Visual Assessment & Photo-Simulations

WOLCOTT SOUTH CT CHESTNUT HILL ROAD WOLCOTT, CT 06716 Prepared in April 2020 by:
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Prepared for Verizon Wireless



VISUAL ASSESSMENT & PHOTO-SIMULATIONS

Cellco Partnership, d/b/a Verizon Wireless is seeking approval for the development of a new wireless communications facility (the "Facility") on a property located on Chestnut Hill Road near the intersection of Grilley Road in Wolcott, identified by the Town of Wolcott Tax Assessor's Office as Map 104, Block 1, and Lot 5B (the "Host Property"). At the request of Verizon Wireless, All-Points Technology Corporation, P.C. ("APT") completed this assessment to evaluate the potential visual effects of the proposed Facility from within a two-mile radius (the "Study Area"). A large portion of the Study Area's western half lies within the neighboring City of Waterbury, whose municipal boundary is approximately 1,000 feet west of the Host Property. Approximately 45 acres within the Town of Plymouth extends into the northwest portion of the Study Area.

Project Setting

The Host Property is a 10.17-acre wooded parcel located south of Chestnut Hill Road in the southwestern portion of Wolcott. Land use in the immediate vicinity consists primarily of residentially-developed properties and wooded land. The topography within the majority of the Study Area consists of hilly terrain. Ground elevations range from approximately 300 feet above mean sea level ("AMSL") in the southwestern portion of the Study Area to approximately 1,026 feet AMSL in the northern portion of the Study Area. Tree cover within the Study Area (consisting of mixed deciduous hardwoods and conifers) occupies approximately 3,496 acres ($\pm 43.5\%$) of the 8,042-acre Study Area. Chestnut Hill Reservoir and Scoville Reservoir in Wolcott and Great Brook Reservoir in Waterbury together occupy approximately 264 acres ($\pm 3.3\%$) of the Study Area.

Project Undertaking

Verizon Wireless plans to construct the proposed Facility in the central portion of the Host Property (the "Site"). The proposed Facility would be located at a ground elevation of approximately 780 feet AMSL and include a 120-foot tall monopole and associated ground-mounted equipment in a 50-foot by 50-foot fenced equipment compound. Proposed Verizon Wireless panel antennas would be located at centerline heights of approximately 116' above ground level ("AGL"). A five-foot tall lightning rod would be installed on the top of the monopole extending the height to approximately 125 feet AGL. Access would be provided over a new 12-foot wide gravel access drive. Please refer to Zoning Drawings prepared by Nexius, Revision 1 dated January 27, 2020, provided under separate cover, for details regarding the proposed installation.

Methodology

APT used the combination of a predictive computer model, in-field analysis, and a review of various data sources to evaluate the visibility associated with the proposed Facility on both a quantitative and qualitative basis. The predictive model provides a measurable assessment of visibility throughout the entire Study Area, including private properties and other areas inaccessible for direct observations. The in-field analyses consisted of raising a tethered brightly-colored balloon to the proposed monopole height and field reconnaissance of the Study Area to record existing conditions, verify results of the model, inventory seasonal and year-round view locations, and provide photographic documentation from publicly accessible areas. A description of the procedures used in the analysis is provided below.

Preliminary Computer Modeling

To conduct this assessment, a predictive computer model was developed specifically for this project using ESRI's ArcMap GIS¹ software and available GIS data. The predictive model incorporates Project and Study Area-specific data, including the site location, its ground elevation and the proposed Facility height, as well as the surrounding topography, existing vegetation, and structures (the primary features that can block direct lines of sight).

A digital surface model ("DSM"), capturing both the natural and built features on the Earth's surface, was generated for the extent of the Study Area utilizing State of Connecticut 2016 LiDAR² LAS³ data points. LiDAR is a remote-sensing technology that develops elevation data by measuring the time it takes for laser light to return from the surface to the instrument's sensors. The varying reflectivity of objects also means that the "returns" can be classified based on the characteristics of the reflected light, normally into categories such as "bare earth," "vegetation," "road," or "building." Derived from the 2016 LiDAR data, the LAS datasets contain the corresponding elevation point data and return classification values. The Study Area DSM incorporates the first return LAS dataset values that are associated with the highest feature in the landscape, typically a treetop, top of a building, and/or the highest point of other tall structures.

Once the DSM was generated, ESRI's Viewshed Tool was utilized to identify locations within the Study Area where the proposed Facility may be visible. ESRI's Viewshed Tool predicts visibility by identifying those cells⁴ within the DSM that can be seen from an observer location. Cells where visibility was indicated were extracted and converted from a raster dataset to a polygon feature which was then overlaid onto an aerial photograph and topographic base map. Since the DSM includes the highest relative feature in the landscape, isolated "visible" cells are often indicated within heavily forested areas (e.g., from the top of the highest tree) or on building rooftops during the initial processing. It is recognized that these areas do not represent typical

ArcMap is a Geographic Information System desktop application developed by the Environmental Systems Research Institute for creating maps, performing spatial analysis, and managing geographic data.

² Light Detection and Ranging

³ An LAS file is an industry-standard binary format for storing airborne LiDAR data.

⁴ Each DSM cell size is 1 square meter.

viewer locations and overstate visibility. As such, the resulting polygon feature is further refined by extracting those areas. The viewshed results are also cross-checked against the most current aerial photographs to assess whether significant changes (a new housing development, for example) have occurred since the time the LiDAR-based LAS datasets were captured.

The results of the preliminary analysis are intended to provide a representation of those areas where portions of the Facility may potentially be visible to the human eye without the aid of magnification, based on a viewer eye-height of five (5) feet above the ground and the combination of intervening topography, trees and other vegetation, and structures. However, the Facility may not necessarily be visible from all locations within those areas identified by the predictive model, which has limitations. For instance, it is important to note that the computer model cannot account for mass density, tree diameters and branching variability of trees, or the degradation of views that occur with distance. As a result, some areas depicted on the viewshed maps as theoretically offering potential visibility of the Facility may be over-predicted because the quality of those views is not sufficient for the human eye to recognize the Facility or discriminate it from other surrounding or intervening objects.

Seasonal Visibility

Visibility also varies seasonally with increased, albeit obstructed, views occurring during "leafoff" conditions. Beyond the variabilities associated with density of woodland stands found within any given Study Area, each individual tree also has its own unique trunk, pole timber and branching patterns that provide varying degrees of screening in leafless conditions which, as introduced above, cannot be precisely modeled. Seasonal visibility is therefore estimated based on a combination of factors including the type, size, and density of trees within a given area; topographic constraints; and other visual obstructions that may be present. Taking into account these considerations, areas depicting seasonal visibility on the viewshed maps are intended to represent locations from where there is a potential for views through intervening trees, as opposed to indicating that leaf-off views will exist from within an entire seasonally-shaded area.

Balloon Float and Field Reconnaissance

To supplement and fine tune the results of the computer modeling efforts, APT completed infield verification activities consisting of a balloon float, vehicular and pedestrian reconnaissance, and photo-documentation. The balloon float and field reconnaissance were completed on January 14, 2020. The balloon float consisted of raising a brightly-colored, approximately 4' diameter, helium-filled balloon to a height of approximately 120 feet AGL⁵ at the proposed monopole location. Weather conditions were favorable for the in-field activity with calm winds and overcast skies.

The bottom of the balloon represented the top of proposed 120' tall monopole. A 5' tall lightning rod will be located on top of the proposed monopole bringing the total height of the Facility to 125'. The lightning rod is included in the 3D model and is displayed in the photo-simulations.

Once the balloon was raised to the proposed height of the monopole, APT conducted a Study Area reconnaissance by driving along local and State roads and other publicly accessible locations to document and inventory where the balloon could be seen above and through the tree canopy and other visual obstructions. Visual observations from the reconnaissance were also used to evaluate the results of the preliminary visibility mapping and identify any discrepancies in the initial modeling.

Photographic Documentation and Simulations

During the Study Area reconnaissance, APT obtained photo-documentation of representative locations where the balloon was visible. At each photo location, the geographic coordinates of the camera's position were logged using global positioning system ("GPS") technology. Photographs were taken with a Canon EOS 6D digital camera body⁶ and Canon EF 24 to 105 millimeter ("mm") zoom lens. APT typically uses a standard focal length of 50mm to present a consistent field of view. On occasion, photos are taken at lower focal lengths to provide a greater depth of field and to provide context to the scene by including surrounding features within the photograph. During this evaluation, two (2) photographs were taken at a 35mm focal length as noted in the table (Table 1 – Photo Locations) on the following pages.

Photographic simulations were generated to portray scaled renderings of the proposed Facility from twenty-one (21) locations presented herein where the Facility may be recognizable above or through the trees. Using field data, site plan information and 3-dimensional (3D) modeling software, spatially referenced models of the site and Facility were generated and merged. The geographic coordinates obtained in the field for the photograph locations were incorporated into the model to produce virtual camera positions within the spatial 3D model. Photo-simulations were then created using a combination of renderings generated in the 3D model and photorendering software programs, which were ultimately composited and merged with the existing conditions photographs (using Photoshop image editing software). The scale of the subjects in the photograph (the balloon) and the corresponding simulation (the Facility) is proportional to their surroundings.

For presentation purposes in this report, the photographs were produced in an approximate 7-inch by 10.5-inch format. When reproducing the images in this format size, we believe it is important to present the largest view while providing key contextual landscape elements (existing developments, street signs, utility poles, etc.) so that the viewer can determine the proportionate scale of each object within the scene. Photo-documentation of the field reconnaissance and photo-simulations of the proposed Facility are presented in the attachment at the end of this report. The field reconnaissance photos that include the balloon in the view provide visual reference points for the approximate height and location of the proposed Facility relative to the scene. All simulations were created to represent the proposed monopole height of 120' AGL. The photo-simulations are intended to provide the reader with a general understanding of the different view characteristics associated with the Facility from various

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⁶ The Canon EOS 6D is a full-framed camera which includes a lens receptor of the same size as the film used in 35mm cameras. As such, the images produced are comparable to those taken with a conventional 35mm camera.

locations. Photographs were taken from publicly accessible areas and unobstructed view lines were chosen wherever possible.

The table below summarizes the photographs and simulations presented in the attachment to this report, and includes a description of each location, view orientation, distance from where the photo was taken relative to the proposed Facility, and the general characteristics of the view. The photo locations are depicted on the photolog and viewshed maps provided as attachments to this report.

Table 1 – Photo Locations

Location	Orientation	Distance to Site	Visibility
Steep Hill Road at Chestnut Hill Road, Waterbury	Northeast	<u>+</u> 0.32 Mile	Not Visible
Crestwood Avenue, Waterbury	Southeast	<u>+</u> 0.38 Mile	Year Round
Meadow Lake Drive	Southeast	<u>+</u> 0.53 Mile	Seasonal
Lyman Road	Southeast	<u>+</u> 0.48 Mile	Year Round
Lyman Road	South	<u>+</u> 0.26 Mile	Seasonal
Chestnut Hill Road	Southeast	<u>+</u> 0.13 Mile	Seasonal
Grilley Road	Southwest	<u>+</u> 0.14 Mile	Year Round
Grilley Road	Southwest	<u>+</u> 0.18 Mile	Year Round
Executive Hill Road	Northwest	<u>+</u> 0.18 Mile	Not Visible
Grilley Road	West	<u>+</u> 0.27 Mile	Not Visible
Sunrise Road	Southwest	<u>+</u> 0.43 Mile	Seasonal
Edgemont Lane	West	<u>+</u> 0.41 Mile	Not Visible
Pembroke Road*	Southwest	<u>+</u> 0.52 Mile	Not Visible
Lyman Road	Southwest	<u>+</u> 0.43 Mile	Not Visible
Lyman Road	Southwest	<u>+</u> 0.45 Mile	Year Round
Lyman Road	Southwest	<u>+</u> 0.46 Mile	Seasonal
Woodgaite Drive	Southwest	<u>+</u> 0.49 Mile	Seasonal
Woodgaite Drive	Southwest	<u>+</u> 0.53 Mile	Not Visible
Overvale Road	Southwest	<u>+</u> 0.87 Mile	Not Visible
Overvale Road	Southwest	<u>+</u> 0.85 Mile	Year Round
Hampshire Drive	Southwest	<u>+</u> 0.97 Mile	Year Round
Coe Road	West	<u>+</u> 1.60 Miles	Not Visible
Coe Road	West	<u>+</u> 1.73 Miles	Year Round
	Steep Hill Road at Chestnut Hill Road, Waterbury Crestwood Avenue, Waterbury Meadow Lake Drive Lyman Road Lyman Road Chestnut Hill Road Grilley Road Grilley Road Executive Hill Road Grilley Road Sunrise Road Edgemont Lane Pembroke Road* Lyman Road Lyman Road Lyman Road Woodgaite Drive Woodgaite Drive Overvale Road Overvale Road Hampshire Drive Coe Road	Steep Hill Road at Chestnut Hill Road, Waterbury Crestwood Avenue, Waterbury Meadow Lake Drive Lyman Road Southeast Lyman Road Southeast Lyman Road Southeast Chestnut Hill Road Southeast Grilley Road Grilley Road Southwest Executive Hill Road Northwest Grilley Road Southwest Executive Hill Road Southwest Sunrise Road Southwest Edgemont Lane West Pembroke Road* Southwest Lyman Road Southwest Lyman Road Southwest	Steep Hill Road at Chestnut Hill Road, Waterbury Crestwood Avenue, Waterbury Meadow Lake Drive Lyman Road Lyman Road Southeast Chestnut Hill Road Southeast Lyman Road Southeast Southeast Lyman Road Southeast Southeas

^{*}Photograph was taken at 35 mm focal length.

(Table continued on the following page)

Table 1 – Photo Locations (continued)

Photo	Location	Orientation	Distance to Site	Visibility		
24	Wolcott Road	Northwest	<u>+</u> 0.91 Mile	Not Visible		
25	Sharon Road at Wolcott Street, Waterbury*	North	<u>+</u> 1.35 Miles	Not Visible		
26	Gilman Street, Waterbury	Northeast	<u>+</u> 1.31 Miles	Year Round		
27	Lakewood Road, Waterbury	Northeast	<u>+</u> 1.16 Miles	Not Visible		
28	Chase Avenue, Waterbury	Northeast	<u>+</u> 1.51 Miles	Not Visible		
29	Rosengarten Drive, Waterbury	East	<u>+</u> 1.35 Miles	Year Round		
30	Rosengarten Drive at North Main Street, Waterbury	East	<u>+</u> 1.02 Miles	Not Visible		
31	Blue Ridge Drive, Waterbury	East	<u>+</u> 1.25 Miles	Not Visible		
32	Bucks Hill Park, Waterbury	Southeast	<u>+</u> 0.83 Mile	Year Round		
33	St. Michael's Drive, Waterbury	Southeast	<u>+</u> 1.22 Miles	Year Round		
34	Wilby High School, Waterbury	Southeast	<u>+</u> 1.44 Miles	Year Round		
35	Red Maple Lane, Waterbury	Southeast	<u>+</u> 1.63 Miles	Not Visible		
36	Owl's Nest Drive at Mountain Laurel Drive, Waterbury	Southeast	<u>+</u> 1.20 Miles	Seasonal		
37	Grandview Street	South	<u>+</u> 1.05 Miles	Year Round		
38	Claudia Lane	South	<u>+</u> 1.05 Miles	Not Visible		
*Photograph was taken at 35 mm focal length.						

Final Visibility Mapping

Information obtained during the field reconnaissance was incorporated into the mapping data layers, including field observations, the photograph locations, areas that experienced recent land use changes and those places where the initial model was found to over or under-predict visibility. Once the additional data was integrated into the model, APT recalculated the visibility of the proposed Facility within the Study Area.

Conclusions

As presented on the attached viewshed maps, predicted year-round visibility of the Facility is primarily limited to three areas as a result of the undulating terrain predominant in the Study Area. The most prominent year-round views of the Facility (represented in Photos 7 and 8)

would be from an area along Chestnut Hill Road, immediately north/northeast of the Host Property. The majority of predicted year-round visibility (±87%) is over Chestnut Hill Reservoir to the north in Wolcott, at the Wilby High School/North End Middle School complex in Waterbury, and at the City of Waterbury closed landfill to the south. Year-round views may be experienced intermittently at distances ranging from 0.5 mile to 1.5 miles from the Site, typically in areas of higher elevations. Representative locations are depicted in Photos 4, 15, and 37 (from the north), Photos 20, 21, and 23 (from the east), and Photo 26 (from the south). Direct view lines from areas south of the Site are limited due to the presence of Chestnut Hill and large tracts of wooded, undeveloped land. Spot views of the Facility would extend westward into Waterbury at distances ranging from approximately 0.38 mile away (represented by Photo 2) to approximately 1.44 miles from the Site (Photos 29, and 32 through 34).

Seasonally, when the leaves are off the deciduous trees, additional visibility is predicted to extend to select locations approximately 0.50-mile north of the Site (see Photos 3, 5, 6, 15, and 17). Photo 36 depicts an isolated seasonal view from approximately 1.20 miles northwest of the Site. A similar spot view would occur on the eastern shoulder of Chestnut Hill, approximately 0.43 mile from the Site (Photo 11).

Predicted year-round visibility of the proposed Facility is estimated to include approximately 93 acres ($\pm 1.2\%$ of the 8,042-acre Study Area). Approximately 60 acres of the predicted year-round visibility is located over the open water of Chestnut Hill Reservoir, north of the proposed Facility. Predicted potential seasonal visibility is estimated to include approximately 44 acres (<1% of the Study Area).

Proximity to Schools And Commercial Child Day Care Centers

There are no schools or commercial child day care centers within 250 feet of the Site. The nearest school (Frank G. Regan Elementary School) is located at 2780 North Main Street in Waterbury, approximately 4,400 feet west of the Site.

There are no commercial child day care centers within 250 feet of the Site. The nearest commercial child day care center is Happy Hands Prep Child Care Center, approximately 4,600 feet east of the Site at 421 Wolcott Road in Wolcott.

No views of the Facility are anticipated from either location.

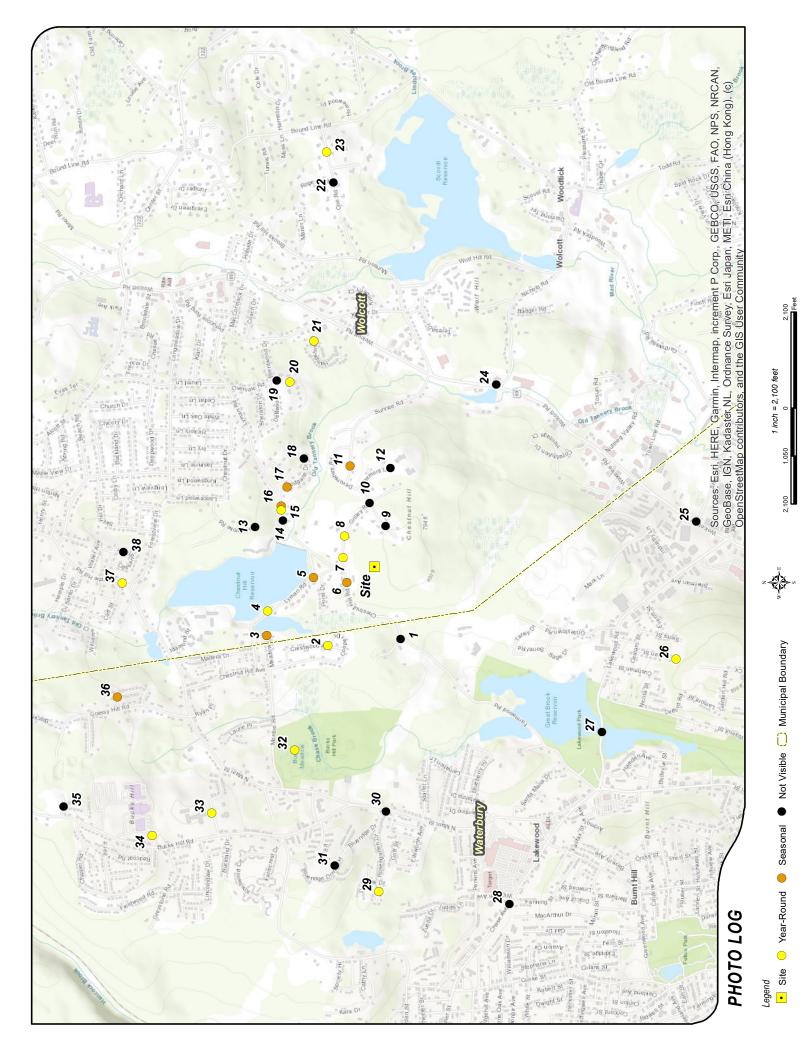
Limitations

The viewshed maps presented in the attachment to this report depict areas where the proposed Facility may potentially be visible to the human eye without the aid of magnification based on a viewer eye-height of five (5) feet above the ground and intervening topography, tree canopy and structures. This analysis may not account for all visible locations, as it is based on the combination of computer modeling, incorporating aerial photographs, and in-field observations from publicly-accessible locations. No access to private properties was provided to APT

personnel. This analysis does not claim to depict the only areas, or all locations, where visibility may occur; it is intended to provide a representation of those areas where the Facility is likely to be seen.

The photo-simulations provide a representation of the Facility under similar settings as those encountered during the field review and reconnaissance. Views of the Facility can change throughout the seasons and the time of day, and are dependent on weather and other atmospheric conditions (e.g., haze, fog, clouds); the location, angle and intensity of the sun; and the specific viewer location. Weather conditions were favorable for the in-field activity, with calm winds and overcast skies.

ATTACHMENTS



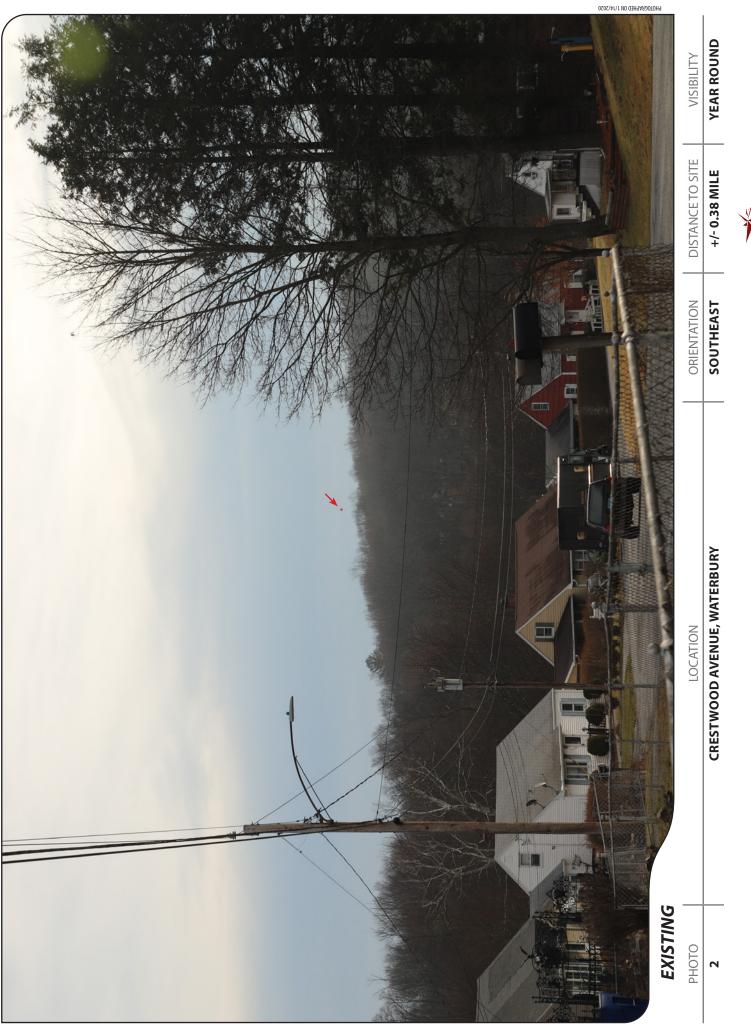






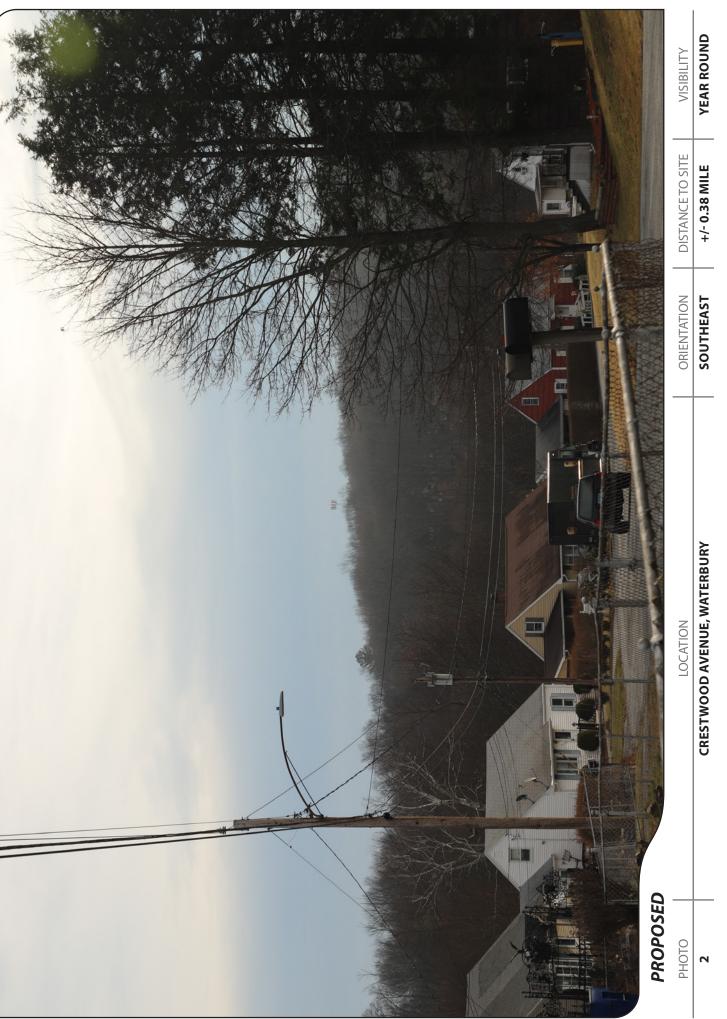














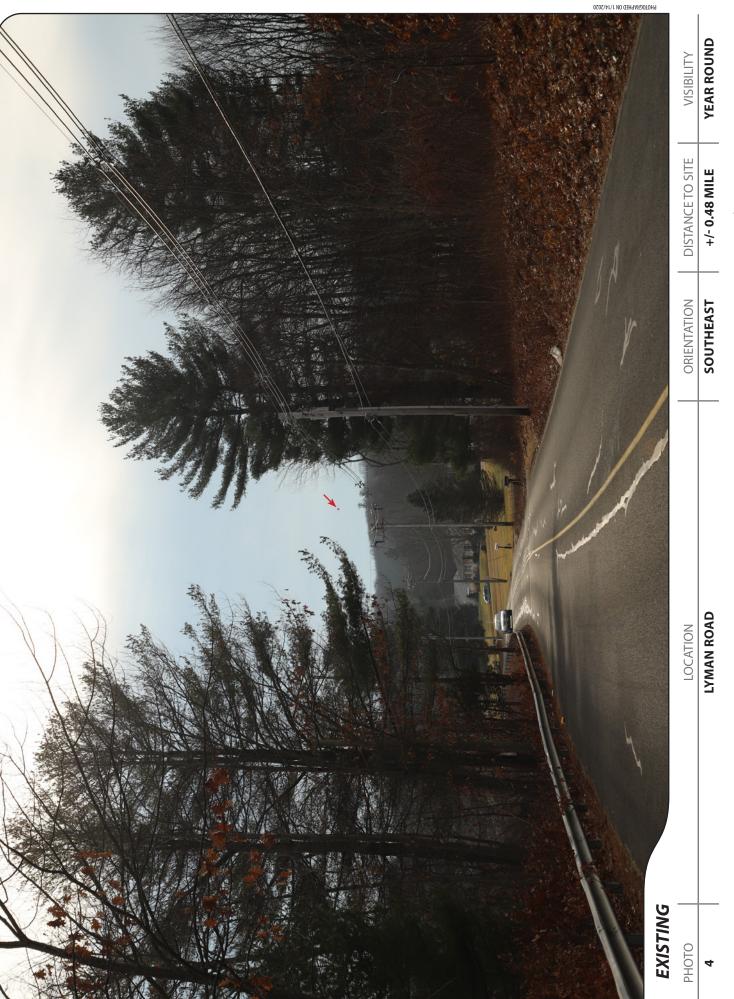
SEASONAL VISIBILITY **DISTANCE TO SITE** +/- 0.53 MILE ORIENTATION SOUTHEAST **MEADOW LAKE DRIVE** LOCATION **EXISTING** PHOTO



SEASONAL VISIBILITY **DISTANCE TO SITE** +/- 0.53 MILE ORIENTATION SOUTHEAST **MEADOW LAKE DRIVE** LOCATION **PROPOSED** PHOTO

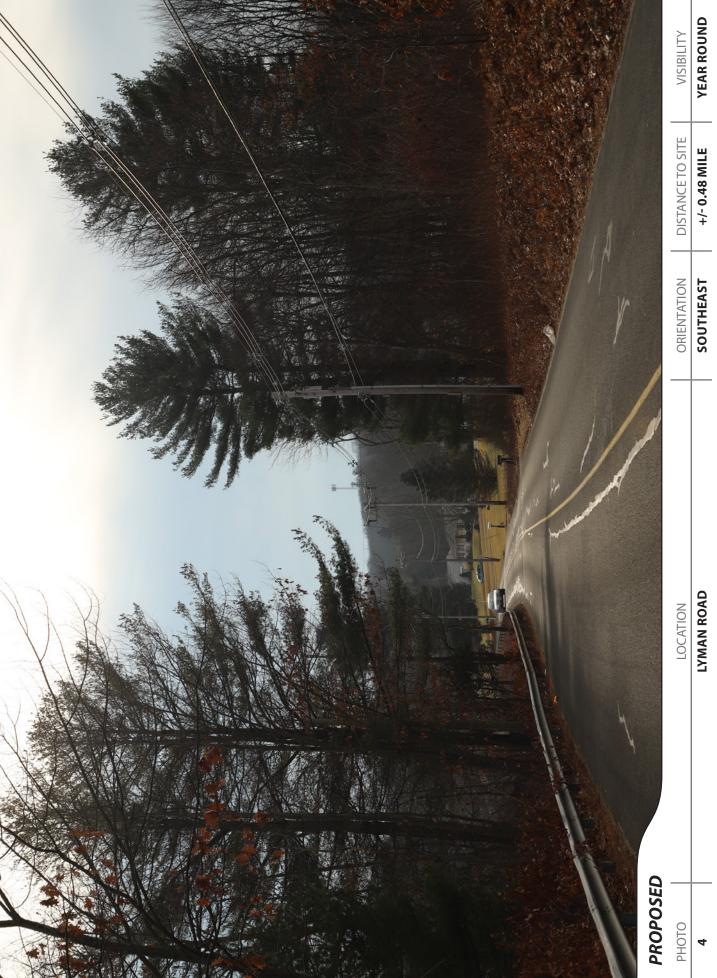










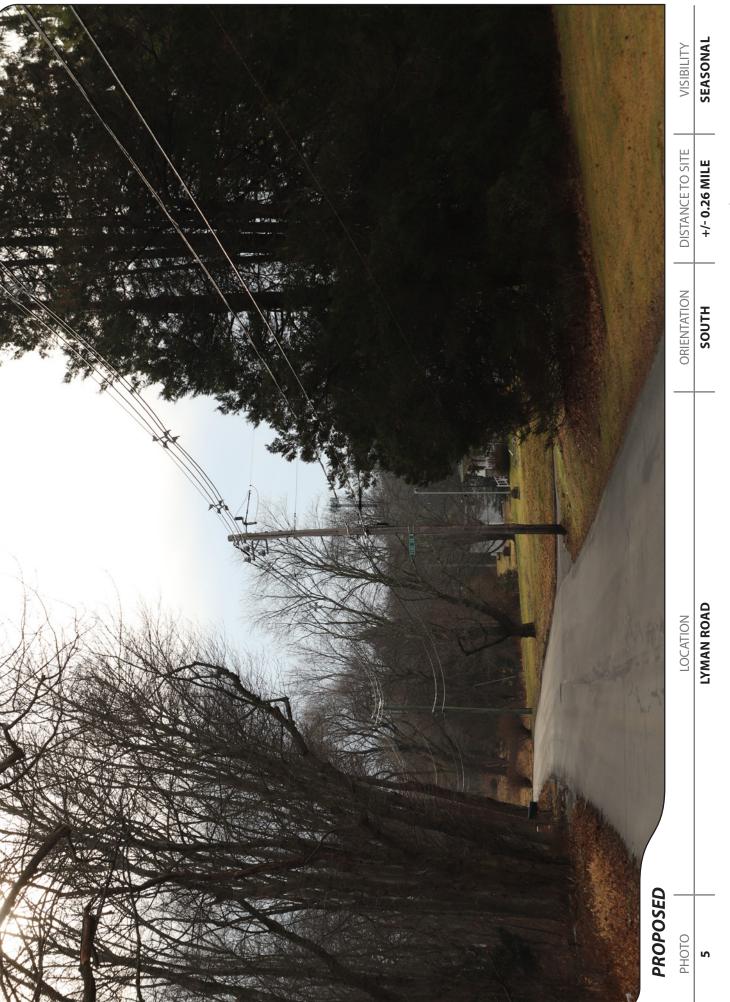














SEASONAL VISIBILITY **DISTANCE TO SITE** +/- 0.13 MILE ORIENTATION SOUTHEAST **CHESTNUT HILL ROAD** LOCATION **EXISTING** PHOTO



SEASONAL VISIBILITY **DISTANCE TO SITE** +/- 0.13 MILE ORIENTATION SOUTHEAST **CHESTNUT HILL ROAD** LOCATION **PROPOSED** PHOTO





