NORTHERN WESTCHESTER COUNTY

COOPERATIVE WIRELESS COMMUNICATIONS

MASTER PLAN

June 23, 2023

PREPARED BY
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INTRODUCTION

The Cooperative Wireless Communications Master Plan (Plan) has been prepared as a resource to address the need for improved wireless services for specific communities in Northern Westchester County (NWC). The study area is made up of eight individual communities and include the Towns of Bedford, Lewisboro, New Castle, North Salem, Pound Ridge, Somers, Yorktown and the Village/Town of Mount Kisco.

The Plan is a comprehensive wireless telecommunications study intended to facilitate an optimal wireless telecommunications environment and promote efficient network deployment practices. The research and analysis in this Plan details and maps existing wireless facilities, simulates current wireless coverages, identifies areas with gaps in wireless services along with suggested locations for new facilities. The wireless network gap maps help direct strategic planning for future wireless communications infrastructure placement and design throughout NWC.

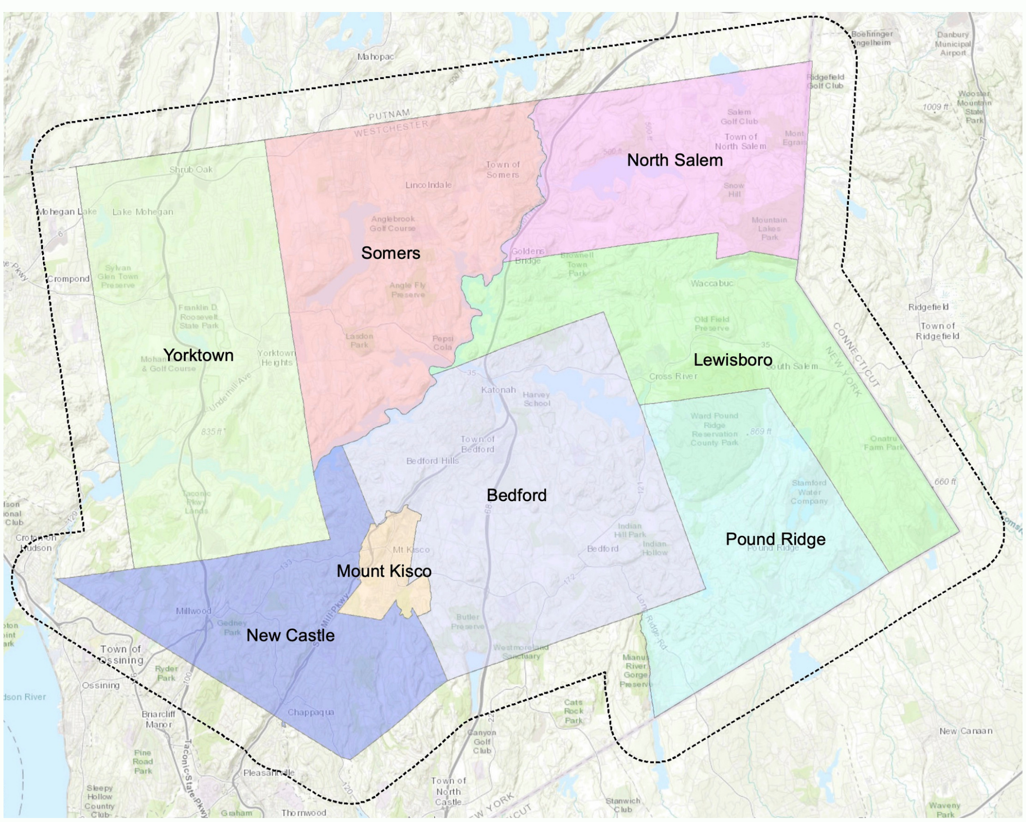
Key objectives identified by NWC community surveys are as follows:

- Improve wireless services throughout the communities allowing for robust wireless connectivity for residents, businesses, visitors and emergency management personnel.
- Protect community aesthetics by planning for well-sited, well-designed, concealed infrastructure consistent with surrounding areas.
- Promote greater transparency from the wireless industry by requiring applicants to demonstrate radio frequency emission compliance with Federal Communications Commission (FCC) standards in connection with any new or existing wireless development.
- Address small wireless facility buildout standards in public rights-of-way.
- Promote continued use of public assets to allow greater community control over placement and design of new wireless infrastructure to protect the community from visual impacts and improve coverage in hard-to-reach areas.

The main document of the Plan consists of the Northern Westchester County overall wireless depiction. Included in the Plan are:

- County characteristics; and
- Wireless inventory maps categorized by structure type, antenna type, location and design type; and
- Simulated propagation mapping outlining existing wireless coverages; and
- Maps indicating gaps in wireless services, recommended solutions, federal and state regulations; and
- Overall community survey results; and
- Regulatory review and recommendations.

Definitions of certain technical terms used within this document can be found in Appendix A. Each communities individual Plan is included as subsequent appendices.



EXECUTIVE SUMMARY

The Cooperative Wireless Communications Master Plan (Plan) began in response to the award of a request for proposal (RFP) for the Town of Bedford for a Study and Report of Emergency Service and Wireless Telecommunications infrastructure Master Plan. The wireless telecommunication portion of the Bedford Study expanded to a northern County-wide project.

The Plan addresses wireless trends and community concerns related to wireless infrastructure and develops the framework to proactively plan for the responsible deployment of new wireless facilities throughout the Northern Westchester County (NWC) region. The NWC region as defined in this plan consists of eight communities of Bedford, Lewisboro, Mount Kisco, New Castle, North Salem, Pound Ridge, Somers and Yorktown.

The study includes the overall region of the eight combined jurisdictional boundaries plus a one-mile perimeter around the border. Each community is also represented as a stand-alone document in Appendices B through I. All existing wireless facilities were assessed, studied, cataloged and used as the baseline in CityScape's mapping and analysis.

Simulated propagation maps from all identified wireless facilities reveal areas throughout the Towns and Village lacking wireless coverages. United States Census population data along with geographic variables are considered and shown on maps illustrating areas with service gaps.

A wireless infrastructure facility survey was conducted in each community to engage residents, staff and elected officials. Collectively there were 4,002 responses from the community surveys which provides guidance related to aesthetics and types of wireless land use development the residents will support. This information was used to strategize solutions for a more continuous wireless network throughout the region over the next ten years.

The assessment process discovered a total of 106 wireless facilities categorized as follows:

Structure Type: 81 Towers, 25 Base Stations
Antenna Type: 71 Macro Cell, 3 Small Cell, 12 Public Safety/Macro,
17 Public Safety, 3 Other
Location: 54 Private Property, 38 Public Property, 8 Utility Easement, 6 Public ROW
Design Type: 76 Non-Concealed, 23 Concealed, 7 Semi-Concealed

The coverage maps simulate wireless coverages utilizing the existing personal wireless facilities and identify wireless coverage gaps throughout NWC.

Coverage does not portray the entire wireless story throughout the region and for that reason network capacity needs to be considered when studying the gaps. Coverage refers to the area where a device can obtain network access. Capacity refers to the amount of traffic a network can handle and its corresponding speeds. The more people in the area using the network the less capacity available; thus, connectivity can be an issue in areas where more people are simultaneously using their wireless devices.

One way to estimate capacity concerns is considering areas with the highest population density. These areas have the potential for the highest usage of wireless devices. Capacity maps are included and consider what may happen to the wireless network when there are higher usage demands. This gives a more realistic picture of gaps in wireless services, estimating the potential capacity strains of a network during peak times.

Each NWC community had three public meetings regarding the project beginning with a project initiation meeting. A second meeting presented results of the infrastructure assessments, the inventory catalog, simulated propagation, census data, land use and capacity heat maps. At the conclusion the public was invited to participate in an on-line Wireless Master Plan Survey. The third meeting summarized survey results and presented gap maps and code review observations.

Potential solutions to fill in identified network gaps include the recommendation of adding 36 macro cell facilities ranging 80' to 130' in height throughout the Study Area. It is recommended that each facility accommodate multiple collocations. A total of 118 small wireless facilities are suggested on existing utility poles as a start to fill in gaps in visually sensitive view sheds.

Wireless communications regulations play an important role in setting clear guidelines for the wireless industry to ensure necessary infrastructure is deployed in a way that meets the preferences of individual communities. Code amendment comments are provided for each community to ensure compliance with current federal guidelines and to incorporate community preferences ascertained from public remarks provided in the community surveys.

CHAPTER 1

WESTCHESTER COUNTY AND WIRELESS INVENTORY

WESTCHESTER COUNTY

Westchester County, located in the Hudson Valley, is approximately 450 square miles and the seventh most populated county in the state of New York. It was founded in 1683 with the county seat located in the City of White Plains. The Hudson River parallels the western county line and the southeastern county line has miles of shoreline along the Long Island Sound.

The County is a large suburban area because of its proximity to New York City. Southern Westchester County is significantly more densely populated with the cities of Yonkers, Mount Vernon, New Rochelle, White Plains and Rye but the northern part of the County has retained much of its rural character while adopting the urban and suburban lifestyles dictated by its proximity to New York City.

To the north is Putnam and Fairfield Counties and to the East the County line abuts Connecticut. The County is intersected by the Bronx, Saw Mill and Croton rivers and there are steep hills within the County's borders.

Northern Westchester County (NWC) is significantly more rural, predominantly low-density single-family dwelling units with significant acreage set aside for conservation, public parks and open spaces. Quaint shopping districts with a few midsize shopping centers in Bedford, New Castle, Yorktown and Somers characterize the commercial service areas throughout NWC. The Village/Town of Mount Kisco is the most densely populated community with the largest shopping districts. Pound Ridge is the least densely populated Town in NWC.

The following *Table 1* is gathered from the U.S. Census Bureau Quick Facts web site with the most notable differences in population between Yonkers to the south and the communities in NWC.

US CENSUS DATA QUICK FACTS	POPULATION ESTIMATES 2021	PEOPLE PER SQUARE MILE 2010	2020
Westchester County	997,895	2,204	2,332
Yonkers	209,530	10,880	11,750
Bedford	17,183	466	461
Lewisboro	12,049	447	442
Mount Kisco	10,777	3,584	3,604
New Castle	18,000	756	793
North Salem	5,195	239	245
Pound Ridge	5,129	225	226
Somers	21,322	689	725
Yorktown	35,953	984	994

Table 1: US Census Data Comparison

The topography varies significantly throughout NWC with tall hills, deep valleys, rock walls and rock outcrops. Most of NWC is heavily wooded with mostly deciduous trees. Rivers, perennial and intermittent streams flow through the region along with several reservoirs and hundreds of lakes and small ponds are located throughout the study area. The highest elevation is 987 feet in Mountain Lakes Park located in North Salem and the lowest elevation is around 20 feet along the water's edge of the New Croton Reservoir in Yorktown.

Major north/south transportation networks in NWC include I-684, the Taconic State Parkway, Highway 22 (Bedford Road), Saw Mill River Parkway and Highway 9. The rail service parallels the Saw Mill River Parkway and a portion of Highway 9. Train stations for commuters are located in Katonah, Bedford Hills, Mount Kisco and New Castle. Park and Ride lots are also found along I-684. There are no major east/west thoroughfares in NWC. Most of the smaller highways and local roads are typically winding and narrow and paralleled with trees and man-made cobblestone/stream bed/local rock walls.

Maintaining the viewsheds among the hilltops and rural open space regions are top priorities and goals of the NWC communities. The goal of the Plan aims to complement these objectives in conjunction with balancing the need of additional infrastructure to accommodate the existing and growing wireless demands.

INFRASTRUCTURE INVENTORY MAPS

Existing and proposed wireless infrastructure is the foundation for understanding the wireless industry deployment patterns and when modeled helps predict where new sites are needed to fill in network gaps.

CityScape completed an assessment of each antenna location to verify the following information: 1) exact location; 2) ownership; 3) tenants; 4) type of facility; and 5) notable observations.

As of October 2022, there are a total of 106 wireless facilities verified in the designated “study area” which is identified as NWC including a one-mile perimeter outside of the NWC boundary.

The inventory is categorized and mapped accordingly for analytical purposes:

- Structure Type: Towers and Base Stations
- All Antenna Type: Macro Cell, Small Cell, Broadcast, Public Safety, Other
- Personal Wireless Service Facility (PWSF) Antenna Type: Macro Cell, Small Cell
- Location: Private Property, Public Property, Utility Easements, Rights-of-Way
- Design Type: Concealed, Non-Concealed, Semi-Concealed, Dual Purpose

Infrastructure in each community is identified by a unique prefix followed by a number to distinguish the specific community in which the site is located as follows: B-Bedford, L-Lewisboro, M-Mount Kisco, C-New Castle, N-North Salem, P-Pound Ridge, S-Somers, Y-Yorktown and O-Outside for facilities in the one-mile perimeter.

Detailed site information is within each individual community's Inventory Infrastructure Catalog located in the respective appendices.

STRUCTURE TYPE

Towers and base stations make up the structure type. Towers are structures that are built for the sole purpose of supporting wireless equipment. Base stations are other structures that wireless equipment can be placed upon such as buildings, water tanks and utility poles.

Wireless infrastructure is not commonly owned by the commercial wireless service providers installing wireless equipment.

Stakeholders who own and lease vertical real estate in NWC are American Tower Corporation (ATC), Crown Castle (CC), Homeland Towers, InSite Towers, and SBA. Public agencies also own tower assets for use of their equipment and in NWC some of those entities include the State of New York, Town of Bedford, Village/Town of Mount Kisco and Westchester County. These facilities are primarily used for public safety equipment but some also host commercial wireless antennas.

Of the 106 wireless facilities in the study area, 81 are towers and 25 are base stations. Three of these structures are approved but not yet built, four are proposed and under review and seven are inquiries. Infrastructure in the one-mile perimeter is included as they may fully or partially provide wireless services to NWC. There are 17 towers and one base station located within the one-mile perimeter outside of the defined NWC borders.

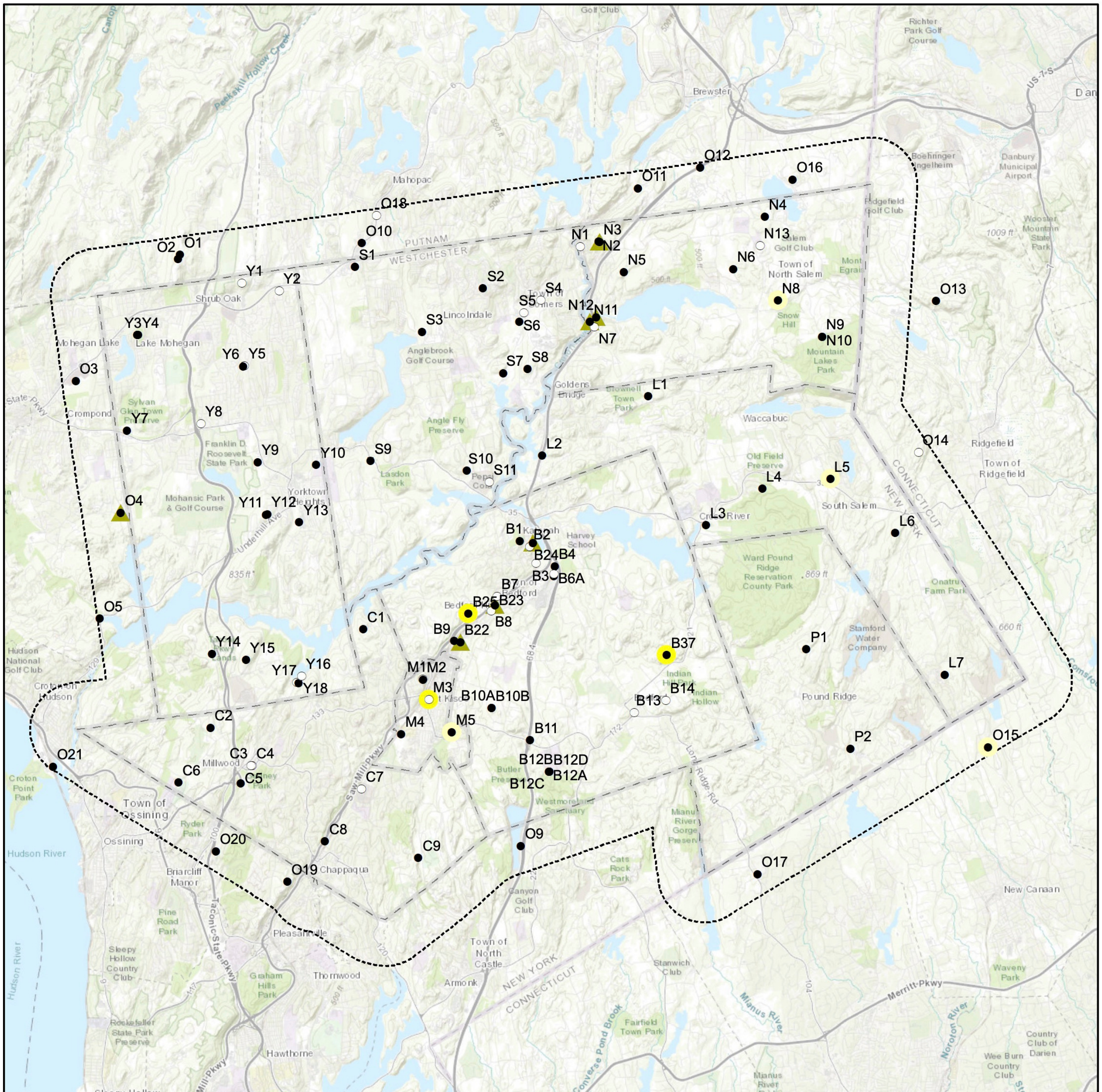
The following *Table 2* summarizes the overall inventory by structure type for each of the communities in the study area.

TOWERS	EXISTING	APPROVED NOT BUILT	PROPOSED UNDER REVIEW	INQUIRY	TOTAL
Westchester County	68	2	4	7	81
Bedford	11	2	0	3	16
Lewisboro	6	0	1	0	7
Mount Kisco	2	0	1	0	3
New Castle	6	0	0	0	6
North Salem	6	0	1	3	10
Pound Ridge	2	0	0	0	2
Somers	8	0	0	0	8
Yorktown	12	0	0	0	12
One Mile Perimeter	15	0	1	1	17
BASE STATIONS					
Westchester County	24	1	1	0	25
Bedford	7	0	0	0	7
Lewisboro	0	0	0	0	0
Mount Kisco	1	1	0	0	2
New Castle	3	0	0	0	3
North Salem	1	0	0	0	1
Pound Ridge	2	0	0	0	2
Somers	3	0	0	0	3
Yorktown	6	0	0	0	6
One Mile Perimeter	1	0	0	0	1
TOTAL	92	3	4	7	106

Table 2: Infrastructure Inventory by Structure Type by Community

The sites are further depicted in *Figure 1* and represented by the following colored dots:

● Towers ○ Base Stations



Northern Westchester County Inventory by: **County**

Cataloged Structure Type

- Tower (80)
- Base Station (26)
- Approved but Not Yet Built (3)
- Proposed and Under Review (4)
- Inquiry (7)
- City Boundaries
- 1 Mile Buffer

Sources: US Census Bureau, Cityscape Consultants, Inc, USGS

Map Created by Cityscape Consultants, Inc. on

Date: 6/21/2023

N

0 0.5 1 2 3 4 5 6 Miles

Figure 1: Wireless Facilities by Structure Type

ANTENNA TYPE

Wireless antenna types are referenced by their characteristics of functionality. The types referenced in this Plan are macro cell (macro), small wireless, public safety, broadcast and other. Personal wireless service facilities (PWSFs) are sites that have at least one commercial wireless provider and the antenna types are referenced as either macro wireless or small wireless antennas. Macro wireless facilities are high powered sites intended to cover sizeable geographic areas (typically within two to three miles of the tower) to service the largest number of network subscribers. Small wireless facilities have smaller antennas, are shorter in height and operate at less power than the traditional macro facilities. Small wireless facilities have a smaller coverage footprint (~500' radius) and are typically placed between macro facility sites to be used to "fill-in" areas. Small facilities can be attached to buildings, rooftops, utility poles, traffic signals or free-standing structures in public rights-of-way. These sites are routinely deployed in areas with large concentrations of network subscribers or in areas not conducive to macro facilities.

AT&T, Dish Wireless, T-Mobile and Verizon are the four personal wireless service providers deploying networks in the study area. Collectively these service providers are on the 71 existing facilities. Of those there are ten existing macro wireless facilities on public safety towers.

There are two approved but not yet built macro sites, four proposed and under review macro facilities, three macro cell inquiries and three small wireless facilities inquiries.

Nineteen existing facilities do not have any personal wireless equipment.

Table 3 categorizes the sites by all antenna type.

	NWC	ONE-MILE PERIMETER	TOTAL
ALL ANTENNA TYPE	88	18	106
Macro Wireless Facilities			
Existing	50	12	62
Approved Not Built	2	0	2
Proposed Under Review	3	1	4
Inquiry	2	1	3
Subtotal Macro Wireless	57	14	71
Small Wireless Facilities			
Inquiry	3	0	3
Subtotal Small Wireless	3	0	3
Public Safety and Macro Wireless Facilities			
Existing	6	4	10
Approved Not Built	2	0	2
Inquiry	0	0	0
Subtotal Public Safety and Macro	8	4	12
Public Safety Facilities			
Existing	16	0	16
Inquiry	1	0	1
Subtotal Public Safety	17	0	17
Other Type Facilities			
Existing	3	0	3
Subtotal Other	3	0	3

Table 3: Infrastructure Inventory by All Antenna Type

The all antenna type sites are further depicted in *Figure 2* and represented by the following colored dots:

● Macro Wireless ● Small Wireless ● Public Safety
● Macro and Public Safety ● Other

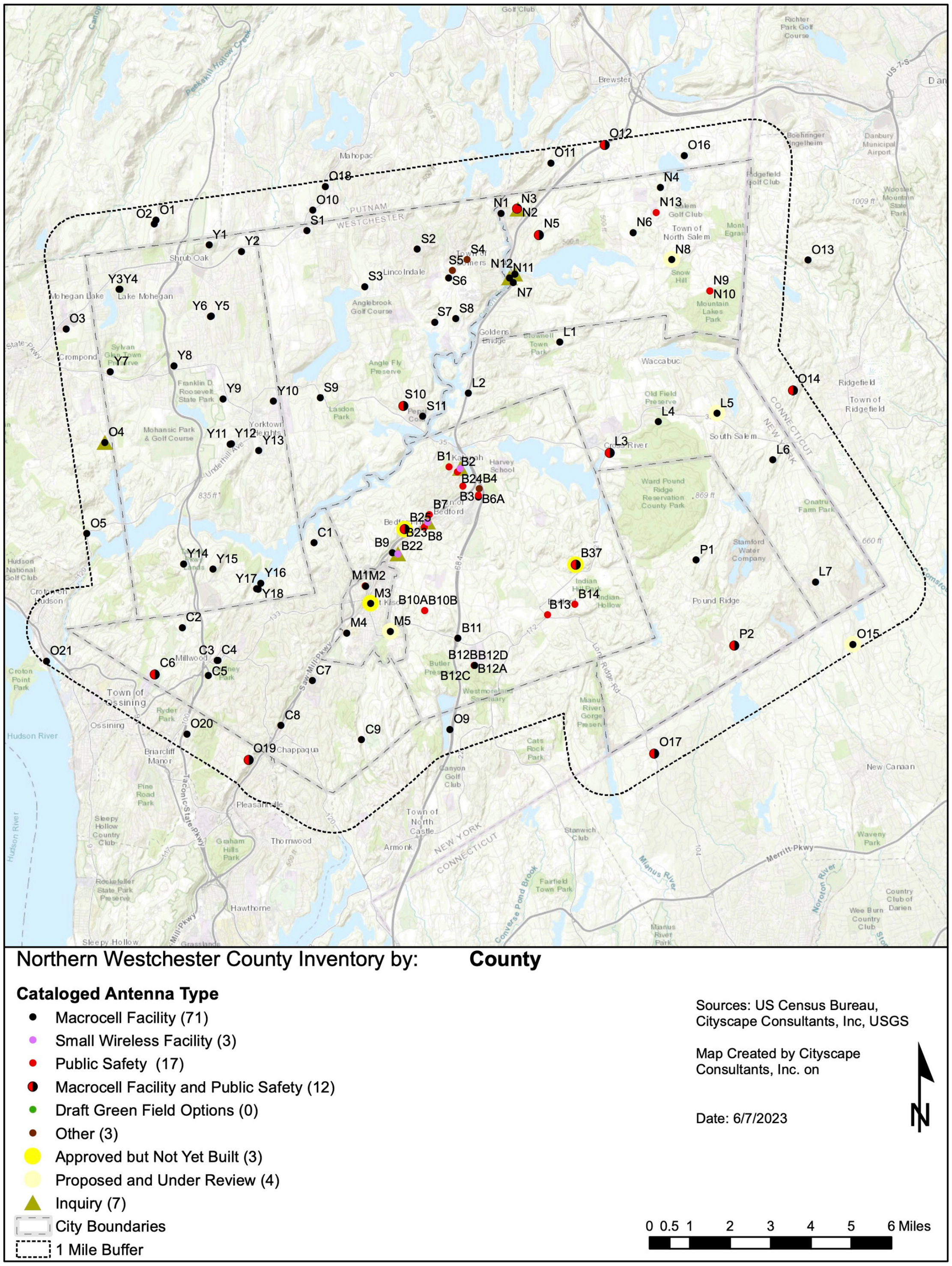


Figure 2: Wireless Facilities by All Antenna Types

The following *Table 4* summarizes the inventory by PWSF sites which are macro and small wireless facilities. *Table 5* itemizes these sites by community.

	NWC	ONE-MILE PERIMETER	TOTAL
PWSF TYPE	68	18	86
Macro Wireless Facilities			
Existing	51	12	63
Approved Not Built	1	0	1
Proposed Under Review	4	1	5
Inquiry	2	1	3
Subtotal Macro Wireless	58	14	72
Public Safety and Macro Wireless Facilities			
Existing	6	4	10
Approved Not Built	1	0	1
Subtotal Public Safety and Macro Wireless	7	4	11
Small Wireless Facilities			
Inquiry	3	0	0
Subtotal Small Wireless	3	0	3

Table 4: Infrastructure Inventory by PWSF Type

PWSF ANTENNA TYPE	EXISTING	APPROVED NOT BUILT	PROPOSED UNDER REVIEW	INQUIRY	TOTAL
Westchester County	73	3	4	6	86
Macro Wireless Facilities					
Bedford	5	2	0	0	7
Lewisboro	6	0	1	0	7
Mount Kisco	2	1	1	0	4
New Castle	9	0	0	0	9
North Salem	6	0	1	2	9
Pound Ridge	2	0	0	0	2
Somers	9	0	0	0	9
Yorktown	18	0	0	0	18
One-Mile Perimeter	16	0	1	1	18
Subtotal Macro	73	3	4	3	83
Small Wireless Facilities					
Bedford	0	0	0	3	3
Subtotal Small	0	0	0	3	3

Table 5: PWSF Infrastructure by Community

The following *Figure 3* illustrates all PWSF antenna types (macro and small wireless) and represented by the following colored dots:

● Macro ● Small Wireless Facilities

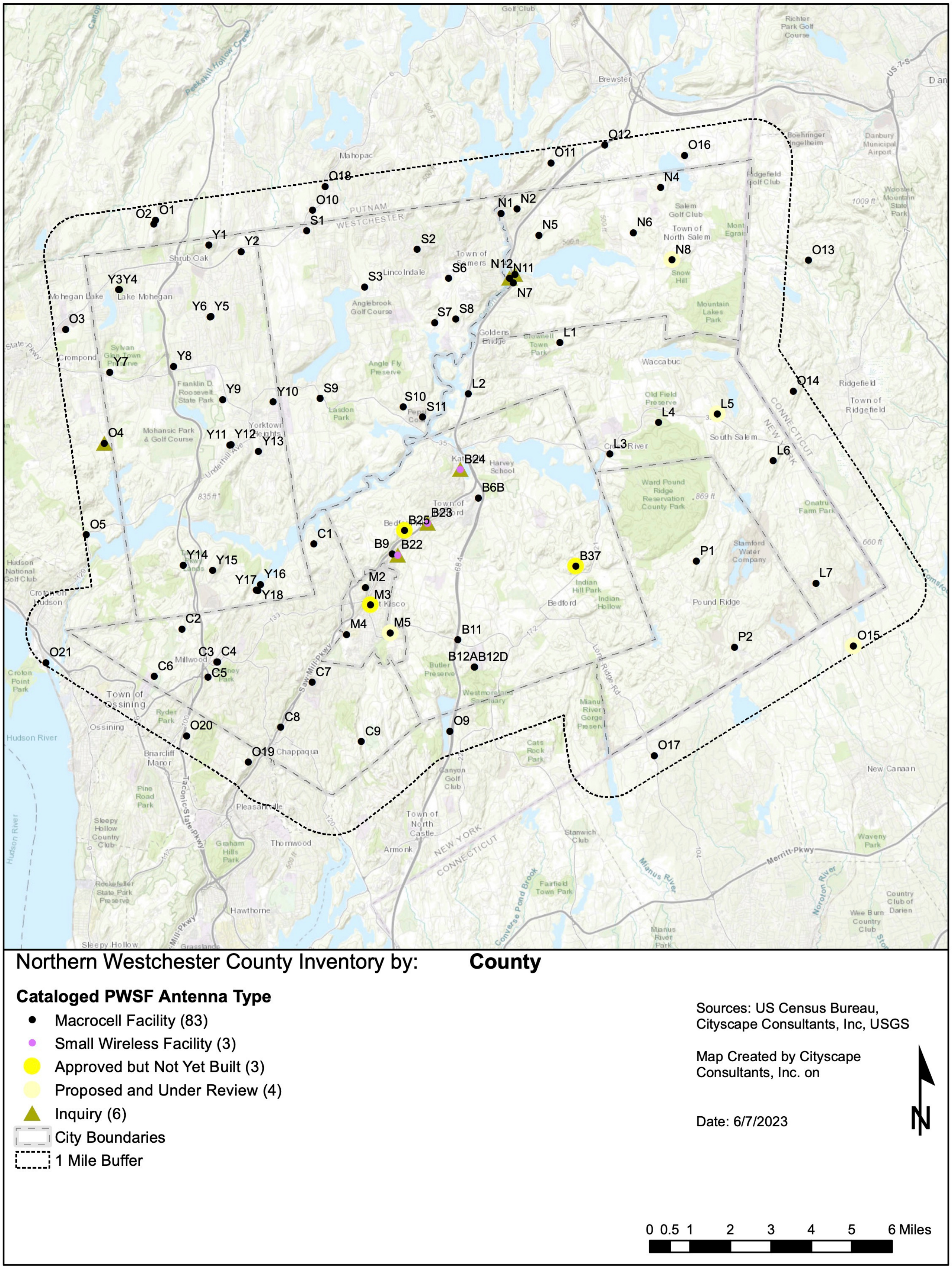


Figure 3: Wireless Facilities by PWSF Type

LOCATION

The location of a wireless facility is denoted as being located on either private or public property, in public rights-of-way (ROW) or in public utility easements. In the overall study area, 54 sites are on private property, 38 on public property, eight in utility easements and six in the ROW. Public property locations include: Westchester County, educational institutions, parks, public utility and waste facilities. Consolidated Edison (Con Ed) and New York Department of Transportation are examples of utility and rights-of-way locations.

The following *Table 6* summarizes the inventory by location.

		NWC	ONE-MILE PERIMETER	TOTAL
LOCATION		88	18	106
Public Property				
	Existing	29	3	32
	Approved Not Built	1	0	1
	Proposed Under Review	2	0	2
	Inquiry	3	0	3
	Subtotal Public Property	35	3	38
Private Property				
	Existing	35	12	47
	Approved Not Built	2	0	2
	Proposed Under Review	1	1	2
	Inquiry	2	1	3
	Subtotal Private Property	40	14	54
Inside Rights-of-Way				
	Existing	4	1	5
	Inquiry	1	0	1
	Subtotal ROW	5	1	6
Utillity Easement				
	Existing	8	0	8
	Subtotal Utility Easement	8	0	8

Table 6: Infrastructure Inventory by Location

The following *Table 7* summarizes the inventory by location and by community.

COMMUNITY	PUBLIC PROPERTY	PRIVATE PROPERTY	INSIDE ROW	UTILITY EASEMENT	TOTAL
Westchester County	38	54	6	8	106
Bedford	19	2	1	1	23
Lewisboro	3	3	1	0	7
Mount Kisco	3	2	0	0	5
New Castle	1	6	0	2	9
North Salem	3	9	1	0	13
Pound Ridge	0	2	0	0	2
Somers	2	7	2	0	11
Yorktown	4	9	0	5	18
One-Mile Perimeter	3	14	1	0	18

Table 7: Location of Infrastructure by Community

The following *Figure 4* illustrates all infrastructure inventory by location and represented by the following colored dots:

●Private Property ● Rights-of-way ● Public Property ● Utility Easement

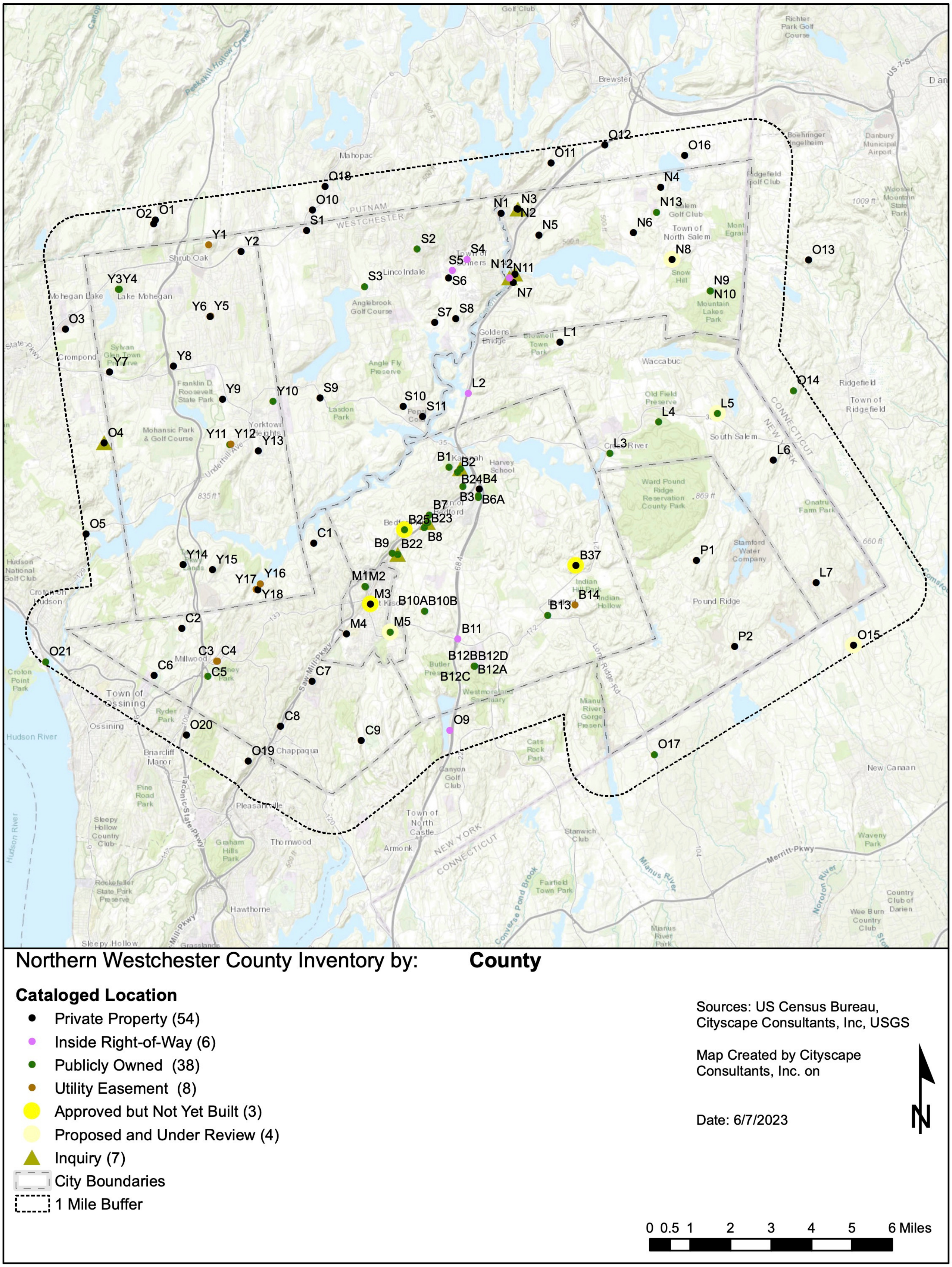


Figure 4: Wireless Facilities by Location

DESIGN TYPE

Wireless facility design types are categorized as either non-concealed, concealed or semi-concealed. Non-concealed facilities mean the antennas, cables, antenna mounts and ancillary equipment are exposed and visible. The most widely used design type is non-concealed and are monopole, guyed or lattice tower.

Concealed towers and base stations are designed to look like something other than a communication facility and/or be disguised to fit in with surrounding architecture and viewsheds. With concealed sites, all antenna, cables, antenna mounts and ancillary equipment are designed to be blend into the existing structure. On buildings the equipment is located inside enclosures, behind shrouds or radio frequency transparent panels. Semi-concealed is considered where the equipment is still visible but painted to blend with the surrounding environment.

Catalogued are a total of 76 non-concealed, 23 concealed and seven semi-concealed wireless facilities in the study area.

The following *Table 8* details the cataloged antennas by design type.

		NWC	ONE-MILE PERIMETER	TOTAL
DESIGN TYPE		88	18	106
Non-Concealed				
	Existing	58	13	71
	Approved Not Built	1	0	0
	Inquiry	3	1	4
	Subtotal Non-Concealed	62	14	76
Concealed				
	Existing	12	3	15
	Approved Not Built	1	0	1
	Proposed Under Review	3	1	4
	Inquiry	3	0	3
	Subtotal Concealed	19	4	23
Semi-Concealed				
	Existing	6	0	6
	Approved Not Built	1	0	1
	Subtotal Semi-Concealed	7	0	7

Table 8: Infrastructure Inventory by Design Type

The following *Table 9* summarizes the inventory by design type and by community.

COMMUNITY	CONCEALED	SEMI-CONCEALED	NON-CONCEALED	TOTAL
Westchester County	23	7	76	106
Bedford	3	2	18	23
Lewisboro	1	1	5	7
Mount Kisco	2	1	2	5
New Castle	1	3	5	9
North Salem	3	0	10	13
Pound Ridge	1	0	1	2
Somers	5	0	6	11
Yorktown	3	0	15	18
One-Mile Perimeter	4	0	14	18

Table 9: Infrastructure Design Type by Community

The following *Figure 5* illustrates all infrastructure inventory by design type and is represented by the following colored dots:

○Concealed ● Semi-Concealed ● Non-Concealed

Site Y2 Concealed

Site C7 Semi-Concealed

Site Y18 Non-Concealed

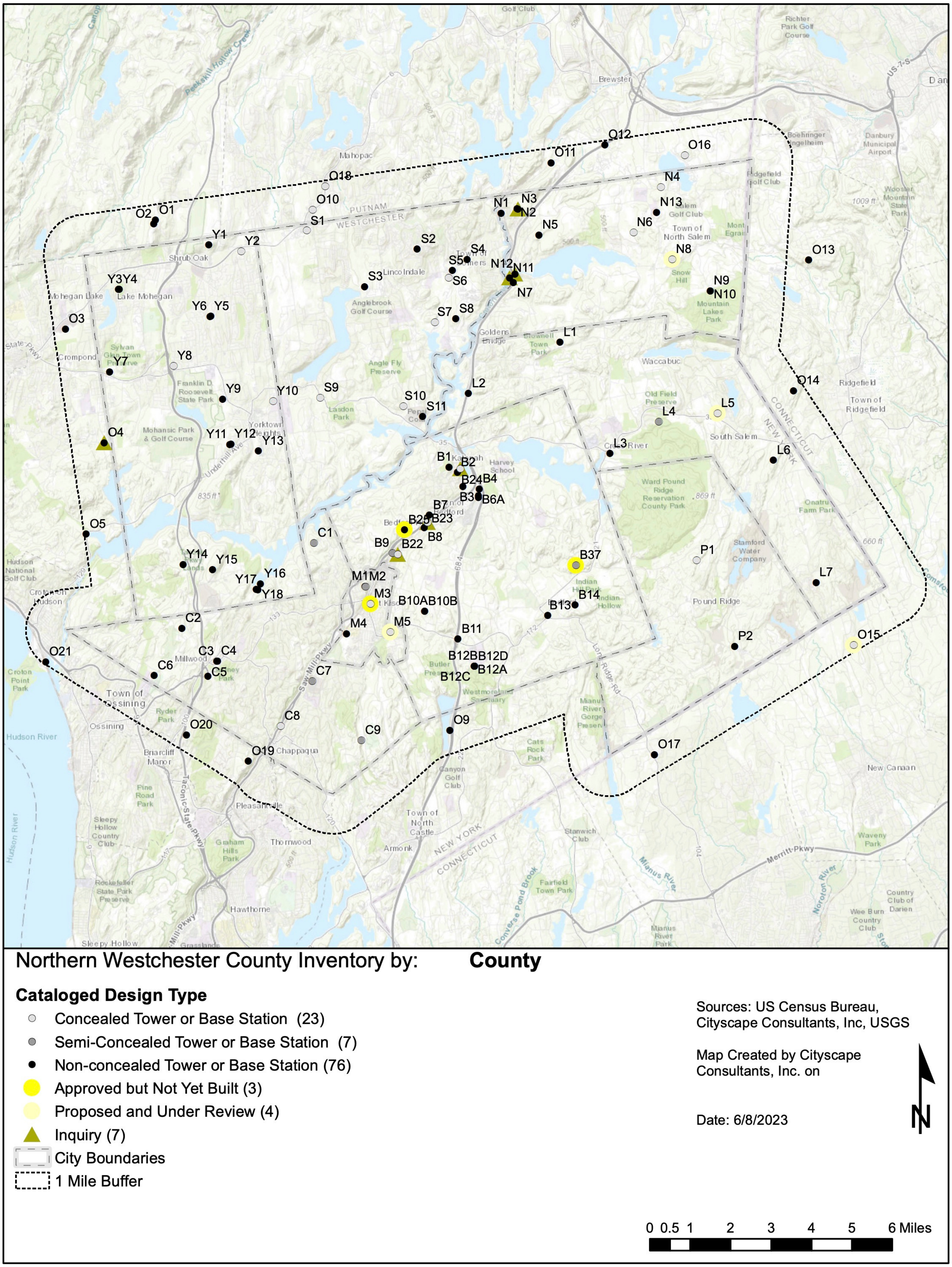


Figure 5: Wireless Facilities by Design Type

CHAPTER 2

WIRELESS OVERVIEW AND COVERAGE MAPPING

WIRELESS OVERVIEW

The current evolution of personal wireless technology is benchmarked by the underlying network platforms and referenced as first, second, third, fourth and fifth generations of wireless deployment (1G, 2G, 3G, 4G and 5G respectively). First and second generations provided the initial launch of personal wireless services. Third generation improved data transfer with the addition of multimedia messaging services, simple applications and games. Fourth generation substantially increased connection speeds which introduced Smartphones. This 4G platform has progressed to LTE as the industry transitions into full 5G technology. The concept of 5G and beyond is using existing bandwidth and new radio spectrum to enable more simultaneous reuse of the same channels and improve data speeds by using advanced antenna systems and other to-be-invented processes.

All wireless telecommunication networks operate using radio bands and frequencies on the wireless spectrum as shown in *Figure 6*. Radio bands contain the frequencies that are transmitted by wireless service providers. Radio frequency refers to a subset of electromagnetic energy, transmitted through an antenna, creating radio waves with a desired frequency and length. Frequency represents the number of waves passing by each second, while wavelength is the distance traveled per individual cycle of a radio wave.

Wireless technology discussed in the Plan refers to the radio frequencies that fall within the non-ionizing electromagnetic fields. Non-ionizing radio waves are not strong enough to directly affect the structure of atoms or damage DNA; however, it does cause atoms to vibrate which can cause them to heat up.[1]

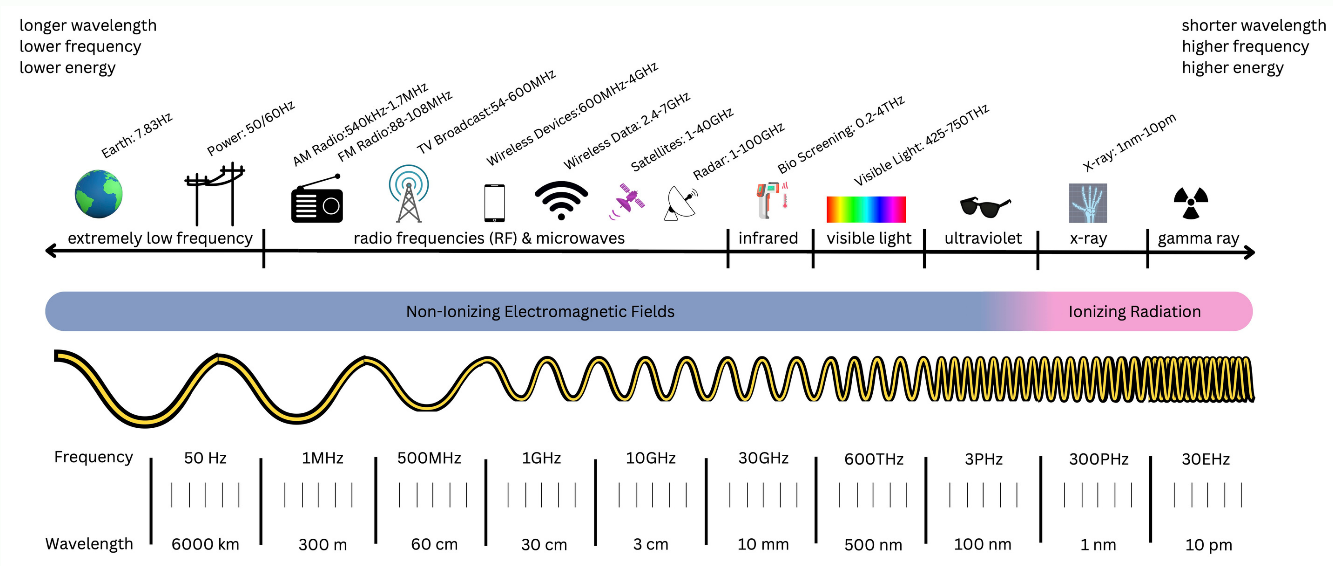


Figure 6: Frequency Wavelength Depiction

[1] www.EPA.Gov

The Federal Communications Commission (FCC) governs radio frequency emissions and sets the safety guidelines for all wireless devices and facilities.

Antennas mounted on towers and base stations transmit and receive the radio waves which provides signal to a designated geographic area. Wireless providers form their network with the connection of their antennas with the idea that subscribers can connect seamlessly. *Figure 7* details in simplistic form what a wireless network may look like and how a subscriber would connect. Each wireless service provider (AT&T, T-Mobile, Verizon, Dish) deploys, operates and maintains their own individualized network for their subscribing customers.

The wireless industry is rapidly upgrading existing 4G LTE equipment as it evolves into 5G infrastructure. The planned 5G standard is intended for true high-speed data. Currently almost all commercial wireless networks are operating within the mid-band frequencies and they are providing high bandwidth services through optimized software and hardware.

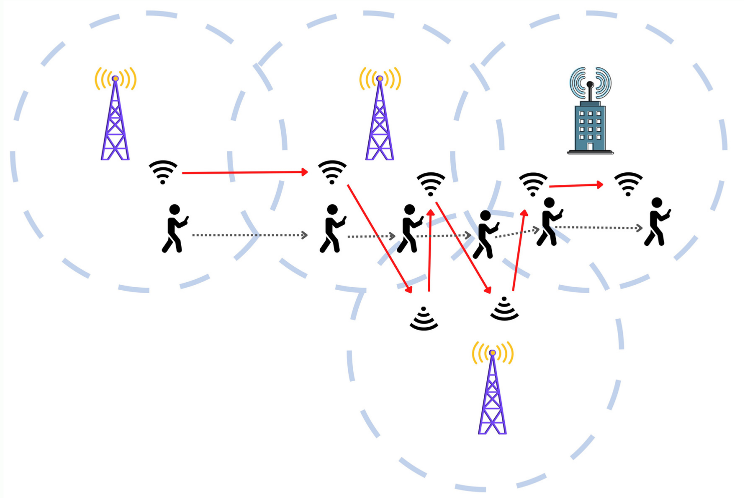


Figure 7: Simplified Wireless Network

The FCC, regulator for wireless services, continues to reallocate frequencies from other radio services to accommodate the evolving 5G technology. Frequencies previously unavailable or considered undesirable by the wireless industry are being tested and utilized for consumer wireless services. The 5G platform will continue to evolve over the next few years.

WIRELESS COVERAGE VARIABLES

There are different types of radio systems using different frequency bands and each have their pros and cons. FM radio is at the lowest end of the wireless spectrum in the VHF band and has the advantage of overcoming terrain and foliage losses better than UHF and the lower radio bands where consumer wireless services are licensed.

For example, the FCC contour map in *Figure 8* illustrates coverage of the FM radio transmitter on Site B6B. The radio station WWES 88.9 FM signal covers a large portion of NWC.

Another example is Land Mobile Radio (LMR) networks or public safety networks, which use VHF and UHF frequencies to provide first responders with two-way radio communications on handheld and mobile devices. This public safety network consists of antenna on taller towers operating at higher power levels than commercial wireless networks. For this reason, only a few public safety facilities are required to cover NWC with LMR service.

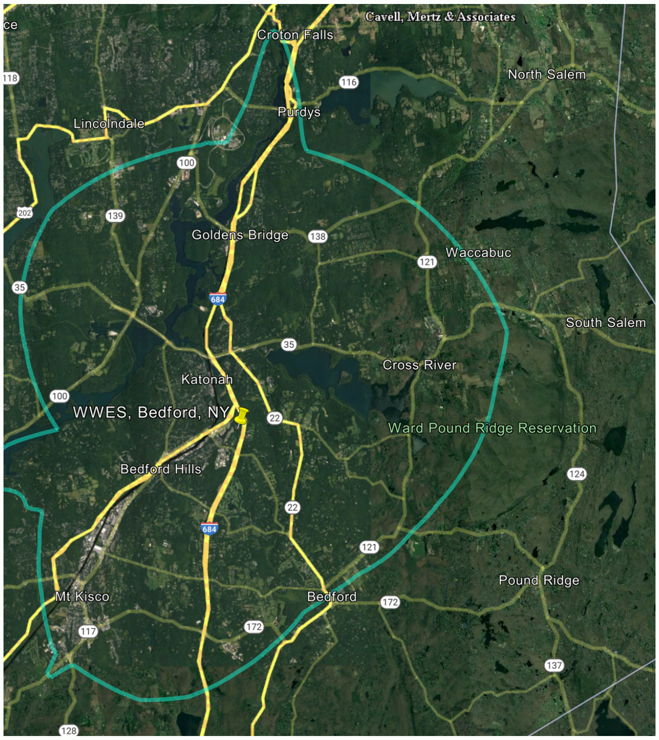


Figure 8: Contour Map Broadcast Coverage

Commercial wireless networks cover a smaller footprint than public safety and AM/FM broadcast networks. As indicated the low-band radio waves can travel greater distances.

The radio waves in mid-band frequencies penetrate buildings better and offer greater network capacity than compared to the low-band frequencies, but the distance the radio waves travel in this range, is limited and much shorter than the low-band.

In summary, operating frequencies used by commercial wireless providers have a variety of limitations and present radio frequency engineering challenges. For example, low-band antennas produce radio waves that provide coverages over a great distance but the signal has difficulty penetrating inside buildings. When compared to low-band, the mid-band frequencies deliver much faster throughput speeds, can enter buildings better and have greater capacity but cannot overcome terrain, are significantly impacted by foliage and provide coverages over a much shorter range. The transition to 5G service necessitates the need for higher-band frequencies above 6000 MHz (6 GHz) which provides significant increases in data transfer capability when compared to low and mid-band frequencies. However, high-band frequencies have a very limited transmission range from the antenna and the signal quickly deteriorates in foliage and terrain.

Geography and tree canopy are the most relevant reasons why there is limited wireless coverages throughout NWC. Heavily wooded regions with mature tree canopies along with hillsides in areas of NWC create terrain obstacles since leaves, trees and land mass absorb and scatter wireless signals. These factors limit the ability to cover distant residences and roadways necessitating wireless facilities in these areas for improved wireless coverages.

The following *Figure 9* demonstrates predicted radio coverage and shows how foliage is a major disruptive factor to wireless coverages. On the left is a 180' tower in the Town of Bedford (Site B6B) and on the right a residence .05 miles away on Harris Road just east of I-684. The signal path passes through free space without much loss before it has to traverse through approximately 100 feet of woods as well as a hillside. Both obstacles are enough to dramatically reduce the mid-band wireless signal levels. A list of limiting factors throughout all of NWC are as follows:

- Distance – Most towers are located in commercial zones or along highways which is quite a distance away from homes, leaving many residential areas without wireless coverages.

- Hillsides – There are rolling hills throughout all of NWC which creates terrain obstacles blocking wireless signals.

- Trees – Leaves on trees are significant absorbers and scatterers of UHF and microwave wireless signals, limiting the ability to cover distant areas. Chances are the coverages are better when the leaves have fallen from the trees during the winter months.

Figure 9: Signal Path From Tower to Residence

WIRELESS COVERAGE

Wireless coverage is a measure of the area around a wireless transmitter (antennas and ground equipment at a tower or base station) that has sufficient signal strength for use by wireless devices to operate. In order to determine where there are gaps in wireless coverages propagation maps are created. Propagation mapping is a process that simulates wireless coverage from individual antenna sites.

Signal strength, in this exercise, is a term used to describe the level and operability of a wireless device. The stronger the signal between the elevated antenna and the wireless device the more likely the device and all the built-in features will work as expected.

A low or reduced signal can cause unsatisfactory service, results in slow download or upload speeds and can cause dropped calls. The distance between the elevated antennas and the physical location of the person using the wireless device is one factor determining signal strength.

Other factors affecting signal strength are any natural or man-made obstructions such as location of buildings, type of building materials or vegetation that comes between the antenna and devices. The use of devices indoors or outdoors is also a factor when determining signal strength. Consider this much like a light bulb in a lamp; the further away you are from the lamp, the dimmer the light becomes and any obstructions in between you and the lamp dims or obscures the light, just like signal strength.

Currently most of the radio spectrum that wireless providers own is within the mid-band frequencies, providing high bandwidth services through optimized software and hardware. Therefore, the following modeling and coverages use this range of spectrum. The following analysis is predicted coverage from the three most prominent wireless service providers (AT&T, T-Mobile and Verizon) in the 1.7 to 2.5 GHz (1700-2500 MHz) mid-band frequency where wireless service providers own most of their spectrum holdings for prioritized 5G deployments.

The level of propagation signal strength is shown through the gradation of colors from yellow to blue. The geographic areas in yellow identify areas where signal strength can penetrate indoors. The areas in green equates to areas with average signal strength typically for outdoor and in vehicle service. Areas shaded in blue symbolizes signal strength that is considered for mostly outdoor use only and gray shaded areas indicate where there is marginal, spotty or no signal.

To further explain; the closer the proximity to the antenna the brighter shades of yellow appear indicating better quality of wireless services. As the subscriber approaches the outer edge of the yellow or into the blue area, the signal strength becomes more prone to degradation, particularly as usage in the area increases or environmental conditions worsen.

A quick reference of the shades and descriptions are as follows in *Table 10*.

SIGNAL STRENGTH COLOR	dBm	SIGNAL STRENGTH DESCRIPTION
Yellow	> -75	In Building
Green	-95	In Vehicle
Blue	-105	Outdoor
Gray or White		Marginal or No Service

Table 10: Signal Strength Description

COVERAGE MAPPING

The following propagation maps simulate coverages for wireless service providers operating throughout NWC. The maps were created using mid-band frequencies, assuming maximum operating power from each facility that currently contains personal wireless service equipment. It also considers a generic antenna model similar to those used by service providers and assumes each provider is located at the highest mounting height on each tower or base station represented.

This modeling assumption gives an estimation of the wireless coverages in NWC if each service provider was located on each facility. However not all service providers are on every facility, but the goal is to maximize the existing infrastructure already in place to accommodate the others.

Out of the total 106 wireless facilities in the study area only 76 are PWSF sites. *Figure 10* illustrates simulated propagation from these PWSF sites using the mid-band frequency spectrum (1700-2400 MHz) range and includes both macro and small wireless facilities. The map includes locations that are approved but not yet built and excludes sites to be removed, sites under review or sites identified as an inquiry.

Throughout NWC the lack of continuous shades of yellow indicates that in building network coverage is spotty or non-existent between existing PWSF sites. To achieve seamless wireless coverages the map would ideally show more yellow and far fewer areas with no coloration. This map however is not the best representation of the overall coverage because not all existing sites contain every service provider on each tower or base station. In reality individual provider maps have more gaps.

Of the 76 existing PWSF antenna locations only 28 of those facilities have all three of the major commercial providers on the same facility. A more realistic representation of the actual coverage patterns is shown in *Figures 11-gh* because these maps are individual simulated propagation for the three different wireless service providers. All the service providers have significant gaps in their individual coverage areas with the only remedy being collocation on existing facilities where available or adding new infrastructure where collocation is not available.

Overall, the existing wireless sites are not evenly dispersed and have an inconsistent deployment pattern leading to many gaps in wireless coverages. Most of the facilities are in clusters along the major transportation corridors attempting seamless coverage along the most travelled thoroughfares.

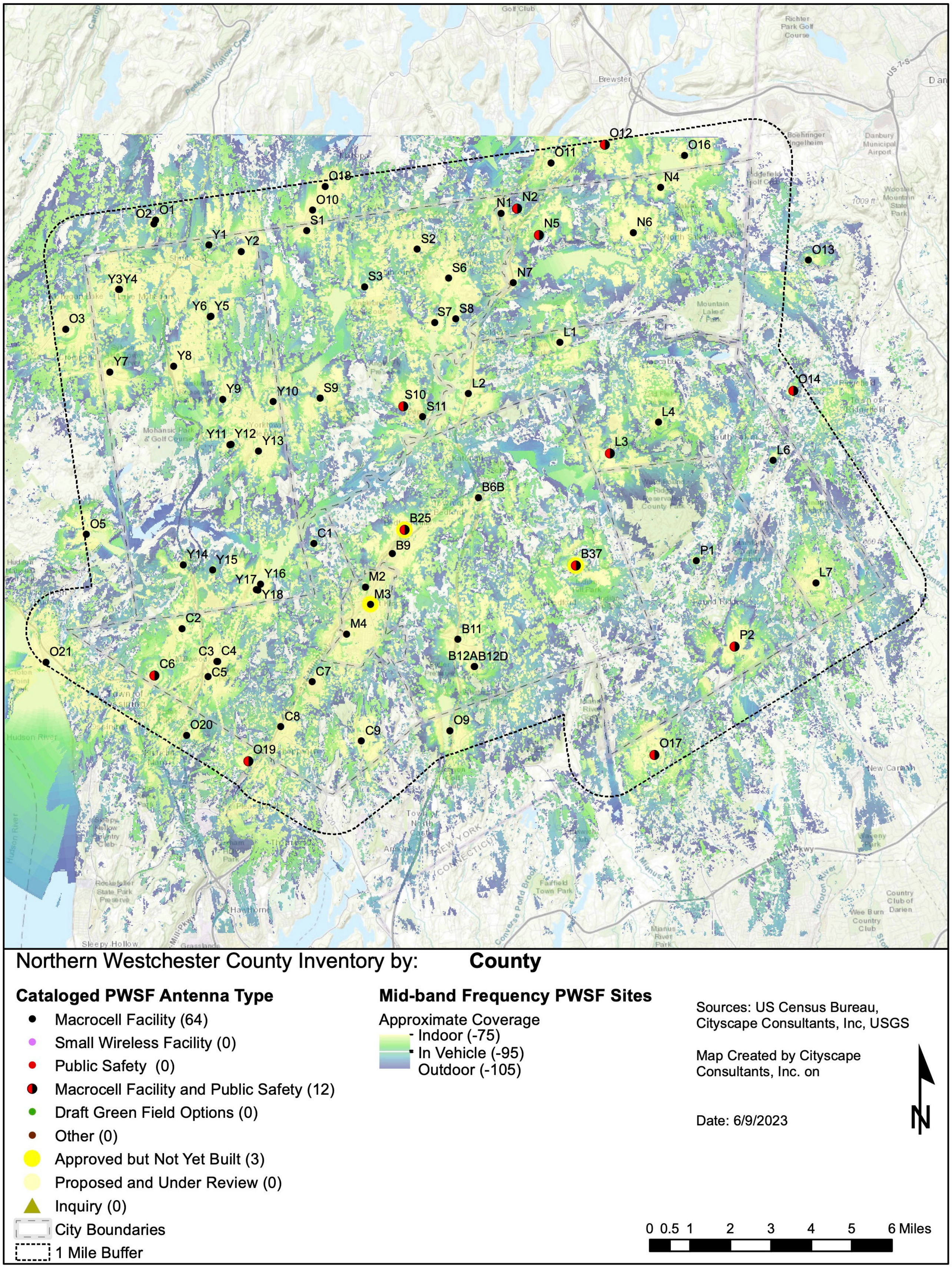


Figure 10: Simulated Coverage Map from PWSF Sites

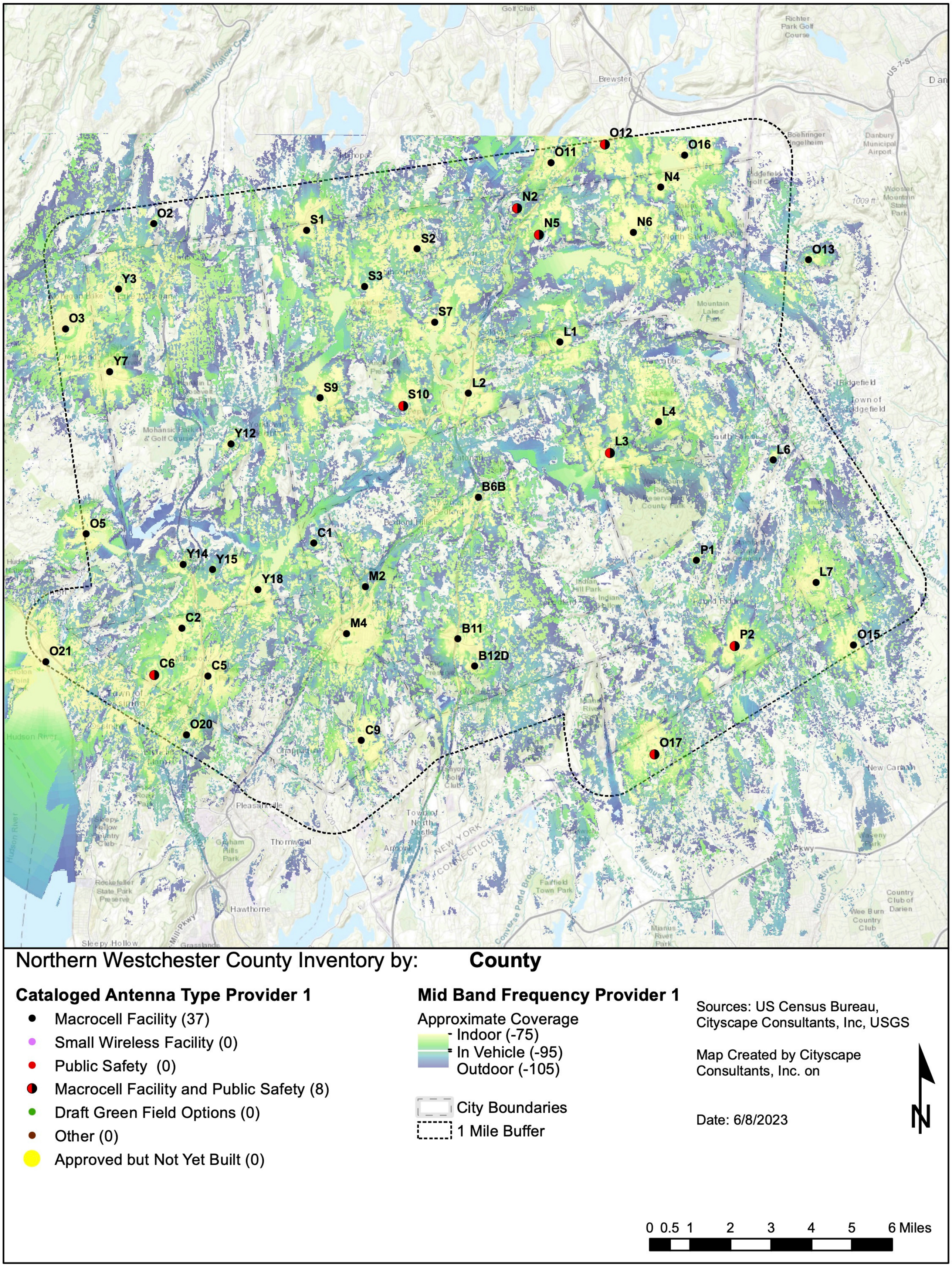
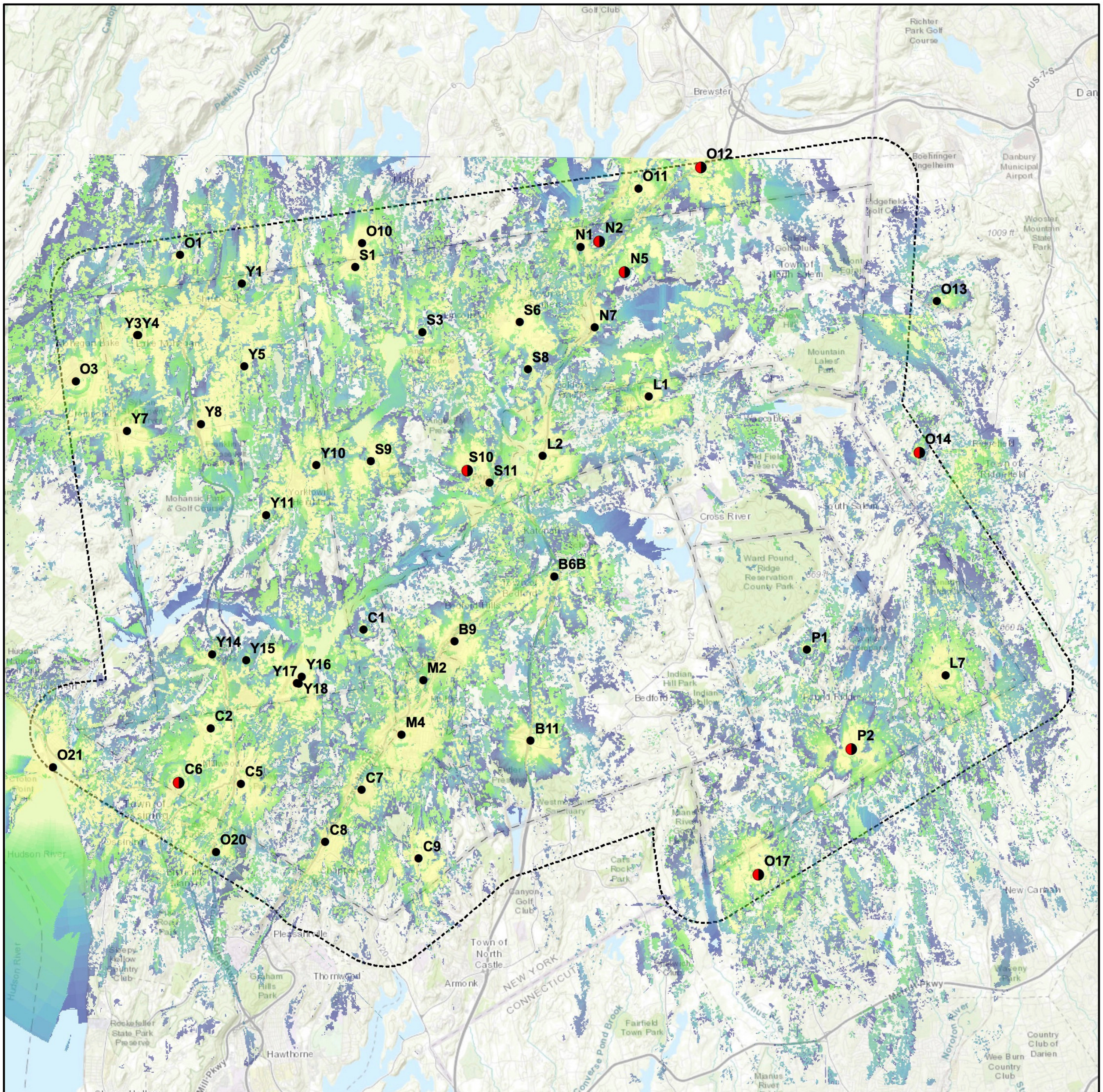


Figure 11: Simulated Coverage Map from Provider 1



Northern Westchester County Inventory by: **County**

Cataloged Antenna Type Provider 2

- Macrocell Facility (43)
- Small Wireless Facility (0)
- Public Safety (0)
- Macrocell Facility and Public Safety (8)
- Draft Green Field Options (0)
- Other (0)
- Approved but Not Yet Built (0)

Mid Band Frequency Provider 2

Approximate Coverage
- Indoor (-75)
- In Vehicle (-95)
- Outdoor (-105)

City Boundaries
1 Mile Buffer

Sources: US Census Bureau, Cityscape Consultants, Inc, USGS

Map Created by Cityscape Consultants, Inc. on

Date: 6/8/2023

N

0 0.5 1 2 3 4 5 6 Miles

Figure 12: Simulated Coverage Map from Provider 2

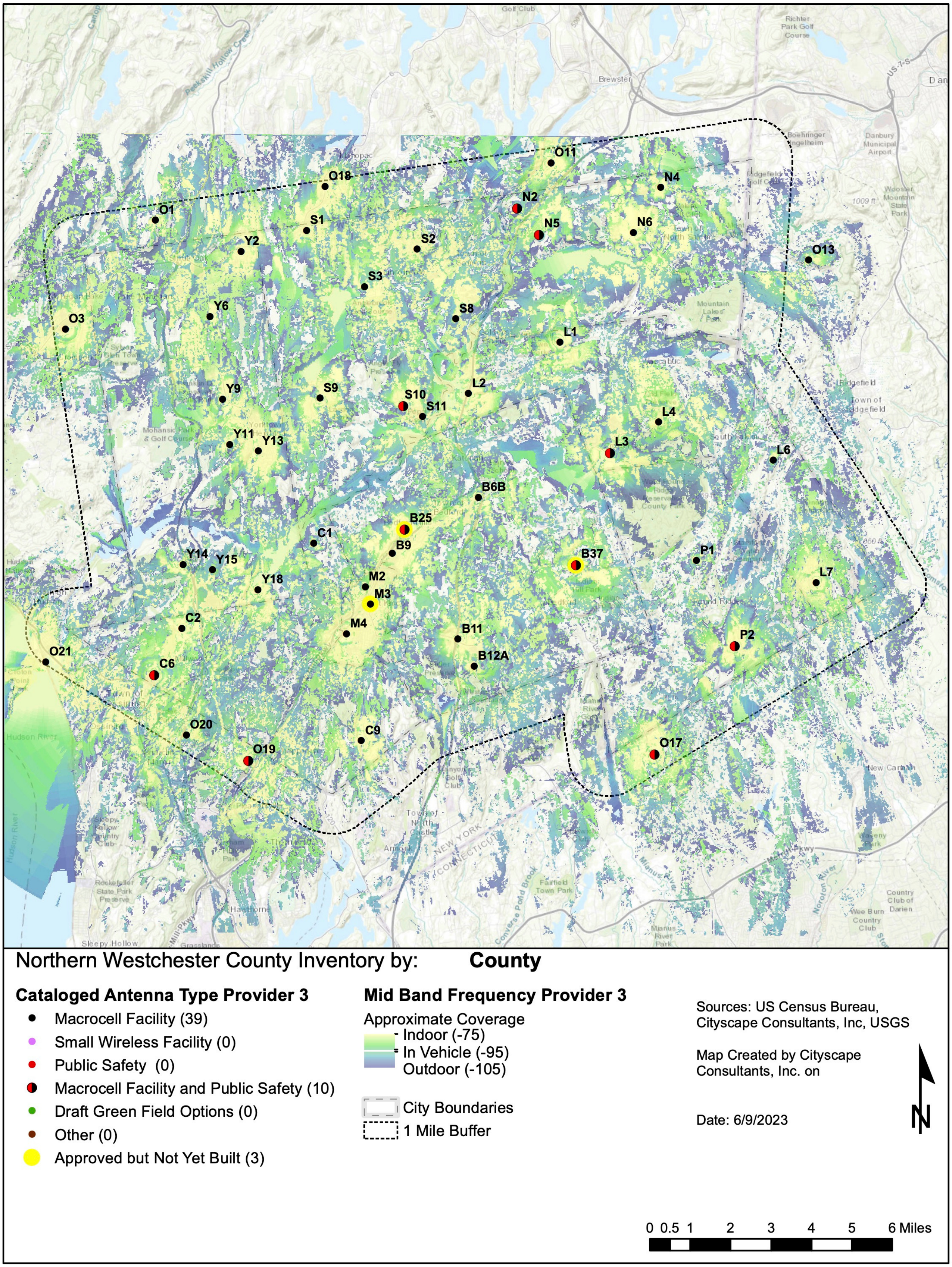


Figure 13: Simulated Coverage Map from Provider 3

MAPPING ANALYSIS

As illustrated on the previous propagation maps there are significant gaps of coverages throughout NWC. There is not a single major north/south thoroughfare with continuous coverage and each community has gaps along local roadways and large areas with no service at all. Ridgelines which run north and south throughout the area creates geographic barriers for wireless radio waves which cannot transmit through the hillsides.

The Taconic State Parkway has coverage along most sections in New Castle but the southern half of the corridor in Yorktown has minimal to no coverage. Coverage along the Saw Mill River Parkway from New Castle through Mount Kisco and Bedford is moderate with some small gaps. Interstate 684 has gaps throughout Bedford, between Somers and Lewisboro and northward through North Salem. Highway 104 (Long Ridge Road), Highway 137 (High Ridge Road), Highway 121 (Old Post Road) and Highway 22 (Salem Road) all have many portions with minimal to no wireless service areas making it very difficult for motorists to reach help in case of emergencies.

Similar issues and concerns are present parallel the east/west thoroughfares of Highway 172 (South Bedford Road), Highway 35 (Cross River Road) and Highway 138 (Waccabuc Road).

Site Y14 Ground Equipment

The following *Table 11* below summarizes the findings by community.

COMMUNITY	MAPPING ANALYSIS SUMMARY
Bedford	There are coverage gaps outside of the Saw Mill Parkway and I-684 corridors because there are great distances between existing sites creating poor hand-off. Additionally, Katonah has spotty coverage due to topography and distances between sites. Some antennas are mounted at elevations below the tallest ridgelines which is blocking the signal from going further.
Lewisboro	I-684 has good coverages but the rest of Town has no continuous coverage due to the lack of sites which are spaced too far apart.
Mount Kisco	Mount Kisco has the greatest coverage of all the communities due to the small amount of land area of the Village/Town and the number of existing wireless facilities. Gaps are shown in the southeast but those areas will be filled in once the approved and not yet built site is constructed and if the proposed and under review sites are approved and built.
New Castle	Swaths of north/south gaps between major transportation corridors are present because antenna mounting heights are lower than tallest topographic features and sites are spaced too far apart for the type of topography in this region.
North Salem	The topography is disrupting hand-off between sites and there is not a PWSF in Mountain Lakes Park. This is creating holes and gaps in coverage between the existing facilities.
Pound Ridge	Pound Ridge only has two existing sites within the Town's zoning jurisdiction resulting in the largest gaps of coverage in comparison to the other communities in NWC. It is also the least populated community and likely one reason the industry is not actively deploying more infrastructure in the Town.
Somers	Eastern and central parts of the Town have better coverage than the rest of the Town. The ridgelines between sites are creating signal blockage. Many sites in the one-mile perimeter just outside the Town provide considerable coverage.
Yorktown	Northern, eastern and southern areas of the Town have large areas with coverage and small gaps while the western side of the Town has large gaps with minimal areas of coverage. The public lands that parallel the Taconic State Parkway, the New Croton Reservoir and Franklin D Roosevelt State Park provide limited or no PWSF opportunities resulting in large gaps in these areas.

Table 11: Mapping Analysis Summary by Community

WIRELESS CAPACITY

Coverage is not the only consideration when designing wireless networks. Due to increasing wireless communication usage, network capacity is a crucial element for consideration in the overall Plan.

Wireless capacity refers to the amount of wireless traffic that a service providers' network can handle within a specific location at any given time. When discussing capacity, it is referencing the amount of bandwidth being used simultaneously by way of voice calls and data usage. With nearly all Americans owning a mobile phone, wireless communication plays a key role in keeping Americans safe during emergencies and natural disasters like hurricanes, northeasters, flooding, snow and ice storms.[2]

Determining areas with network capacity issues is difficult, however examining high usage areas is one way to estimate areas with capacity concerns. Vehicular traffic volumes and patterns are impactful when discussing network capacity because these areas can be high volume depending on the time of day, year and season. Service providers typically want to provide seamless coverage for their subscribers as they move throughout NWC therefore eliminating gaps along major transportation corridors and thoroughfares. Seamless coverage will also be necessary as the industry transitions further into future technological 5G wireless services.

Another way to determine potential capacity concerns of a network is to analyze population density as a variable. Wireless service providers want to deploy as close to their subscriber base as possible which is why higher density residential areas, employment centers, recreational facilities and transportation thoroughfares are ideal locations for infrastructure.

The map in *Figure 14* identifies the existing PWSF facilities as an overlay on top of the NWC population density by US Census Block Group. The darkest shades of brown represent US Census Block Groups with over 3,000 people per square mile and are the highest population densities in the study area. It is not surprising to view existing towers and base stations along the roadways and in the most densely populated areas of NWC. A few high-density areas without any facilities are identified in Yorktown and Somers indicating problematic areas. But most areas in NWC are low density residential land uses with 500 or fewer people per square mile. Deploying in these areas do not net a great return on investment from the industry which is one reason the industry is slow to deploy new facilities in the areas shown in light yellow.

[2] www.CTIA.org

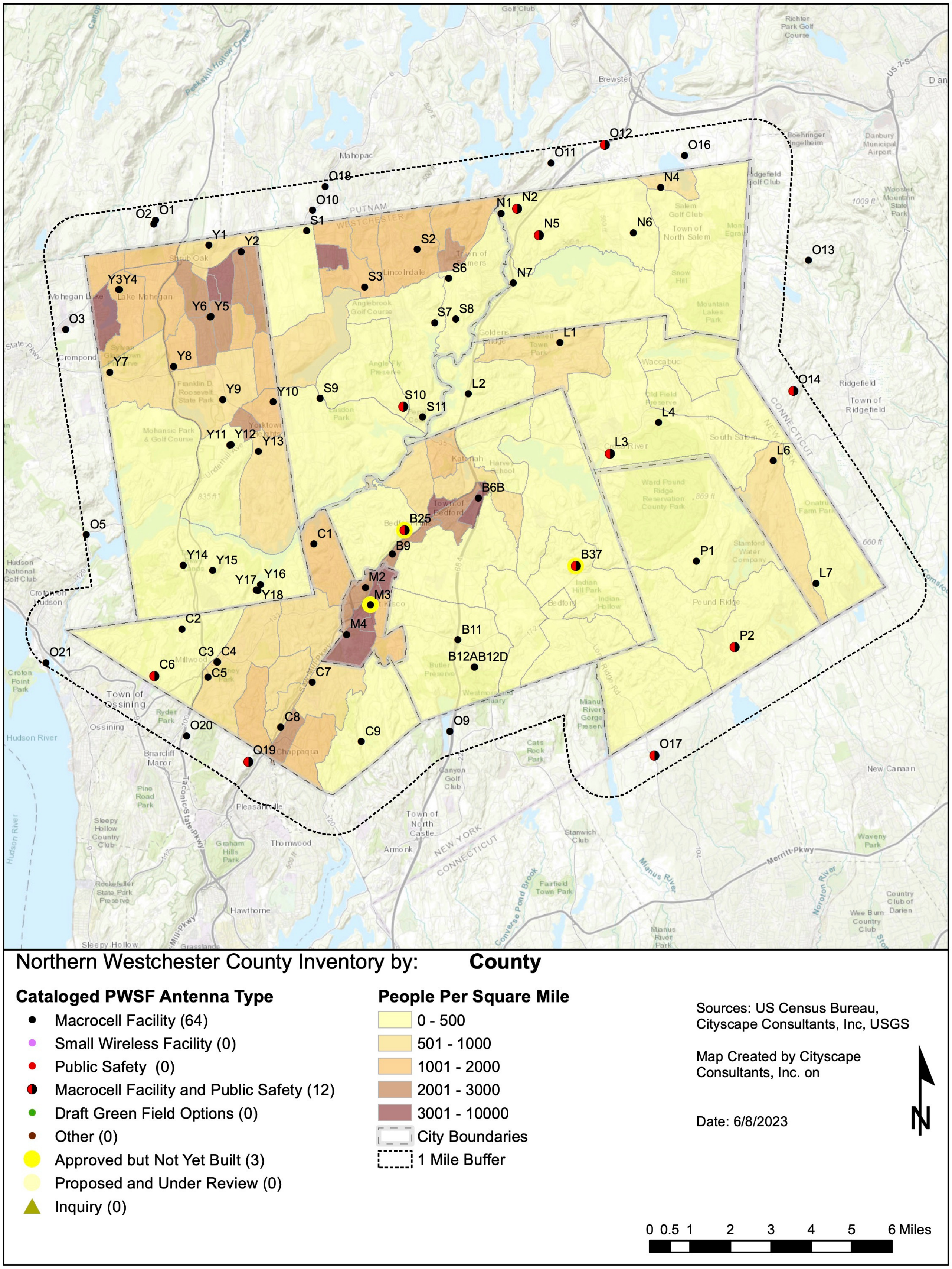


Figure 14: PWSF - Population Density with Wireless Faclities Overlay

NETWORK CAPACITY GAP ANALYSIS

Since each provider has their own usages, numbers and thresholds of need, it is difficult to accurately demonstrate network capacity. However, to best calculate and project the wireless facilities needed over the next ten years, network capacity needs to be taken into consideration. Therefore, people per household data from the US Census is compared to the existing facilities in an area and calculated to determine if there is a deficit of infrastructure. Heat maps are generated to illuminate which areas have the greater need for more infrastructure for anticipated network growth. Red and orange shaded areas are vicinities where the existing number of towers and base stations are proportionally insufficient to the number of existing households. Yellow and green shaded areas do not necessarily need immediate wireless densification (or the need for more sites), provided existing PWSFs inside those areas can accommodate collocations for other service providers. If collocation options are not available at the existing sites, then a wireless facility may be necessary to fill in that network gap.

It is noted that each wireless service provider’s needs are different, and this map is provided for illustration purposes only to showcase the needs throughout the different areas of NWC.

As indicated in *Figure 15*, any area void of yellow, green, orange or red colorings represents gaps in wireless coverage and areas with immediate need of personal wireless service facilities.

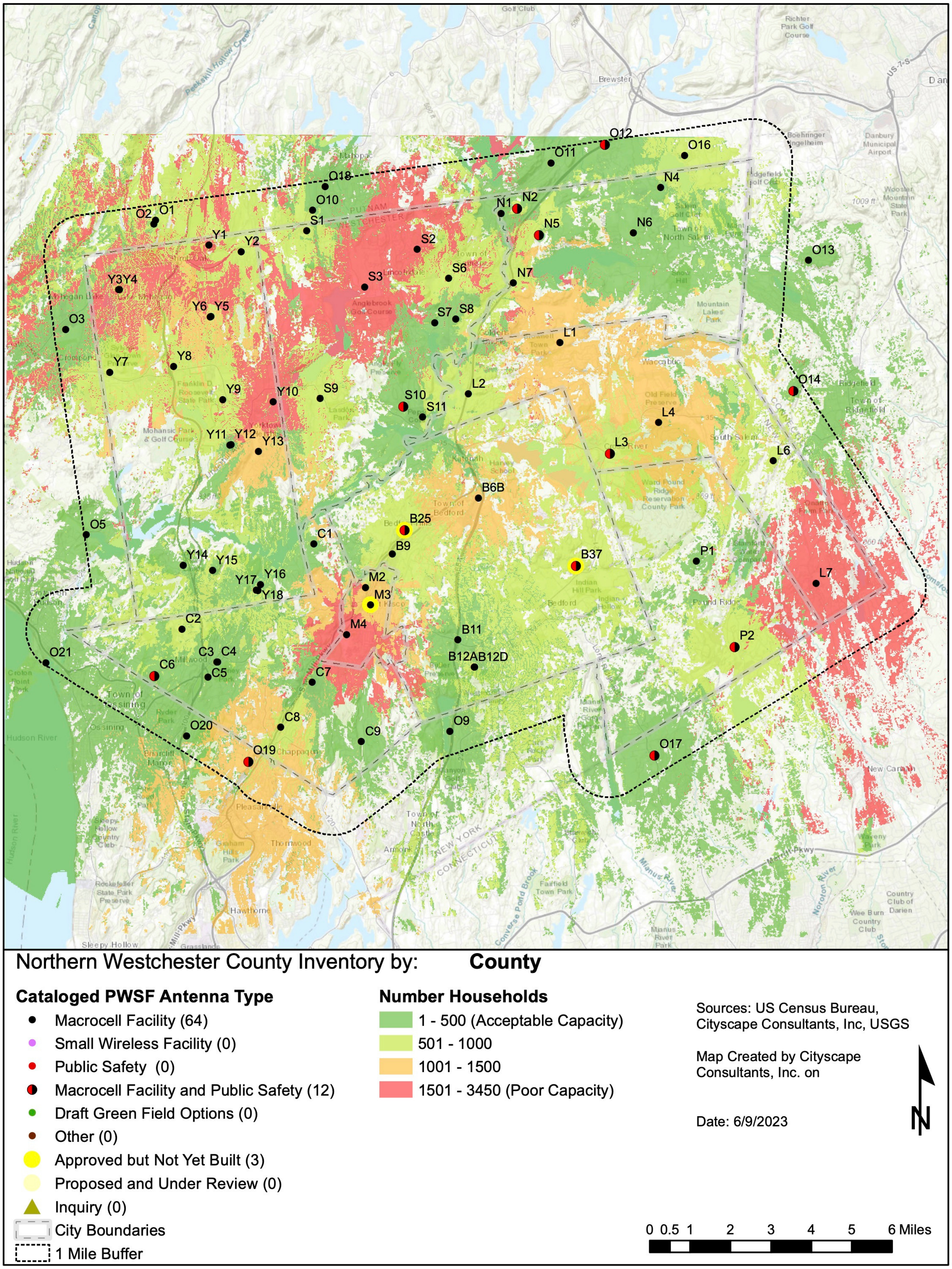


Figure 15: Heat Map Approximating Network Capacity Areas of Concern

LTE WIRELESS SERIVCE GAPS

Wireless service providers are going through, or will be going through the shutdown process of their 3G networks, which rely on older technology. This change ushers in more advance network services including 5G technology. AT&T began phasing out its 3G network in February 2022; T-Mobile completed the shut-down of Sprint's 3G CDMA network in March 2022 and T-Mobile's 3G UMTS network in July 2022; and Verizon anticipated turning off its 3G network by December 31, 2022.[3]

Long Term Evolution (LTE) is a 4G wireless communication standard currently used by wireless providers to offer voice and data services on mobile devices. LTE is a wireless network that is optimized to process a very high volume of data messages with minimal delay or latency. LTE and its successor 5G are both built on the same wireless technology platform that is designed to boost bandwidth efficiency needed for higher processing speeds.

The previous maps in *Figures 10-13* make assumptions that illustrates an overview of all providers at the highest mounting elevation, using maximum operating power. When designing LTE coverage there are standard thresholds or decibels used for LTE signal strength that differs from the propagations shown in the previous maps.

Decibels are used in radio engineering to best describe the signal strength variations between radio signals. Radio signals have strong levels nearest the transmitting antenna, but they reduce their intensity the further they are away. Much like the ripple on the surface of the water when a rock is thrown in a pond.

This makes describing radio signal values difficult in a linear fashion.

For example, many radio systems can tolerate signal degradations to 0.00000000000001% (or 10-16) of the original transmitter power. When this is expressed in decibels (10*log (linear value)) it is easier to describe the signal changes as 10-16, also known as -160 decibels.

[3] FCC "Plan Ahead for Phase out of 3G Cellular Networks and Service"

Signal power is typically described in units of dBm (decibels referenced to one milliwatt). A received signal level of -80 dBm usually provides excellent radio service, but represents only 10-11 of a watt (10-8 milliwatts). Typically, radio coverage maps will show various signal levels to represent fringe/marginal outdoor coverage at the lowest usable signal level up to signal levels that are strong enough to penetrate buildings and provide indoor wireless service from outdoor locations. Whereas a typical vehicle's glass will absorb or reflect 90% of the radio signal due to the metal impregnations for safety glass as well as for UV protection, creating a 10 dB loss, building walls and windows, particularly in modern, energy efficient buildings, can absorb and reflect over 99% (20+ dB of loss) of the incoming radio signals, which is why different thresholds for outdoor/fringe, in-car and in-building coverage are presented in coverage maps.

The minimum usable LTE coverage level is -115 dBm Reference Signal Received Power (RSRP). This level is useful for outdoor coverage only and too low to provide decent coverage indoors or in a vehicle. The typical minimum service level for outdoors is -105 dBm, which makes for reliable text, call and data sessions. Residential structures tend to lose 10-20 dB signal level indoors versus outdoors. Therefore, residential indoor service tends to require a minimum of -95 dBm RSRP which contains a 5 dB margin added to ensure reliable indoor services.

As an example the following *Figures 16, 17 and 18* are representations of simulated LTE coverage. Each of these figures use the following RSRP signal level as shown in *Table 12*.

SIGNAL STRENGTH COLOR	dBm	SIGNAL STRENGTH DESCRIPTION
Yellow	> -90	In Building
Green	-90 to -105	In Vehicle
Blue	-105 to -115	Outdoor

Table 12: LTE Signal Strength Description

When examining coverage to individual residences, the wireless coverage prediction tool considers buildings in NWC including residential structures.

In *Figure 16* the predicted modeling shows the residential area in green indicating most of the signal level is consistently above -105 dBm. The actual dwellings are represented in blue indicating the predicted signal levels are above the -115 dBm range. This concludes that although there may be moderate coverage outside the home there is minimal if any coverage inside the home.

Figure 16: LTE Residential Coverage Prediction

Figure 17 shows an area at the fringe of solid coverage where there is sufficient signal level for outdoor and in-vehicle services, but indoors shows very little solid or usable coverage as indicated by the brown or no color. The map background is an aerial photo, showing additional detail of the residential area.

Figure 17: LTE Residential Aerial Coverage Prediction

The following *Figure 18* is a depiction of simulated LTE coverage from all cataloged sites throughout NWC study area noticing the best coverages are from the areas closest to the existing tower or base station.

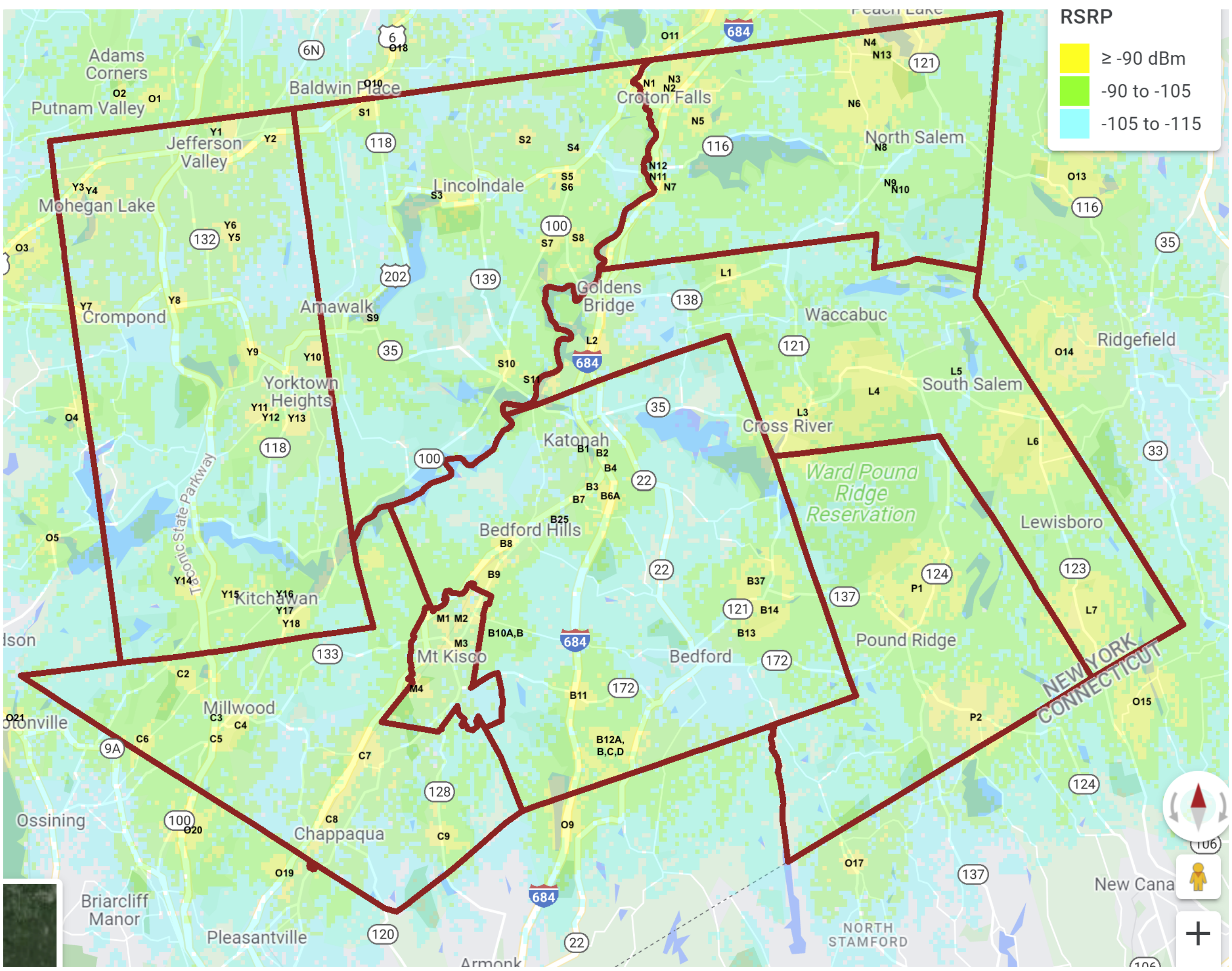


Figure 18: NWC Study Area Simulated LTE Coverage

POTENTIAL SOLUTIONS

The estimations in *Table 13* list each community and the number of new macro and small wireless facilities predicted for the next ten years. These projections are based on the analysis of US Census per household data, the total number of wireless facilities in the same geographic area, trends of the wireless industry and propagation of the suggested fill-in sites. The results are shown on the LTE solution maps for each community located in the Appendices of this Plan.

Both macro wireless facilities and small wireless facilities are suggested as solutions to fill in network gaps. The suggested facilities are as follows:

- Macro cell towers or base stations on commercial or public property at 80' to 130' in height. Most are contemplated on agricultural lands and public properties with the goal of shielding their view from residential areas.
- Small wireless facilities on approximately 50' existing utility poles along most of the roadways in NWC. The assumption is that small wireless antenna can be added to the top of existing utility poles or the pole can be replaced to accommodate the antenna.

There are no new facilities suggested in open space or sparsely populated areas that have some outdoor coverages since these are considered low priority locations by the wireless industry.

COMMUNITY	PROJECTED MACRO	PROJECTED SMALL	TOTAL
Westchester County	36	118	154
Bedford	8	34	42
Lewisboro	6	7	13
Mount Kisco	3	0	3
New Castle	5	26	31
North Salem	1	6	7
Pound Ridge	4	6	10
Somers	6	16	22
Yorktown	5	23	28

Table 13: Estimated Ten-Year Projections by Community

CHAPTER 3

COMMUNITY SURVEY

COMMUNITY SURVEY

Community involvement and participation was highly promoted through public meetings and on-line surveys. The main objective was to solicit information from citizens in each community regarding thoughts, concerns, and preferences of wireless infrastructure facilities. Opinions gathered from the survey pertaining to wireless connectivity, aesthetics and placement of future infrastructure can be used to guide public policies for future wireless deployments. *Table 14* provides the dates for the survey in each community and the total responses.

COMMUNITY	START DATE	END DATE	TOTAL RESPONSES
Westchester County	July 28, 2021	July 26, 2022	4002
Bedford	February 15, 2022	March 23, 2022	655
Lewisboro	July 28, 2021	September 7, 2021	477
Mount Kisco	October 7, 2021	December 16, 2021	119
New Castle	June 23, 2022	July 26, 2022	475
North Salem	October 29, 2021	November 16, 2021	307
Pound Ridge	September 1, 2021	September 26, 2021	365
Somers	September 8, 2021	October 25, 2021	671
Yorktown	July 29, 2021	September 8, 2021	933

Table 14: Community Survey Dates and Number of Respondents

The survey was offered in English and in Spanish in the Village/Town of Mount Kisco and the Town of Bedford. Collectively there were a total of 4,002 unique responses.

On average, those who participated in the survey have six wireless devices (cell phone, tablet, watches etc.) in their household that rely on wireless services for functionality. These devices are used primarily for either recreational/leisure, personal and/or employment purposes. Additionally, wireless devices are used to access telehealth, medical devices and/or educational learning. Verizon has the most subscribers of the participants and just over half of the respondents use network extenders to booster their network signal.

Less than ten percent indicated they have excellent wireless coverage at their residence with the majority identifying service as poor. Poor or inconsistent service while traveling throughout the study area was reported at 61%. Eighty-eight percent entirely agreed the quality of wireless service is important to them and 61% indicated they would rely more on their device if the network was better.

Overall respondents support taller towers that can accommodate multiple collocations; concealed towers, base stations, and small wireless facilities over non-concealed towers and 52% support the use of public property for wireless infrastructure as a revenue source for the community and method to control aesthetics and long-term maintenance of the infrastructure.

The most notable observation of responses are as follows:

Use of Devices

- 85.84% - Personal, Recreation/Leisure
- 63.33% - Employment Related
- 61.64% - Personal Use & Employment
- 48.64% - Smart Devices
- 45.60% - Telehealth
- 44.12% - Educational
- 11.93% - Medical Devices
- 0.13% - Do Not Own a Wireless Device

Personal Wireless Service Provider

- 29.31% - AT&T
- 12.71% - T-Mobile/Sprint
- 63.26% - Verizon
- 03.0% - Other

Wireless Coverage at Residence

- 08.70% - Excellent
- 34.33% - Acceptable
- 36.65% - Poor
- 19.26% - Inconsistent
- 01.04% - Not Applicable

Wireless Coverage at Work

- 35.37% - Excellent or Acceptable
- 32.60% - Poor or Inconsistent
- 32.83% - Not Applicable

Wireless Coverage Traveling Around NWC

- 37.18% - Excellent or Acceptable
- 61.88% - Poor or Inconsistent
- 00.93% - Not Applicable

Network Extender (Booster)

- 56.65% - No
- 43.35% - Yes

What is Most Important

- 56.24% - Excellent Connectivity
- 38.71% - Good Connectivity & Minimal Visual Impact
- 01.20% - Aesthetics
- 03.80% - Worse Service for Less Infrastructure

Would Rely More on Device if Network Services were better

- 61.90% - Entirely Agree

Quality of Wireless Service is Important

- 87.64% - Entirely Agree

Height Preference

- 44.64% - Taller with Multiple Collocations
- 33.84% - Shorter but More
- 22.54% - No Preference

Design Type Preference

- 62.09% - Non-Concealed Monopole
- 70.11% - Concealed Flagpole
- 78.65% - Concealed Rooftop
- 89.99% - Concealed Small Wireless Facilities in ROW

Location Preference

- 60.88% - Anywhere

Support the Use of Public Property for Revenue and Aesthetic Control

- 52.18% - Yes

CHAPTER 4

FEDERAL AND STATE REGULATIONS

FEDERAL REGULATIONS

Local government agencies are allowed to regulate personal wireless service facilities as a permitted land use provided local code aligns and does not exceed federal regulations already in place for the industry to follow.

Local codes and land development standards can address concerns related to: proximity of infrastructure to other land uses, zones and scenic viewsheds; visual concerns related to location, height and pedestrian views of a structure's height and ground equipment; setbacks outside rights-of-way; fencing; signage; parking, and certain lighting types.

The Telecommunication Act of 1996 preserves local siting authority but contains several provisions that require municipalities to follow federal restrictions. Subsequent congressional legislation and federal regulations adopted by the Federal Communications Commission (FCC) provides definitions and timelines referenced as "shot clocks" that state and local governments must follow when regulating wireless infrastructure.

Telecommunication Act 1996 Section 704(a) (47 U.S.C. § 332(c) (7))

The Federal Telecommunications Act of 1996 includes Section 704(a) (47 U.S.C. § 332(c) (7)) and preserves local governments the authority to regulate wireless infrastructure. Section 704 states in relevant part that:

- Land use development standards may not unreasonably discriminate among the wireless providers and may not prohibit or have the effect of prohibiting the deployment of wireless infrastructure.
- Local governments must act on applications for new wireless infrastructure within a "reasonable" amount of time.
- Land use policies may be adopted to promote the location and siting of telecommunications facilities in certain designated areas.
- Encourages the use of third-party professional review of site applications.
- Prohibits local government from denying an application for a new wireless facility or the expansion of an existing facility on the grounds that radio frequency emissions are harmful to human health so long as the wireless service provider meets federal standards.

(47 USC § 1455) Section 6409(a) Middle Class Tax Relief and Job Creation Act of 2012

Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, referenced as the "Spectrum Act" was enacted by Congress to promote wireless deployments of broadband for public safety and commercial purposes. As stated in the Spectrum Act,

> "…a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station."

After much debate between the wireless industry and local government the FCC issued a response clarifying definitions and meaning to the Spectrum Act in a Report and Order released October 21, 2014 in W.T. Docket 13-238.

The **2014 Report and Order,** clarified the Spectrum Act stating:

> "[n]ot withstanding section 704 of the Telecommunications Act of 1996 or any other provision of law, a state or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station."

Several other subsequent Report and Orders have since been vetted and approved by the FCC and the regularity definitions and shot clocks are provided in the Code of Federal Regulations: Title 47, Chapter I, Subchapter A, Part 1, Subpart U Titled State and Local Government Regulation of the Placement, Construction and Modification of Personal Wireless Service Facilities.

Code of Federal Regulations Reasonable Time Periods to Act on Siting Applications

When an applicant requests a modification, a state or local government may require the applicant to provide documentation or information only to the extent reasonably related to determining whether the request meets and does not exceed the definitions and requirements for collocation or modification. A state or local government may not require an applicant to submit any other documentation, including but not limited to documentation intended to illustrate the need for such wireless facilities or to justify the business decision to modify such wireless facility.

The shot clock date for a siting application is determined by counting forward, <u>beginning on the day after the date when the application was submitted</u>, by the number of calendar days of the shot clock period and including any pre-application period asserted by the siting authority, provided, that if, the date calculated in this manner is a "holiday" or a legal holiday within the relevant state or local jurisdiction, the shot clock date is the next business day after such date.

The presumptively reasonable periods of time for PWSF applications is as follows in *Table 15* unless mutually agreed upon in writing.

INSTALLATION TYPE	TIME PERIOD FOR DECISIONS	REVIEW AND INITIAL TOLLING PROCESS	RESUBMISSION APPLICATIONS TOLLING PROCESS FOLLOWING A NOTICE OF DEFICIENCY
Small Wireless Facilities (SWF)			
New SWF Structure	90 Days*	10 days after submission to determine if application is incomplete and to specifically identify missing information including specific rule or regulation creating the obligation	If incomplete, the shot clock date calculations restart at zero on the date on which the applicant submits all the documents and information identified by the siting authority to render the application complete. If still an incomplete application, then the review and tolling process continues until application is deemed complete.
Collocation Existing SWF Structure	60 Days*		
Macro Wireless Facilities			
New Macro Facility Structure	150 Days**	30 days after submission to determine if application is incomplete and to specifically identify missing information including specific rule or regulation creating the obligation	If incomplete, the shot clock date calculations restart where it left off in the count the day after applicant submits all the documents and information identified by the siting authority to render the application complete. Ten days after that if still an incomplete application, then review and tolling process continues until application is deemed complete.
Collocation Existing Macro Facility Structure	90 Days**		

*In the event the reviewing authority fails to approve or deny a request seeking approval, under the shot clock stipulations the request shall be deemed granted. The deemed granted does not become effective until the applicatant notifies the applicable reviewing authority in writing after the review period has expired (accounting for any tolling) that the application has been deemed granted.

**In the event of FCC shot clock expiration for a new macro facility or collocation on an existing PWSF, the applicant is entitled to bring an action in federal court seeking to compel the jurisdiction to grant the permit, which the court is supposed to hear on an expedited basis. The community faces a rebuttable presumption that it violated 47 USC §322 by failing to timely adjudicate the application. The community can then defend and explain why it was unable to do so within the allowable timeframes.

Table 15: Federal Shot Clock Timelines

STATE REGULATIONS

In New York, wireless providers are afforded the status of public utilities for the purposes of zoning applications (Cellular Tel. Co. v. Rosenberg, 82 N.Y.S. 2d 364 (1993)), so the traditional use variance standards do not apply. An applicant seeking a use variance for a cell tower therefore need not show an unnecessary hardship or that the subject property will not yield a reasonable return for any permitted use in the zoning district.

Rather, their applicants are reviewed under the "public necessity" standard established in Consolidated Edison Co. v. Hoffman, 43 N.Y.2d 598 (1978). This standard provides that "[r]ather than granting a variance only on a showing of 'unnecessary hardship,' a local zoning board must consider whether the public utility has shown 'a need for its facilities' and whether the needs of the broader public would be served by granting the variance." Cellular Telephone Co. v. Town of Oyster Bay, 166 F.3d__, 490, 494 (quoting Consolidated Edison Co. v. Hoffman, 43 N.Y2d at 608-10,). This has been interpreted in the context of zoning decisions for telecommunications facilities to require that "[a] telecommunications provider that is seeking a variance for a proposed facility need only establish [1] that there are gaps in service, [2] that the location of the proposed facility will remedy those gaps, and [3] that the facility presents a minimal intrusion on the community". Site Acquisitions, Inc. v. Town of New Scotland 2 A.D. 3d 1135 (3d Dep't 2003); see also Omnipoint Comm'ns, Inc. v. City of White Plains, 430 F.3d 529, 535 (2d Cir. 2005); New York SMSA Ltd. Partnership v. Vil. of Floral Park Bd. of Trustees, 812 F. Supp. 2d 143, 154 (E.D. N. Y. 2011).

The burden of proof for necessity is on the applicant. The utility must show more than the location it has selected will enable it to render cheaper service or that the location is appropriate and the need for the installation is great. Long Island Lighting Co. v. Incorporated Village of East Rockaway, 279 App. Div. 926, 110 N.Y.S. 2d __ (1952), aff'd, 304 N.Y.S. 932 (1953); New York State Elec & Gas Co. v. McCabe, 32 Misc. 2d 898, (N.Y. Supp. Ct. 1961) 224 N.Y.S. 2d 527. It must be demonstrated that the proposed site is necessary to enable the company to render safe and adequate service, and that no alternative sites are available which could be used with less disruption of the community's zoning plan. Niagara Mohawk Power Corp. v. City of Fluton, 8 A.D.2d 523, 188 N.Y.S. 2d 717 (4th Dep't 1959); Video Microwave, Inc. v. Zoning Bd. of Appeals of Town of Lewisboro, 77 Misc. 2d 798, 354 N.Y.S. 2d 817 (1974) (denial of variance and permit was upheld on the grounds that, among other things, the applicant has not demonstrated that alternative sites were not available, and the visual harm to the developed residential neighborhood could not be prevented by conditioning the permit).

CHAPTER 5

REGULATORY RECOMMENDATIONS

AND

CONCLUSION AND ACTION ITEMS

REGULATORY RECOMMENDATIONS

Each community's wireless telecommunication codes were reviewed comparatively to the Code of Federal Regulation. Several of the communities have made revisions in the last several years to address FCC mandates to streamline reviews of eligible facility requests and expedite timelines for review of new wireless infrastructure. However, the Code of Federal Regulation changes often therefore communities need to continually monitor revisions and update their local codes frequently to stay current with federal standards.

Table 16 below summarizes Code revision recommendations by community.

COMMUNITY	SUMMARY OF CODE ANALYSIS
Bedford	Code revised in 2018 and is mostly consistent with federal standards. Definitions section should be revised to align with the Code of Federal Regulations.
Lewisboro	Existing Code updated recently to include treatment of "eligible facility request" and comprehensively address wireless deployment. Recommend modifications to certain sections to harmonize with Code of Federal Regulations; specifically shot clock, application requirements, interference and alterations, amendments and waiver of application requirements.
Mount Kisco	The PWSF Overlay District likely needs expansion to address future site locations; definitions, shot clock timelines and small wireless facilities in the ROW should be added to the existing Code.
New Castle	Town's Code recently amended to address Code of Federal Regulations; no other changes are recommended at this time.
North Salem	Certain code sections are not consistent with federal code and should be updated; definition of substantial change and criteria for development subsections related to height and bulk should be revised or eliminated to prevent perceived barriers to entry.
Pound Ridge	Separation between property boundaries and/or residences and setbacks from property lines should be reviewed and revised to prevent perceived barriers to entry.
Somers	Requiring Link Budget and Special Permit for collocations needs to be reviewed and likely revised to meet federal shot clocks and processes. Setback, tower lighting, location on parcels and along scenic roadways provisions needs be reviewed and revised to prevent perceived barriers to entry.
Yorktown	Definitions, shot clock timelines and small wireless facilities in the ROW need to be added to the existing Code. The frequency, modulation, and class of service and NIER operating standards should be reviewed and harmonized with federal regulations.

Table 16: Code Recommendations by Community

In addition to the code amendments related to Federal definitions and regulations, all communities should consider harmonizing text amendments based on the common survey responses. This could improve visual appearance of the wireless infrastructure and ease deployment throughout the study area.

Developing a list of preferred locations and designs for new facilities in each Town/Village Code as a preferred site list or hierarchy of preferred wireless facility types and location is an option. Based on NWC citizen participation during the Plan process the most preferred option for new infrastructure would be listed first in the preferred list. The least preferred option last. When alternatives are proposed, the applicant must demonstrate through relevant information why the preferred options are not technically feasible, practical or justified given the location of the proposed facility. The applicant must provide this information in the application in order for the application to be considered complete.

For Example:

1. Collocation on existing base station or tower
2. Concealed small wireless facility
3. New concealed base station
    a. on public property
    b. on private property
4. New concealed tower
    a. on public property
    b. on private property
5. New non-concealed base station
    a. on public property
    b. on private property
6. New non-concealed tower
    a. on public property
        i. Monopole
        ii. Lattice
        iii. Guyed
    b. on private property
        i. Monopole
        ii. Lattice
        iii. Guyed

Very few of the Towns have adopted small wireless facility criteria. The Plan suggests 118 small wireless facilities throughout NWC to close coverage gap in areas near residential viewsheds where a macro cell would be more visible. Small wireless facilities offers a plausible solution for densification in those specific census blocks. The Towns/Village could develop standards for small wireless facility design in public rights-of-way that promotes concealed facilities, placement of ancillary ground equipment and other development standards such as nearby tree pruning.

Backup power during electrical outages is a shared concern articulated by Board members. The FCC requires one in every three sites to be “hardened” meaning operating on backup power for at least 72 hours. Given the number of power outages throughout NWC over the course of a year, codes could be amended to require each wireless service provider to show which sites meet this standard and indicate a preference that each site be designed for backup power.

Generator at Site L1

CONCLUSION AND ACTION ITEMS

The NWC Wireless Communications Master Plan takes a comprehensive look at each community within the defined NWC study area analyzing the existing wireless facilities, wireless coverages and identifies gaps in services. Identification of wireless service network gaps has been a driving force for this study, first by Board members concerned about access to public safety in remote areas and second, by citizens who voiced, in the surveys, frustration over lack of wireless services.

Smart phone penetration is nearly 100% throughout each community and demand in wireless services is growing at an ever-increasing rate. These concerns can only be addressed by adding wireless facilities. However, network improvements are not free of financial obligations by the wireless industry. Wireless facilities, even small cells, are expensive to build and encumber the wireless providers with operational expenses for rent, utilities, and technician hours to keep sites operational.

When a wireless service provider considers a new site to their existing network, the provider considers the area the new facility will serve and how much revenue that site will generate. If the population is dispersed on mostly single-family lot (1/4 acre or larger), the number of wireless users per site drops rapidly. Areas with terrain variations (hills) and significant tree cover also significantly reduce the coverage area from a wireless facility, making it difficult to justify a return on investment from a financial perspective in low density suburban and rural areas. This, combined with pricing pressures that are restricting the Average Revenue Per Unit (ARPU) per subscriber that providers receive, creates disincentives to adding new wireless facilities, especially in non-urbanized low growth census blocks.

After many high-profile anti-zoning encounters regarding new wireless locations, most wireless providers are not as motivated to add wireless facilities in certain areas with the impression that residents are more likely to oppose a new tower. Consequently, areas with minimal vegetation and higher residential density, roadways with significant traffic counts and commercial and employment centers with greater concentrations of wireless subscribers are more enticing locations for the wireless industry to seek deployment of new wireless infrastructure.

One last point for the near future is the stark influence that increased interest rates have on the technology industry, especially wireless. The steep losses in technology valuations and technology funding are occurring due to higher costs of bonds to finance technology expansion projects. Capital to fund new wireless facilities is raised in the bond market and the cost for that capital has risen considerably in the past six months (end of 2022), which will likely restrict future capital projects from all the wireless providers.

Jurisdictions that want to promote improved wireless coverages throughout their communities can work together to proactively interest wireless service providers. The following action items can help ease wireless deployment.

1. Pinpoint specific appropriate locations and acceptable infrastructure design for each suggested facility identified in the gap areas.
2. Develop unified development standards, including but not limited to, siting preferences for future infrastructure. This will create visual continuity of future towers and base stations throughout NWC.
3. Establish procedures for permitting wireless facilities that allows the applicant to confidently budget the time and expense associated with obtaining permits.
4. Adopt expedited approval processes for facilities meeting location and visual design expectations. This can streamline review and permitting by the community. Meeting federal shot clocks will generate confidence from the wireless providers that their proposed facilities can be permitted without risk of delayed buildout timelines.
5. Communicate with utility pole owner(s) to ascertain their willingness to allow small cells on their poles. If allowed, then share design objectives of the community and support streamlined processes for review of plans and lease agreements.
6. Prepare standard lease agreements for use of community owned property and buildings with pre-approved terms by the Board to expedite the lease process.
7. Invite wireless and fiber providers to a stakeholder meeting to present goals for improving wireless coverage and problem solve together on how to expand services, including fiber in each community.
8. Work with the local cable TV franchisee to verify their fiber infrastructure is available for wireless providers backhaul.
9. Obtain fiber maps from cable franchisees, the local phone company and others that have obtained fiber installation permits for the jurisdiction, preferably in a GIS-compatible format for entities interested in obtaining fiber backhaul. Maps of TV/internet Cable fiber infrastructure should include hybrid fiber-coax (HFC) lines in neighborhoods to determine if spare fiber capacity is accessible for small cell fiber backhaul.
10. Map current fiber by ownership and identify any spare capacity for future broadband and wireless growth.
11. Create a broadband plan that expands delivery of fiber optic cables and includes all wireless communication facilities.
12. Consider fiber optic cables to underserved areas at the jurisdictions' expense with the goal of obtaining dark or lit fiber leasing revenue from wireless providers and others interested in high-speed fiber backhaul.

APPENDIX A

WIRELESS DEFINITIONS

WIRELESS DEFINITIONS

For purposes of the Plan the following terms are used throughout and provided as reference as follows:

Antenna - An apparatus designed for the purpose of emitting radio frequency (RF) radiation, to be operated or operating from a fixed location. For most services, an antenna will be mounted on or in, and is distinct from, a supporting structure such as a tower, structure or building.

Bandwidth - A range of frequencies used to transmit a signal. The channel width (bandwidth) affects how much data can transmit per unit time. Each service provider has their own designated finite amount allocated to them by the Federal Communications Commission (FCC).

Base Station - Equipment and non-tower supporting structure at a fixed location that enables wireless telecommunications between user equipment and a communications network. Examples include transmission equipment mounted on a rooftop, water tank, silo or other above ground structure other than a tower. The term does not encompass a tower as defined herein or any equipment associated with a tower. “Base Station” includes, but is not limited to:

- Any structure other than a tower that supports or houses radio transceivers, antennas, coaxial or fiber optic cable, regular and back-up power supplies and comparable equipment, regardless of technological configuration; and
- Equipment associated with wireless telecommunications services such as private, broadcast, and public safety services, as well as license-free wireless services and fixed wireless services such as microwave backhaul and broadband.

Concealment - A tower, base station or utility pole that is not readily identifiable as a wireless communication facility and that is designed to be aesthetically compatible with existing and proposed building(s) and uses on a site or in the neighborhood or area. Some of the types of concealment found in the City are faux dormers, faux facades, parapets, steeples, faux chimneys and unipoles.

Macro Wireless Facilities or Macro Cell - Traditional support structures for personal wireless service facilities (PWSF) identified as macro cell facilities consist of multiple provider use towers and base stations. Macro facilities are taller infrastructure usually between 50 and 200 feet in height and have been the most commonly utilized infrastructure over the last thirty years. Macro facilities are considered the backbone of the network and allow service providers the most flexible options when deploying their usable spectrum and providing signal over the greatest area. It also allows the flexibility to target the desired signal to a specific location.

Personal Wireless Service Facilities (PWSF) - Facilities for the provision of personal wireless services. Personal wireless service facilities include transmitters, antennas, structures supporting antennas and electronic equipment that is typically installed in close proximity to a transmitter that provides commercial wireless services.

Radio Frequency (RF) - A range of frequencies that are allocated to be transmitted/received through the air without wires, with the use of transmitters/receivers and associated antennas. Radio waves are generated for fixed and/or mobile communication. A frequency or band of frequencies suitable for use in telecommunications.

Radio Spectrum - A general term used to define a portion of the entire radio band. Examples are the low-band, mid-band and high-band spectrum that are used for wireless services. Each of these three "bands" of spectrum contain a number of individual wireless bands as well as radio bands used by other services.

Small Wireless Facilities or Small Cell - Small wireless facilities have antennas mounted on structures at lower heights, generally the height of a utility pole. The equipment is mounted on or inside these smaller poles and are interconnected with fiber optic cables which allows for greater bandwidth and faster transmission speeds. For a single service provider, the small wireless facilities are typically spaced every 650 feet, although there are many variations, creating a densification of the transmitting signals for the network. The ideal service area for a small cell is a specified corridor or neighborhood. According to federal rules small wireless facilities must meet each of the following conditions:

- Are mounted on structures 50 feet or less in height including their antennas; or
- Are mounted on structures no more than 10 percent taller than other adjacent structures; or
- Do not extend existing structures on which they are located to a height of more than 50 feet or by more than 10 percent, whichever is greater.

Tower - Any support structure built for the primary purpose of supporting antennas and associated facilities for commercial, private, broadcast, microwave, broadband, public, public safety, licensed or unlicensed, and/or fixed or wireless services. A tower may be concealed or non-concealed.

Utility Pole - Any pole or structure designed to maintain, or used for the purpose of lines, cables, or wires for communications, cable, electricity, street lighting, other lighting standards, or comparable standards.