

Independent Radio Frequency Report
Regarding a proposed
Wireless Communications Facility
For
Homeland Towers, LLC

Site ID: “Mount Kisco”

Mount Kisco, NY
Westchester County

Prepared for
Homeland Towers, LLC

By

PierCon Solutions, LLC
January 2, 2019

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1 PURPOSE AND SCOPE

PierCon Solutions LLC, an engineering firm specializing in wireless communications, performed an independent analysis regarding the radiofrequency engineering aspects of the proposal by Homeland Towers, LLC to construct and operate a wireless telecommunications facility consisting of a facility in Leonard Park, Mount Kisco, NY. The purpose of this site is to relieve a significant gap in service in Verizon Wireless' network caused by a significant coverage gap. The following report describes the results of this analysis and how those results apply to the purpose of the proposed site.

In preparation for conducting this analysis, PierCon Solutions obtained applicable engineering data from Verizon Wireless, reviewed coverage propagation studies, and considered the potential for alternative site locations.

The following report results from a thorough independent study and analysis (from a radiofrequency engineering perspective) of the applicant's proposal.

2 GENERAL OVERVIEW

Verizon Wireless is a commercial wireless communications service provider licensed by the Federal Communications Commission (FCC) to provide personal wireless services throughout the Westchester County area. The wireless telecommunications facility proposed in this application is to provide coverage for voice and data in the LTE service for three different frequency bands.

The FCC assigns licenses in the 700, 850, 1900, and 2100 MHz frequency bands, all of which Verizon Wireless has obtained licenses. The FCC refers to the 700 MHz band as the 700 band, 850 MHz band as the Cellular band, 1900 MHz as the PCS band, and 2100 MHz as the AWS band (the bands will be referred to by their FCC names in this report). While the PCS and AWS bands have many advantages to users and providers, radio coverage at PCS and AWS bands is adversely affected by various local factors more than cellular and 700 bands. PCS and AWS coverage is more sensitive to such factors as topography, terrain, close-in clutter (trees, nearby foliage, buildings), and general area foliage.

The general use of each frequency band varies as well. For Verizon Wireless, the Cellular frequency band handles older 3G technology (speeds of 500Kbits/sec to 1000 Kbits/sec) with a portion reserved for LTE (4G) services. New wireless facilities are no longer equipped with this frequency band as it is currently in transition to become an all LTE band. All three other frequency bands, 700, PCS, and AWS serve Fourth Generation (4G) data (5 MB/sec and greater).

A wireless base station facility communicates with each user's mobile handset through a pair of wireless frequencies. The operation of a commercial wireless communications system is dependent upon an intermeshed network of wireless communication facilities – often called base stations or cell sites. Each wireless communications facility is designed to use low transmit power and provide a limited broadcast range. In order to provide seamless communications, it is essential that the radio coverage from each facility overlaps with adjacent facilities. This design factor allows users to engage in uninterrupted wireless telephone conversations and remain connected as they move across a geographic region. A gap in coverage exists when the wireless user cannot reliably initiate, receive, or continue telephone conversations or establish a data session on the wireless network.

The area of coverage which an individual wireless telecommunications facility can provide is affected by its cell type, antenna height and the surrounding area. Generally, the optimum antenna height for a macro-cell wireless communication facility is below 200 feet AGL (Above Ground Level). Height requirements are also influenced by mean ground elevation at the site, the wireless carrier's coverage objective, surrounding topography, tree heights, and expected user traffic.

3 DESIGN OBJECTIVES

The design objective for each wireless communications carrier is to provide seamless, ubiquitous, and reliable wireless service to their users, in accordance with the Wireless Communications and Public Safety Act of 1999. Verizon Wireless' design objectives are consistent with these goals. Verizon Wireless achieves this design objective by designing its network to supply signal levels sufficient enough to support reliable in-vehicle and in-building communications. Today's wireless systems, like Verizon Wireless', provide enhanced communications beyond the initial expectations for voice communication along roadways. The demand to provide in-building communications, voice and data communications, and enhanced E-911 access is a paramount requirement in today's wireless systems. Verizon Wireless' design objectives are consistent with this goal.

Designing a wireless telecommunications network involves balancing the need for coverage and capacity. Coverage is the ability of each site to provide reliable signal to the network of expected users. Capacity is the ability of the site to support simultaneous user traffic. This design balance is accomplished through an analysis of demographics, terrain, and long term planning. Initially, system design focuses on providing wide-area coverage, particularly targeting the major highways and roads in an area. As the wireless communications system matures, the carrier's focus changes to increasing their ability to support anticipated volume of user traffic, as well as providing coverage to additional locations in the area, such as business and residential districts.

In order to adequately provide reliable wireless service to Mount Kisco, the design threshold for reliable service must be defined. The design threshold is a reference to signal strength and varies depending on the physical characteristics of the area under analysis. Verizon Wireless defines the reliable coverage boundary of an LTE site using a value of Reference Signal Received Power (RSRP). This value is derived from industry standard definitions of LTE receiver sensitivity and data throughput, along with statistically quantifiable variations in the physical surroundings. This threshold takes into account additional losses associated with the location of the user; such as on-street, in-vehicle or in-building. The propagation coverage analyses for Mount Kisco, presented herein, are for services based upon a suburban in-building standard with a corresponding RSRP of -95 dBm. The suburban in-building standard encompasses most wood framed structures such as single family homes. Stronger signal levels may be required in other locations and environments where higher density buildings are located.

4 RADIO FREQUENCY ENGINEERING ACTIVITIES PERFORMED

In the course of the analysis described in this report, PierCon engineers performed the following tasks:

- Reviewed the wireless telecommunications services facilities ordinance of Mount Kisco
- Reviewed USGS Topographical Maps of Mount Kisco and surrounding areas.
- Performed an engineering site analysis and reviewed potential alternate locations.
- Link Budget Analysis and Aerial analysis
- Reviewed the location and design of adjacent wireless communications facilities
- Reviewed Radio Frequency coverage maps and the RF design and objective within and surrounding the Village of Mount Kisco

5 RADIO FREQUENCY DESIGN

Documentary evidence regarding the need for the proposed telecommunications facility at the proposed location was obtained by PierCon Solutions from Verizon Wireless' radio coverage planning tool called Atoll (created by Forsk). Forsk products are used in 140 countries and are used by Verizon Wireless, AT&T, Sprint, and many other service providers throughout the world. The propagation data provided was used to produce propagation coverage maps indicating the locations where reliable service is being provided by Verizon Wireless' wireless communications facilities.

Within the current network of sites for Verizon Wireless, gaps in coverage currently exist for all four (4) FCC licensed frequency bands for Verizon Wireless (700, Cellular, PCS, and AWS). To define these gaps in coverage PierCon analyzed the propagation data. Propagation data was obtained for the lowest (700) and highest (AWS) frequency bands to demonstrate the best and worst (respectively) performing frequency bands. Based on the analysis, there is a gap in coverage in the vicinity of the site. Please reference Exhibits A-1 and A-2 in the Appendix for a graphical representation of the existing Verizon Wireless LTE coverage in the 700 and 2100 MHz frequency bands. See below for a breakdown of Exhibits A-1 and A-2.

- Exhibit A-1 – Existing Verizon Wireless 700 MHz LTE Coverage
- Exhibit A-2 – Existing Verizon Wireless 2100 MHz LTE Coverage

Reviewing Exhibit A-1, the entire gap in coverage for Verizon Wireless includes a rather large area including many areas in the vicinity of the site located at Leonard Park. The objective for the Mount Kisco project is to alleviate gaps in coverage to the north, west, and south of the site at Leonard Park.

The in-building coverage gap areas described above contain approximately 1,308 residents according to a 2010 US census. Of these 1,308 residents, 347 are located in Mount Kisco, 687 are located in Bedford, and 274 are located in New Castle.

As outlined in Section 2, Verizon Wireless has obtained FCC Licenses in the AWS and PCS frequency bands. These frequency bands have a reduced coverage radius in areas dominated by trees and rolling hills. Therefore the gap in coverage for the AWS FCC licensed frequency bands will be different than the gaps in coverage for the 700 MHz LTE band shown in Exhibit A-1. Although coverage is more difficult to provide at higher frequency bands, adequate coverage is equally important. As briefly mentioned in section 2 of this report, the AWS frequency band is primarily used to provide additional capacity due to the larger channel size and ability to handle more users. Additional capacity is needed in areas like residential neighborhoods, schools, businesses, and anywhere high speed data is used. Reviewing Exhibit A-2, the entire gap in coverage for Verizon Wireless includes a very large area. The objective for the Mount Kisco project at the AWS/PCS frequency band is to alleviate gaps in in-building coverage in the surrounding neighborhoods from the proposed site.

Reviewing Exhibit A-2, the entire gap in coverage for Verizon Wireless includes a rather large area including many areas in the vicinity of the site. The objective for the Mount Kisco project is to alleviate gaps in coverage in all directions from the site at Leonard Park.

The in-building coverage gap areas described above contain approximately 6,820 residents according to a 2010 US census. Of these 6,820 residents, 5,367 are located in Mount Kisco, 687 are located in Bedford, and 766 are located in New Castle.

In order to determine where a new facility could be located, the Village was consulted and two different properties have been considered as possible facility locations. Two property locations, at Leonard Park and another on Rolling Ridge Court, were identified as possible site locations and are evaluated below.

The first location at Leonard Park, which is the proposed location in the exhibits, will be discussed first. The proposed site is located near the top of a set of hills between Byram Lake Road, Carlton Drive, and Main Street surrounded immediately by trees. This facility is proposed with antenna centerline heights 126' which allows for 3 additional co-

locaters below Verizon Wireless that can clear the trees of the nearby hill. Please reference Exhibits B-1, B-2, C-1, and C-2 in the Appendix for a graphical representation of the existing and proposed Verizon Wireless LTE coverage in the 700 and 2100 MHz frequency bands. See below for a breakdown of Exhibits B-1, B-2, C-1, and C-2.

- Exhibit B-1 – Proposed Verizon Wireless 700 MHz LTE Coverage
- Exhibit B-2 – Proposed Verizon Wireless 2100 MHz LTE Coverage
- Exhibit C-1 – Existing & Proposed Verizon Wireless 700 MHz LTE Coverage
- Exhibit C-2 – Existing & Proposed Verizon Wireless 2100 MHz LTE Coverage

Exhibits B-1 and B-2 demonstrate the coverage which the proposed site will provide to the area in the vicinity of the site. Exhibits C-1 and C-2 demonstrate the composite coverage which includes both the existing and proposed coverage together on one map.

In reviewing Exhibit C-1, it can be demonstrated that the several areas will no longer be located in the residential coverage gap for 700 MHz. The quantity of individuals which would no longer be located in the coverage gap for 700 MHz is approximately 634 individuals. Of these 634 residents, 347 are located in Mount Kisco, 28 are located in Bedford, and 259 are located in New Castle.

In reviewing Exhibit C-2, it can be demonstrated that the several areas will no longer be located in the residential coverage gap for 2100 MHz. The quantity of individuals which would no longer be located in the coverage gap for 2100 MHz is approximately 1,897 individuals. Of these 1,897 residents, 1,642 are located in Mount Kisco and 255 are located in New Castle.

The second location, 6 Rolling Ridge Court, which is the Rolling Ridge (Alternate) location in the exhibits, will be discussed next. The Rolling Ridge site is located near the top of a hill between Rolling Ridge Court and Sarles Street surrounded immediately by trees. This facility is proposed with antenna centerline heights 96' which allows for 3 additional co-locaters below Verizon Wireless that can clear the trees nearby. Please reference Exhibits D-1, D-2, E-1, and E-2 in the Appendix for a graphical representation of the existing and alternate Verizon Wireless LTE coverage in the 700 and 2100 MHz frequency bands. See below for a breakdown of Exhibits D-1, D-2, E-1, and E-2.

- Exhibit D-1 – Alternate Verizon Wireless 700 MHz LTE Coverage
- Exhibit D-2 – Alternate Verizon Wireless 2100 MHz LTE Coverage
- Exhibit E-1 – Existing & Alternate Verizon Wireless 700 MHz LTE Coverage
- Exhibit E-2 – Existing & Alternate Verizon Wireless 2100 MHz LTE Coverage

Exhibits D-1 and D-2 demonstrate the coverage which the alternate site will provide to the area in the vicinity of the site. Exhibits E-1 and E-2 demonstrate the composite coverage which includes both the existing and alternate coverage together on one map.

In reviewing Exhibit D-1, it can be demonstrated that the several areas will no longer be located in the residential coverage gap for 700 MHz. The quantity of individuals which would no longer be located in the coverage gap for 700 MHz is approximately 918 individuals. Of these 918 residents, 347 are located in Mount Kisco, 312 are located in Bedford, and 259 are located in New Castle.

In reviewing Exhibit D-2, it can be demonstrated that the several areas will no longer be located in the residential coverage gap for 2100 MHz. The quantity of individuals which would no longer be located in the coverage gap for 2100 MHz is approximately 626 individuals. Of these 626 residents, 176 are located in Mount Kisco, 201 are located in Bedford, and 249 are located in New Castle.

A new facility at either location would be able to provide coverage to a significant quantity of individuals and provide reliable service to those who previously did not have it.

6 CONCLUSION:

PierCon Solutions' analysis of Verizon Wireless' existing network coverage indicates that a significant gap in wireless service exists within the Village of Mount Kisco. The application by Verizon Wireless proposes to construct a new wireless telecommunications facility at Leonard Park in Mount Kisco, NY. The proposed installation, consisting of antennas at centerline heights of 126' will alleviate coverage deficiencies and provide reliable service as described above. There is also an acceptable alternative location at 6 Rolling Ridge Court that will also be able to alleviate coverage deficiencies with antenna centerline heights of 96'.

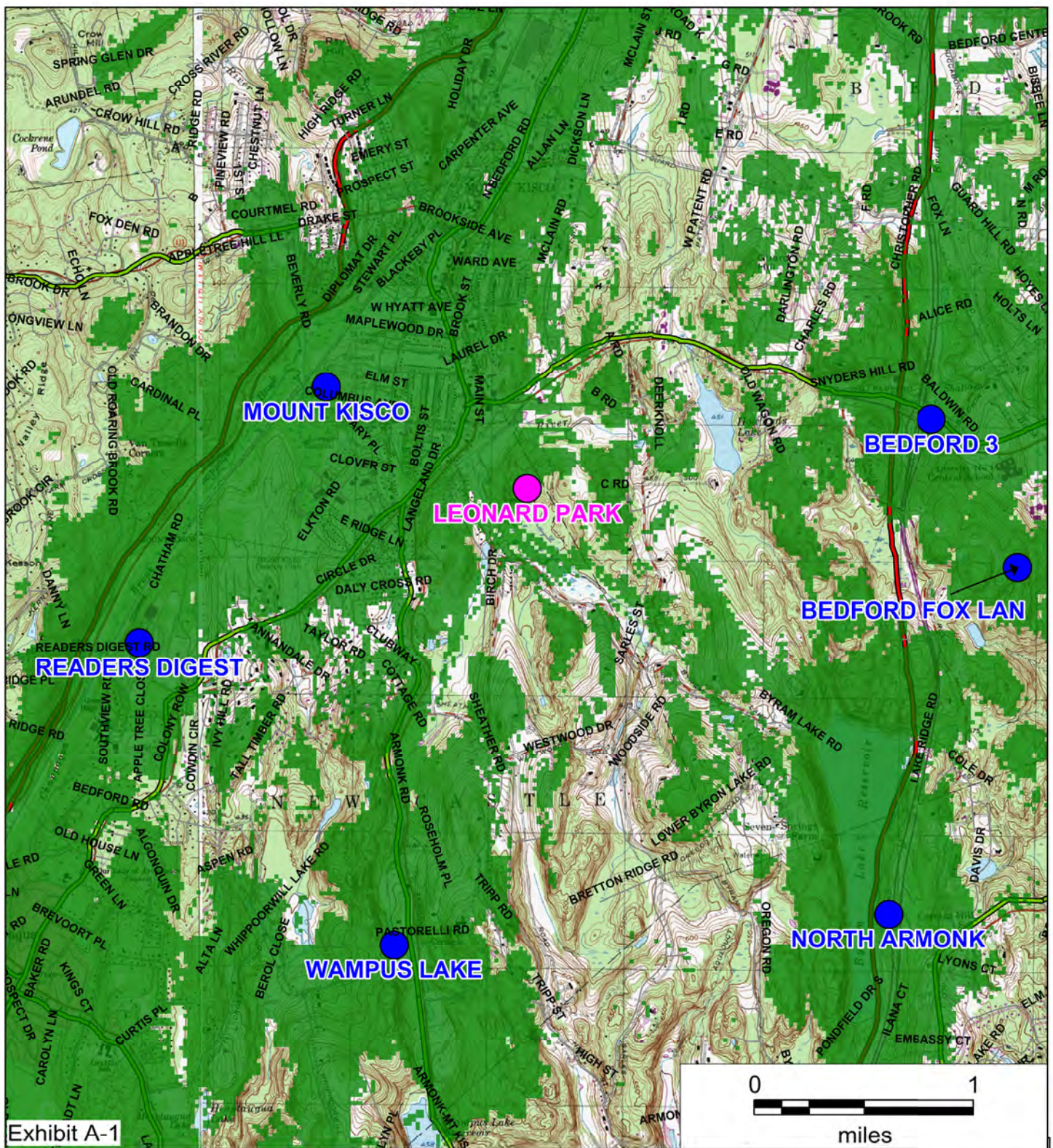
The operation of this facility will enable Verizon Wireless to provide reliable wireless service to Village of Mount Kisco and to remedy the identified service gaps. After performing the independent radiofrequency analysis, PierCon Solutions concludes that this facility is essential to Verizon Wireless' network design for the Village of Mount Kisco. Without the proposed facility, Verizon Wireless will be materially inhibited from providing its services.

Report Prepared by:

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Sr RF Engineer
1/2/2019
PierCon Solutions, LLC

7 APPENDIX - EXHIBITS

- *Exhibit A-1 – Existing Verizon Wireless 700 MHz LTE Coverage*
- *Exhibit A-2 – Existing Verizon Wireless 2100 MHz LTE Coverage*
- *Exhibit B-1 – Proposed Verizon Wireless 700 MHz LTE Coverage*
- *Exhibit B-2 – Proposed Verizon Wireless 2100 MHz LTE Coverage*
- *Exhibit C-1 – Existing & Proposed Verizon Wireless 700 MHz LTE Coverage*
- *Exhibit C-2 – Existing & Proposed Verizon Wireless 2100 MHz LTE Coverage*
- *Exhibit D-1 – Alternate Verizon Wireless 700 MHz LTE Coverage*
- *Exhibit D-2 – Alternate Verizon Wireless 2100 MHz LTE Coverage*
- *Exhibit E-1 – Existing & Alternate Verizon Wireless 700 MHz LTE Coverage*
- *Exhibit E-2 – Existing & Alternate Verizon Wireless 2100 MHz LTE Coverage*



Mt. Kisco

Existing
Verizon Wireless
700 MHz LTE Coverage

Leonard Park
Mount Kisco, NY 10549

- Existing Verizon Wireless Facility
- Proposed Verizon Wireless Facility
- Existing Reliable LTE In-Building Coverage (≥ -95 dBm RSRP)

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1/2/2019

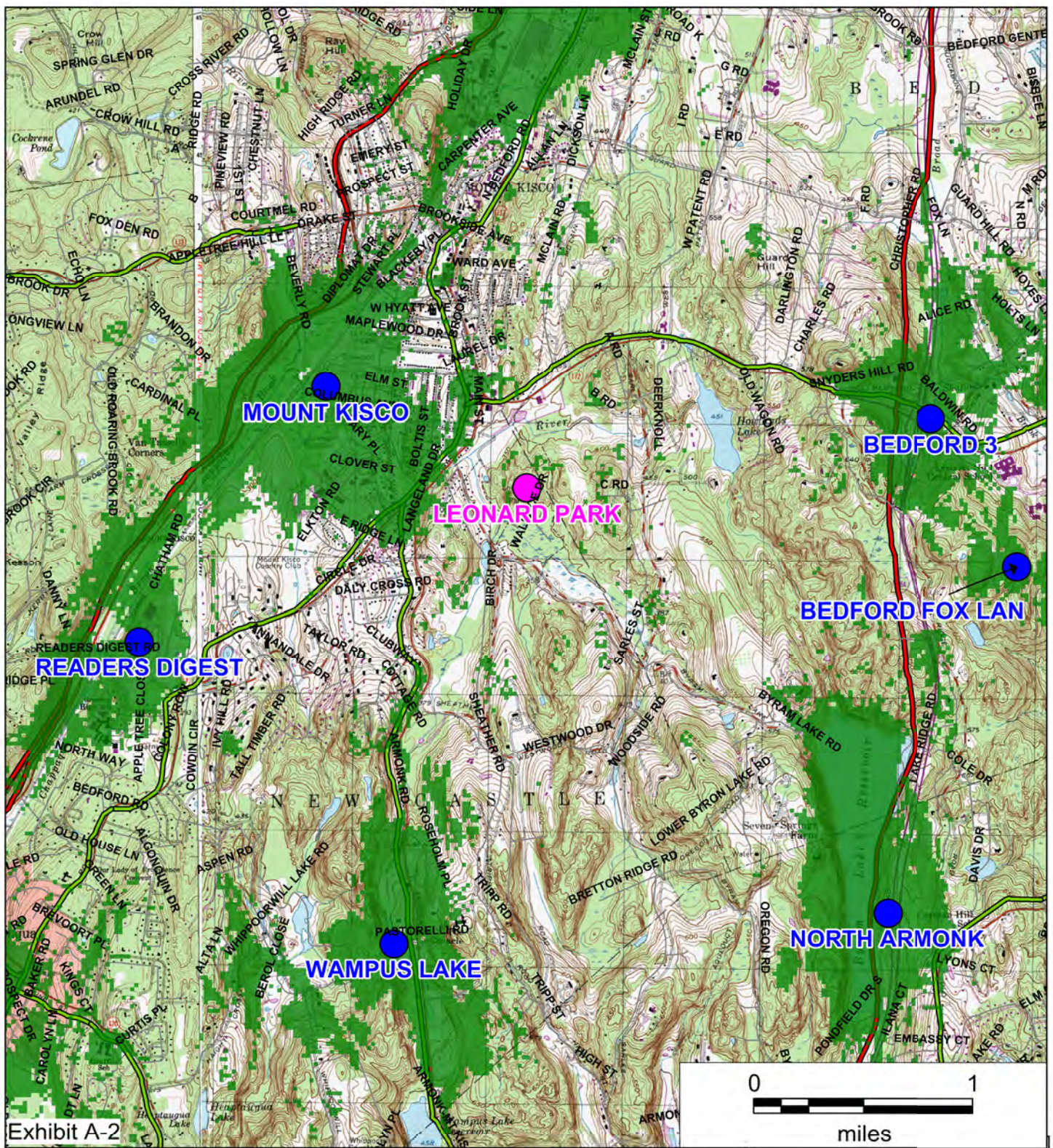


Exhibit A-2

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Existing
Verizon Wireless
2100 MHz LTE Coverage

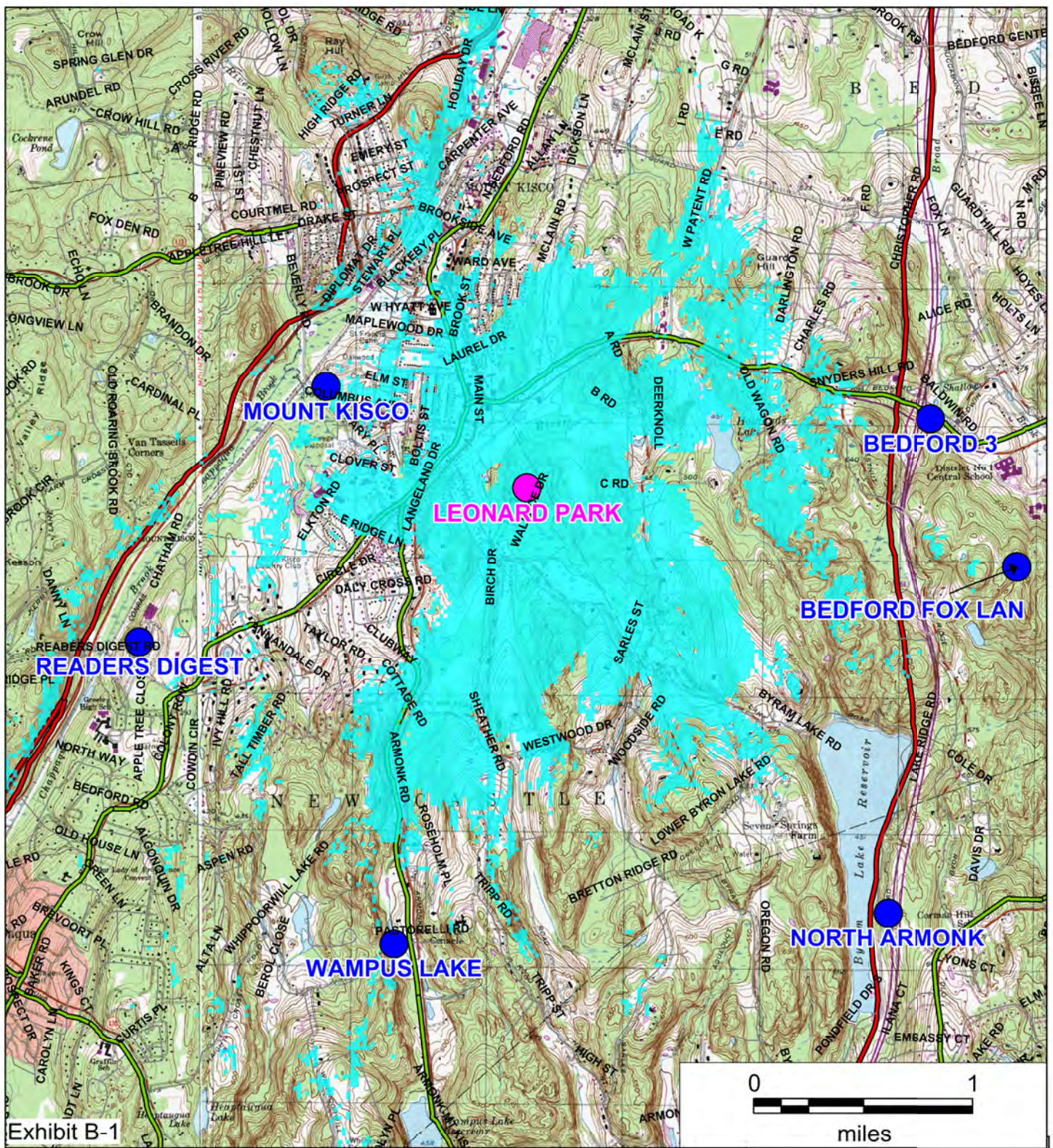
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Mt. Kisco

Proposed
Verizon Wireless
700 MHz LTE Coverage

Leonard Park
Mount Kisco, NY 10549



Existing Verizon Wireless Facility



Proposed Verizon Wireless Facility

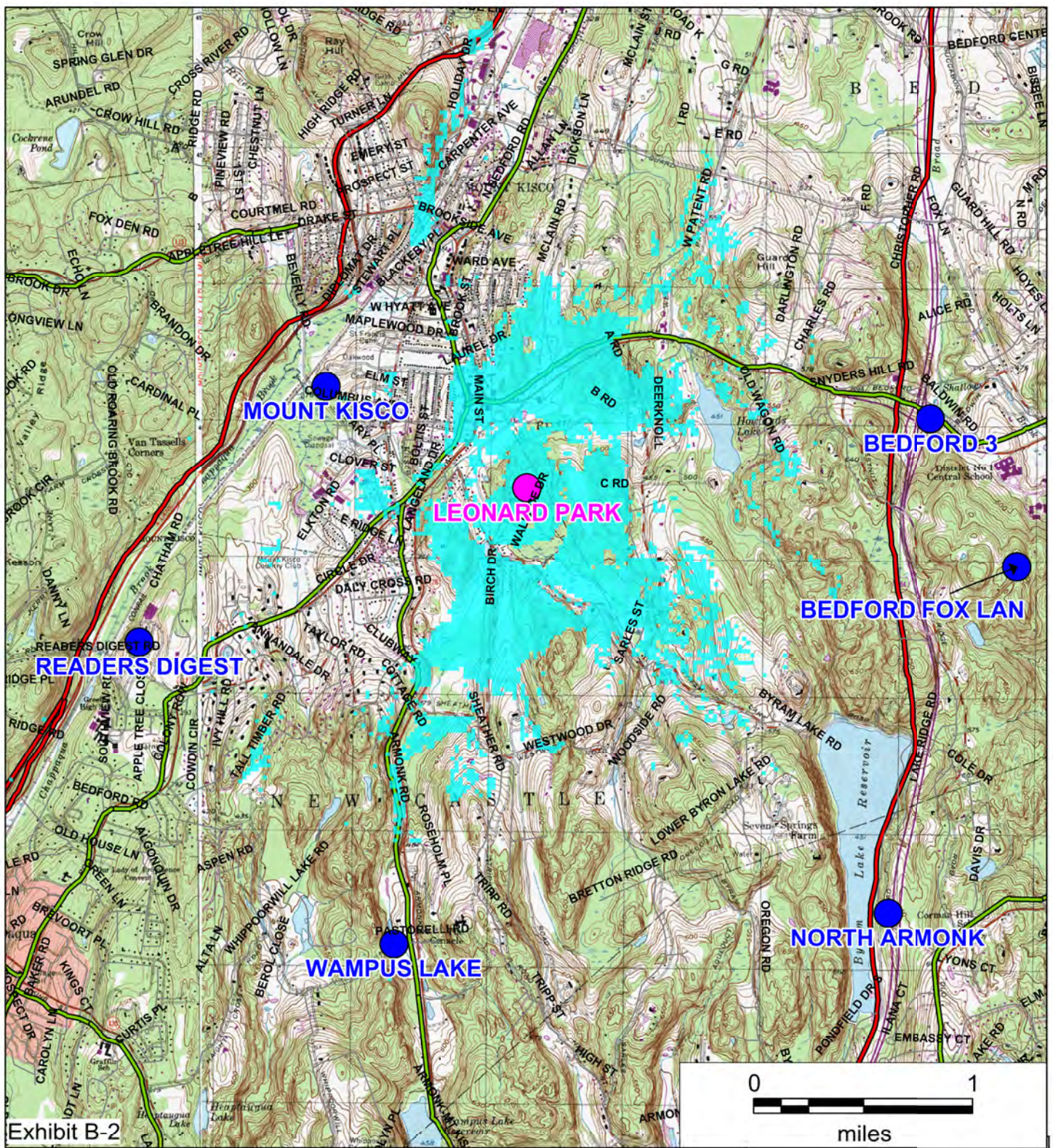


Proposed Reliable LTE In-Building
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Mt. Kisco

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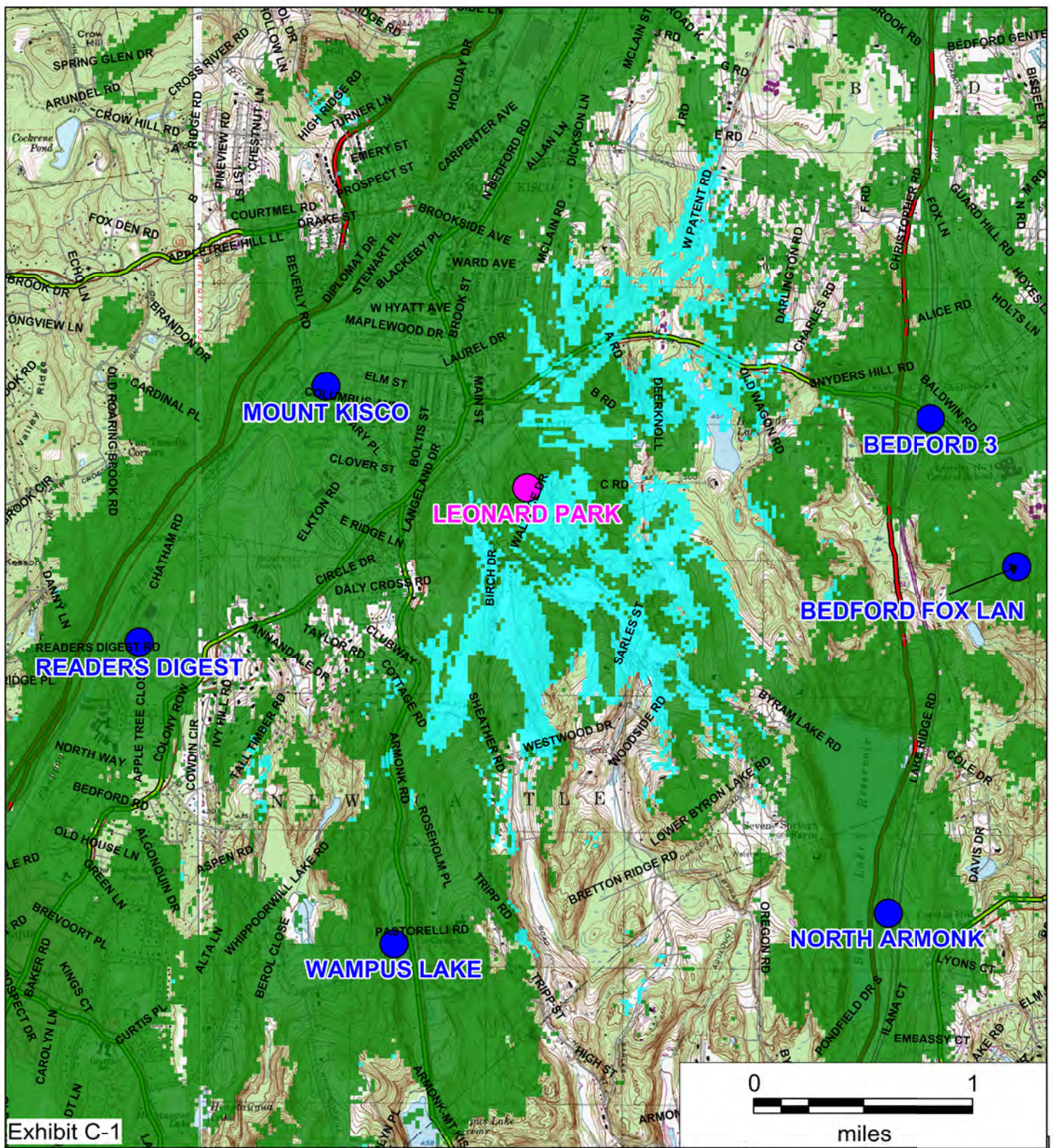
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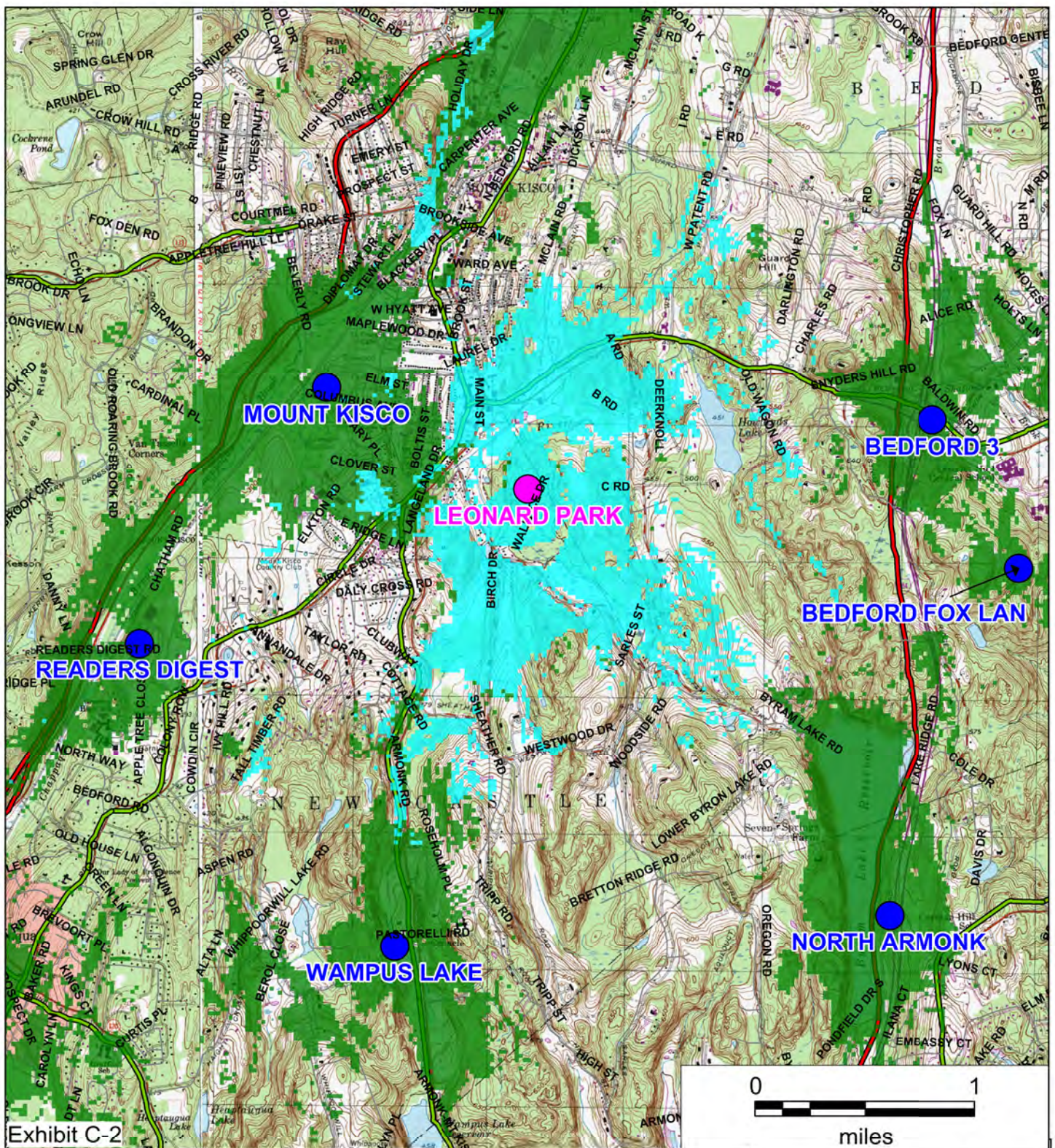
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Mt. Kisco

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2100 MHz LTE Coverage

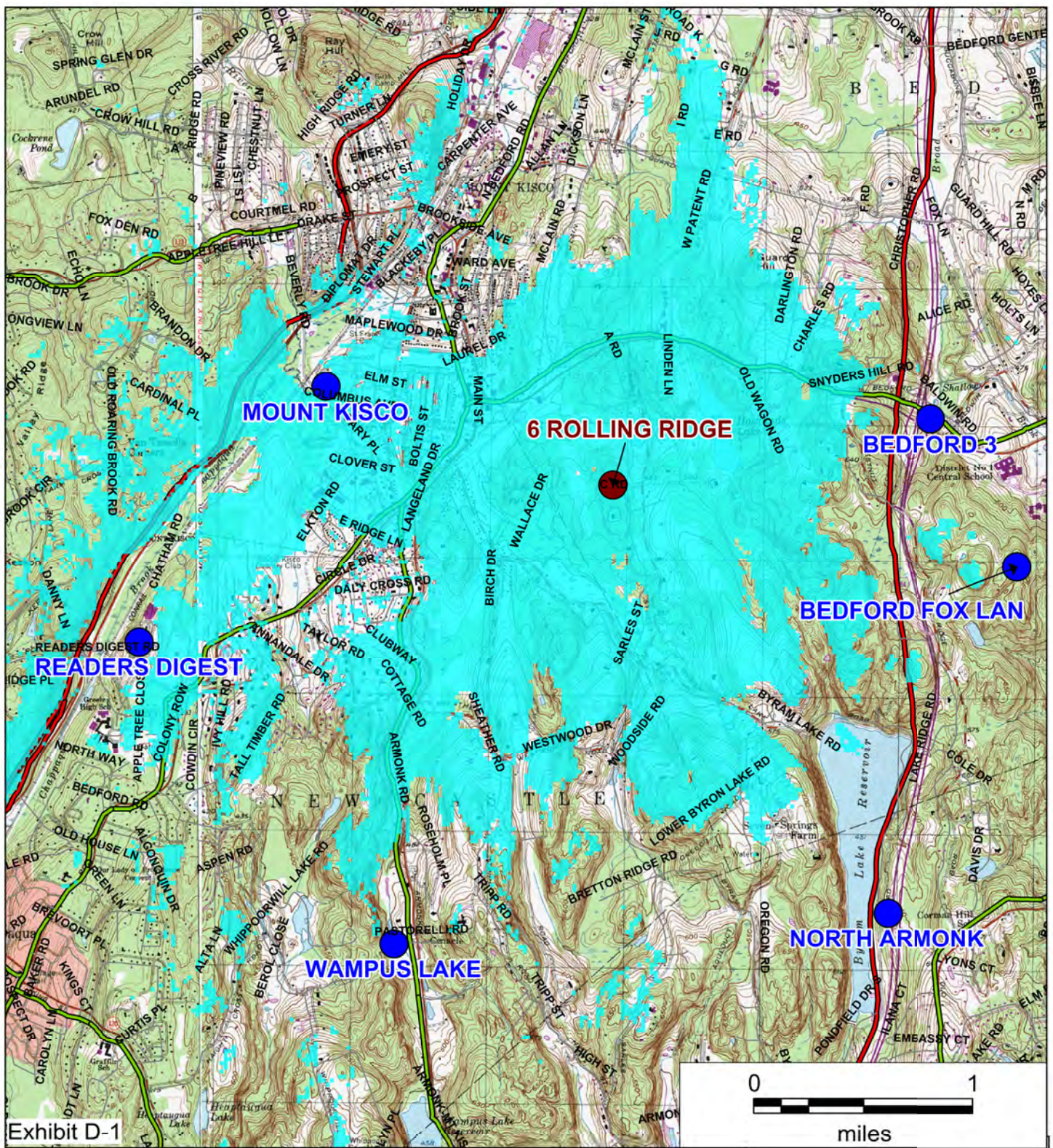
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Mt. Kisco

Alternate
Verizon Wireless
700 MHz LTE Coverage

6 Rolling Ridge
Mount Kisco, NY 10549



Existing Verizon Wireless Facility



Alternate Verizon Wireless Facility

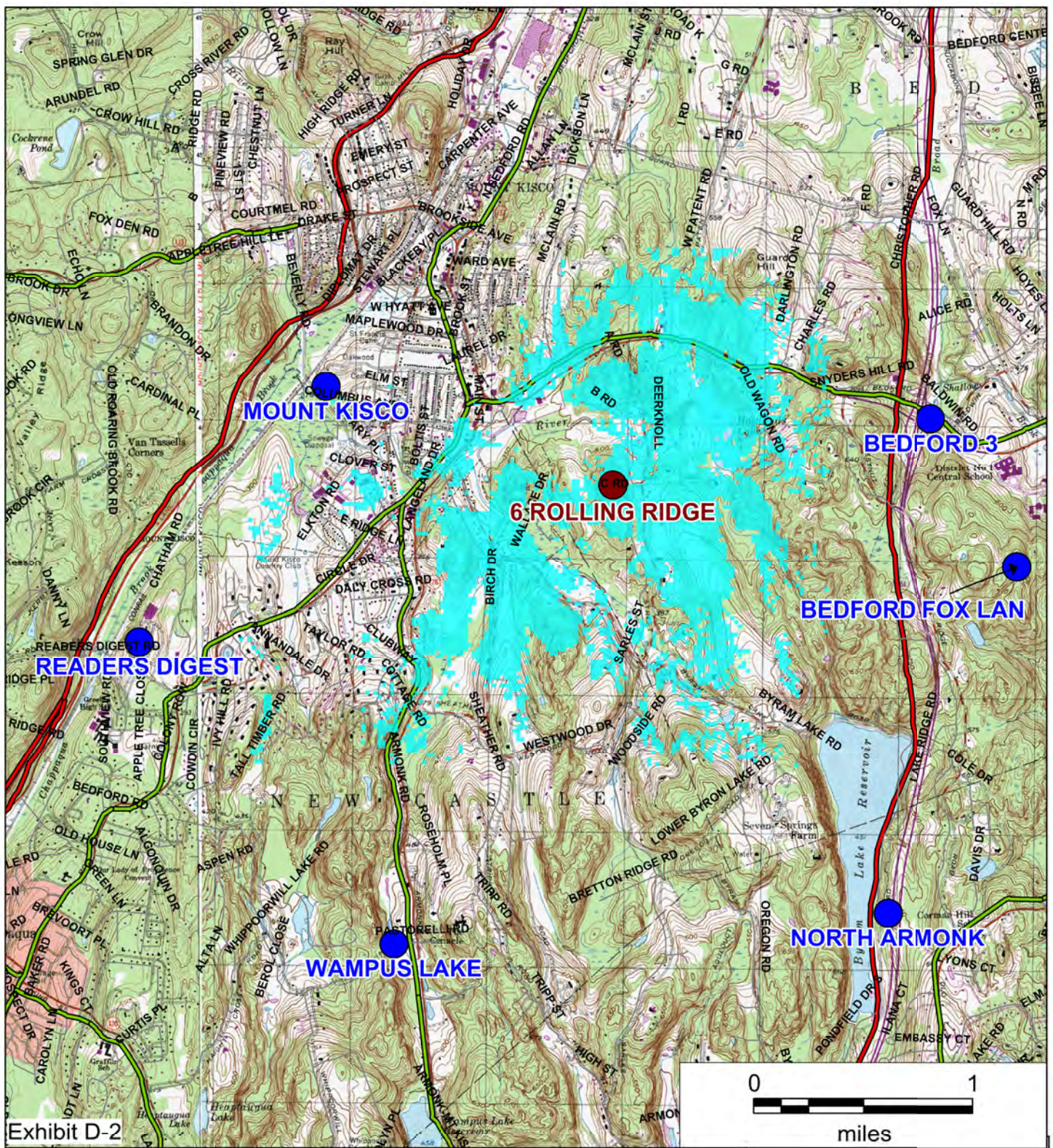


Proposed Reliable LTE In-Building
Coverage (≥ -95 dBm RSRP)

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Mt. Kisco

Alternate
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6 Rolling Ridge
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Existing Verizon Wireless Facility



Alternate Verizon Wireless Facility

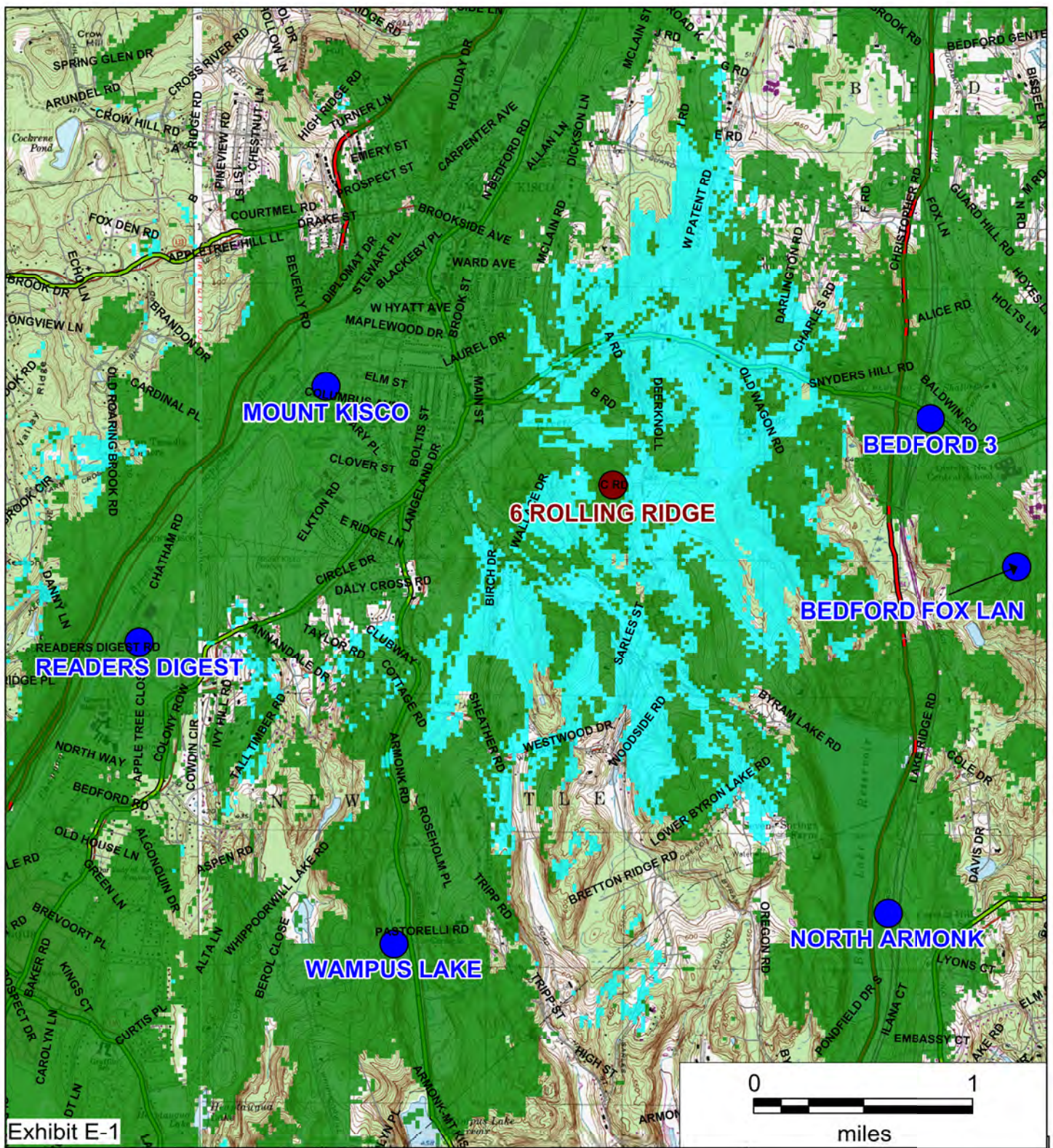


Proposed Reliable LTE In-Building
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Mt. Kisco

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700 MHz LTE Coverage

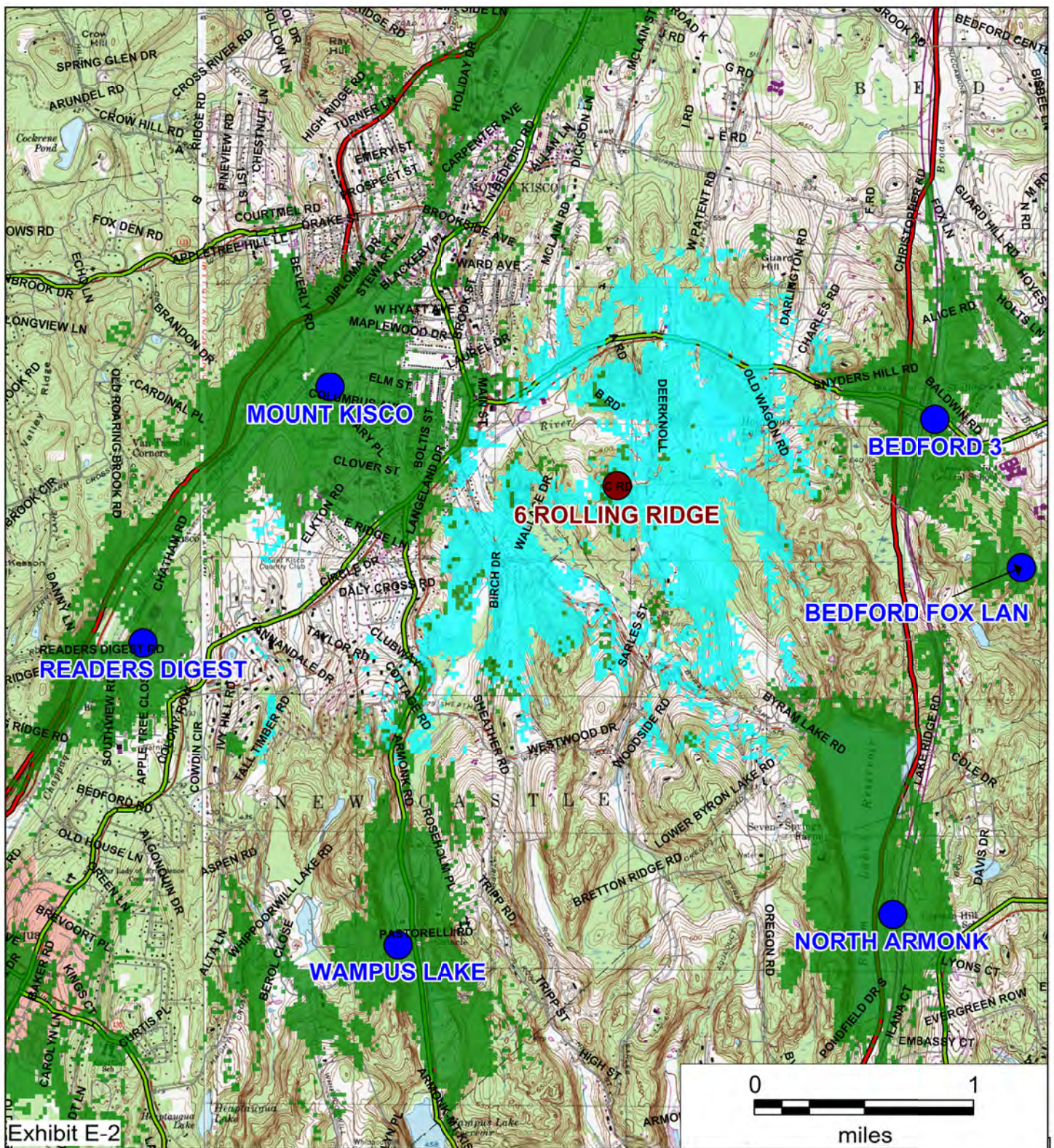
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