

**Middletown to Norwalk
345-kV Transmission Line Project
Highway Corridor Study**

For

**Northeast Utilities
and
The United Illuminating Company**

August 2003



**Northeast
Utilities System**



The United Illuminating Company

**Burns &
McDonnell**

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August, 2003

by
**Burns & McDonnell
Engineers-Architects-Consultants
Kansas City, Missouri**

Project 30522

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As part of the Middletown to Norwalk 345-kV Transmission Project, Northeast Utilities requested Burns & McDonnell to perform a review of the feasibility of following various highway corridors with the transmission line. This report provides a summary of our findings.

PROJECT DESCRIPTION

Due to the increasing demand in the Southwest Connecticut (SWCT) area, Connecticut Light & Power and the United Illuminating Company (UI) (“the Companies”) have proposed to expand the 345-kilovolt transmission system into SWCT. The expansion will take the form of a 345-kV “loop”. The first portion of this loop will run from Plumtree Substation in Bethel to Norwalk Substation in Norwalk. The second portion of this loop will extend the 345-kV lines from the Middletown Area to Norwalk Substation. This “loop” will serve to correct the reliability criteria violations of the transmission system, minimize the costs associated with congestion, and help us to better serve our customers.

The Bethel to Norwalk line has been proposed and is anticipating a Certificate of Environmental Compatibility and Public Need by the Connecticut Siting Council (CSC). The proposed Middletown to Norwalk line has recently completed the municipal consultation phase of the permitting process. The route from Middletown to Norwalk must be interconnected to two proposed substations and one proposed switching station along the way; Beseck Switching Station in Wallingford, East Devon Substation in Milford, and Singer Substation in Bridgeport. The project will also connect to the existing Norwalk Substation in Norwalk and Scovill Rock Switching Station in Middletown. Both underground and overhead line options have been considered and routes were evaluated. In the Middletown to Norwalk section of the “loop”, several sections entail removing one of the 115-kV lines from service and replacing it with a 345-kV line, as well as upgrading several existing substations and 115-kV transmission lines.

The purpose of this study is to determine the feasibility of constructing the 345-kV line either overhead or underground along Interstates 91, 95, and U.S. Highway 7. This review included Interstate 91 from Meriden to New Haven, Interstate 95 from New Haven southwest to U.S. Highway 7 in Norwalk, and U.S. Highway 7 north from Interstate 95 to the Norwalk Substation. Additionally, the Companies examined the Wilbur Cross/Merritt Parkways (CT-15) between Meriden and Norwalk as a possible alternative for the new 345-kV transmission facility.

The Connecticut Department of Transportation (CDOT) has informed the Companies that their policy is not to allow construction of a new line within and parallel to the right-of-way of any controlled access highway, including I-91, I-95, U.S. Highway 7, and CT-15. Regardless, these corridors were evaluated to determine the feasibility of constructing a transmission line either within or parallel to the highway rights-of-way.

Initially, the I-91, I-95, and U.S. Highway 7 rights-of-way appear to offer a feasible route from Meriden to Norwalk because the highways run in proximity to most of the desired

connection points. However, the highways do not run in proximity to Oxbow Junction or Scovill Rock Substation; as a result, routes to those points were not part of this study. Upon further review, this route presents a number of technical and economic issues that make the use of this route impractical for a 345-kV transmission facility.

APPROACH

The analysis included review of aerial photos and CDOT right-of-way maps to identify areas that would possibly constrain construction of a transmission line. In addition to the photo and map review, transmission line designers drove the highways to field check conditions. The right-of-way usage and construction feasibility criteria used to determine the practicality of routing either an overhead or underground 345-kV line along this route are listed below:

Right-of-Way Criteria:

- The minimum width for the overhead right-of-way is 120 feet; based on a single-shaft steel pole with a vertical conductor configuration. In evaluating the highways, the criterion was that this 120 feet could be within or adjacent to the highway right-of-way. If the pole placement for the overhead line were to be located just outside of the highway right-of-way, the transmission line and highway rights-of-way would overlap requiring approximately 65 feet of new right-of-way for the line.
- The construction of an underground line requires a 15-foot permanent easement, plus a 25-foot temporary easement to be used during construction and maintenance, for a total of 40 feet. The analysis considered that an underground line could be placed inside highway rights-of-way, but not directly under the pavement of the highways.
- Any change from overhead to underground construction would require a transition station of significant size, approximately 2-4 acres.

Construction Feasibility Constraints:

- Steep sideslopes, embankments, and elevated portions of the highway are unsuitable for either placing poles or trenching.
- Rock outcroppings or cuts make the placement of foundations for overhead structures and excavation for underground facilities impractical because of the extensive rock removal involved. In most cases, such a large quantity of rock would have to be removed using disruptive techniques such as blasting, cutting, or drilling.
- Long water crossings and wetlands pose construction and environmental constraints, especially for underground construction.

- Any construction along these corridors would pose severe traffic impediments, disrupting commuters between New Haven and Hartford and along the Connecticut Coastline.

Real Estate Impact Considerations:

- Avoid having to remove residences or businesses.
- Avoid cutting trees that buffer residential areas from the highways.

CORRIDOR REVIEW

Using the above criteria, Interstates 91, 95 and U.S. Highway 7 were evaluated for the suitability of either an overhead or underground 345-kV transmission line. Business and residential development, rock outcroppings, small medians, and elevated portions of these highways make it impractical to parallel the highways for the entire length from Black Pond Junction to Norwalk Substation. However, Figure 1 (Sheets 1, 2 and 3) identify limited portions of the highway rights-of-way that could be used for constructing either an overhead or underground line. The identified segments are short, discontinuous segments that must be interconnected to form a continuous route as discussed in the project description. Because these segments are not continuous and would require additional right-of-way acquisition to interconnect, this route along the highways does not meet the established criteria. Each of these segments is discussed individually below.

Interstate 91

Black Pond Junction to Beseck Substation.

Meriden/Wallingford:

The majority of this portion of the highway corridor could accommodate either overhead or underground construction, however, a portion south of Murdock Avenue in Meriden is constrained by adjacent houses that would have to be acquired. Therefore, this section does not offer a more practical option between the two connection points than other potential routes and corridors that require no property or home acquisitions. In addition, running the line west to I-91, then south and back east to the Beseck Substation in Wallingford would extend the length of the line and require still more property acquisition.

Beseck Substation to New Haven.

Wallingford:

Both overhead and underground options run west from the proposed Beseck Substation and cross I-91. I-91 is constrained by existing development for approximately a half-mile south of Carpenter Lane. As an option, an underground route could follow Thorpe Avenue to CT-68 (Barnes Rd) and then return to I-91.

The majority of the route from CT-68 south to E. Center Street could accommodate an overhead or underground transmission facility with the acquisition of right-of-way. However, one section near Durham Rd is limited to underground only due to adjacent development, which would in turn require the acquisition of two 2-4 acre sites for transition stations immediately adjacent to I-91 (See Figure 1, Sheet 1.)

Based on the construction feasibility constraints and real estate impact considerations, the combination of development and shallow rock make both overhead and underground options impractical between Center Street and Woodhouse Avenue (CT-150) in Wallingford.

North Haven/New Haven:

The route from Woodhouse Avenue in Wallingford to US Route 5 (Washington Avenue) in North Haven could accommodate an overhead or underground transmission facility with the acquisition of right-of-way.

From Route 5 south through North Haven for the next three miles, I-91 is bounded by commercial/industrial facilities interspersed with large water/wetland complexes associated with the Quinnipiac River floodplain. In addition, the east side of I-91, south of US Route 5, is bounded by two large cemeteries. Due to the floodplain, the highway has been built up, resulting in steep side-slopes. Building beyond the highway would result in conflicts with the above facilities, and pose serious engineering difficulties, making this stretch not suitable for overhead or underground construction.

For approximately one mile south of Montowese Ave, the area along I-91 is bordered by commercial and industrial facilities, but could accommodate an underground route. However, occasional buildings next to the highway make a continuous overhead route infeasible.

Once the highway enters New Haven it is both congested and elevated in many places, making it unsuitable for any type of transmission facility based on the construction feasibility constraints and real estate impact considerations.

I-91 Summary.

Following I-91 offers only limited pieces of usable right-of-way rather than an alternative route. The availability of enough overhead right-of-way is more limited than underground due to the obvious difference in space requirements. Additionally, any change from overhead to underground construction would require a transition station of significant size, approximately 2-4 acres.

Interstate 95

New Haven:

Field investigations determined that an underground line could be constructed in New Haven from the North Frontage Road overpass southeast along Brewery Street and Sargent Drive to just before the Howard Avenue overpass. The line would have to be located on Sargent Drive because United Illuminating has an existing 115-kV underground transmission line on Long Wharf Drive along the east side of the interstate. As a result of the widening of I-95 associated with Pearl Harbor Memorial Bridge reconstruction (“Q-Bridge”), UI has been forced to relocate existing 115-kV underground and overhead transmission lines at considerable expense. This type of relocation has become more common as a result of modifications to Connecticut highways.

West Haven:

The portion of I-95 through most of West Haven is elevated, bounded by sound barriers in places, and cut through rock, making this portion infeasible for either overhead or underground options. (See Figure 1, Sheet 2.)

Orange:

Approximately one mile of line could be constructed in the general area of southeast Orange.

Milford/Stratford/Bridgeport:

Only three short sections of corridor were considered feasible in Milford, and none in Stratford or Bridgeport. This part of the highway corridor is congested, elevated, and passes through shallow rock in many places. (See Figure 1, Sheet 3.)

Fairfield /Westport:

A section of approximately 1.5 miles was identified south of U.S. Highway 1 from Fairfield into Westport. This short stretch has enough space for either overhead or underground right-of-way. The rest of the way through Westport is highly developed, elevated, and bounded by water or shallow rock.

Norwalk:

An underground line could be constructed from just west of CT-33 for approximately a mile into the Town of Norwalk. From there to U.S. Highway 7 the corridor is not feasible for either overhead or underground construction due to the adjacent development and steep side-slopes.

I-95 Summary.

Following I-95 offers only limited pieces of usable right-of-way rather than an alternative route. The availability of enough overhead right-of-way is more limited than underground due to the obvious difference in space requirements. Additionally, any change from overhead to underground construction would require a transition station of significant size, approximately 2-4 acres. Furthermore, due to its path through the center of several cities and towns with highly congested residential and commercial development adjacent to the highway corridor, and the physical limitations of the corridor itself (elevated segments, rocky or bounded by water/wetlands) the route is impractical.

U.S. Highway 7**Norwalk:**

Based on the construction feasibility constraints and real estate impact considerations, neither an overhead nor an underground line could be constructed from I-95 north along U.S. Highway 7 to the Norwalk Substation. As an alternative, an underground line could follow U.S. Highway 1 north to Riverside Avenue to the Norwalk Substation. This route was identified as an underground alternative in the routing study.

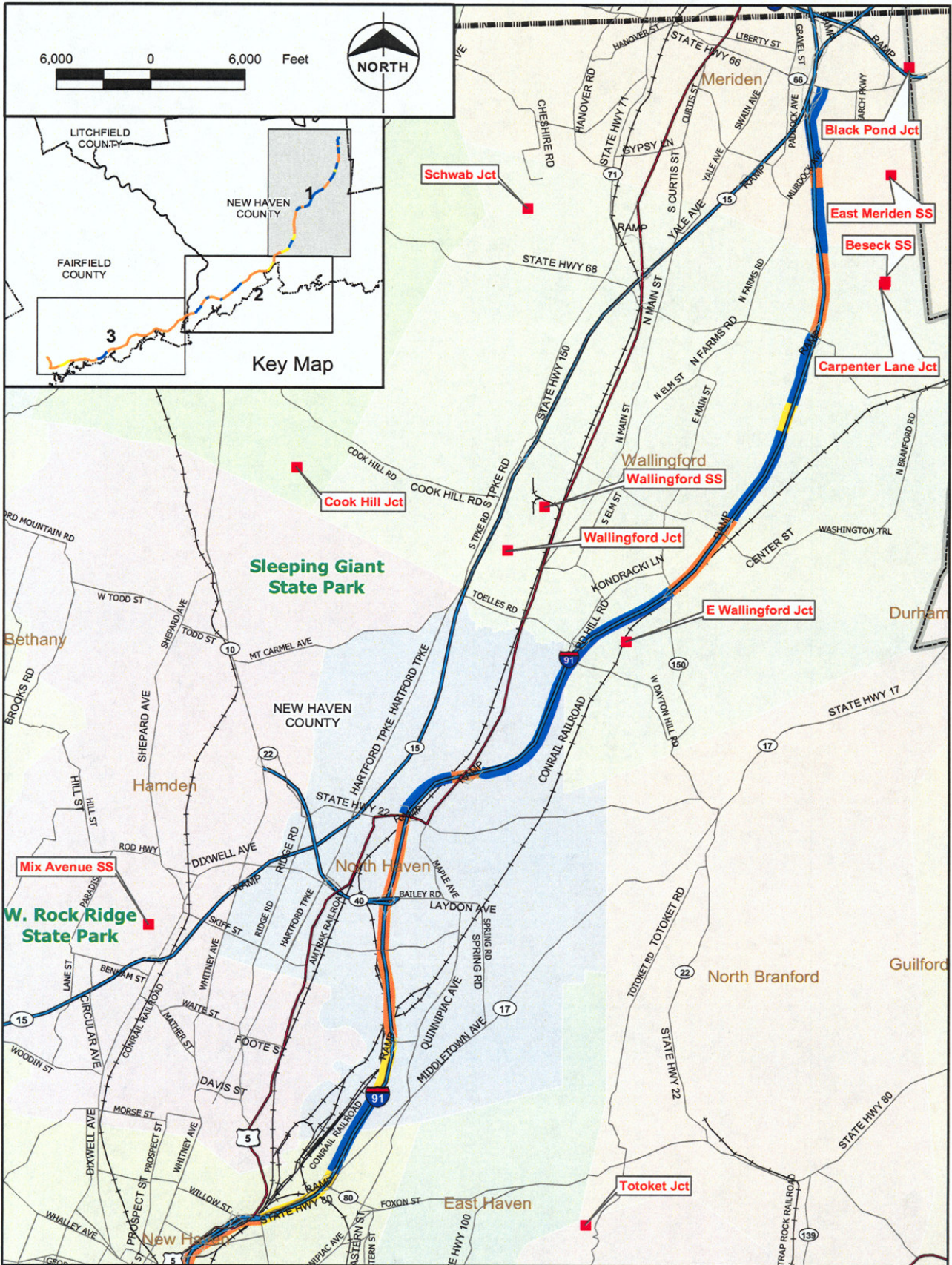
Wilbur Cross/Merritt Parkways (CT-15)

The Wilbur Cross/Merritt Parkway (CT-15) route from Meriden to Norwalk was given consideration similar to that given to the I-91, I-95 and US Highway 7 route. Field investigations revealed that this corridor poses even greater challenges to the right-of-way criteria, construction feasibility constraints and real estate impact considerations than the I-91/I-95/US7 route. Based on this initial investigation, a detailed segment by segment analysis was deemed unwarranted. This route has an extremely narrow right-of-way corridor and a narrow vegetated median that precludes the placement of a transmission facility within or adjacent to the existing highway corridor. The path of CT-15 traverses many severe rock cuts as well as tunneling through West Rock in New Haven. The highway also crosses the Housatonic River at an extremely high elevation at the Milford/Stratford town line which makes both overhead and underground construction options impractical. Many stretches of CT-15 have heavy mature overhanging tree growth that provides a substantial buffer between the highway and nearby residential communities. This buffer, which provides visual and acoustical barriers for these residences would need to be eliminated to accommodate either an overhead or underground transmission facility. This highway contains a substantial number of bridges that have unique architecture and are listed on the National Register of Historic Places by the National Park Service. The Merritt Parkway is also designated a National Scenic Byway by the Federal Highway Administration.

In summary, for the above reasons, this route was dismissed and not investigated to the same degree as the I-91/I-95/US7 route, because of the obvious severe violations of right-of-way criteria, construction feasibility constraints, and real estate impact considerations.

CONCLUSION

The review of potential highway corridors determined that there are only limited possible locations for the placement of a 345-kV transmission line along or within the highway rights-of-way. Based on the evidence from the investigation of these routes, the highway corridors lack the constructibility that would allow them to be considered as practical alternative routes. Not only would such routes require the acquisition of a significant number of homes, but physical limitations in many areas make construction impractical. The limitations include elevated portions of highway with steep sideslopes or bridge supports, water and wetlands, heavy vegetation buffers, narrow rights-of-way, shallow rock, rock cuts, tunnels and an elevated river crossing. There are also historic, architecturally significant and scenic designations along one of the routes that would need to be addressed. Based on this evaluation, the highway corridors are not practical alternatives for the proposed transmission line route.



LEGEND	Overhead or Underground Location	Limited Access Highway	Railroad	Study Area
	Underground Location Only	Highway	Pipeline	County Boundary
	Non-Feasible Areas	Roads	Derby	Towns
			Substations	

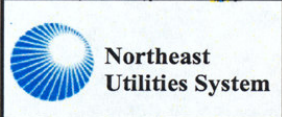


Figure 1
MIDDLETOWN TO NORWALK
345-kV TRANSMISSION PROJECT
HIGHWAY CORRIDOR FEASIBILITY
Sheet 1 of 3

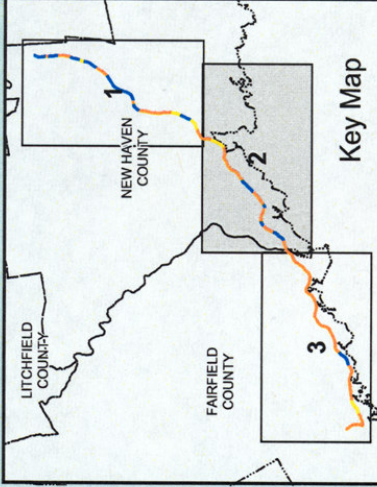
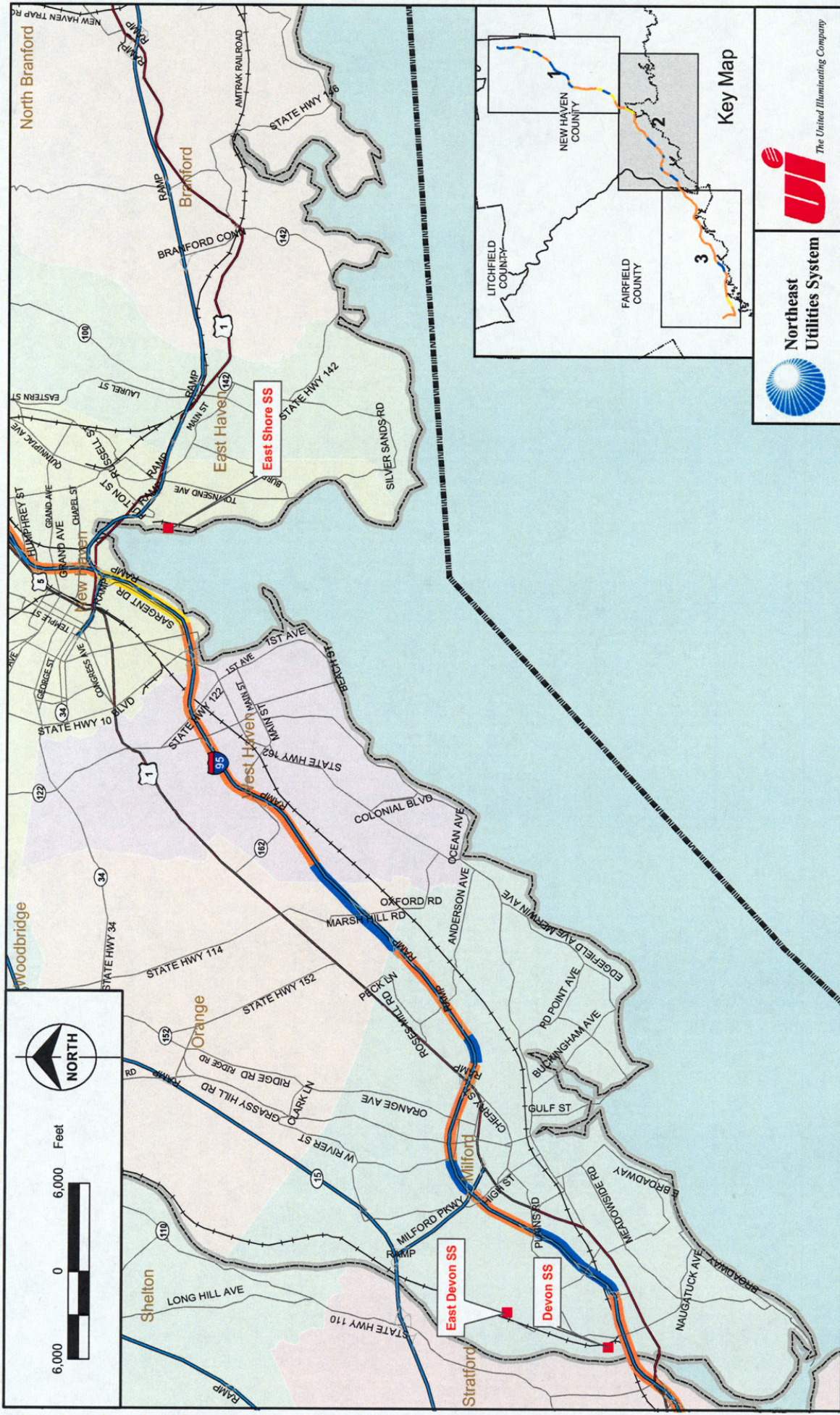


Figure 1
MIDDLETOWN TO NORWALK
345-KV TRANSMISSION PROJECT
HIGHWAY CORRIDOR FEASIBILITY
Sheet 2 of 3

LEGEND

	Overhead or Underground Location		Limited Access Highway		Railroad		Study Area
	Underground Location Only		Highway		Pipeline		County Boundary
	Non-Feasible Areas		Roads		Towns		Substations
			Derby				

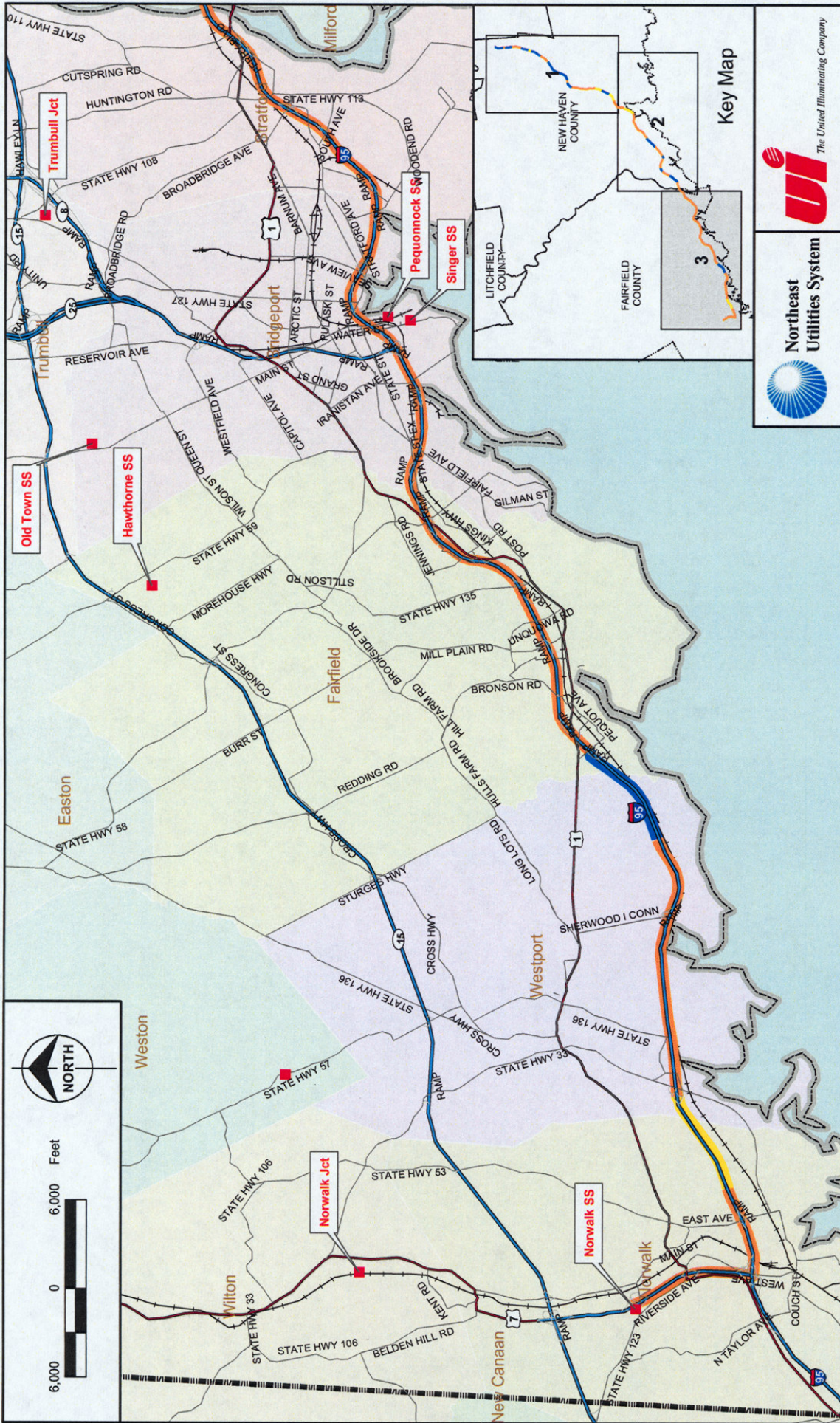

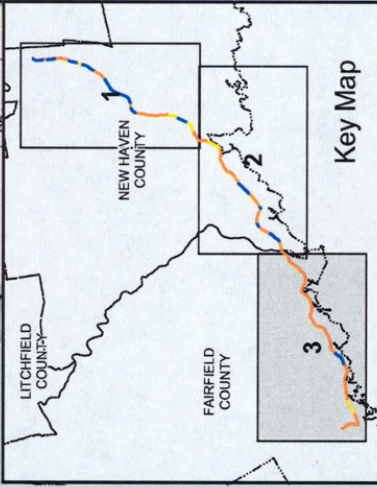














Figure 1
MIDDLETOWN TO NORWALK
345-KV TRANSMISSION PROJECT
HIGHWAY CORRIDOR FEASIBILITY
Sheet 3 of 3



Northeast Utilities System
The United Illuminating Company



Key Map

	Overhead or Underground Location		Substations
	Underground Location Only		Towns
	Non-Feasible Areas		County Boundary
	Limited Access Highway		Railroad
	Highway		Pipeline
	Roads		Derby