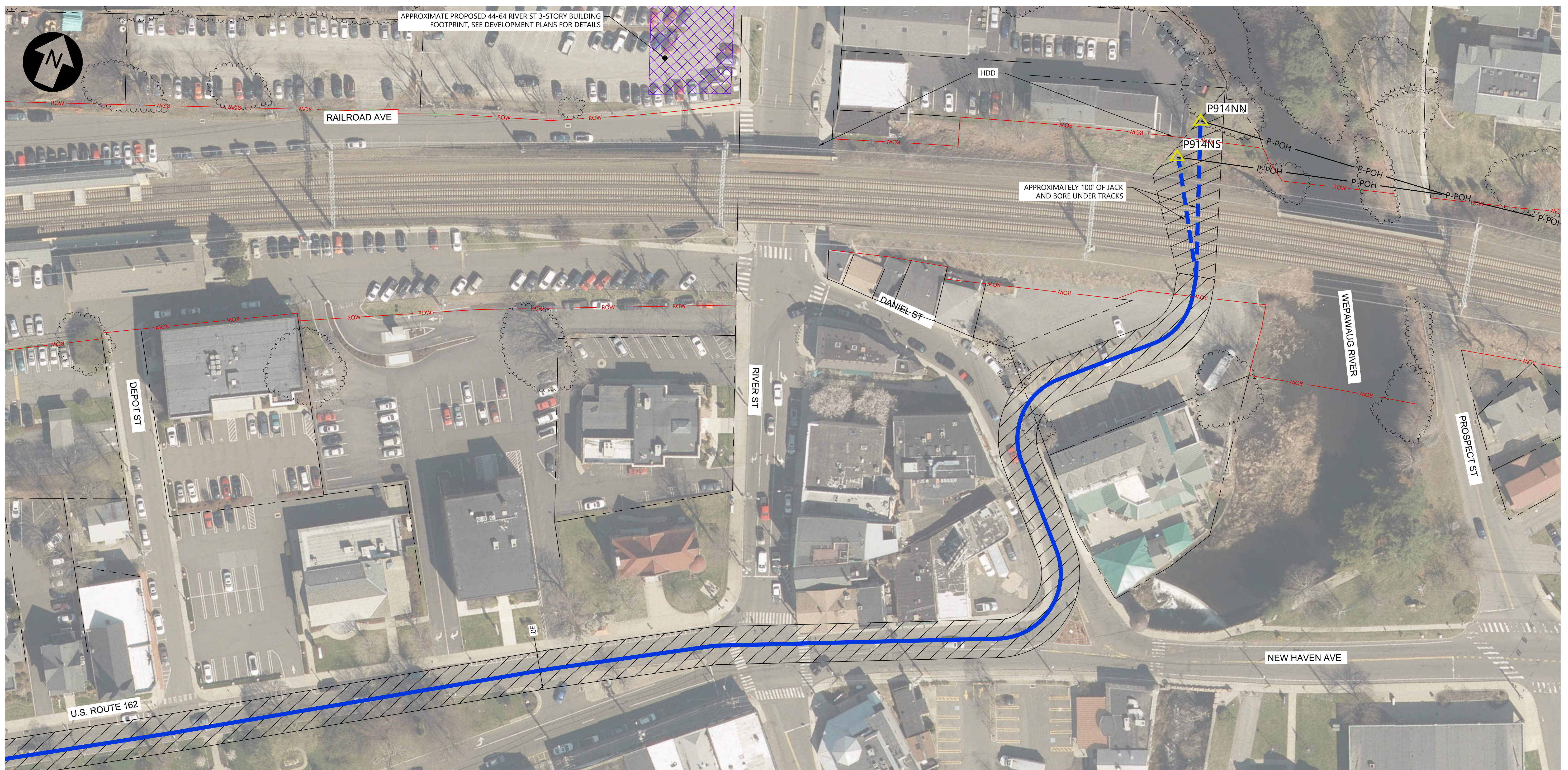
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APP.	MSP			
REV.	DATE	BY	DESCRIPTION	APP.

CADD Drawing, DO NOT REVISE MANUALLY.

PLAN	SURVEYED	REVIEWED	BY	DATE
NOTEBOOK NO.	ROW	CHKD		

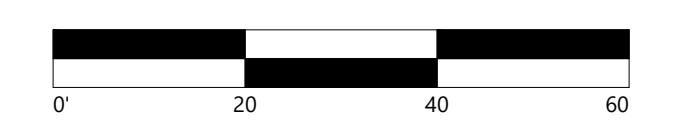
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NOTEBOOK NO.	NOTES REDUCED			



- LEGEND**
- RISER POLE
 - OPTION G CONCEPT UNDERGROUND ALIGNMENT
 - TREE CLEARING AREA
 - SPLICE CHAMBER
 - P-POH
 - EXISTING CT DOT CORRIDOR BOUNDARY
 - EXISTING PROPERTY LINE
 - APPROXIMATE WORK AREA

DOWNTOWN MILFORD CONCEPT PLAN



UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE	YR. CONST.	W/O	PE Stamp
TENSION	TENSION	TENSION	TENSION	NOTES: 1. PRELIMINARY, NOT FOR CONSTRUCTION		
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	REV.	DATE	BY

REV.	DATE	BY	DESCRIPTION	APP.

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UI 115-kV RR PROJECT MILVON TO WEST RIVER
 OPTION G - UNDERGROUND IN STREETS

3 OF 3

DR.	SFB	SCALE	AS SHOWN	FILE:	REV.
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APP.	MSP				
DATE:					

Cost Estimate-Furnish and Install

Item	Quantity	Estimate
Overhead Line Design and Construction ⁴		\$290,961,000
Engineering & Indirects		\$9,439,000
Cable installation, accessories and commissioning ⁵		\$14,646,000
Duct bank installation	3,500'	\$18,941,000
HDD		-
Jack and Bore	200'	\$590,000
Transition Stations	1	\$1,522,000
Land Rights		\$371,000
Environmental		\$1,839,000
AFUDC		\$11,993,000
Contingency (30%)		\$14,082,000
Option G Total Cost		\$364,384,000

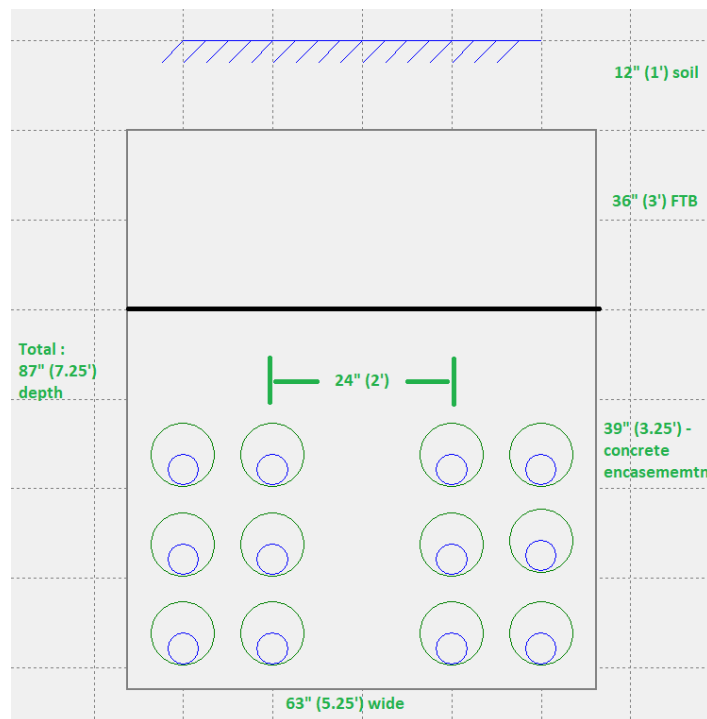
⁴ Inclusive of all associated costs for the overhead design to connect to this underground option. Other detailed cost are pertinent to the underground engineering and construction only

⁵ The following quantities were used in this estimate: Cable – 66,996' Terminations 24, Splices: 12

Assumptions

Design/Engineering

- Transmission center line shown on the drawings is based above grade visual inspection of the area and is subject to change based on completion of below grade survey
- Changes to the typical cross section depth may result in increased cable size or other design parameters to achieve required ampacity
- No P&C work has been included (remote ends)
- Potential archeological impacts have not been assessed on the south side of the corridor. This option poses a higher likelihood of impacting archeological resources.
- 1 transition station is included and will consist of a fenced in area containing:
 - 2 riser poles
 - 1 control enclosure
- Cable system consists of 2 cables per phase – 3,500 kcmil
- Assumed duct bank cross section:



Cost Estimate

- ISO-PP4 Appendix D assumptions:
 - This is a “Project Initiation” type estimate (-50%/+200% accuracy)
 - Contingency for this type of estimate is 30%-50%
 - This estimate used 30% contingency
- Does not include removals
- Does not include remote substation work (P&C)
- Does not include taxes
- Land right costs are preliminary. Final acreage will be determined once final route is selected
- Escalation is calculated at 1.75% per year
- Any estimates on rock or foreign utilities are based on surface level observations
- Soil and groundwater disposal costs have been estimated based on soil analysis along the route which was performed in preparation for the proposed solution, which will be substantially higher for this option

Schedule

- Conceptual level schedule is based on duct bank installation at 20'/day
- Cable pulling, termination, and splicing is based on past project: ~1 year for 8 miles, 1 cable per phase, 1 circuit
- Extended schedule due to undergrounding, longer stretch and two additional track crossings

Construction

- It anticipated for this option there will be significant impacts to local traffic, business, and public during construction activities. Both cable pulling and splicing as well as duct bank excavation

Option H

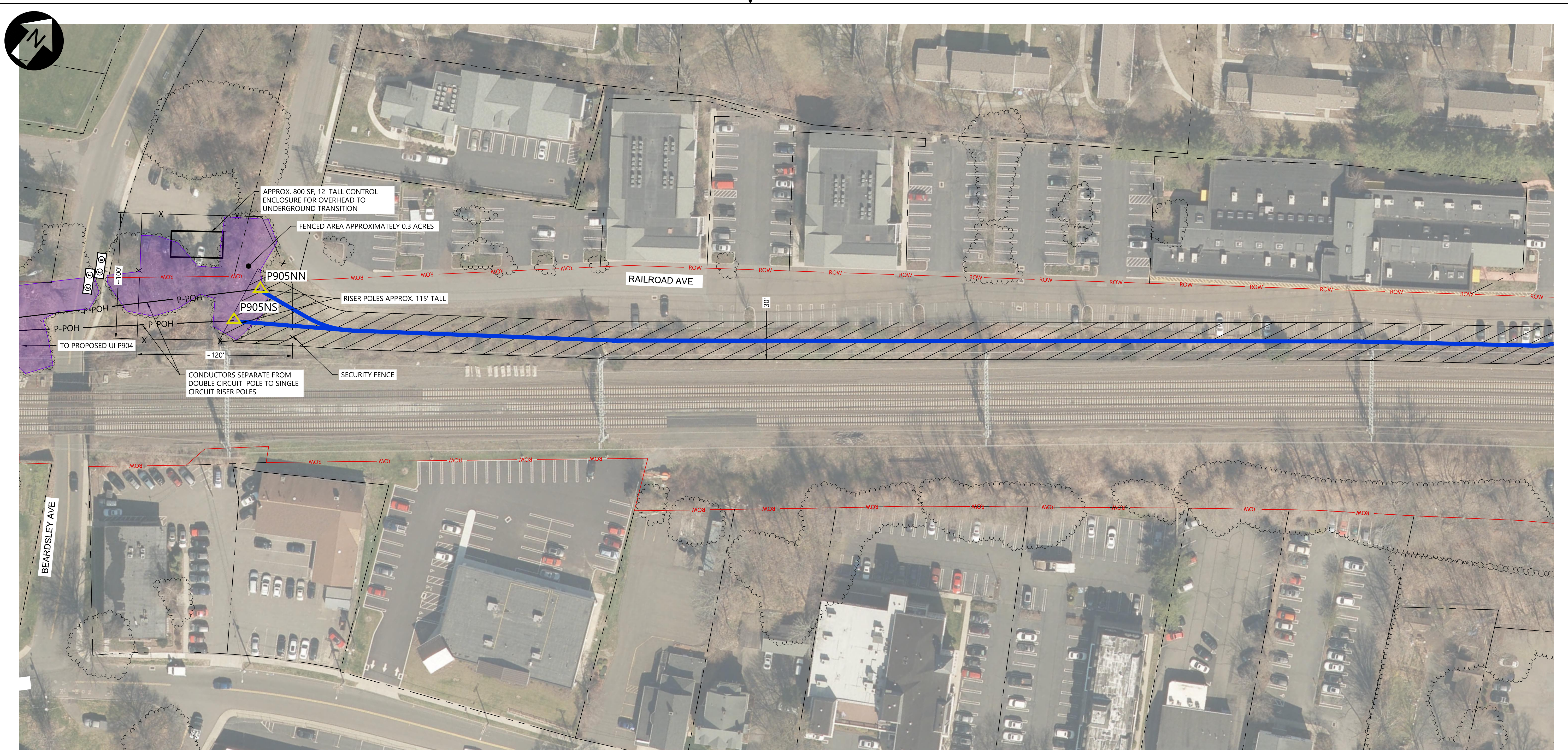
Underground Transmission Line, P905N-P914N, within RR ROW

Proposed Project area between P905N and P914N constructed completely underground, within the RR ROW

PLAN	SURVEYED	BY	DATE
NOTEBOOK NO.	REVIEWED		
	ROW CHKD		

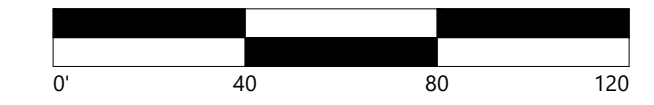
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NOTEBOOK NO.	REVIEWED		
	NOTES REDUCED		



- LEGEND**
- RISER POLE
 - OPTION H CONCEPT UNDERGROUND ALIGNMENT
 - TREE CLEARING AREA
 - SPLICE CHAMBER
 - P-POH OVERHEAD TRANSMISSION CENTER LINE
 - EXISTING CT DOT CORRIDOR BOUNDARY
 - EXISTING PROPERTY LINE
 - APPROXIMATE WORK AREA

DOWNTOWN MILFORD CONCEPT PLAN



UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE	YR. CONST.	W/O	PE Stamp
TENSION	TENSION	TENSION	TENSION	NOTES: 1. PRELIMINARY, NOT FOR CONSTRUCTION		
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	REV.	DATE	BY

REV.	DATE	BY	DESCRIPTION	APP.

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UI 115-kV RR PROJECT MILVON TO WEST RIVER
 OPTION H - UNDERGROUND IN ROW

1 OF 3

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CK.	JRD	NO.			
APP.	MSP				
REV.	DATE	BY	DESCRIPTION	APP.	DATE

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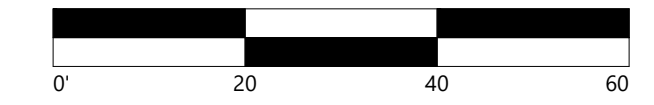
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NOTEBOOK NO.	NOTES REDUCED		
BY			



LEGEND

- RISER POLE
- OPTION H CONCEPT UNDERGROUND ALIGNMENT
- TREE CLEARING AREA
- SPLICE CHAMBER
- P-POH
- OVERHEAD TRANSMISSION CENTER LINE
- EXISTING CT DOT CORRIDOR BOUNDARY
- EXISTING PROPERTY LINE
- APPROXIMATE WORK AREA

DOWNTOWN MILFORD CONCEPT PLAN



CADD Drawing, DO NOT REVISE MANUALLY.

UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE	YR. CONST.	W/O	PE Stamp
TENSION	TENSION	TENSION	TENSION			
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.			

NOTES:
1. PRELIMINARY, NOT FOR CONSTRUCTION

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AVANGRID ENGINEERING CONFIDENTIAL, PROPRIETARY and TRADE SECRET INFORMATION Property of AVANGRID							UI 115-kV RR PROJECT MILVON TO WEST RIVER OPTION H - UNDERGROUND IN ROW 2 OF 3
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APP.	MSP				
REV.	DATE	BY	DESCRIPTION	APP.	DATE:

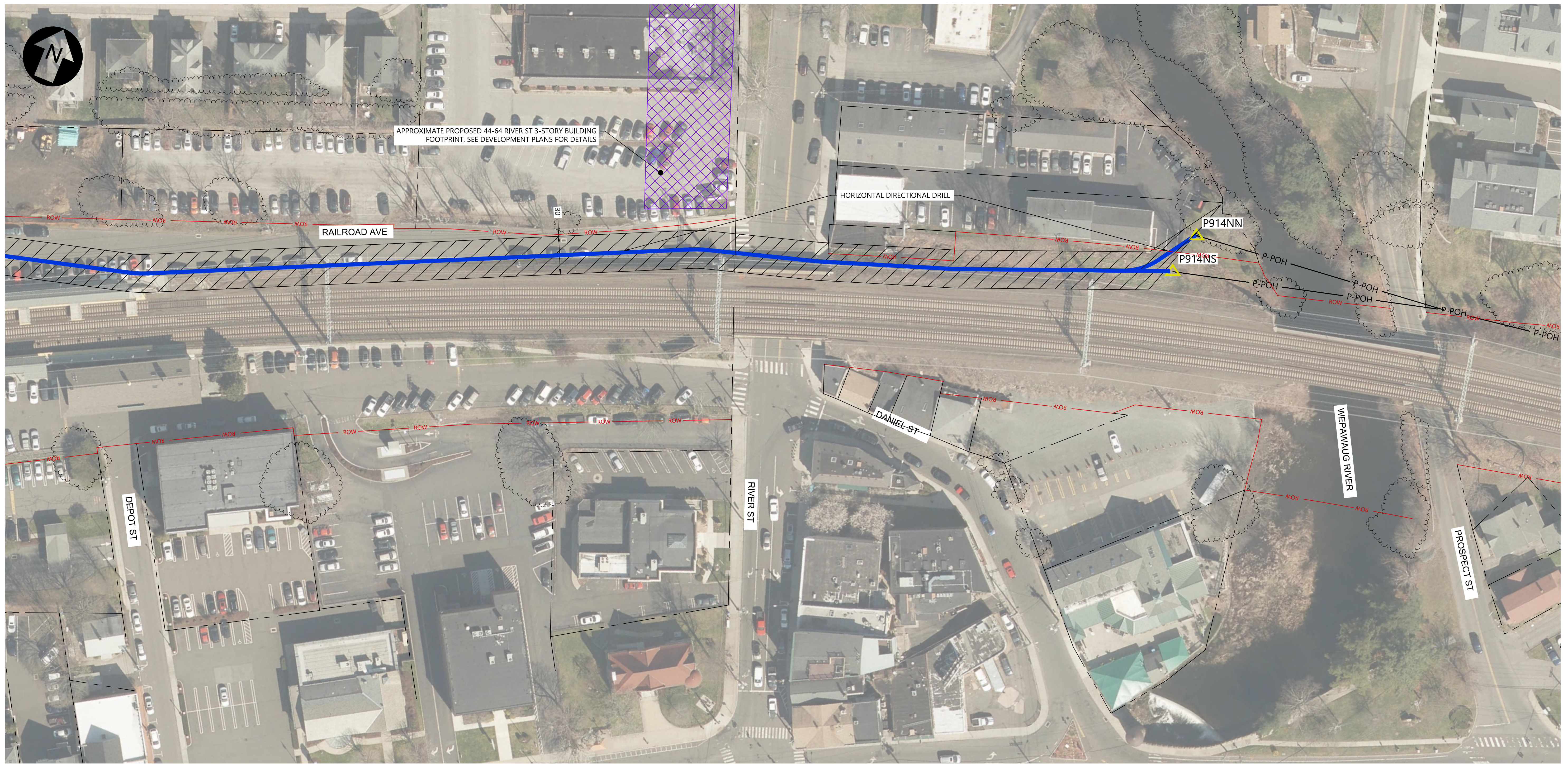
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	ROW CHKD		

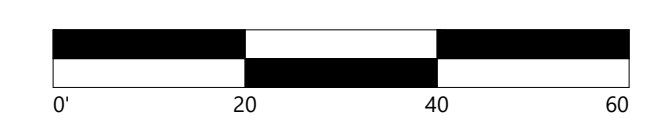
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NOTEBOOK NO.	REVIEWED		
	NOTES REDUCED		



- LEGEND**
- RISER POLE
 - OPTION H CONCEPT UNDERGROUND ALIGNMENT
 - TREE CLEARING AREA
 - SPLICE CHAMBER
 - P-POH
 - EXISTING CT DOT CORRIDOR BOUNDARY
 - EXISTING PROPERTY LINE
 - APPROXIMATE WORK AREA

DOWNTOWN MILFORD CONCEPT PLAN



UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE
TENSION	TENSION	TENSION	TENSION
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.

YR. CONST.	W/O			
NOTES: 1. PRELIMINARY, NOT FOR CONSTRUCTION				
REV.	DATE	BY	DESCRIPTION	APP.

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UI 115-kV RR PROJECT MILVON TO WEST RIVER
 OPTION H - UNDERGROUND IN ROW

3 OF 3

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APP.	MSP			
REV.	DATE	BY	DESCRIPTION	APP.

REV. 0

Cost Estimate-Furnish and Install

Item	Quantity	Estimate
Overhead Line Design and Construction ⁶		\$291,020,000
Engineering & Indirects		\$8,749,000
Cable installation, accessories and commissioning ⁷		\$12,871,000
Duct bank installation	2,680'	\$15,635,000
HDD	800'	\$1,492,000
Jack and Bore		-
Transition Station	1	\$1,522,000
Land Rights		\$998,000
Environmental		\$1,490,000
AFUDC		\$10,498,000
Contingency (30%)		\$12,736,000
Option H Total Cost		\$357,011,000

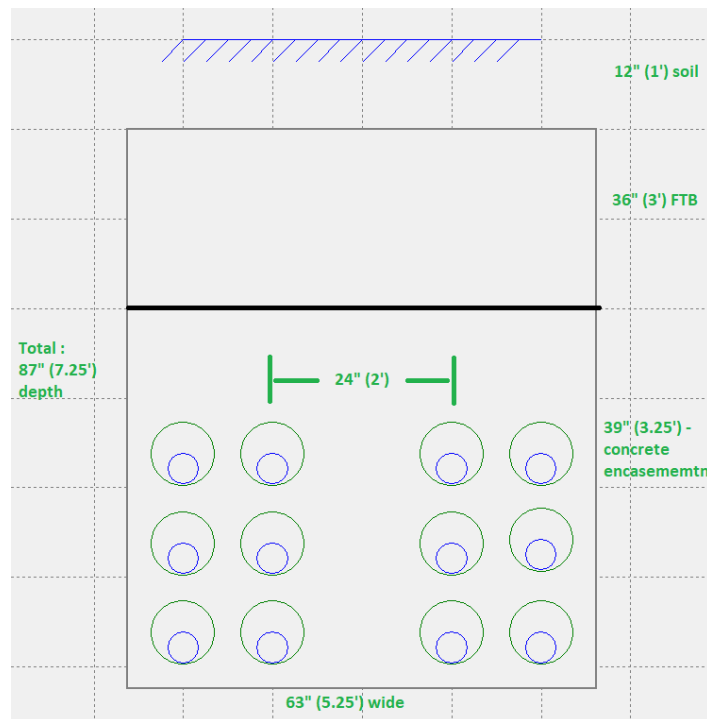
⁶ Inclusive of all associated costs for the overhead design to connect to this underground option. Other detailed cost are pertinent to the underground engineering and construction and removals only

⁷ The following quantities were used in this estimate: Cable – 57,636' Terminations 24, Splices: 12

Assumptions

Design/Engineering

- Transmission center line shown on the drawings is based above grade visual inspection of the area and is subject to change based on completion of below grade survey
- 1 transition station is included and will consist of a fenced in area containing:
 - 2 riser poles
 - 1 control enclosure
- Changes to the typical cross section depth may result in increased cable size or other design parameters to achieve required ampacity
- No P&C work has been included (remote ends)
- This option poses a higher likelihood of impacting archeological resources.
- Installation of underground cable system within RR ROW is contingent on approval from CDOT/MNR
- Cable system consists of 2 cables per phase – 3,500 kcmil
- Assumed duct bank cross section:



Cost Estimate

- ISO-PP4 Appendix D assumptions:
 - This is a "Project Initiation" type estimate (-50%/+200% accuracy)
 - Contingency for this type of estimate is 30%-50%

- This estimate used 30% contingency
- Does not include removals
- Does not include remote substation work (P&C)
- Does not include taxes
- Land right costs are preliminary. Final acreage will be determined once final route is selected
- Any estimates on rock or foreign utilities are based on surface level observations
- Escalation is calculated at 1.75% per year
- Soil and groundwater disposal costs have been estimated based on soil analysis along the route which was performed in preparation for the proposed solution, which will be substantially higher for this option

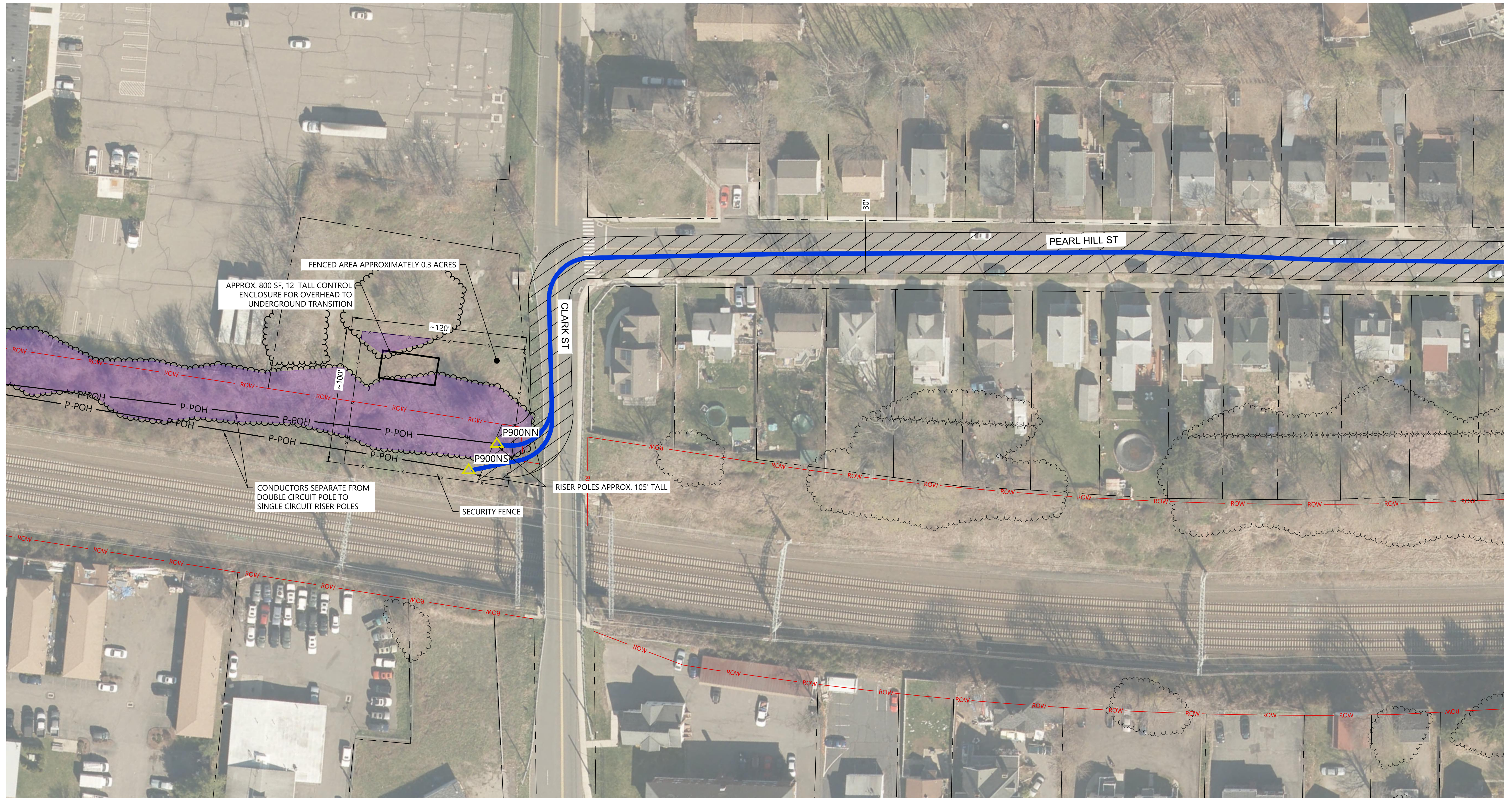
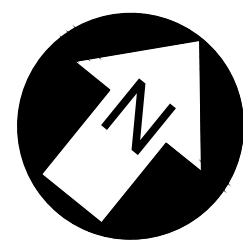
Schedule

- Conceptual level schedule is based on duct bank installation at 40'/day
- Cable pulling, termination, and splicing is based on past project: ~1 year for 8 miles, 1 cable per phase, 1 circuit

Option I

Underground Transmission Line P900N-P914N

*Proposed Project area between P900N and P914N constructed completely
underground-Through RR Corridor*



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BY			

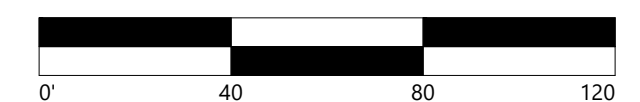
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BY			

LEGEND

- RISER POLE
- OPTION I CONCEPT UNDERGROUND ALIGNMENT
- TREE CLEARING AREA
- SPLICE CHAMBER
- P-POH OVERHEAD TRANSMISSION CENTER LINE
- EXISTING CT DOT CORRIDOR BOUNDARY
- EXISTING PROPERTY LINE
- APPROXIMATE WORK AREA

PEARL HILL ST CONCEPT PLAN



CADD Drawing, DO NOT REVISE MANUALLY.

UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE	YR. CONST.	W/O	PE Stamp
TENSION	TENSION	TENSION	TENSION	NOTES: 1. PRELIMINARY, NOT FOR CONSTRUCTION		
DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	DESIGN TEMP.	REV.	DATE	BY

DESCRIPTION	APP.

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UI 115-kV RR PROJECT MILVON TO WEST RIVER
 OPTION I - MORISSETTE UNDERGROUND

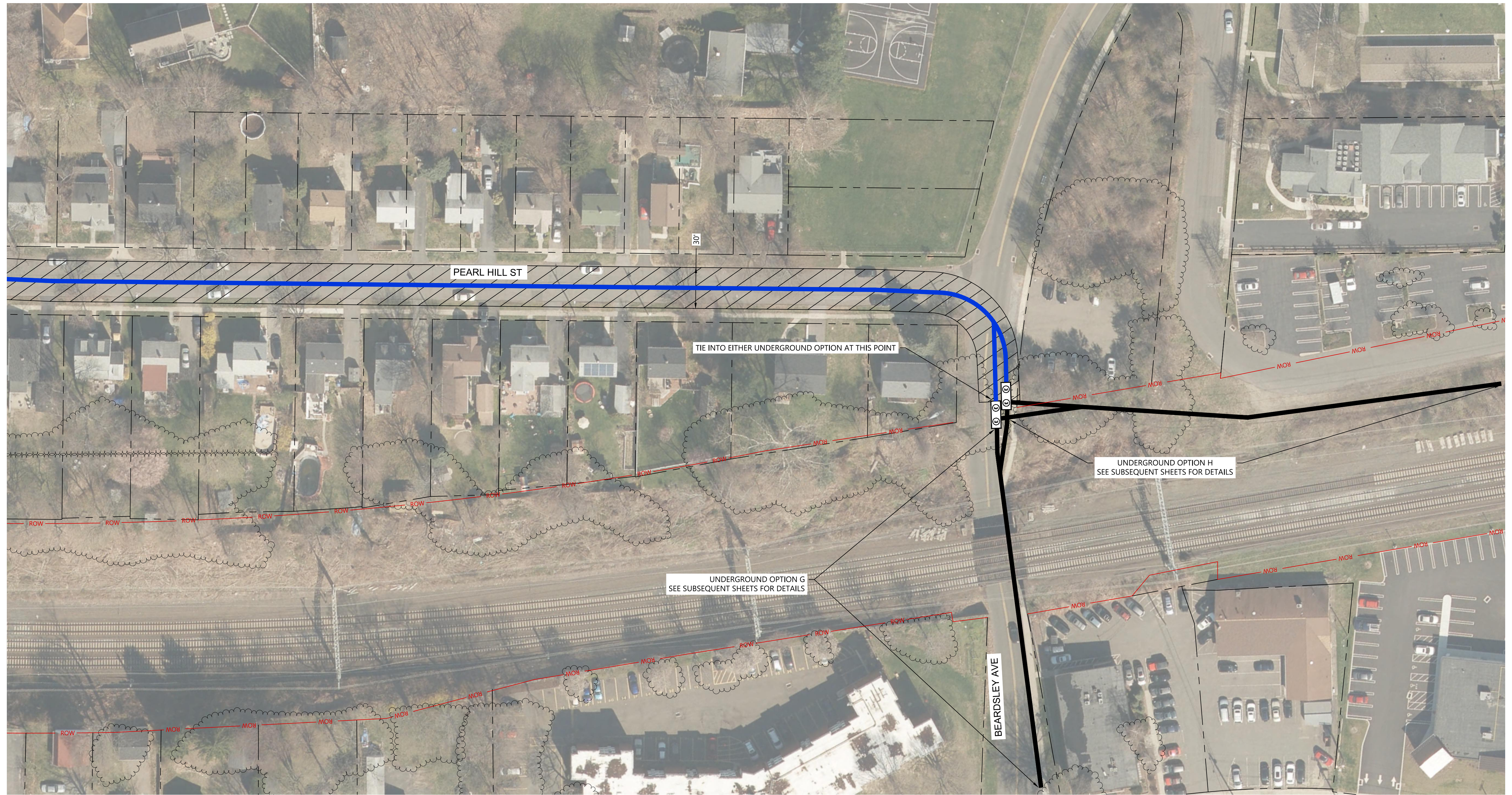
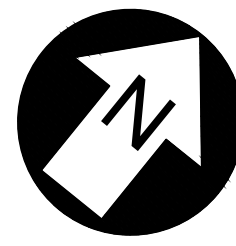
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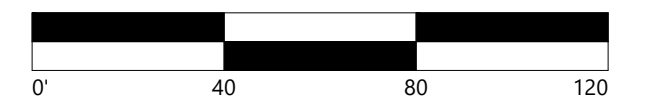
PROFILE	SURVEYED	REVIEWED	DATE
NOTEBOOK NO.	NOTES REDUCED		



LEGEND

- RISER POLE
- OPTION I CONCEPT UNDERGROUND ALIGNMENT
- TREE CLEARING AREA
- SPLICE CHAMBER
- P-POH OVERHEAD TRANSMISSION CENTER LINE
- EXISTING CT DOT CORRIDOR BOUNDARY
- EXISTING PROPERTY LINE
- APPROXIMATE WORK AREA

PEARL HILL ST CONCEPT PLAN



CADD Drawing, DO NOT REVISE MANUALLY.

UNDERBUILD CONDUCTOR TYPE	NEUTRAL CONDUCTOR TYPE	OPGW TYPE	CONDUCTOR TYPE	YR. CONST.	W/O	PE Stamp
TENSION	TENSION	TENSION	TENSION	NOTES: 1. PRELIMINARY, NOT FOR CONSTRUCTION		
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DESCRIPTION	APP.

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REV.	DATE	BY	DESCRIPTION

UI 115-kV RR PROJECT MILVON TO WEST RIVER OPTION I - MORISSETTE UNDERGROUND	
2 OF 2	
APP.	DATE:

Cost Estimate-Furnish and Install

Item	Quantity	Estimate
Overhead Line Design and Construction ⁸		\$289,100,000
Engineering & Indirects		\$13,063,000
Cable installation, accessories and commissioning ⁹		\$20,410,000
Duct bank installation	4,368'	\$22,322,000
HDD	800'	\$1,492,000
Jack and Bore		-
Transition Station		\$1,522,000
Land Rights		\$998,000
Environmental		\$2,023,000
AFUDC		\$15,311,000
Contingency (30%)		\$18,135,000
Option I Total Cost		\$384,376,000

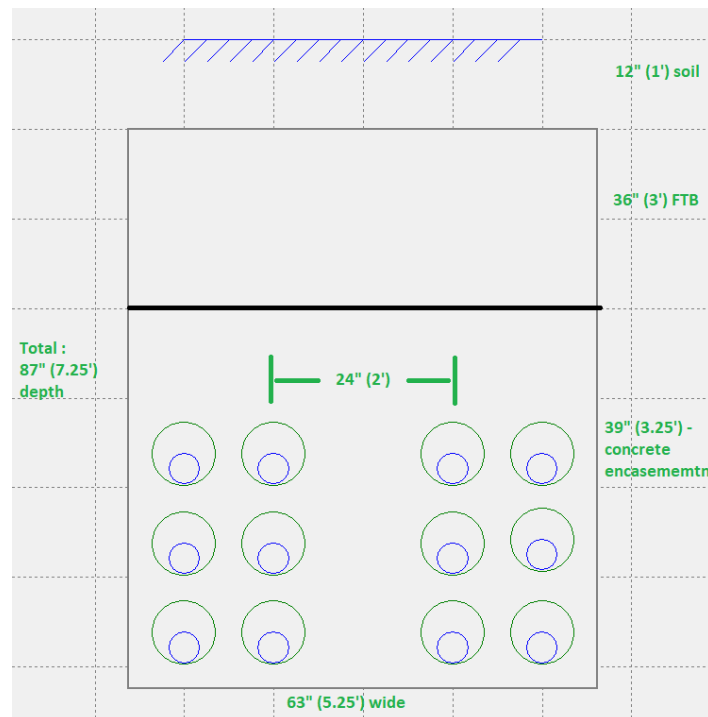
⁸ Inclusive of all associated costs for the overhead design to connect to this underground option. Other detailed cost are pertinent to the underground engineering and construction and removals only

⁹ The following quantities were used in this estimate: Cable – 95,340' Terminations 24, Splices: 24

Assumptions

Design/Engineering

- Transmission center line shown on the drawings is based above grade visual inspection of the area and is subject to change based on completion of below grade survey
- Any estimates on rock or foreign utilities are based on surface level observations
- Changes to the typical cross section depth may result in increased cable size or other design parameters to achieve required ampacity
- No P&C work has been included (remote ends)
- This option poses a higher likelihood of impacting archeological resources.
- 1 transition station is included and will consist of a fenced in area containing:
 - 2 riser poles
 - 1 control enclosure
- Installation of underground cable system within RR ROW is contingent on approval from CDOT/MNR
- Cable system consists of 2 cables per phase – 3,500 kcmil
- Assumed duct bank cross section:



Cost Estimate

- ISO-PP4 Appendix D assumptions:
 - This is a "Project Initiation" type estimate (-50%/+200% accuracy)

- Contingency for this type of estimate is 30%-50%
 - This estimate used 30% contingency
- Does not include removals
- Does not include remote substation work (P&C)
- Does not include taxes
- Land right costs are preliminary. Final acreage will be determined once final route is selected
- Escalation is calculated at 1.75% per year
- Soil and groundwater disposal costs have been estimated based on soil analysis along the route which was performed in preparation for the proposed solution, which will be substantially higher for this option

Schedule

- Conceptual level schedule is based on duct bank installation at 40'/day
- Cable pulling, termination, and splicing is based on past project: ~1 year for 8 miles, 1 cable per phase, 1 circuit