Visual Resource Evaluation Report

Proposed Wireless Telecommunications Facility

Branford South
723 Leetes Island Road (Route 146)
Branford, Connecticut

Prepared for verizon wireless

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Visual Resource Evaluation

Cellco Partnership, dba Verizon Wireless, seeks approval from the Connecticut Siting Council for a Certificate of Environmental Compatibility and Public Need for the construction of a wireless telecommunications facility ("Facility") in the southeast portion of the Town of Branford, Connecticut. The proposed Facility site that is the subject of this report would be located on property at 723 Leetes Island Road (identified herein as the "host property"), in Branford. This Visual Resource Evaluation was conducted to evaluate the visibility of the proposed Facility within a two-mile radius ("Study Area"). The Study Area also includes land located within the neighboring municipality of Guilford, Connecticut to the east. Attachment A contains a map that depicts the location of the proposed Facility and the limits of the Study Area.

Project Introduction

The project would include a 109-foot tall stealth Facility, designed to resemble a rustic-style water tank. The Facility would consist of a steel monopole with the upper portion of the tower and three antenna platforms concealed within a radio frequency transparent housing measuring approximately 15 feet wide by 41 feet tall. A 12-foot by 24-foot agricultural shed, to contain the Facility's ground equipment, would be located within a 57-foot by 57-foot, fenced compound area situated at the base of the water tank. The proposed Facility would be located at a ground elevation of approximately 46 feet Above Mean Sea Level (AMSL). Access to the Facility would initially follow an existing woods road/grass path currently located on the host property (to be improved) for approximately 275 feet then continue for an additional 100± feet to the proposed compound area in a northeasterly direction along a proposed gravel driveway. Attachment A contains a photograph of the proposed project area.

Site Description and Setting

Identified in the Town of Branford land records as Map K09/Block 004/Lot 008, the host property consists of approximately 19 acres of mostly wooded, undeveloped land. Land use within the general vicinity of the proposed Facility is mainly comprised of active agricultural land; undeveloped woodlands; low-density residential development; and an existing Amtrak right-of-way and its associated infrastructure. In addition to the Amtrak rail corridor, the Study Area features approximately 40 linear miles of roadways, including segments of Route 146, a two-lane, east to west, state numbered arterial roadway.

The topography within the Study Area is generally characterized by gently rolling hills with ground elevations that range from approximately sea level to approximately 214 feet AMSL. The Study Area contains approximately 2,943 acres of surface water, dominated in large measure by portions of Long Island Sound located roughly 0.75-mile to the south of the proposed Facility. The tree cover within the Study Area consists mainly of mixed deciduous hardwood species that occupy approximately 3,765 acres of the 8,042-acre study area (47%).

The average tree canopy height throughout the Study Area was determined to be approximately 50 feet.

METHODOLOGY

To evaluate the visibility associated with the proposed Facility, VHB used the combination of a predictive computer model and in-field analysis. The predictive model provided a preliminary assessment of potential visibility throughout the entire study area, including private property and other areas inaccessible for direct observations. A "balloon float" and Study Area reconnaissance were subsequently conducted for field verification to back-check the initial computer modeling results, to obtain location and height representations, and to provide photographic documentation from publicly accessible areas. A description of the procedures used in the analysis is provided below.

Visibility Analysis

VHB uses ArcGIS® Spatial Analyst, a computer modeling tool developed by Environmental Systems Research Institute, Inc., to calculate the areas from which at least the top of the proposed Facility is expected to be visible. Project- and Study Area-specific data were incorporated into the computer model, including Facility height, its ground elevation, underlying and surrounding topography and existing vegetation. Information used in the model included Connecticut LiDAR[1]-based digital elevation data and model and a digital forest (or tree canopy) layer developed for the Study Area. The LiDAR-based Digital Elevation Model (DEM) represents ten-foot spatial resolution elevation information for the state of Connecticut that was derived through the spatial interpolation of airborne LiDAR-based data collected in the year 2000 and has a horizontal resolution of ten (10) feet. The data was edited in 2007 and made available by the University of Connecticut through its Center for Land Use Education and Research (CLEAR). To create the forest layer, mature trees and woodland areas depicted on aerial photographs (ranging in dates from 2004 to 2008) were manually digitized (hand traced) in ArcGIS®, creating a geographic data layer for inclusion in the computer model. The black and white, digital aerial photographs, obtained from the Connecticut Department of Transportation, were flown in the spring of 2004 and selected for use in this analysis because of their image quality and depiction of pre-leaf emergence (i.e., "leaf-off") conditions. These photographs are half-foot pixel resolution. The more recent aerial photographs (2006 and 2008) were overlaid and evaluated to identify any new development resulting in significant clearing, the removal of trees, or additional homes or businesses.

Once the specific data layers were entered, the ArcGIS® Spatial Analyst Viewshed tool was applied to achieve an estimate of locations where the proposed Facility could be visible.

[1] LiDAR is an acronym for Light Detection and Ranging. It is a technology that utilized lasers to determine the distance to an object or surface. LiDAR is similar to radar, but incorporates laser pulses rather than sound waves. It measures the time delay between transmission and reflection of the laser pulse.

First, only topography was used as a possible visual constraint; the tree canopy was omitted to evaluate potential visibility with no intervening vegetative screening. The initial omission of this data layer resulted in an excessively conservative prediction, but it provided an opportunity to identify areas within potential direct lines of sight of the Facility.

The forest data layer was then overlaid and built into the DEM, using an initial average tree canopy height of 50 feet, to establish a baseline assessment of intervening vegetation. The resultant preliminary viewshed map was used during the in-field activities (described further below) to compare the outcome of the initial computer modeling with observations of the balloon float to identify deviations. Information obtained from the field reconnaissance was ultimately incorporated into the model to refine the viewshed map.

The average tree canopy height in this case was determined to be 50 feet, was determined based on information collected in the field using a combination of a hand-held laser range finder and comparative observations. The forested areas were overlaid on the DEM with a height of 50 feet added to the base elevation and the visibility within the Study Area calculated.

As a final step, the forested areas were extracted from the areas of visibility, using a conservative assumption that a person standing within the forest will not be able to view the proposed Facility beyond a distance of approximately 500 feet. Depending on the density of the intervening tree canopy and understory of the surrounding woodlands, it is assumed that some locations within this distance could provide visibility of at least portions of the proposed Facility at any time of the year. In "leaf-on" conditions, this distance may be overly conservative for most locations. However, for purposes of this analysis, it was reasoned that forested land beyond 500 feet of the proposed Facility would consist of light-impenetrable trees of a uniform height.

Also included on the map is a data layer, obtained from the State of Connecticut Department of Environmental Protection ("CTDEP"), which depicts various land and water resources such as parks and forests, recreational facilities, dedicated open space, CTDEP boat launches and other categories. The viewshed map also depicts several Town of Branford hiking trails that are located within the Study Area. This data was provided to VHB in a digital format by the Town of Branford's GIS department. Lastly, based on both a review of published information and discussions with municipal officials in Branford it was determined that the segment of Route 146 that traverses the Study Area is a state-designated scenic roadway. This portion of the roadway is depicted on the viewshed map located in Attachment B.

Balloon Float and Study Area Reconnaissance

Vanasse Hangen Brustlin Inc., (VHB) conducted balloon floats on October 30, 2009 and March 17, 2010 to further evaluate the potential viewshed within the Study Area. The October 30th float also included reconnaissance from portions of Long Island Sound contained within the Study Area. The balloon floats consisted of raising and maintaining helium-filled balloons at the proposed site location at heights of 120 feet and 100 feet for the

October 30, 2009 float and March 17, 2010 float, respectively, reflecting the proposed heights of the Facility at those times. A five-foot diameter, blue and white balloon was used during the October 30th float and a red, four-foot diameter balloon was used during the March 17th float. Once the balloons were secured, VHB staff conducted a drive-by reconnaissance along the roads located within the Study Area (and over open water on Long Island sound during the initial balloon float conducted in October of 2009) 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 document where the balloon was, and was not, visible above and/or through the tree canopy. During the October 30th balloon float, the temperature was approximately 60 degrees Fahrenheit with calm wind conditions and mostly sunny skies. During the March 17th balloon float, the temperature was approximately 40 degrees Fahrenheit with calm wind conditions and sunny skies.

Photographic Documentation

During the balloon floats, the balloons were photographed from a number of different vantage points to document the actual view towards the proposed Facility. Several locations where the balloons were not visible are also included. The locations of the photos are described below:

View	Location	Orientation	Dist. To Site	Visibility
1	Long Island Sound within Thimble Islands	Northeast	± 1.02-Mile	Year-Round
2	Long Island Sound	North	± 1.45-Mile	Year-Round
3	Adjacent to #626 Leetes Island Road (Route 146)	Southeast	± 0.61-Mile	Year-Round
4	Leetes Island Road (Route 146) Railroad Underpass	Northwest	± 0.18-Mile	Year-Round
5	Leetes Island Road (Route 146) Railroad Underpass	Northwest	± 0.18-Mile	Year-Round
6	Adjacent to #790 Leetes Island Road (Route 146)	Northwest	± 0.13-Mile	Year-Round
7	Old Quarry Road	Northwest	± 0.43-Mile	Year-Round
8	Point Road	Northeast	± 0.89-Mile	Non-Visible
9	Trolley Lane	Northwest	± 1.60-Mile	Non-Visible
10	Beach Road	Northwest	± 1.07-Mile	Non-Visible
11	Leetes Island Road (Route 146), Adjacent to John Rogers house	Southeast	± 0.31-Mile	Non-Visible
12	Leetes Island Road (Route 146)	Southeast	± 0.23-Mile	Non-Visible
13	Leetes Island Road (Route 146)	Northwest	± 0.27-Mile	Non-Visible
14	Leetes Island Road (Route 146)	Northwest	± 0.60-Mile	Non-Visible

Photographs of the balloon from the view points listed above were taken with a Nikon D-80 digital camera body and a Nikon 18 mm to 175 mm zoom lens. For the purposes of this analysis, the lens was set to 50 mm, "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]"

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

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

Photographic Simulation

Photographic simulations were generated for the representative locations where the balloon was visible during the in-field activities. The photographic simulations portray a scaled rendering of the proposed Facility from these locations. Using field data, site plan information and 3-dimension (3D) modeling software, a spatially referenced model of the site area was generated. Geographic coordinates (latitude and longitude) were collected in the field for all of the photograph locations via GPS and later used to generate virtual camera positions within the spatial 3D model. Photo simulations were then created using a combination of renderings generated in the 3D model and photo rendering software programs. The balloon, flown at heights of 120 feet AGL in October of 2009 and 100 feet AGL in March of 2010, was included in the photographs to provide a visual marker and to cross-reference the height and proportions of the proposed Facility. A photolog map and the simulations are contained in Attachment A.

CONCLUSIONS

Based on this analysis, areas from where the proposed 109-foot tall water tank would be visible above the tree canopy comprise approximately 1,197 acres. As depicted on the attached viewshed map, the majority of year-round visibility associated with the water tank would occur over open water on Long Island Sound. Visibility over Long Island Sound accounts for approximately 1,157 acres of the 1,197-acre total (97%). Representative views from Long Island Sound are depicted in Views 1 and 2. As depicted, potential views of the water tank from the Sound would be mostly be nestled within the intervening and background tree canopies. Roughly 25 acres of year-round visibility is also anticipated to occur over a tidal marsh located to the northwest with potential views extending to a short stretch of Leetes Island Road (View 3). VHB estimates that at least partial year-round views may be achieved from portions of two residential properties located within the Study Area, both of which are located along Leetes Island Road within the general vicinity of the host property. This information is summarized in the table below. Overall potential year-round views of the water tank would be limited to the areas described above by a combination of its relatively short height and the intervening topography and vegetation contained within the Study Area. The design of the proposed Facility, a rustic-style water tank, would conceal associated telecommunications equipment and serve to mitigate potential visual effects normally associated with traditional monopole/full antenna array configurations. The stealth water tank design is also contextually consistent with surrounding land uses including the existing Amtrak rail corridor and agricultural properties.

The viewshed map also depicts several additional areas where seasonal (i.e. during "leaf off" conditions) views are anticipated. These areas comprise approximately 27 acres and are

located within the general vicinity of the proposed Facility, including select portions of Leetes Island Road and Old Quarry Road. VHB estimates that limited seasonal views of the water tank would be achieved from portions of approximately seven additional residential properties, the locations of which are provided in the table below.

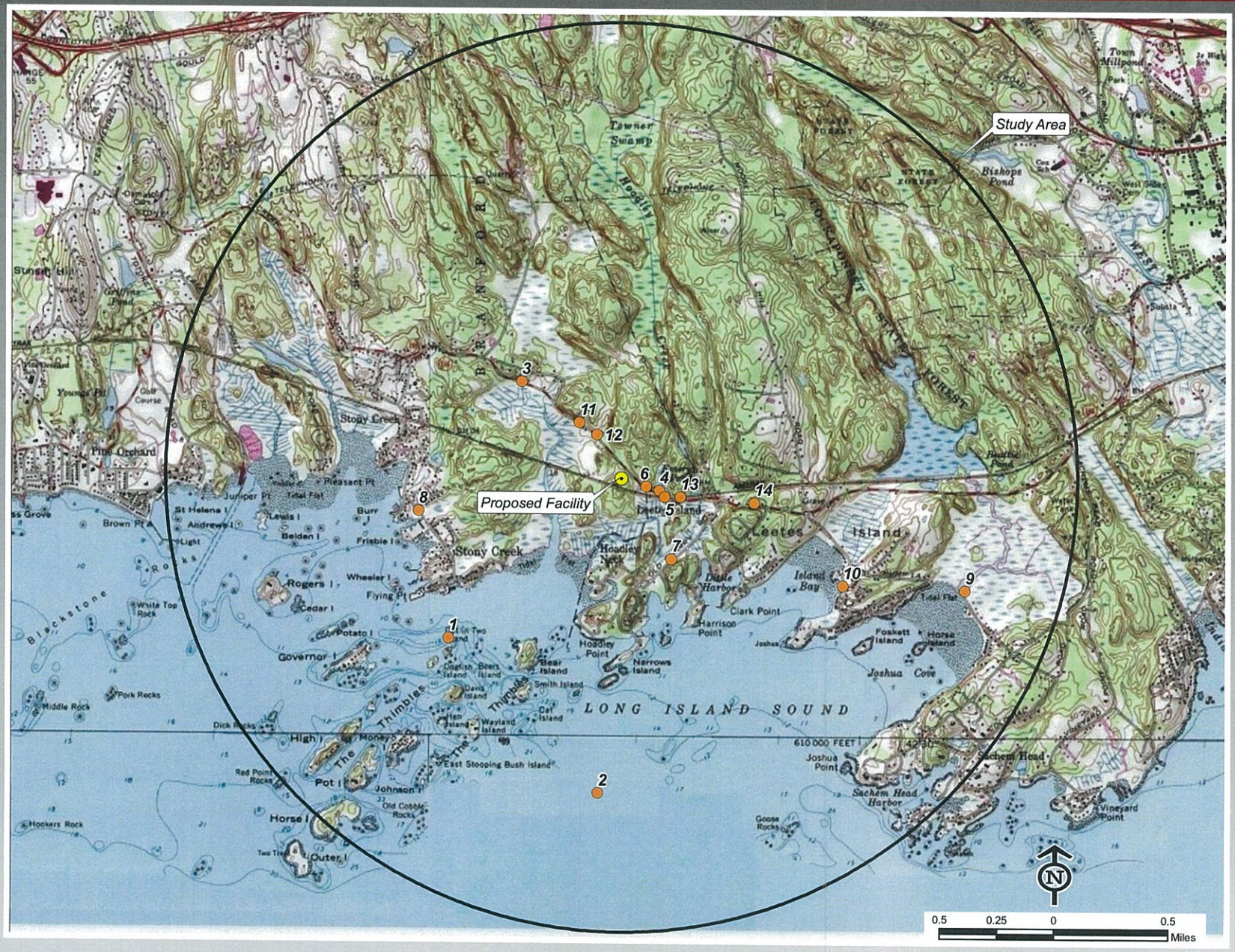
Location	*Number of Residential Properties With Potential Year-Round Visibility (Leaf-On)	*Number of Residential Properties With Potential Seasonal Visibility (Leaf-Off)
Leetes Island Road	2	6
Old Quarry Road	-	1
TOTAL:	**2**	**7**

*Indicates potential year-round or seasonal visibility from portions of the properties listed in the table above. Potential visibility on a "residential property" does not necessarily mean that the property is developed with a home or views would be achieved from within residential dwellings, exterior decks, porches or patios that might be located on such properties. Further, it may be possible to view the Facility from within portions of the shaded areas indicating potential visibility, but not necessarily from all locations within those shaded areas.

Attachment A

Project Area Photograph, Study Area Map, Balloon Float Photographs, and Photographic Simulations

Photolog Map



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Photographic Documentation

PROPOSED PROJECT AREA

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Photographic Documentation

VIEW	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	LONG ISLAND SOUND WITHIN THIMBLE ISLANDS	NORTHEAST	1.02 MILES +/-	YEAR-ROUND

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