

Proposed Wireless Telecommunications Facility

Maennerchor Club
39 Maennerchor Avenue
Norwich, Connecticut

Prepared for **Optasite Towers LLC**
1 Research Drive, Suite 200C
Westborough, MA 01581

Prepared by **VHB/Vanasse Hangen Brustlin, Inc.**
54 Tuttle Place
Middletown, CT 06457

September 2007

Visual Resource Evaluation

Towers LLC seeks approval from the Connecticut Siting Council for a Certificate of Environmental Compatibility and Public Need to construct a wireless telecommunications facility ("Facility") on property located at 39 Meannerchor Avenue ("host property") in the Taftville section of the City of Norwich, Connecticut. This "Visual Resource Evaluation" was conducted to approximate the visibility of the proposed Facility within a two-mile radius of the Site ("Study Area").

Project Introduction

The proposed Facility includes the construction of a 120-foot tall monopole capable of supporting up to four antenna arrays with associated ground equipment to be located within a fenced compound at the base of the tower. Based on information provided by the project engineer, Clough Harbour and Associates LLP, the proposed project area is located at approximately 155 feet Above Mean Sea Level (AMSL). Access to the Facility would be provided via a proposed gravel driveway that would extend to the compound area in a southerly direction from Beauregard Street.

Site Description and Setting

Identified in the City of Norwich Tax Assessors records as Map 55/Block 2/Lot 43, the host property consists of 7.01 acres of wooded, undeveloped land. The Facility would be situated on the southern portion of the host property, roughly 250 feet south of Beauregard Avenue. A photograph of the proposed project area is included in Attachment A. Attachment A also contains a map that depicts the location of the proposed Facility and the limits of the Study Area. Land use within the general vicinity of the host property is comprised of medium-density residential parcels with various commercial establishments located along Route 12 further to the south. Segments of Route 12, Route 97, Route 165 and Route 169 traverse the Study Area. In total, the Study Area contains roughly 95 linear miles of roadways.

The topography in the Study Area is generally characterized by rolling hills that range in ground elevation from approximately 20 feet AMSL to roughly 400 feet AMSL. The tree cover within the Study Area consists mainly of mixed deciduous hardwood species. The tree canopy occupies approximately 5,152 acres of the 8,042-acre study area (64%). During the in-field activities associated with this analysis, an infrared laser range finder was used to accurately determine the average tree canopy height throughout the Study Area. Numerous trees were selected for measurement and the average tree canopy established, in this case 60 feet. In addition, the Study Area features a total of approximately 490 acres of surface water; attributed mainly to portions of the Shetucket and Quinnebaug Rivers east of the host property.



METHODOLOGY

To estimate the visibility associated with the proposed Facility, VHB incorporates a two-fold approach utilizing both a predictive computer model and in-field analysis. The predictive model is employed to assess potential visibility throughout the entire Study Area, including private property and/or otherwise inaccessible areas for field verification. A balloon float and Study Area drive-through reconnaissance are also conducted to obtain locational and height representations, back-check the initial computer model results and provide photographic documentation from publicly accessible areas. Results of both activities are analyzed and incorporated into the final viewshed map. A description of the methodologies used in the analysis is provided below.

Visibility Analysis

Using ESRI's ArcView® Spatial Analyst, a computer modeling tool, the areas from where the proposed Facility is expected to be visible are calculated. This is based on information entered into the computer model, including Facility height, its ground elevation, the surrounding topography, existing vegetation and any significant structures/objects that may act to obstruct potential views. Data incorporated in the model includes 7.5 minute digital elevation models (DEMs) and a digital forest layer for the Study Area. The DEMs were produced by the United States Geological Survey (USGS) in 1982 at a 30 meter resolution. The forest layer was derived through on-screen digitizing in ArcView® GIS from 2005 and 2006 digital orthophotos with 2-meter and 0.5-foot pixel resolutions, respectively.

Once the data are entered, a series of constraints are applied to the computer model to achieve an estimate of where the Facility will be visible. Initially, only topography was used as a visual constraint; the tree canopy is omitted to evaluate all areas of potential visibility without any vegetative screening. Although this is an overly conservative prediction, the initial omission of these layers provides a reference for comparison once the tree canopy is established and also assists in the evaluation of potential seasonal visibility of the proposed Facility. A conservative tree canopy height of 50 feet is then used to prepare a preliminary viewshed map for use during the Study Area reconnaissance. The average height of the tree canopy is determined in the field using a hand-held infra-red laser range finder. The average tree canopy height is incorporated into the final viewshed map; in this case, 60 feet was identified as the average tree canopy height. The forested areas within the Study Area were then overlaid on the DEM with the measured tree height of 60 feet added and the visibility calculated for the final viewshed map. The forested areas are then extracted from the areas of visibility, with the assumption that a person standing among the trees will not be able to view the Facility beyond a distance of approximately 500 feet. Depending on the density of the vegetation in these areas, it is assumed that some locations within this range will provide visibility of at least portions of the Facility based on where one is standing. This analysis was conducted in 30-foot increments in order to provide an estimate of the amount of the

proposed monopole structure that would likely be visible above the surrounding tree canopy.

Also included on the map is a data layer, obtained from the Connecticut State Department of Environmental Protection (CTDEP), which depicts various land and water resources such as parks and forests, recreational areas, dedicated open space as well as other categories. This layer is useful in identifying potential visual impacts to any sensitive receptors that may be located within the Study Area. Lastly, based on a review of available data published by the Connecticut Department of Transportation and discussions with staff in Norwich and Preston, it was determined that there are no state or locally designated scenic roadways contained within the Study Area.

A preliminary viewshed map is generated for use during the in-field activity in order to confirm that no significant land use changes have occurred since the aerial photographs used in this analysis were produced and to verify the results of the model in comparison to the balloon float. Information obtained during the reconnaissance is then incorporated into the final visibility map.

Balloon Float and Study Area Reconnaissance

On July 18 and July 19, 2007 Vanasse Hangen Brustlin Inc., (VHB) conducted “balloon floats” at the Facility site to further evaluate the potential viewshed within the Study Area. The balloon floats consisted of raising and maintaining an approximate four-foot diameter, helium-filled weather balloon at the proposed site location to a height of 120 feet. Once the balloon was secured, VHB staff conducted a drive-by reconnaissance along the roads located within the Study Area with an emphasis on nearby residential areas and other potential sensitive receptors in order to evaluate the results of the preliminary viewshed map and to verify where the balloon was, and was not, visible above and/or through the tree canopy. During the July 18th balloon float, weather conditions were initially overcast with calm winds and temperatures of approximately 75 degrees Fahrenheit. This float was aborted due to increasing cloud cover and light rain. Views 1 through 7 were obtained during the July 18th float, prior to the cancellation. Views 9 through 21 were obtained on the following day, July 19, 2007. During the July 19th float, the temperature was approximately 80 degrees Fahrenheit with calm wind conditions and mostly sunny skies.

Photographic Documentation

During the balloon float, VHB personnel drove the public road system in the Study Area to inventory those areas where the balloon was visible. The balloon was photographed from a number of different vantage points to document the actual view towards the proposed Facility. The locations of the photos are described below:

1. View from Maennerchor Avenue adjacent to house #48.
2. View from Maennerchor Avenue adjacent to house #64.
3. View from Laporte Drive adjacent to house #9.

4. View from Schiller Street adjacent to house #27.
5. View from Hunters Road adjacent to house #51.
6. View from Boswell Avenue adjacent to house #815.
7. View from McKay Street adjacent to house #14.
8. View from Hunters Road adjacent to house #11.
9. View from Boswell Avenue adjacent to Starrwood Food Market.
10. View from intersection of Norwich Avenue, Hunters Road and Prentice Street.
11. View from intersection of Norwich Avenue and Blissville Road.
12. View from Prentice Street near intersection with Norwich Avenue.
13. View from Prentice Street adjacent to house #10.
14. View from Germania Street at intersection of Maennerchor Avenue.
15. View from Maennerchor Avenue adjacent to house #24.
16. View from Bolduc Lane adjacent to house #33.
17. View from Norwich Avenue at access road to Bob's Furniture Warehouse.
18. View from Route 12 at intersection with Lower Blissville Road.
19. View from Bungy Hill Road adjacent to house #220.
20. View from Route 12 east of Lower Blissville Road.
21. View from the intersection of Route 169 and Route 97.

Photographs of the balloon from the view points listed above were taken with a Panasonic Digital Camera DMC-FZ5, which has a lens focal length equivalent to a 35 mm camera with a 38 to 115 mm zoom. "The lens that most closely approximates the view of the unaided human eye is known as the normal focal-length lens. For the 35 mm camera format, which gives a 24x36 mm image, the normal focal length is about 50 mm."¹ The optical zoom lens for the Panasonic DMC-FZ5 was set at a range of 50 mm to 70 mm for the purposes of this Visual Resource Evaluation.

The locations of the photographic points are recorded in the field using a hand held GPS receiver and are subsequently plotted on the maps contained in the attachments to this document.

Photographic Simulation

Photographic Simulations were generated for the twenty one locations identified above. The Photographic Simulations represent a scaled depiction of the proposed monopole from these locations. The height of the Facility is determined based on the location of the balloon in the photographs and a proportional monopole image is simulated into the photographs. The simulations are contained in Attachment B.

¹ Warren, Bruce. *Photography*, West Publishing Company, Eagan, MN, c. 1993, (page 70).



CONCLUSIONS

Based on this analysis, areas from where the proposed 120-foot tall monopole would be visible above the tree canopy comprise approximately 175 acres, or just over two percent of the 8,042 acre Study Area. A significant portion of the anticipated year-round visibility depicted on the viewshed map occurs over open, undeveloped fields to the southeast of the proposed Facility. These areas are located across the Shetucket River, approximately 0.35-mile and 1.25 mile from the project area and include approximately 25 acres and 47 acres of year-round visibility, respectively. In general, other areas of anticipated year-round visibility are located within the immediate vicinity of the host property, including those areas represented in the photographic documentation and simulations contained in this report, and along the Route 12 traffic corridor to the south and southeast. The viewshed map also depicts several smaller areas of visibility located on private properties throughout the Study Area. VHB estimates that approximately 30 residences within the Study Area will have at least partial year-round views of the proposed monopole from select portions of their respective properties. The viewshed map also depicts several additional areas where seasonal (i.e. during “leaf off” conditions) views through the trees are anticipated. These areas comprise approximately 64 additional acres and are generally located within a 0.25-mile radius surrounding the proposed Facility. In total, VHB anticipates that approximately 14 additional residences would achieve seasonal views of the proposed Facility from select portions of their respective properties.

Attachment A

Site Area Photograph, Photolog Documentation Map, Balloon Float Photographs, and Photographic Simulations

Photographic Documentation

City of
Norwich
Connecticut



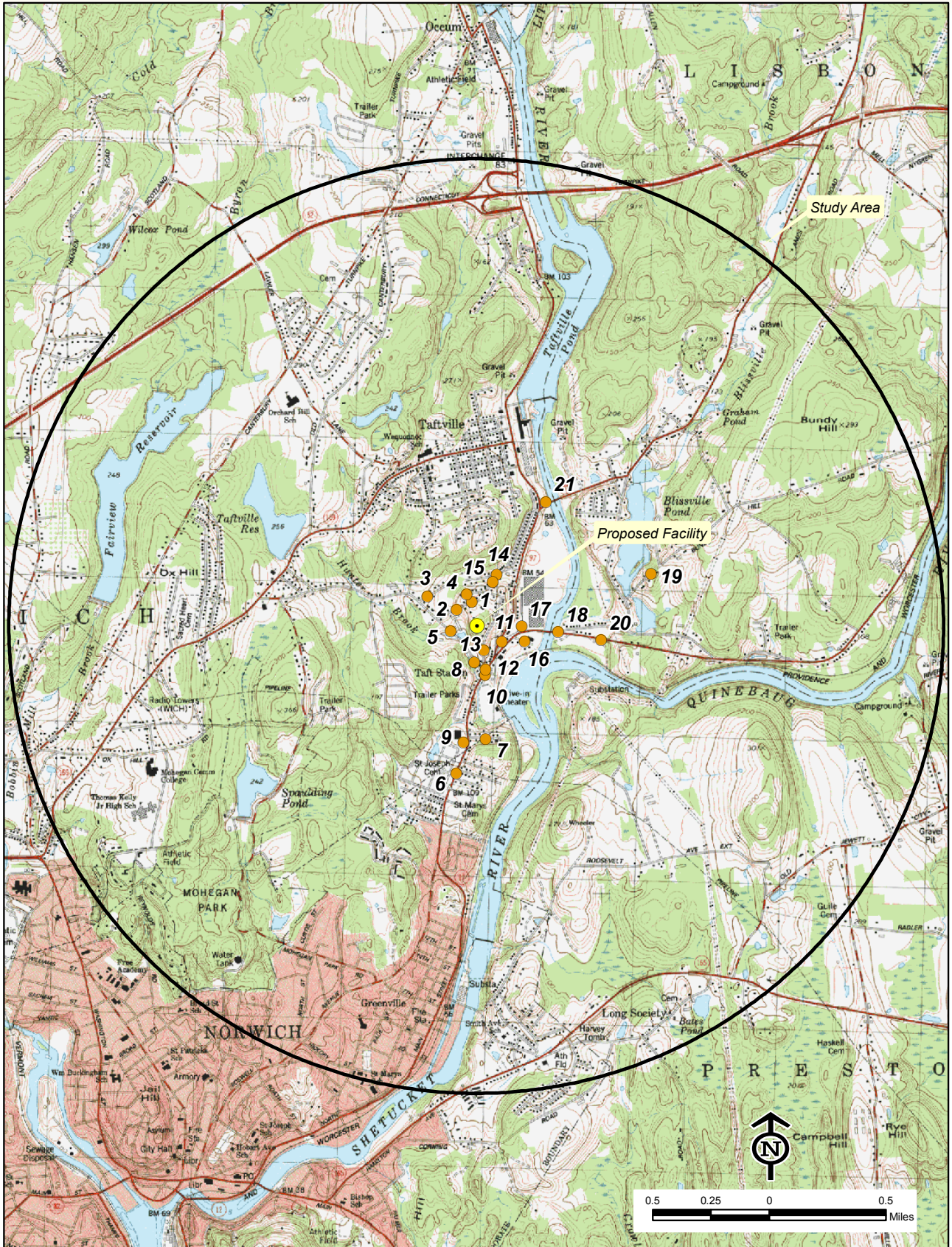
39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

PHOTO TAKEN OF PROPOSED PROJECT AREA

ctmidat\proj\40999.23\graphics\figures\40999_23_pr_site.indd

Photolog Documentation

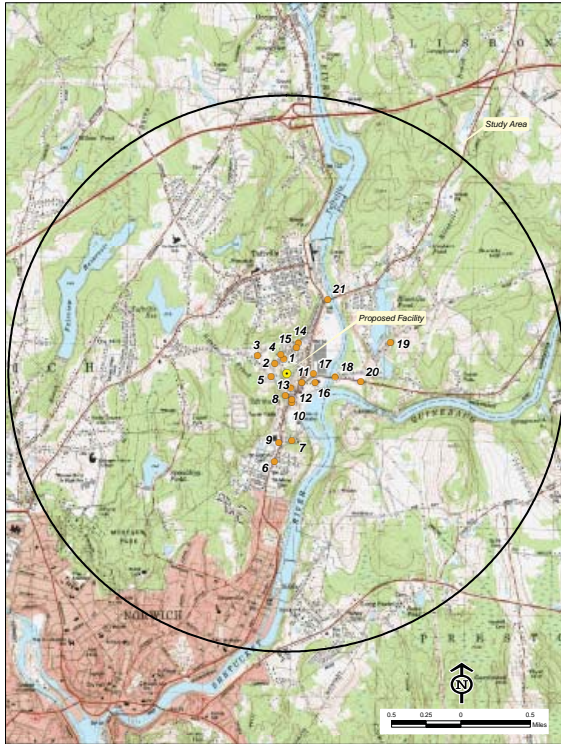
City of
Norwich
Connecticut



cmiddatprof\408999.23\graphics\figures\40999.23_photolog.indd

Photographic Documentation and Simulation *View 1*

City of
Norwich
Connecticut



39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

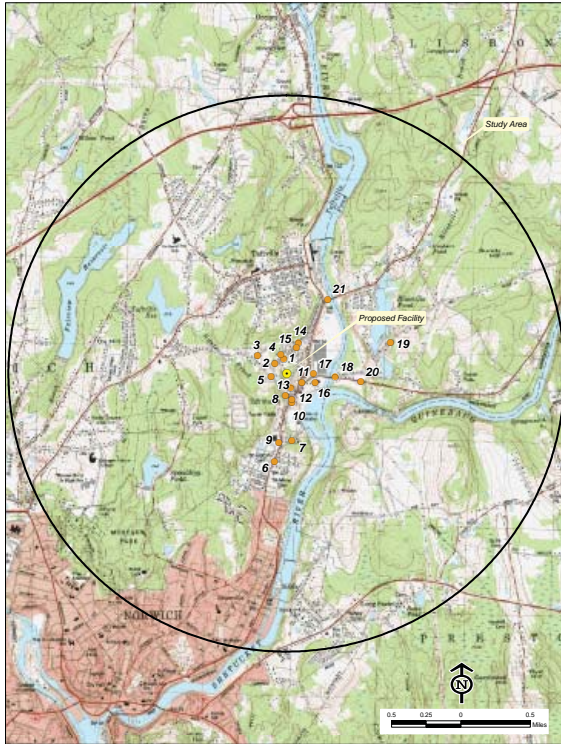
Proposed Monopole
shown with four
carriers



PHOTO TAKEN FROM MAENNERCHOR AVENUE ADJACENT TO HOUSE #48, LOOKING SOUTH
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.12 MILE +/-

Photographic Documentation and Simulation *View 2*

City of
Norwich
Connecticut



39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers

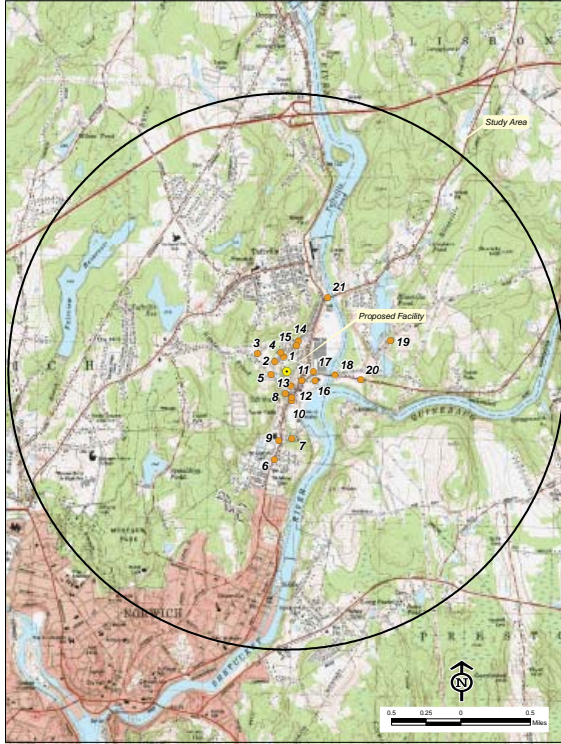


Balloon Test Photo

PHOTO TAKEN FROM MAENNECHOR AVENUE ADJACENT TO HOUSE #64, LOOKING SOUTHEAST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.12 FEET +/-

Photographic Documentation and Simulation *View 3*

City of
Norwich
Connecticut



39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

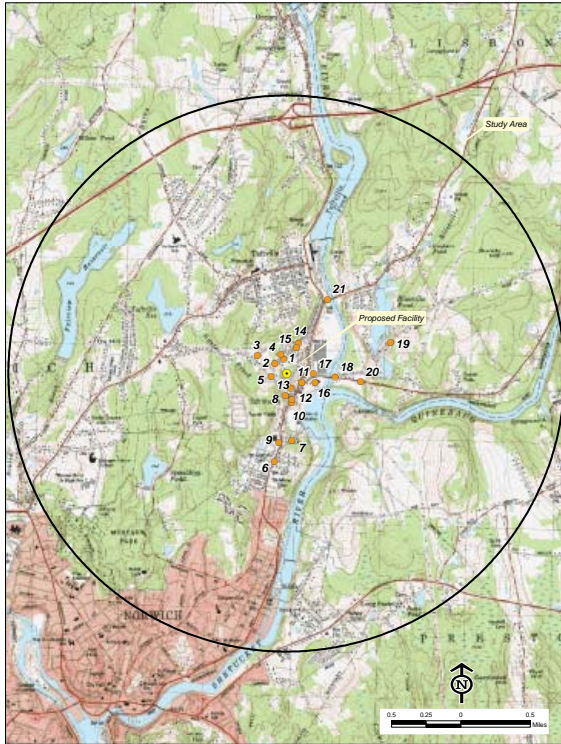
Proposed Monopole
shown with four
carriers



Balloon Test Photo

PHOTO TAKEN FROM LAPORTE DRIVE ADJACENT TO HOUSE #9, LOOKING SOUTHEAST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.25 MILE +/-

Photographic Documentation and Simulation *View 4*



39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

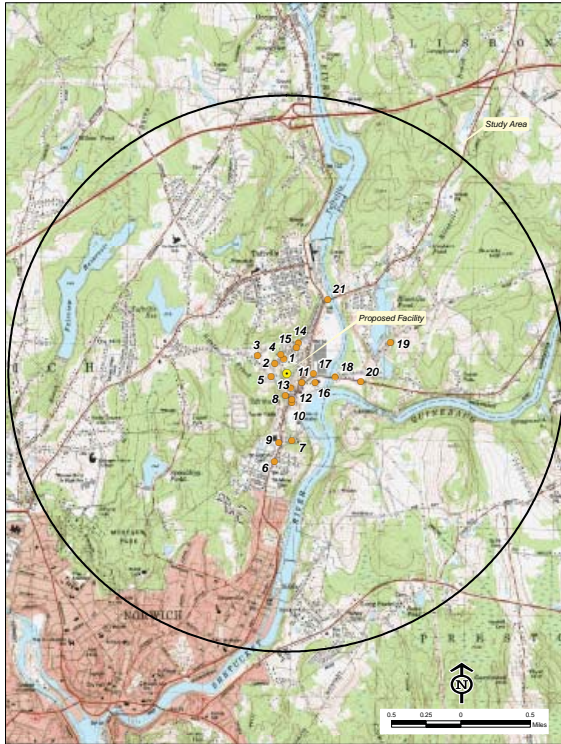
Proposed Monopole
shown with four
carriers



Balloon Test Photo

PHOTO TAKEN FROM SCHILLER STREET ADJACENT TO HOUSE #27, LOOKING SOUTHEAST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.15 MILE +/-

Photographic Documentation and Simulation *View 5*



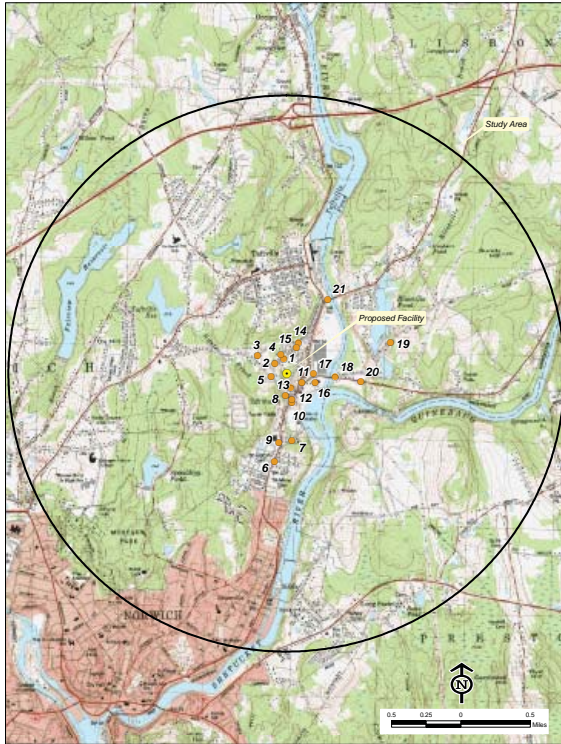
39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers



PHOTO TAKEN FROM HUNTERS ROAD ADJACENT TO HOUSE #51, LOOKING NORTHEAST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.11 MILE +/-

Photographic Documentation and Simulation *View 6*



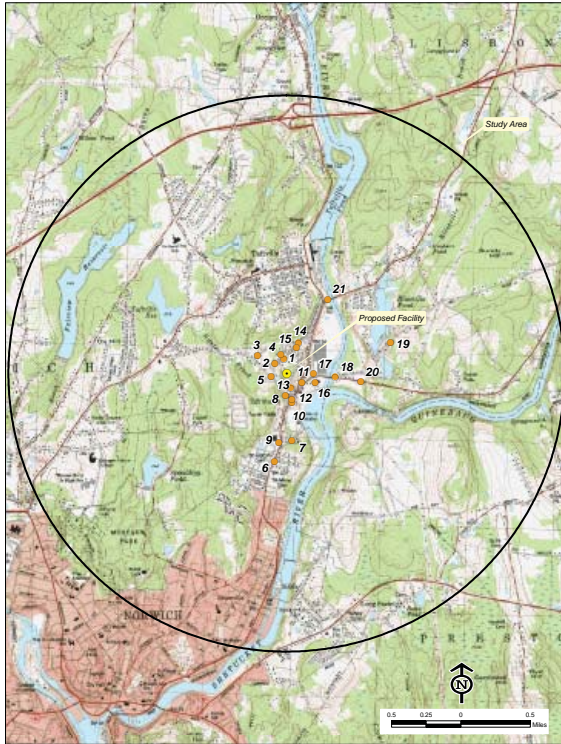
39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers

Balloon Test Photo

PHOTO TAKEN FROM BOSWELL AVENUE ADJACENT TO HOUSE #815, LOOKING NORTH
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.63 MILE +/-

Photographic Documentation and Simulation *View 7*



39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

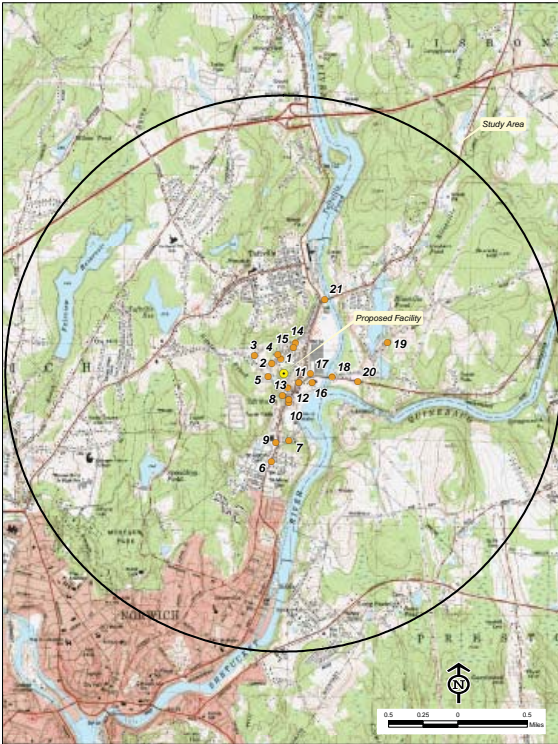
Proposed Monopole
shown with four
carriers



Balloon Test Photo

PHOTO TAKEN FROM MCKAY STREET ADJACENT TO HOUSE #14, LOOKING NORTH
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.48 MILE +/-

Photographic Documentation and Simulation *View 8*



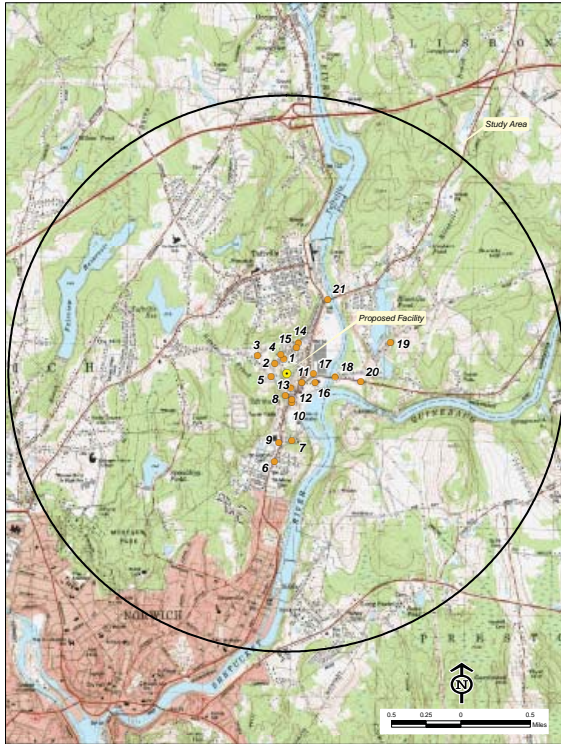
39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers



PHOTO TAKEN FROM HUNTERS ROAD ADJACENT TO HOUSE #11, LOOKING NORTH
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.15 MILE +/-

Photographic Documentation and Simulation *View 9*



39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

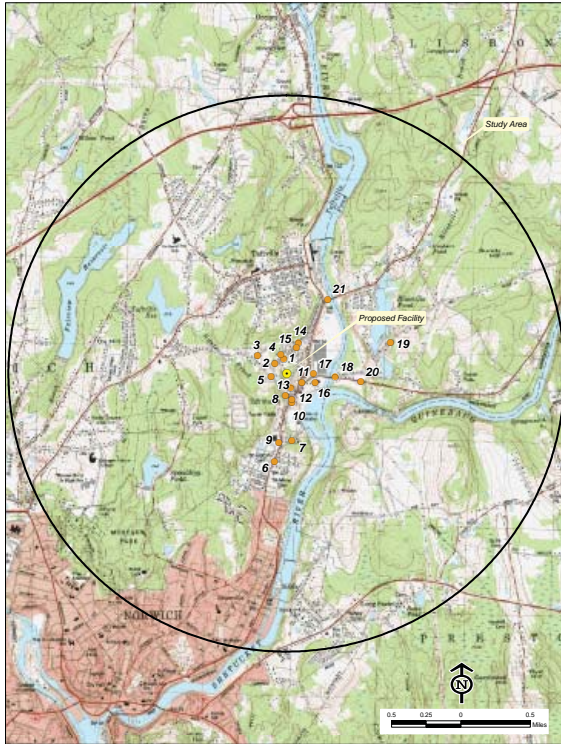
Proposed Monopole
shown with four
carriers



PHOTO TAKEN FROM BOSWELL AVENUE ADJACENT TO STARRWOOD FOOD MARKET, LOOKING NORTH
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.50 MILE +/-

Photographic Documentation and Simulation *View 10*

City of
Norwich
Connecticut



39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

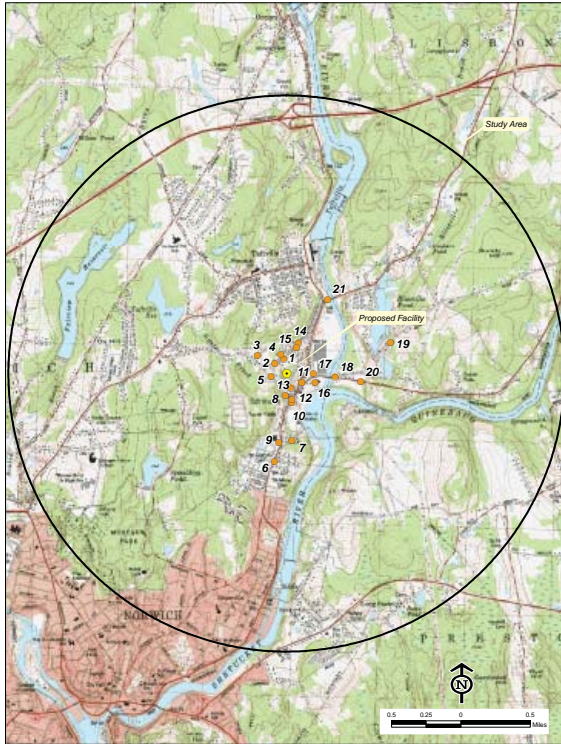
Proposed Monopole
shown with four
carriers

PHOTO TAKEN FROM INTERSECTION OF NORWICH AVENUE, HUNTERS ROAD AND PRENTICE STREET, LOOKING NORTH

DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.21 MILE +/-

Photographic Documentation and Simulation *View 11*

City of
Norwich
Connecticut

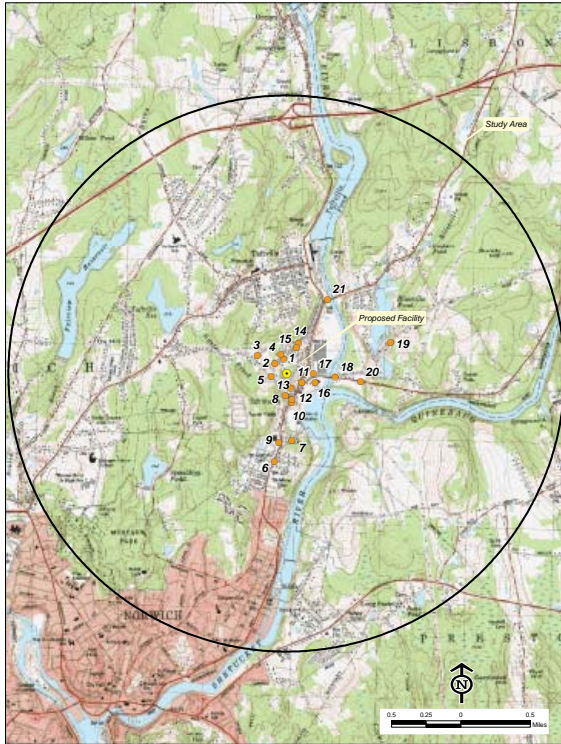


39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers

PHOTO TAKEN FROM INTERSECTION OF NORWICH AVENUE AND BLISSVILLE ROAD, LOOKING NORTHWEST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.12 MILE +/-

Photographic Documentation and Simulation *View 12*

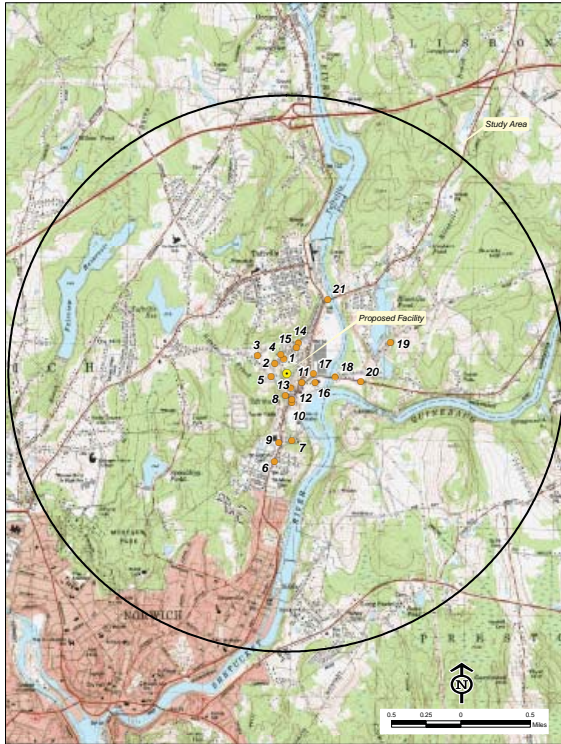


39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers

PHOTO TAKEN FROM PRENTICE STREET NEAR INTERSECTION WITH NORWICH AVENUE, LOOKING NORTH
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.18 MILE +/-

Photographic Documentation and Simulation *View 13*



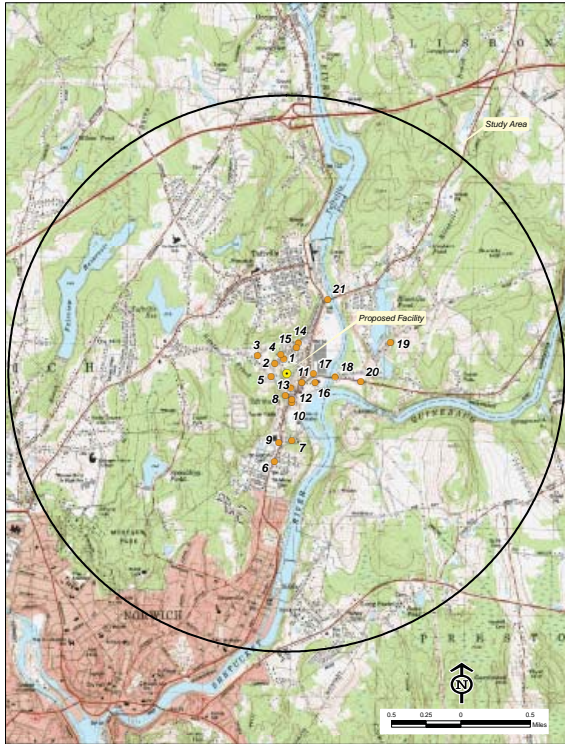
39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers



PHOTO TAKEN FROM PRENTICE STREET ADJACENT TO HOUSE #10, LOOKING NORTH
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.15 MILE +/-

Photographic Documentation and Simulation *View 14*



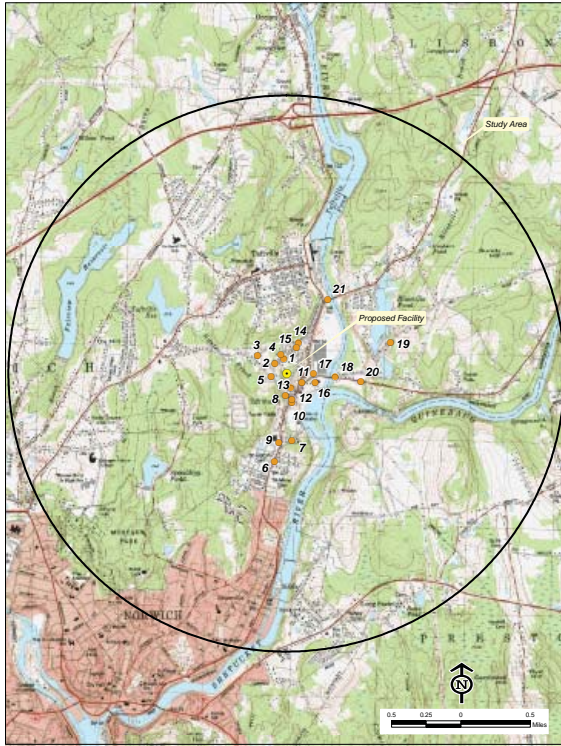
39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers

**PHOTO TAKEN FROM GERMANIA STREET AT INTERSECTION OF MAENNERCHOR AVENUE, LOOKING SOUTH
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.24 MILE +/-**

Photographic Documentation and Simulation *View 15*

City of
Norwich
Connecticut



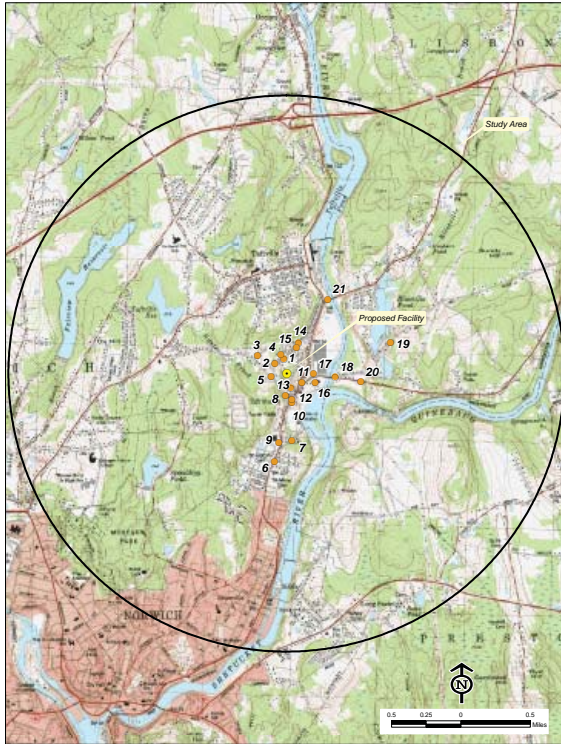
39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers

PHOTO TAKEN FROM MAENNERCHOR AVENUE ADJACENT TO HOUSE #24, LOOKING SOUTH
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.20 MILE +/-

ctm\dat\proj\405999_23\graphics\figures\Tatville_sim\sim1.indd

Photographic Documentation and Simulation *View 16*



39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

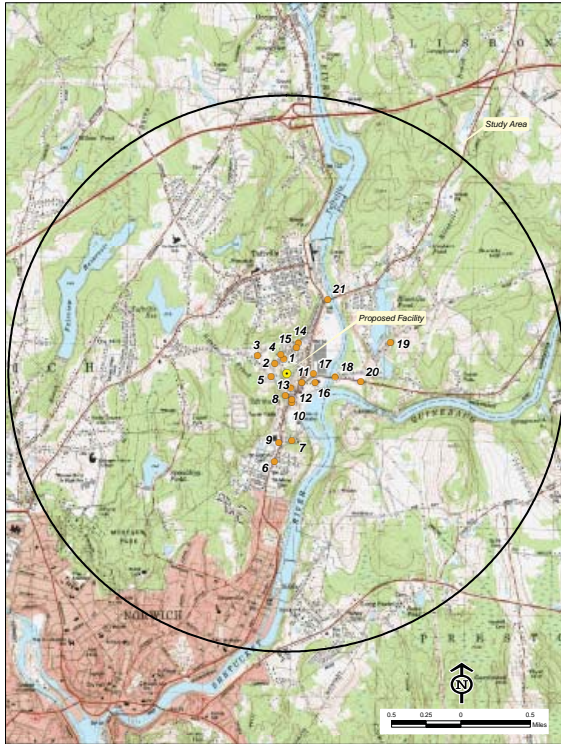
Proposed Monopole
shown with four
carriers



Balloon Test Photo

PHOTO TAKEN FROM BOLDUC LANE ADJACENT TO HOUSE #33, LOOKING NORTHWEST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.21 MILE +/-

Photographic Documentation and Simulation *View 17*



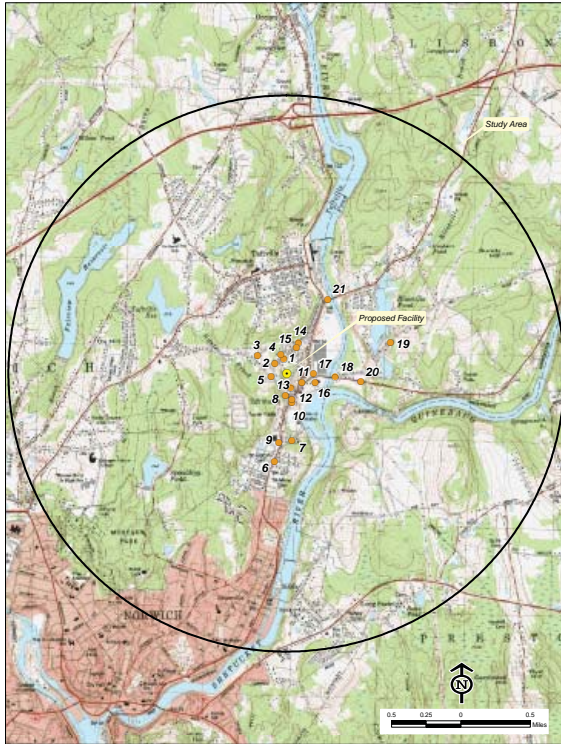
39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers



PHOTO TAKEN FROM NORWICH AVENUE AT ACCESS ROAD TO BOB'S FURNITURE WAREHOUSE, LOOKING WEST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.19 MILE +/-

Photographic Documentation and Simulation *View 18*

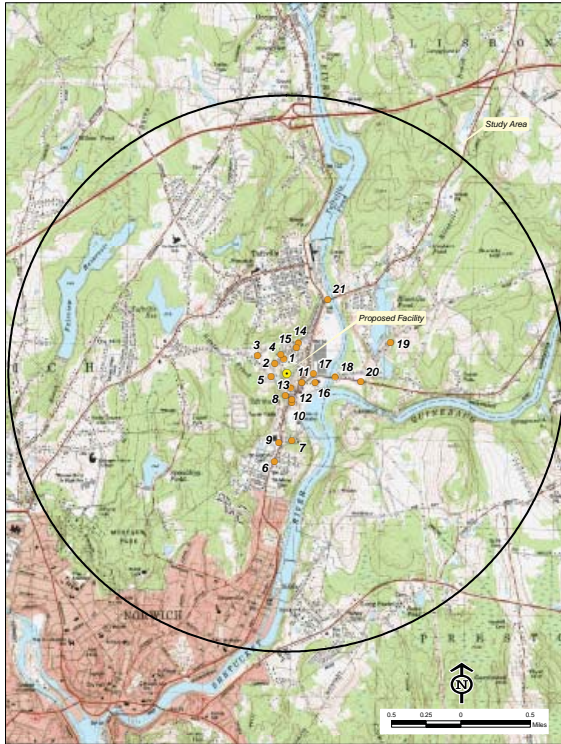


39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers

PHOTO TAKEN FROM ROUTE 12 AT INTERSECTION WITH LOWER BLISSVILLE ROAD, LOOKING WEST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.35 MILE +/-

Photographic Documentation and Simulation *View 19*



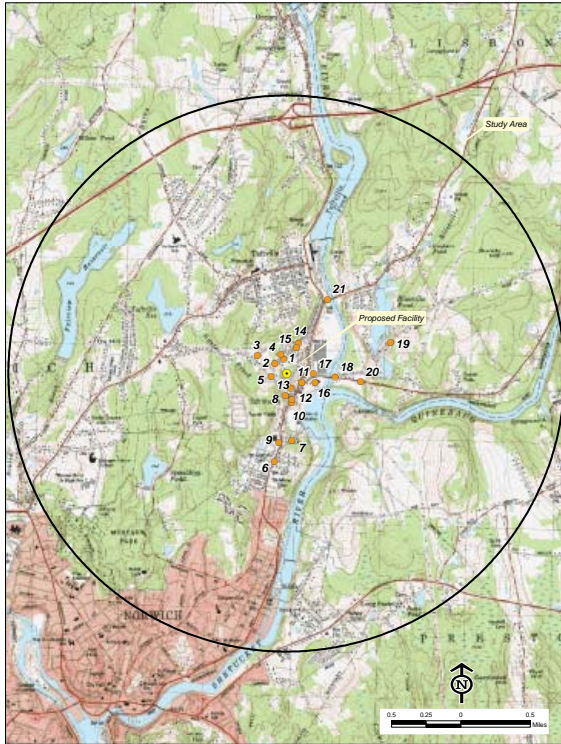
39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers



PHOTO TAKEN FROM BUNGY HILL ROAD ADJACENT TO HOUSE #220, LOOKING SOUTHWEST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.78 MILE +/-

Photographic Documentation and Simulation *View 20*

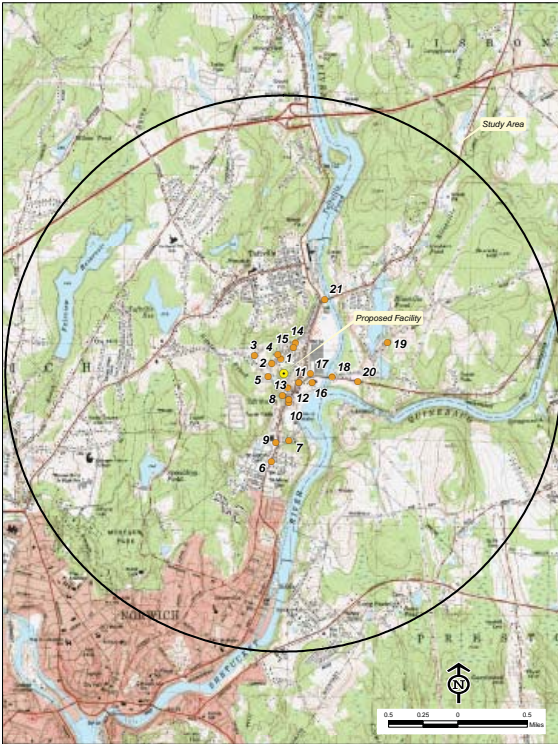


39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers

PHOTO TAKEN FROM ROUTE 12 EAST OF LOWER BLISSVILLE ROAD, LOOKING WEST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.54 MILE +/-

Photographic Documentation and Simulation *View 21*



39 Maennerchor Avenue
Norwich, Connecticut
CT999-0093

Proposed Monopole
shown with four
carriers



PHOTO TAKEN FROM THE INTERSECTION OF ROUTE 169 AND ROUTE 97, LOOKING SOUTHWEST
DISTANCE FROM THE PHOTOGRAPH LOCATION TO THE PROPOSED SITE IS 0.61 MILE +/-

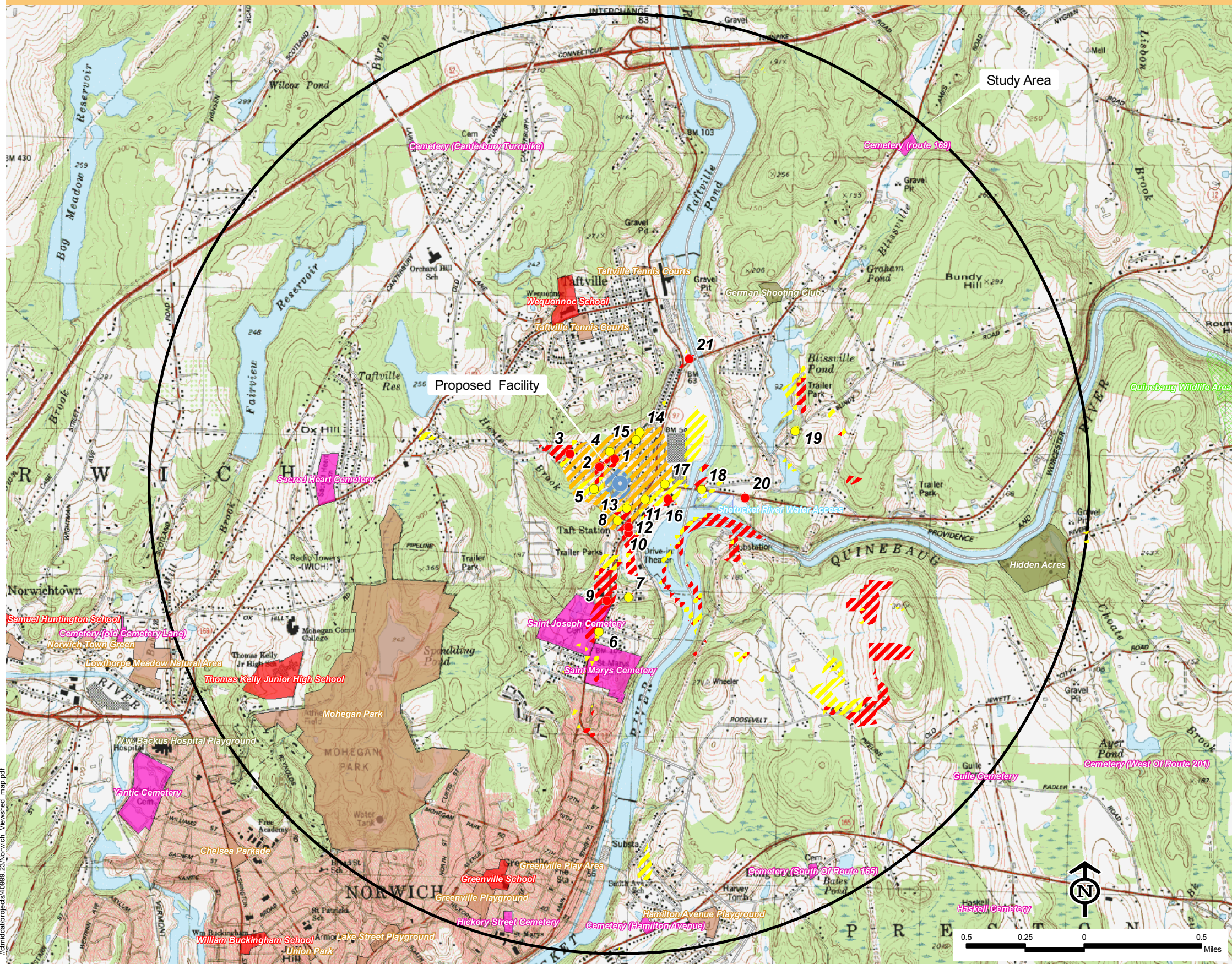
Attachment B

Viewshed Map

Viewshed Map

Topography and Forest Cover as Constraints

City of
Norwich
Connecticut



Proposed Optasite Telecommunications Facility 39 Maennerchor Avenue Norwich, Connecticut

NOTE:
 - Viewshed analysis conducted using ESRI's Spatial Analyst.
 - Proposed Facility height is 120 feet.
 - Existing tree canopy height estimated at 60 feet.

DATA SOURCES:
 - National Elevation Dataset (NED) with a resolution of one arc-second (approximately 30 meters) produced by the USGS, 1925 - 1999
 - Forest areas derived from 2005 digital orthophotos with 2-meter pixel resolution; digitized by VHB, 2007
 - Base map comprised of Norwich USGS (1983) Quadrangle Map
 - Protected properties data layer provided CTDEP; May, 2007
 - Scenic Roads layer derived from available State and Local listings.

Map Compiled August, 2007

Legend

- Proposed Monopole Location (Includes select areas of visibility approximately 500 feet around facility)
- Photographs - July 18 and 19, 2007
- Photographic Locations (colors correspond to areas of visibility)
- Anticipated Seasonal Visibility (Approximately 64 Acres)

Approx. % of Monopole Visible (Year-Round)

- Tree Line View To Upper 25% - 74 Acres
- 50% - 93 Acres
- Entire Facility Visible - 8 Acres

Total Year-Round Visibility Approximately 175 Acres

Protected Properties (CT DEP)

- State Forest
- State Park
- DEP Owned Waterbody
- State Park Scenic Reserve
- Historic Preserve
- Natural Area Preserve
- Fish Hatchery
- Flood Control
- Other
- State Park Trail
- Water Access
- Wildlife Area
- Wildlife Sanctuary

Protected Properties (Municipal)

- Cemetery
- Preservation
- Conservation
- Existing Preserved Open Space
- Recreation
- General Recreation
- School
- Uncategorized

Other Symbols:

- DEP Boat Launches
- Scenic Road (State and Local)
- Town Line
- Protected Properties (Federal)