NEW CINGULAR WIRELESS PCS, LLC
D/B/A AT&T

NWL03301X SITE
NELSONVILLE

15 ROCKLEDGE ROAD
NELSONVILLE, NY

EXPERT WITNESS
RF ANALYSIS AND REPORT

MARCH 15, 2019

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RF ANALYSIS AND REPORT

V-COMM, L.L.C., and more specifically its principal Dominic C. Villecco, has been retained by New Cingular Wireless PCS, LLC d/b/a AT&T ("AT&T") to provide expert analysis in association with its proposed wireless communications facility at the NWL03301X site which utilizes a proposed monopine (i.e. camouflaged tree monopole) located at 15 Rockledge Road, Nelsonville, NY.

QUALIFICATIONS

V-COMM, L.L.C. is a telecommunications-engineering firm primarily focused on providing engineering and related business services to network operators in the telecommunication industry as well as municipalities. V-COMM was founded in late 1995 with the intent of providing services to the emerging wireless and wired segments of the telecommunication industry. V-COMM's client base includes wireless operators, local, county and state governments, telecommunications companies and commercial enterprises. Services performed for these clients over the past twenty years include:

- Expert Witness Analysis and Testimony
- Business and Strategic Planning
- Capital and Operational Expenditure Modeling
- Infrastructure Requests for Proposal (RFPs) and Analysis
- Infrastructure Contract Negotiation
- Technical and Financial Support in Obtaining Vendor and Equity Financing
- Interconnect Contract Negotiation
- RF Network Design, Implementation and Optimization
- Interconnect Network Design, Implementation and Optimization
- Telephony Signaling (SS-7) and Vertical Systems Design and Implementation
- Local Government Communication Systems
- Project Management of Network Implementation
- Expert Witness Zoning Testimony
- License Tender/Bid Technical Support

(Please see Mr. Villecco's bio in Appendix C of this report.)

AT&T is licensed by the FCC to provide cellular service in the New York, NY-NJ/Nassau-Suffolk CMA on the Cellular A-Band (869-880 MHz); in the New York, NY BTA on the Personal Communications Service (PCS) A and E band (1930-1945 MHz; 1965-1970 MHz); and in the New York, NY-NJ/Nassau-Suffolk CMA on the 700 MHz Lower B and C Bands (734-746 MHz), which includes Putnam County, New York.

WIRELESS SYSTEMS

The FCC licenses a specific amount of Radio Frequency (RF) spectrum to each wireless carrier and stipulates that each carrier efficiently use that spectrum to support its wireless customers. Traditionally, wireless carriers have achieved this efficiency by continuously reusing the allocated radio frequencies throughout their licensed service area. This is accomplished by building small radio base stations, or cell sites, in a particular pattern (also known as a grid). The application of the grid concept affords a wireless carrier the ability to effectively and efficiently plan the reuse of radio frequencies more easily. By following proper planning techniques (as originally defined by Bell Labs and further refined by the wireless industry), the same radio frequency can be reused at reasonably close intervals throughout the licensed area, without causing harmful interference. Noisy or dropped calls, or the inability to originate a call, are typical manifestations of harmful interference. When designing a wireless network, an RF Engineer starts with a theoretical grid pattern and applies it to the licensed area. Each licensed area has many variables that can affect the design and must be considered. These variables include terrain features, land use considerations, zoning ordinances, use of existing structures, and traffic distribution, as well as others. In order to provide effective coverage while maintaining an efficient frequency reuse plan, the design engineer must perform a balancing test of all applicable variables. The primary variables that the engineer must take into consideration are the location and the overall height of the cell site. If a cell site is too high, it will have increased coverage, but cause interference throughout the rest of the wireless network thereby significantly affecting network efficiency. If a cell site is too low, it will provide ineffective coverage. If a cell site is too close to another cell, it will also cause interference, as a result of duplicative coverage utilizing the same frequencies. Additionally, each site has specific frequency bands licensed, each having a finite capacity to service wireless customers. Low band frequencies, as they are known in the industry, are the 700 and 850 MHz bands. Signal propagation from low band sites are approximately the same whether at 700 MHz or 850 MHz, providing the site configurations are the same. Utilizing a single low band propagation plot to demonstrate coverage for both bands is a common practice in the industry. High band frequencies, as they are known in the industry, are 1900 MHz and higher. Similar to low band propagation, it is a common practice to have one band represent coverage for all bands, as coverage is approximately the same for identical configurations. Low bands provide a greater area of coverage than high bands, however all subscriber devices are capable of all bands and therefore utilize all frequency bands as a way to deal with network capacity requirements. High bands provide effective capacity relief, albeit it in a reduced coverage radius from that of the low bands.

A proper wireless network design begins with strategically located cell sites. At each cell site there is a building, tower, water tank or other structure on which antennas are mounted. Typically, radio-transmitting equipment (base station) is located at the base of the structure. Radio signals leave the base station and travel through transmission lines to the antennas, or from fiber optic cable to the remote radio head (RRH) at the top of structure and then to the antennas. Radio signals are broadcast through the antennas and travel to the customer's wireless phone, completing a call. When a wireless customer places a call, the signal is received by the antennas and travels down the transmission line and into the base station. The base station converts the signal into digital data and combines it with all the other wireless calls and digital traffic at that cell site. This data is then sent over fiber optic digital leased lines to the main switching platform. The main switching platform, or Mobile Switching Center (MSC), is interconnected to the Public Switched Telephone Network (PSTN) and Internet service providers, where calls are routed to other wireless or landline phones or Internet locations.

As this technology enables mobile calling, once a wireless call is originated and the customer travels away from the cell site of origination, the system tracks the changes and begins a process of determining whether there is a better serving cell site. Upon determination of a stronger serving site, the system automatically switches the wireless customer over to the new cell site. This process is known as a handover and allows for seamless coverage within a wireless carrier's service area. By design, this process is supposed to happen

so quickly that the wireless customer does not perceive it. If the network is designed efficiently, there is no interruption of service and connection quality remains adequate. This efficient design includes the proper location of sites with minimal variance from the original grid pattern.

AT&T EXISTING AND PROPOSED SITES IN AND AROUND NELSONVILLE

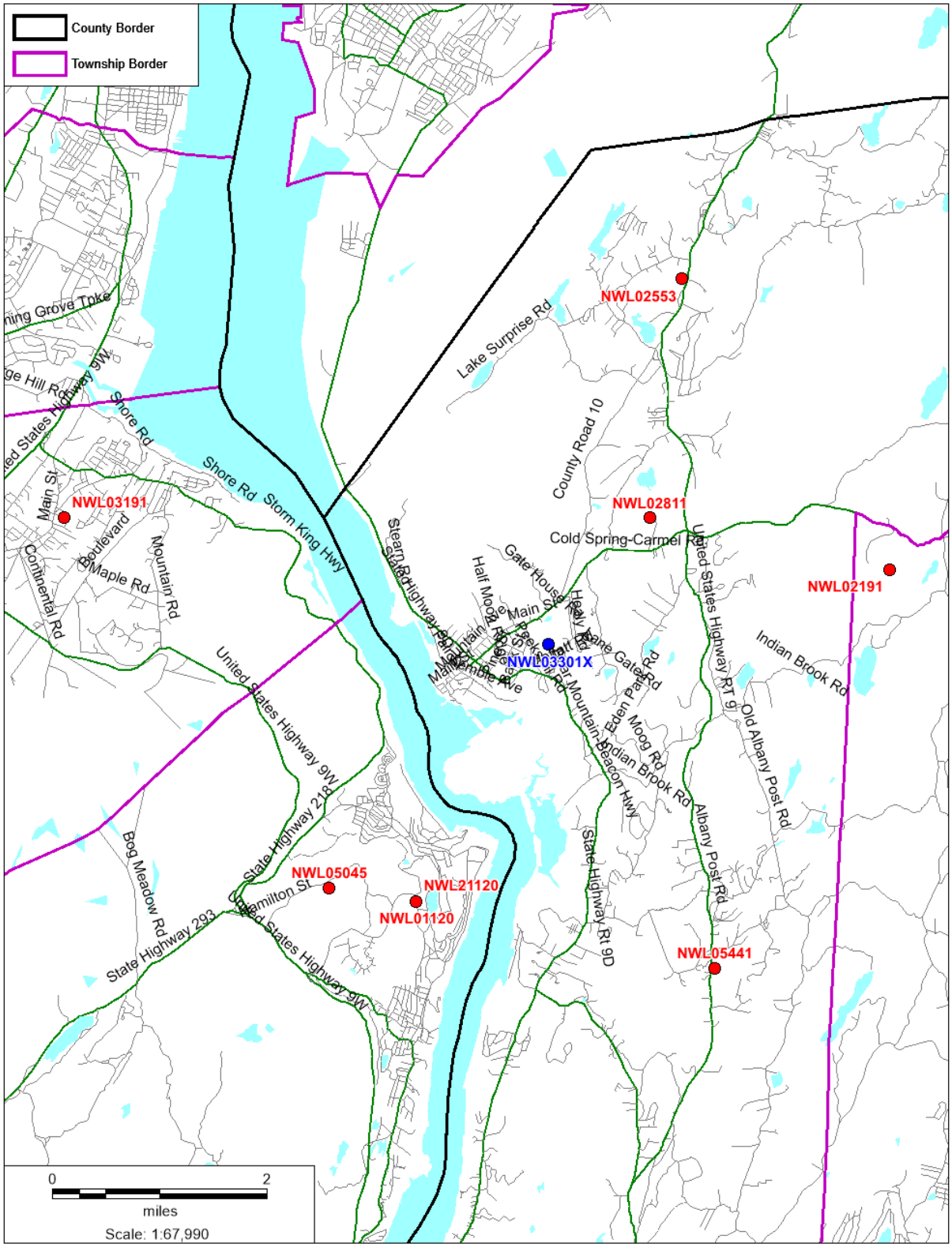
V-COMM has identified AT&T existing antenna support structures that provide coverage to the Village of Nelsonville. The AT&T proposed and existing site structures are listed in Table 1 below, and depicted in Map 1 – Existing and Proposed Sites In and Around Nelsonville.

TABLE 1 – AT&T EXISTING AND PROPOSED SITES SERVING THE VILLAGE OF NELSONVILLE, NY

Cell Name	Address	Structure	Antenna C/L in Ft.
NWL03301X (Proposed Site)	15 Rockledge Road Nelsonville	Monopine	96
NWL01120/ NWL21120	700 Mills Road West Point	Rooftop	115
NWL02191	Route 301 Putnam Valley	Self-Support	246
NWL02553	1 Tower Road Dup1 Cold Spring	Monopole	98
NWL02811	23 Grey Rock Road Garrison	Monopole	90
NWL03191	183 Main Street Cornwall	Monopole	130
NWL05045	US Military Academy West Point	Self-Support	128 & 130
NWL05441	1924 Route 9 Garrison	Monopole	88

The existing sites are depicted with red dots, and the proposed site is depicted with a blue dot in Map 1 below. The subject site is a collocation on a proposed 110 ft. Monopine structure with Verizon Wireless' antennas mounted at a 106 ft. centerline and AT&T's antennas mounted at a 96 ft. centerline.

MAP 1 - AT&T EXISTING AND PROPOSED SITES SERVING THE VILLAGE OF NELSONVILLE, NY



RF COVERAGE

When enacting the Telecommunications Act of 1996 ("TCA"), Congress acted to "promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies."[1] In the context of personal wireless services, this national mandate is articulated in terms of a declared public policy enabling "the construction and operation of seamless, ubiquitous, and reliable telecommunications systems."[2] Cases such as *Cellular Tel. Co. v. Zoning Board of Adj. of Ho-Ho-Kus*, 197 F.3d 64, 70 (3rd Cir. 1999), long ago established that, at a minimum, the TCA ensures that a user of personal wireless services be able to rely on their ability to make and maintain a connection with the national telephone network of an acceptable quality.

The TCA does not anticipate a static level of service but assumes that over time technology will improve to permit – and customers will come to rely upon - increased levels of quality, availability and reliability of service. Recent trends of this nature include customers converting their older 3G technology phones to 4G technology. That factor, coupled with the release and popularity of ever increasingly more data intensive apps, customer's social media proclivities, VoLTE – (Voice over LTE) service and the proliferation of smart phones, tablets and wireless air cards for laptops, supports the overall industry trends of higher and higher demands for 4G service.

The evolving growth and utility of personal wireless services to the national economy is why the FCC recently clarified that "effective prohibition includes materially inhibiting additional services or improving existing services."[3] Provision of personal wireless services encompasses providing service to all users, particularly those in buildings, as over half of American households are now wireless-only.[4] A particular concern is ensuring 911 and E911 services are provided to these customers, as 70% of 911 calls are now originated from personal wireless services devices.[5] The combination of a high percentage of 911 calls originating from wireless devices and a large percentage of homes relying entirely on wireless devices has significant implications with respect to the public safety importance of providing reliable in-building service. One of the reasons the FCC recently clarified that effective prohibition includes materially inhibiting improving existing services is to ensure quality service to in-building wireless users.[6]

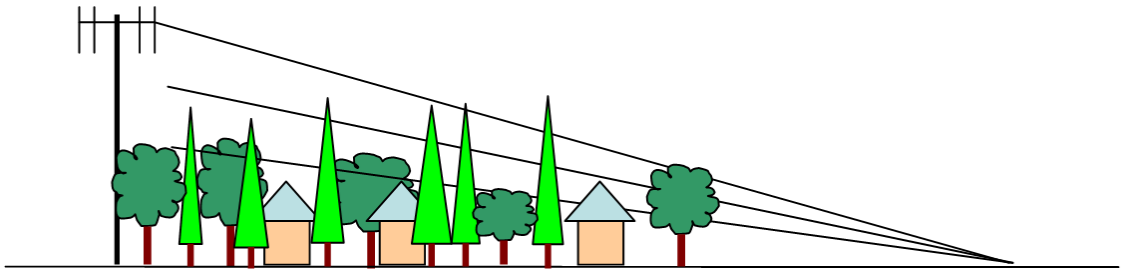
Adequate signal strength is the primary determinant of reliable service. A metric called Reference Signal Received Power (RSRP) is used to specify the coverage capabilities of the AT&T network. This standard has been chosen to best represent the Long-Term Evolution (LTE) data technology (also known as 4G) being utilized as well as the Voice-Over LTE (VoLTE) technology, which is being deployed on 4G to augment and ultimately replace AT&T's wireless voice capacity. RSRP is the average received power over resource elements that carry a reference signal. Resource elements are the fundamental unit of frequency allocation in LTE and carry the information from the cell site to the mobile device and back. The reference signal is one of the components of the LTE channel that the mobile receiver uses to determine the channel power.

[1] Preamble, Telecommunications Act of 1996, P.L. 104-104, 100 Stat. 56 (1996).
[2] The Wireless Communications and Public Safety Act of 1999, Pub. L. No. 106-81, 113 Stat. 1286 (1999).
[3] *In re Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*, FCC-18-133 at p, 18 para. 37.
[4] *Twentieth Wireless Competition Report*, FCC 17-126, p. 5, para. 5.
[5] https://transition.fcc.gov/cgb/consumerfacts/wireless911srvc.pdf.
[6] *In re Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment*, FCC-18-133 at p. 21 para. 40.

RSRP is measured in units of "decibels" referenced against 1 milliwatt, or dBm. The decibel is a logarithmic unit that allows ratios to be added or subtracted. The definition formula for decibels referenced against 1 milliwatt is $dBm = 10\log(P\ /\ 1mW)$ with P measured in milliwatts. Therefore 10 mW would be 10dBm, 100 mW would be 20dBm, etc.

As a transmitted signal descends from the proposed antenna centerline (C/L), it enters into a range where the surrounding environmental clutter becomes an increasingly problematic factor. Examples of clutter are trees, houses, buildings, soil, vehicles and other physical objects on the ground. Clutter attenuates, or weakens and disperses, the RF energy necessary for wireless telecommunications. As the signal descends from the C/L, RF energy is increasingly attenuated by the total accumulated volume of clutter. A graphic depiction of this attenuation is found in Figure 1 below (not to scale).

FIGURE 1 – IMPACT OF CLUTTER



The service boundary of a 4G site is defined using RSRP equating to an acceptable signal threshold at the receiver (i.e. mobile device). This value is derived from industry standards, 4G received signal levels and quality and acceptable signal to noise ratios, along with statistically quantifiable variations in terrain. This threshold must also take into account additional losses associated with location of the mobile user. In engineering terms, this means that to account for users within vehicles and buildings, additional margin must be added to RSRP so that adequate coverage exists inside. Industry standards and AT&T engineering experience reflect that an additional 10 dB of margin to RSRP is needed, compared to signal strength available outdoors, to provide reliable vehicular service, and another 10 dB to provide reliable in-building service in light suburban areas, with increasing values for higher density land usage.

V-COMM uses an industry standard RF computer-aided design tool to aid in the design of wireless networks. This tool can generate a plot of RSRP that shows underlying geographic information (highways, arterial roads, etc.). For the Village of Nelsonville, the subject site is in a predominately-suburban area. The propagation map is drawn showing the region where the RSRP equates to the minimally acceptable received signal level for adequate service, as measured at the mobile's receiver. The propagation map includes the RSRP of the surrounding environment including the nominal attenuation of in-building and in-vehicle use of service.

The minimally acceptable signal level for adequate 4G LTE service in-vehicle usage is represented by the green shaded areas (greater than -105 dBm). The minimally acceptable signal level for adequate 4G LTE service in light suburban in-building usage is represented by the blue shaded areas (-95 dBm or better). Signal levels would need to be greater for heavier construction buildings like schools. Where there is inadequate signal coverage between the sites, an increased and unacceptable likelihood of dropped calls,

missed calls, lost data and data connectivity will occur. These areas are known in the industry as service gaps, where there is insufficient coverage for users to be able to rely on their ability to originate, maintain and/or receive calls from "Public Switched Telephone Network" and the Internet for VoLTE calls and data sessions. Wireless carriers have largely transitioned from older 2G/3G legacy technologies, which are the traditional circuit-switched technologies, and increasingly rely on 4G LTE coverage to provide voice (VoLTE) service throughout its service area. 4G LTE is also a more efficient format for data services.

The propagation maps below show the AT&T sites in Village of Nelsonville,[7] at two frequency bands: 1900 MHz (PCS) band and the Lower 700 MHz band. The coverage provided from a given site is dependent upon several factors; including AT&T's licensed frequency band, the height of the antenna above the ground, as well as the terrain and morphology around the site. The propagation model is also validated with the empirical drive test data to ensure accuracy. See Appendix A for data from drive test performed in January 2018 overlaid on a Google Earth base map.[8]

As detailed later in this report, the propagation plots demonstrate that AT&T lacks reliable wireless service throughout a substantial area in and around the Village of Nelsonville. Therefore, the purpose of the proposed location is to fill the existing gap in service. Without this proposed fill-in site, AT&T subscribers will be unable to rely on their ability to use their personal wireless devices to originate and maintain communications. In addition to the coverage deficiency, the A&T network is also experiencing a network performance deficiency in the area of the proposed site, which is not in accordance with industry performance standards. This is substantiated by the dropped call data for the adjacent sites, and is provided in Appendix B.

In addition, AT&T has been awarded the FirstNet contract to operate the country's first nationwide first responder broadband network, which will provide nationwide interoperability to local, county, state and federal first responders, as outlined in the 9/11 Commission Report.[9] Due to communications challenges during the response to the 9/11 terrorist attacks, the 9/11 Commission recommended the establishment of a single, interoperable network for public safety. The FirstNet contract awarded AT&T 20 MHz of 700 MHz Band 14 spectrum, and the build-out of that spectrum has presented the carrier with an opportunity to increase coverage and performance on its network overall. The service gap in the area surrounding the Village of Nelsonville impairs this service. The proposed location, along with the other nearby AT&T locations will supply the needed reliable service to first responders. AT&T's customers, and our nation's FirstNet public safety-first responders will rely on AT&T's commercial network and FirstNet 700MHz network for making 911 and other emergency calls for customers in this area.

[7] The propagation maps do not model signal propagation from sites outside of the immediate ring of sites surrounding the proposed gap. Signals from distant sites at weaker signal strengths might touch areas within the service gap due to irregularities of topography (such as a distant signal that catches the top of a ridge) but do not materially contribute to coverage.

[8] As the drive test data was gathered in January 2018, the plots of this data in Appendix A reflects a standard 5 dB adjustment which, in my opinion, adequately accounts for the lack of leaves and other seasonal vegetation at the time the data was collected.

[9] http://govinfo.library.unt.edu/911/report/911Report.pdf

AT&T SERVICE

RF Coverage Deficiency

V-COMM analyzed whether there was sufficient RF coverage and found there was a significant gap in coverage for AT&T 4G LTE in the 1900 MHz and 700 MHz frequency bands. AT&T's FCC licensed frequencies allow for one LTE channel in the 700 MHz band and one LTE channel in the 1900 MHz band and future channels in WCS (2300 MHz) and 850 MHz bands. In the past, AT&T utilized its 850 MHz licensed frequency band (actual frequencies are in the 869-880 MHz range, but the band is commonly referred to as the "850 Band" in the industry) for 3G UMTS service. While some legacy sites may still be used for 850 MHz 3G UMTS service, AT&T, consistent with industry trends, is far along the transition migrating subscribers to 4G service, and any plans to utilize the 850 MHz band in this area going forward would be in a 5G LTE format. We have determined that existing 4G LTE coverage in the bands currently in use at surrounding sites – 700 MHz and 1900 MHz - is inadequate for the AT&T network in this section of Nelsonville, thus a new wireless facility is needed to enhance and provide adequate service in this area of Nelsonville.

In evaluating this gap, it is important to note that the need to provide reliable service to year-round residents, itself sufficient grounds to consider this gap significant, is not the only concern. This area of service deficiency is also a major seasonal tourist destination. Over 35,000 visitors attend the Hudson Valley Shakespeare Festival in a three-month period, with another 10,000 annual visitors touring the mansion on the grounds of the Boscobel House and Gardens[10]. Additionally, another 100,000 visitors hike the Breakneck Ridge Trail, which has a connector in Cold Spring, NY[11]. Finally, State Routes 9D and 301 that connect this area within Nelsonville and Cold Spring have average vehicular traffic counts of over 6,200 and 5,300 daily trips, respectively. These are Annual Average Daily Traffic (AADT) counts. When considering the seasonality of this area due to the tourist and recreational activities, it can be expected that the seasonal traffic counts –and number of persons affected - would be significantly higher.

The propagation map titled "Map 2 - AT&T Existing Sites Coverage 1900 MHz 4G LTE" depicts coverage from the surrounding sites, without including the proposed site, and represents the service from the closest existing sites. "Map 3 - AT&T Existing Site Coverage - 1900 MHz 4G LTE Zoomed in Coverage Gap" shows the zoomed in coverage from the existing sites for 1900 MHz 4G LTE. Major buildings that lack in-building coverage include Haldane High School, the Medical Center at Cold Spring, Manitou School, Boscobel House and Gardens, Putnam History Museum and the historic churches. There is also lack of reliable in-vehicle coverage on Main Street and Pearl Street. Variable and unreliable coverage on Fishkill Rd, Cold Spring-Carmel Rd and Bear Mountain-Beacon Hwy is due to terrain obstruction. Depending on day and season, signal paths vary and results in varying signal strengths. The high band frequency, 1900 MHz band, does not propagate as far, but provides important additional capacity to the broader low band coverage provided at 700 MHz band.

"Map 4 – AT&T Coverage with Proposed "NWL03301X" Site – 1900 MHz 4G LTE" depicts coverage from the AT&T existing sites with the proposed site. The proposed site provides excellent in-building coverage throughout Main Street, Bear Mountain-Beacon Hwy. The high band coverage from NWL03301X site would bridge the existing gap for in-vehicle service in this band on Main Street (Rt. 301), Chestnut Street, Bear Mountain-Beacon Hwy (9D), Fishkill Rd (RT 10) and other roads within the boundary. At 1900 MHz the existing gap is broader and deeper, but even in this high band, the proposed

[10] See attendance information at https://boscobel.org/wp-content/uploads/2018/03/Boscobel-2016-Annual-Report.pdf

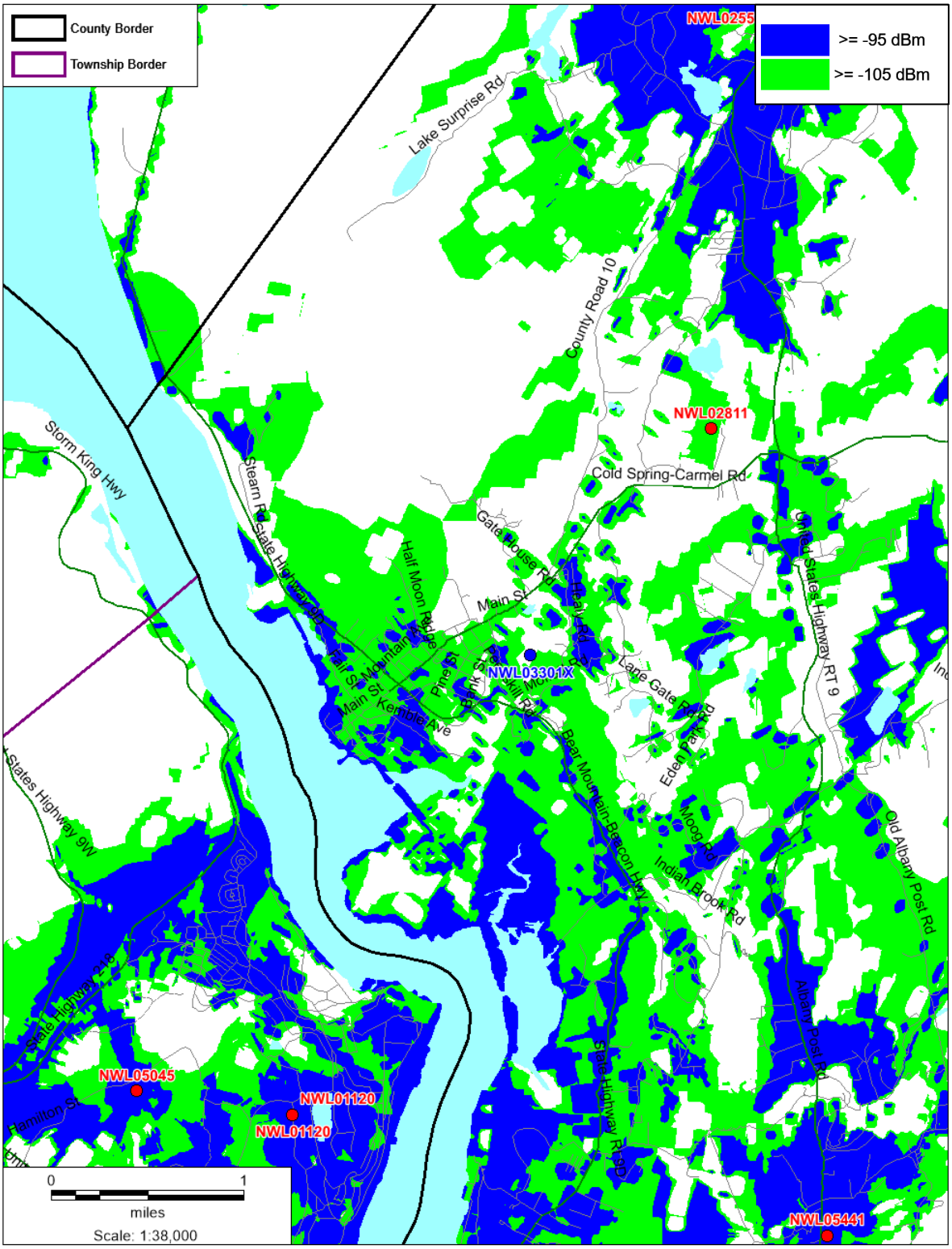
[11] See NY/NJ Trail Conference information at https://www.nynjtc.org/news/protecting-north-americas-most-popular-hiking-destination

Nelsonville site will provide in-building coverage to the targeted residential areas, schools, and commercial buildings within the village of Nelsonville and Cold Spring.

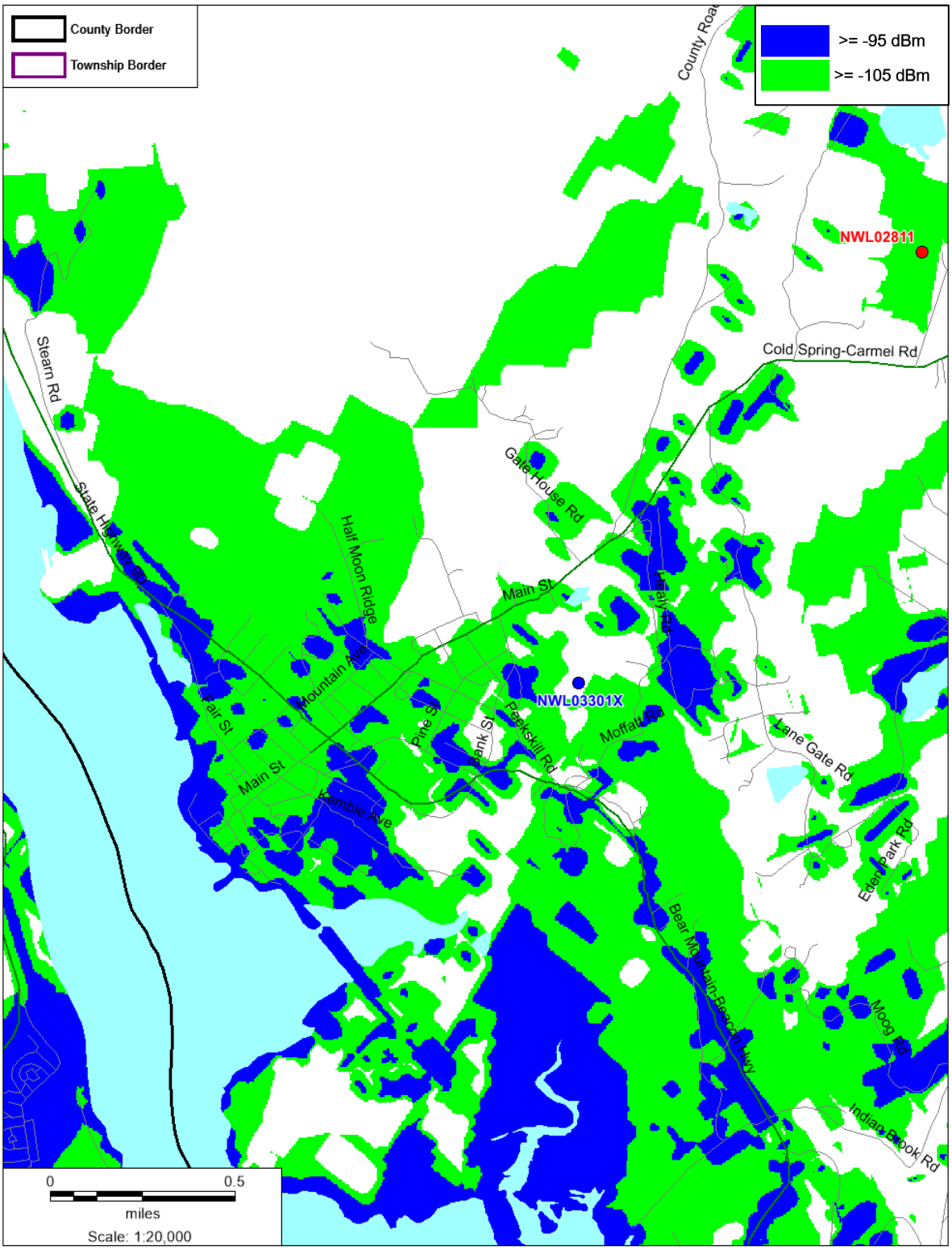
"Map 5 - AT&T Existing Sites Coverage NWL03301X- 700 MHz 4G LTE," depicts current service from the closest existing sites, without the proposed site. "Map 6 - AT&T Existing Site Coverage - 700 MHz 4G LTE Zoomed in Coverage Gap" shows zoomed in coverage from the existing sites for 700 MHz 4G LTE. There is an extensive area within Nelsonville and Cold Spring that experience lack of reliable in-building coverage. Even with the low band coverage from surrounding sites, an in-building service gap of approximately 1.2 square mile exists in areas between Main Street and Bank Street, including many homes, the Medical Center at Cold Spring – Hospital, Putnam History Museum, and M&T Bank.

"Map 7 – AT&T Coverage with Proposed "NWL03301X" Site – 700 MHz 4G LTE Zoomed in Coverage Gap" depicts coverage from the existing sites and the proposed site. The proposed site combined with the existing sites provide excellent in-building coverage throughout the village of Nelsonville and Cold Spring. The low band coverage from NWL03301X site would bridge the gap for in-building service on Main Street (RT 301), Chestnut Street, Bear Mountain-Beacon Hwy, Fishkill Rd (RT 10) and other roads within the boundary. The proposed 110-foot tall monopole at 15 Rockledge Road, Nelsonville, with antennas installed at 96 ft. AGL is well situated to remedy the gap in service for the AT&T network, and correct current network deficiencies as outlined herein.

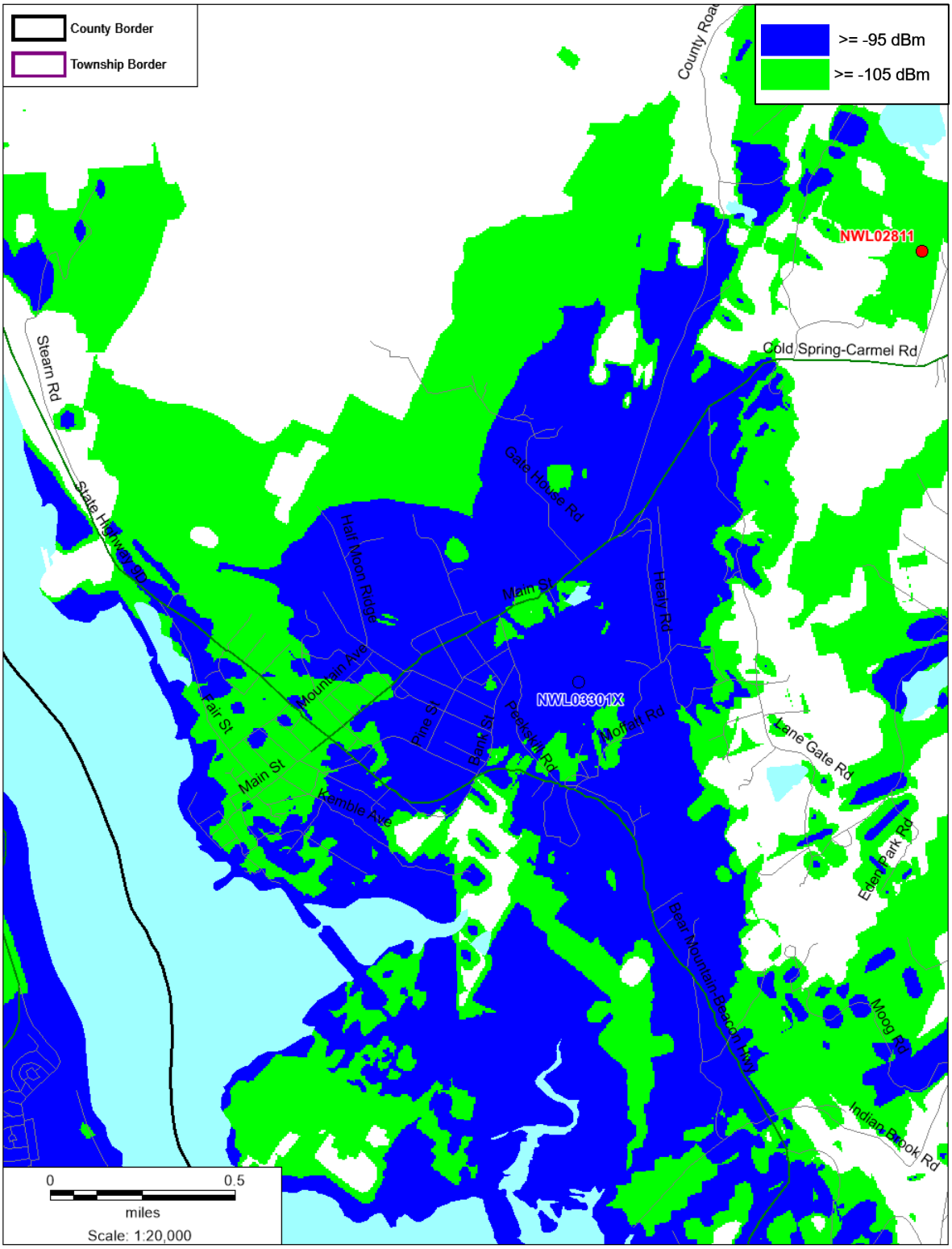
MAP 2 - AT&T EXISTING SITE COVERAGE - 1900 MHZ 4G LTE



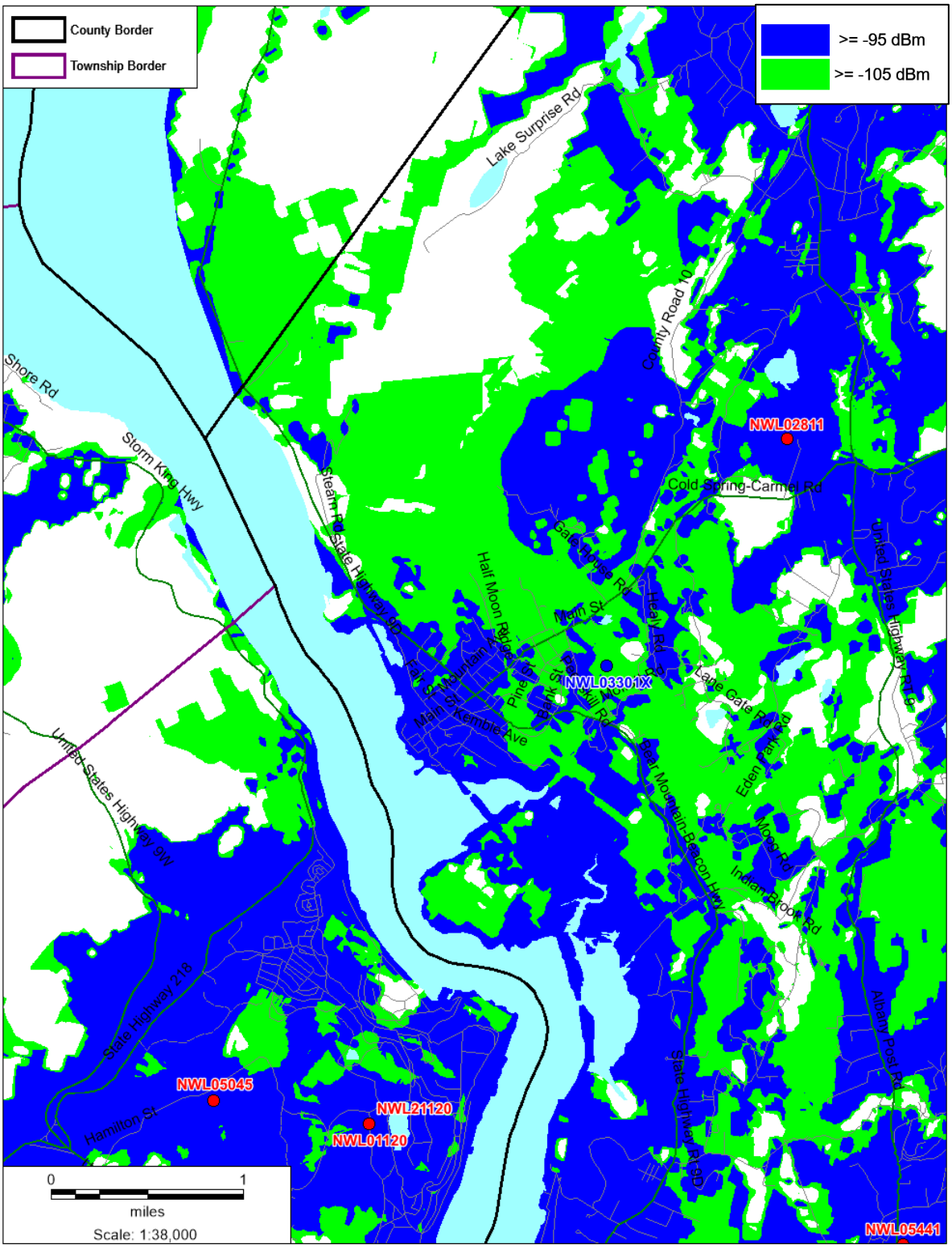
MAP 3 - AT&T EXISTING SITE COVERAGE - 1900 MHZ 4G LTE (ZOOMED IN COVERAGE GAP)



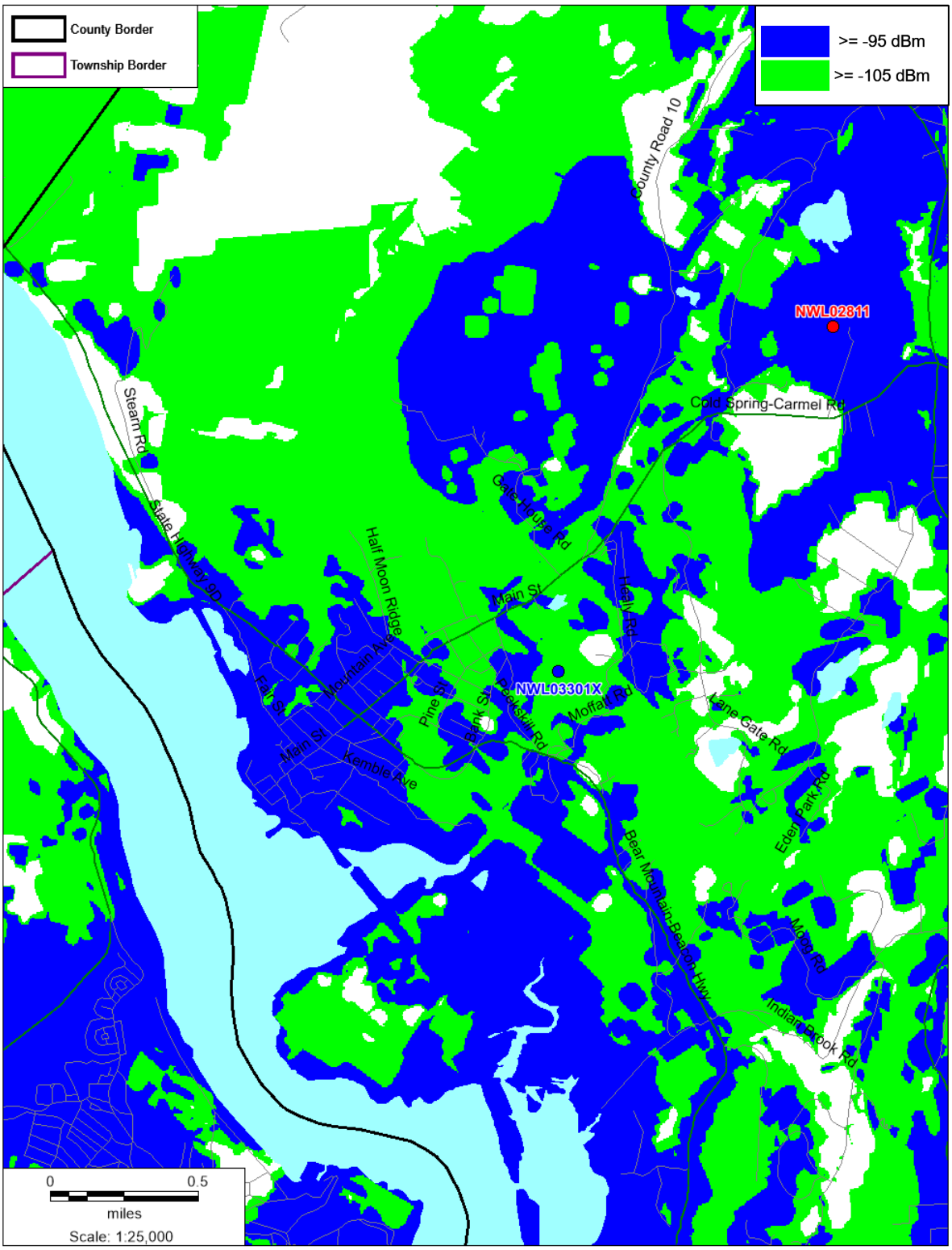
MAP 4 - AT&T COVERAGE WITH PROPOSED "NWL03301X" SITE – 1900 MHZ 4G LTE (ZOOMED IN COVERAGE)



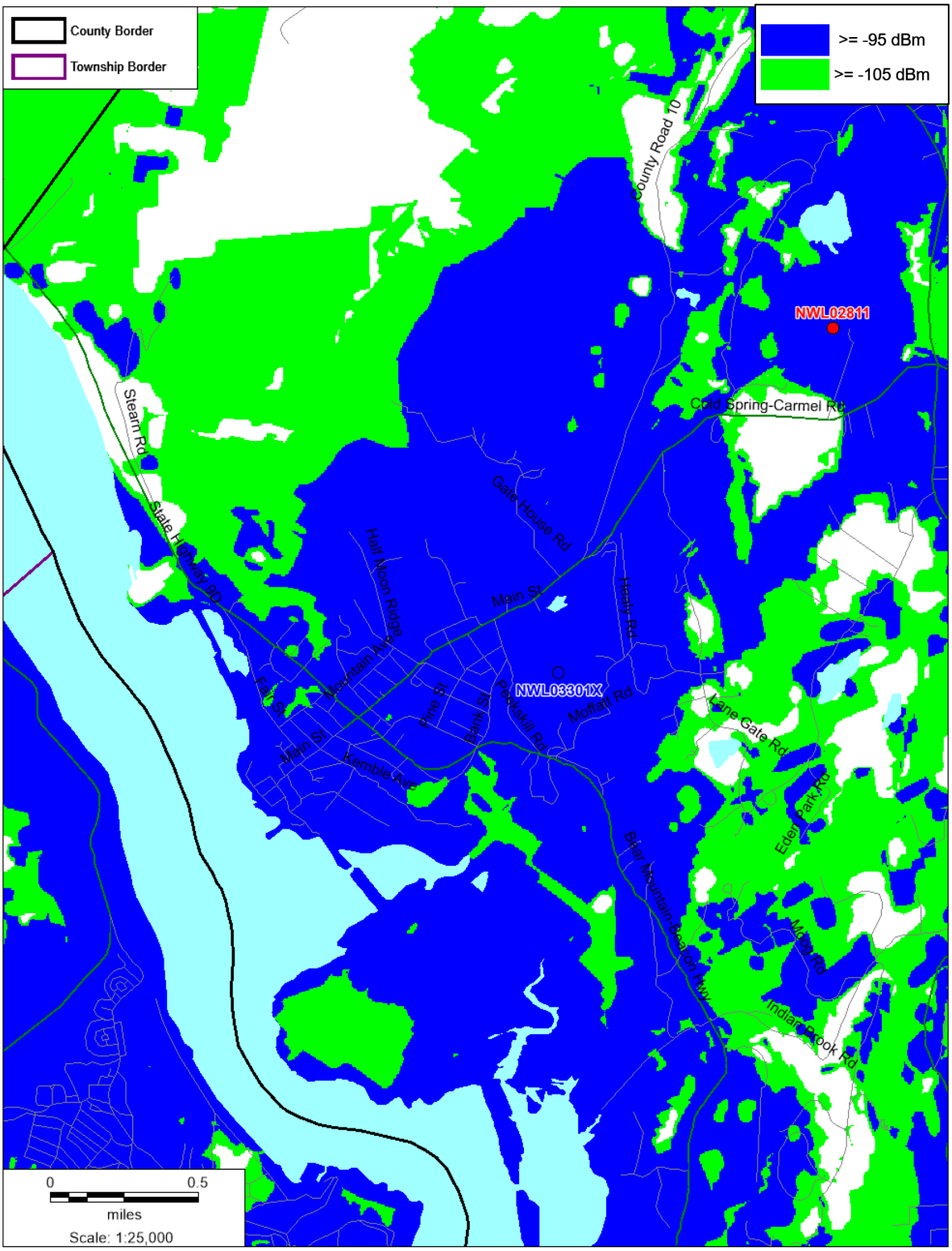
MAP 5 - AT&T EXISTING SITE COVERAGE - 700 MHZ 4G LTE



MAP 6 - AT&T EXISTING SITE COVERAGE - 700 MHZ 4G LTE (ZOOMED IN COVERAGE GAP)



MAP 7 - AT&T COVERAGE WITH PROPOSED "NWL03301X" SITE - 700 MHZ 4G LTE (ZOOMED IN COVERAGE)



System Performance Deficiency

The network coverage deficiency discussed above is also manifesting as a system performance deficiency in the Nelsonville area. Appendix B shows dropped call rates within the area for sites serving Nelsonville and the areas immediately surrounding Nelsonville. The wireless telecommunications industry utilizes the dropped call rate (DCR) metric as a key performance indicator of a network's performance. A 1% DCR threshold is the standard industry performance level used to identify areas of inadequate and poor network performance. The DCR of the sectors serving Nelsonville are consistently above the 1% DCR threshold, indicating an additional site is required to remedy this problem for the AT&T network in this area.

AT&T's network performance goals include achieving lower than a 1% dropped call rate for acceptable system performance. The graphs in Appendix B show the percentage of call drops occurring each day from the sectors surrounding Nelsonville. For example, NWL02811 Gamma sector (i.e. western facing sector antennas) shows very high dropped calls (as high as 20%), measured during a period of 6 months (see Appendix B, Figure 2). NWL02811 Beta sector (i.e. southeastern facing sector antennas) also shows high dropped calls (between 2-4%, see Appendix B, Figure 3), especially during busy tourist summer months. The existing NWL02811 site alone is not suitable to provide coverage along Rt 301, and Fishkill Rd. A new facility is required to provide handoff and retain the calls along Rt 301, to reduce the call drops demonstrated by NWL02811 site in Appendix B.

NWL01120 (Michie Stadium at West Point) Alpha sector dropped call data is shown in Appendix B, Figure 4, shows dropped calls between 2-7%. The West Point site (NWL05045), which is also serving parts of the village of Cold Spring, dropped call data is shown in Appendix B, Figure 5-6. The surrounding AT&T sites' drop call data demonstrates there is a network performance deficiency in the area of Nelsonville, and that an additional facility is needed to remedy this gap in service.

Commercial wireless operators, like AT&T, optimize system performance and dropped calls utilizing sites with high-gain, narrow-beamwidth antennas and transmitted power tailoring. Intuitively, new sites are built closer to areas where users are experiencing dropped calls and service degradations in order to remedy the network deficiency. The proposed site also will improve the overall system performance for customers being served by the existing AT&T sites NWL02811, NWL01120 and NWL05045.

The proposed NWL03301X Alpha sector (northeastern facing sector antennas) will provide coverage towards the northeast along Main St and Fishkill Rd where the NWL02811 site is currently serving. The NWL03301X Beta sector will provide coverage towards the Bear Mountain-Beacon Highway (9D) where served by the Michie Stadium Alpha and West Point Beta sectors. The NWL03301X Gamma sector will provide coverage in and around the Cold Spring area, which is currently served by West Point Alpha and Michie Stadium sites from across the river.

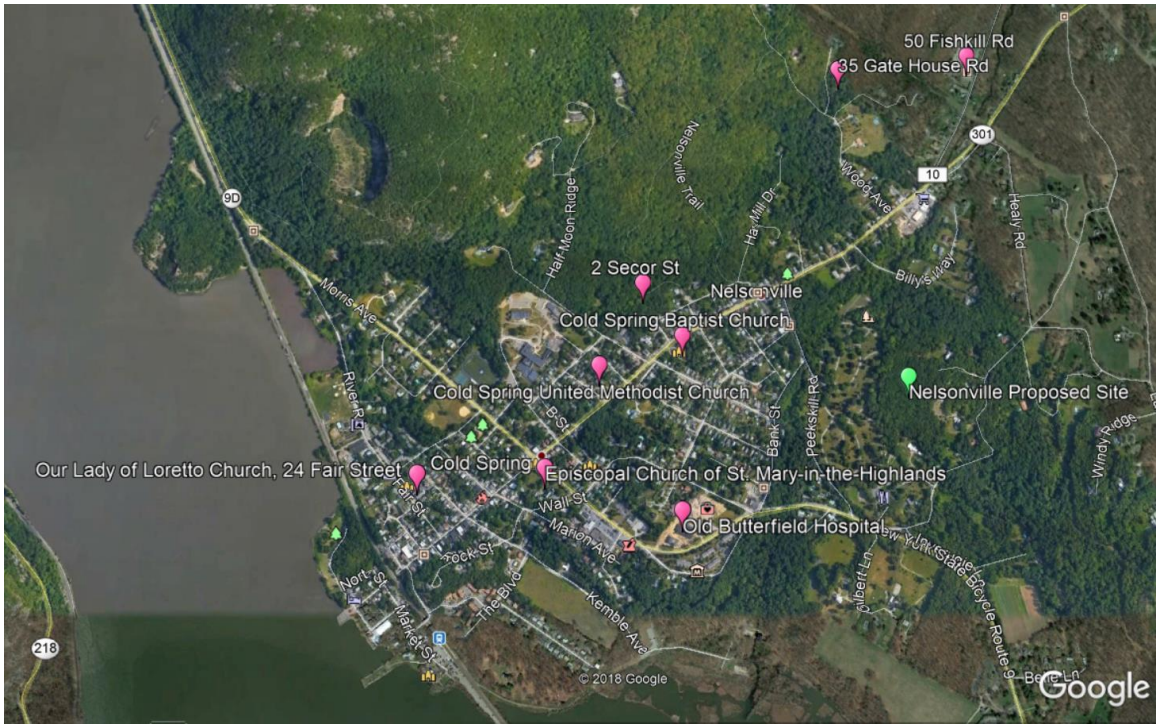
Providing coverage from sites across a river is problematic and creates challenges for wireless operators. First, both population bases (i.e. Cold Spring and Nelsonville) are pulling capacity from the serving site across the river. Second, optimizing handovers and other performance tailoring becomes a challenge, as the distance across the river coupled with the density of buildings and other attenuation factors causes network performance issues, as exhibited herein. Finally, having areas in Nelsonville/ Cold Spring served by facilities across the river presents a suboptimal situation for coordination of E911 services, as calls may originate in one county that are supposed to be routed

to a county across the river. This is problematic for both the wireless carrier as well as the 911 dispatch centers, in trying to route these emergency calls properly the first time.

ALTERNATIVE LOCATIONS

A review of the surrounding area reveals a marked absence of existing tall structures, towers, or water tanks that meet all the requirements for a wireless facility. Six (6) locations were identified including four (4) existing historic church steeples in Cold Spring and Nelsonville surrounding areas. All of these alternate locations were evaluated based on their location, elevation, surrounding foliage and equipment space requirements for both the applicants. See Map 8 below depicting the nearby areas around the proposed site.

MAP 8 - ALTERNATIVE LOCATIONS NEARBY "NWL03301X" SITE



The following properties were suggested as potential alternate locations for the proposed **NWL03301X** site at 15 Rockledge Rd.

1. **Cold Spring Baptist Church, 245 Main Street**: The existing 60 ft. tall steeple is very narrow and does not provide adequate interior space to support the equipment requirements of the applicants. This site is listed on the National Register of Historic Places (90NR02392) which creates limitations on the type of modifications that are permitted. In addition, effective transmission is not possible from the inside of the steeple unless replaced with RF friendly materials i.e. historic building fabric would need to be removed. In addition, the 60 ft. tall steeple is located below the tree line and

antennas located at this height would not be able to meet the coverage objective due to the effects of clutter discussed earlier.

2. **Episcopal Church of St. Mary-in-the-Highlands, 1 Chestnut Street:** The site is not a feasible structure to accommodate a wireless facility due to lack of space within the approximately 90' steeple, stone structure. The property is also within the R1 Zoning District where wireless facilities are not a Permitted Use. Further, this site is listed on the National Register of Historic Places (90NR02385) which creates limitations on the type of modifications that are permitted. In order to build an RF facility within the steeple, the stone structure must be replaced with RF friendly material i.e. a new structure would be required at this location. Supporting two carriers' equipment at a height above ground to facilitate the necessary coverage will not be feasible within this low elevation structure.

3. **Cold Spring United Methodist Church, 216 Main Street:** The site is not a feasible structure to accommodate a wireless facility due to lack of space within the tall narrow steeple. The property is also within the R1 Zoning District where wireless facilities are not a Permitted Use. Further, this site is listed on the National Register of Historic Places (90NR02385) which creates limitations on the type of modifications that are permitted. In order to build an RF facility within the steeple, the stone structure must be replaced with RF friendly material i.e. historic building fabric would need to be removed. The existing steeple also lacks space to support the equipment requirements of the applicants. Finally, the property owner was not interested in a lease at this location, therefore, this is not an available structure, despite its other shortcomings.

4. **Our Lady of Loretto Church, 24 Fair Street:** The property is within the R1 Zoning District where wireless facilities are not a Permitted Use. Additionally, this site is listed on the National Register of Historic Places (90NR02385) which creates limitations on the type of modifications that are permitted. Further, the 50' steeple is located below the tree line and antennas located at this height would not be able to meet the coverage objective due to the effects of clutter discussed earlier. The church steeple also lacks space to support the equipment requirements of the applicants.

5. **Property at 2 Secor St:** AT&T investigated this candidate, however the residents objected to the proposed location for a new wireless facility, and therefore the town withdrew their offer.

6. **Property at 50 Fishkill Rd:** AT&T investigated a site candidate at this location; however, the property owner withdrew their offer and is not interested in locating a site on their property.

7. **Property at Gate House Rd:** Without specification, defendants have identified the "Gate House Road property" as an alternate site. As discussed in the hearing materials, this is an ambiguous reference covering numerous potential properties. None have been identified as available and all have zoning and/or construction issues, including a long, narrow site that is part of the New York City Aqueduct system. As the terrain in

this area is aggressive, unless and until a site that is available and buildable is specified, it is impossible to determine what height facility would be needed or what coverage would be provided from such a facility.

8. **Replacement site at Former Butterfield Hospital:** The new facility replacing the former Butterfield Hospital will provide a 40 ft. antenna height, which is well below the tree line and nearby terrain features. Additionally, any site that may be constructed at the new facility would experience the same problems as the previous site and not provide needed coverage to the north, due to the terrain obstructions, the same terrain along which the proposed Nelsonville site is located. This blockage of service by terrain would not help in remedying the service deficiencies and poor drop call performance experienced from the NWL02811 site in the McKeel's Corner area. Therefore, this site would not be an effective or efficient alternative, as it would still require another site to the north to address the network performance issues outlined herein.

ALTERNATIVE TECHNOLOGIES

As part of this analysis, V-COMM investigated the use of alternative technologies such as microcells or small network nodes. In a suburban area like the Village of Nelsonville as many as 20 to 25 small network nodes and /or Outdoor Distributed Antenna system (ODAS) nodes (approximately 20 nodes per square mile), evenly distributed, would be needed to provide similar geographic coverage as a single macrocell (full-size wireless communication facilities). Typically, small network nodes or ODAS nodes are used in a campus or dense urban environment to provide capacity or coverage in a specific venue to supplement the existing coverage and capacity of the macrocell network. In suburban areas like Nelsonville, with significant variations in terrain features, these outdoor small cell nodes have not proven to be a viable alternative to traditional macro sites like that proposed. These low height, low power nodes have very limited site distance (900 feet or less) when there are no terrain or foliage blockage features. In this area, due to its significant terrain features (up to 100 foot elevation changes in short distances) and tree growth, this is not a viable replacement to what is proposed in this 110 foot camouflaged structure, which as demonstrated herein, covers the gap in service and provides contiguous service with neighboring sites. Additionally, the town's expert, Ronald E. Graiff, P.E (Radio Frequency Consulting Engineer, Witness for Village of Nelsonville) mentioned in his January 2018 Report that ODAS nodes are not a practical solution in Nelsonville due to large areas of terrain obstructions.

Despite the terrain issues, ODAS nodes have other limitations and are more susceptible to failure than traditional macro sites. ODAS nodes will not function during maintenance work on the electric poles or during power outages since they cannot house a generator. Therefore, during emergencies, these nodes will not be available to residents for 911 and other emergency communications.

Typically, 90 – 95% of utility poles are not be usable. Poles with capacitor banks, reclosures, transformer and/or electrical secondary riser, primary risers, air break switches are typically rejected by local power companies due to safety and constructability reasons. Junction poles and poles with primary are also rejected for the same reasons.

Taking into account all issues outlined above, it is not practical to deploy ODAS nodes as an alternate technology to meet AT&T's coverage requirements in this part of village of Nelsonville.

CONCLUSIONS

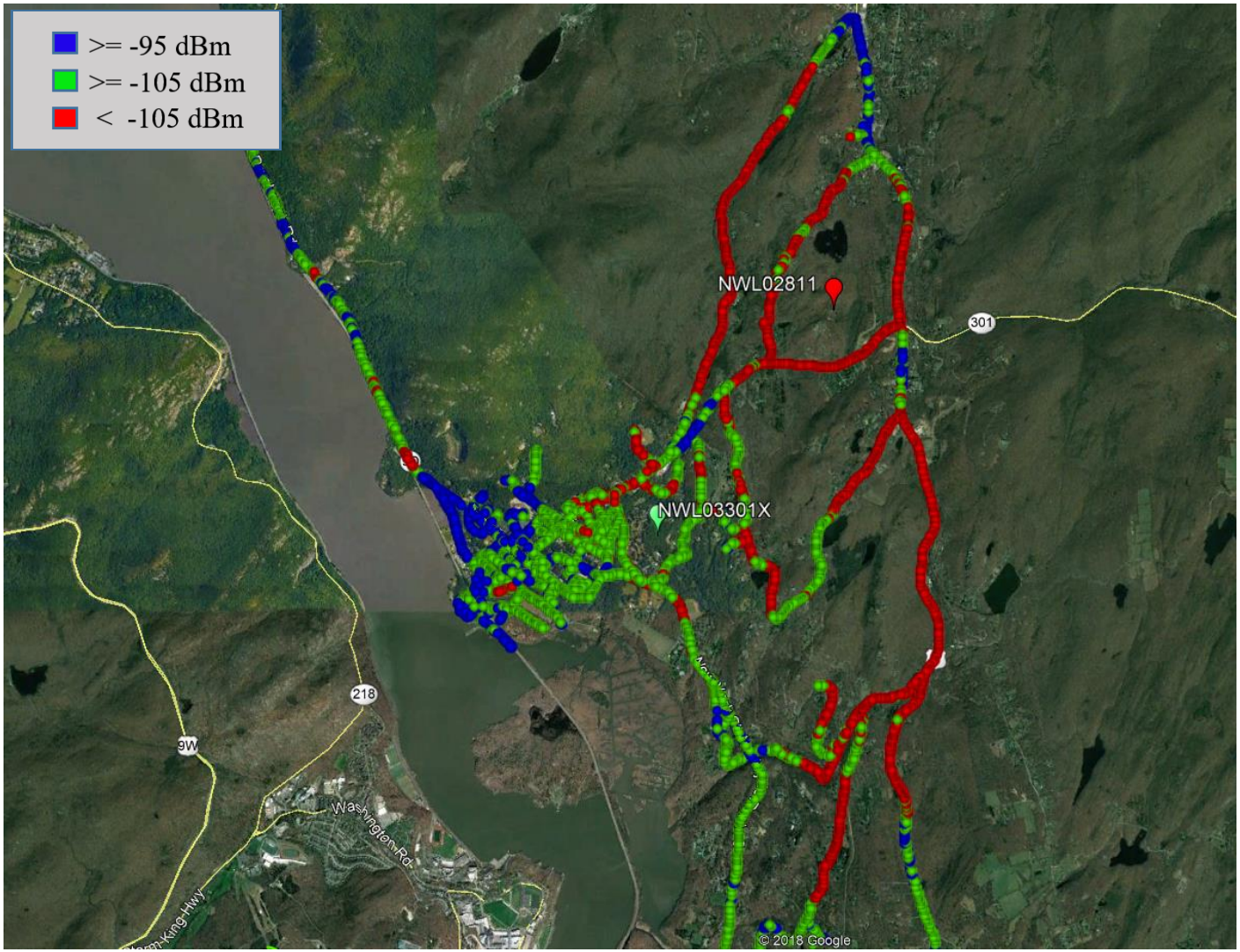
V-COMM reviewed the materials provided by AT&T and prepared an analysis of the existing cell sites and their respective radio frequency coverage. With the existing sites, it is my expert opinion that there is a substantial gap in coverage that restricts AT&T customers from originating, maintaining or receiving calls from the "Public Switched Telephone Network" for VoLTE calls. It is also my expert opinion that AT&T subject site located at 15 Rockledge Road in Nelsonville, NY, will satisfy the coverage and 4G LTE data needs of AT&T and its subscribers in this portion of the Village of Nelsonville.

In addition, I have reviewed the overall system plan for AT&T in the Village of Nelsonville and find that the plan is sound and consistent with industry standards and practices.

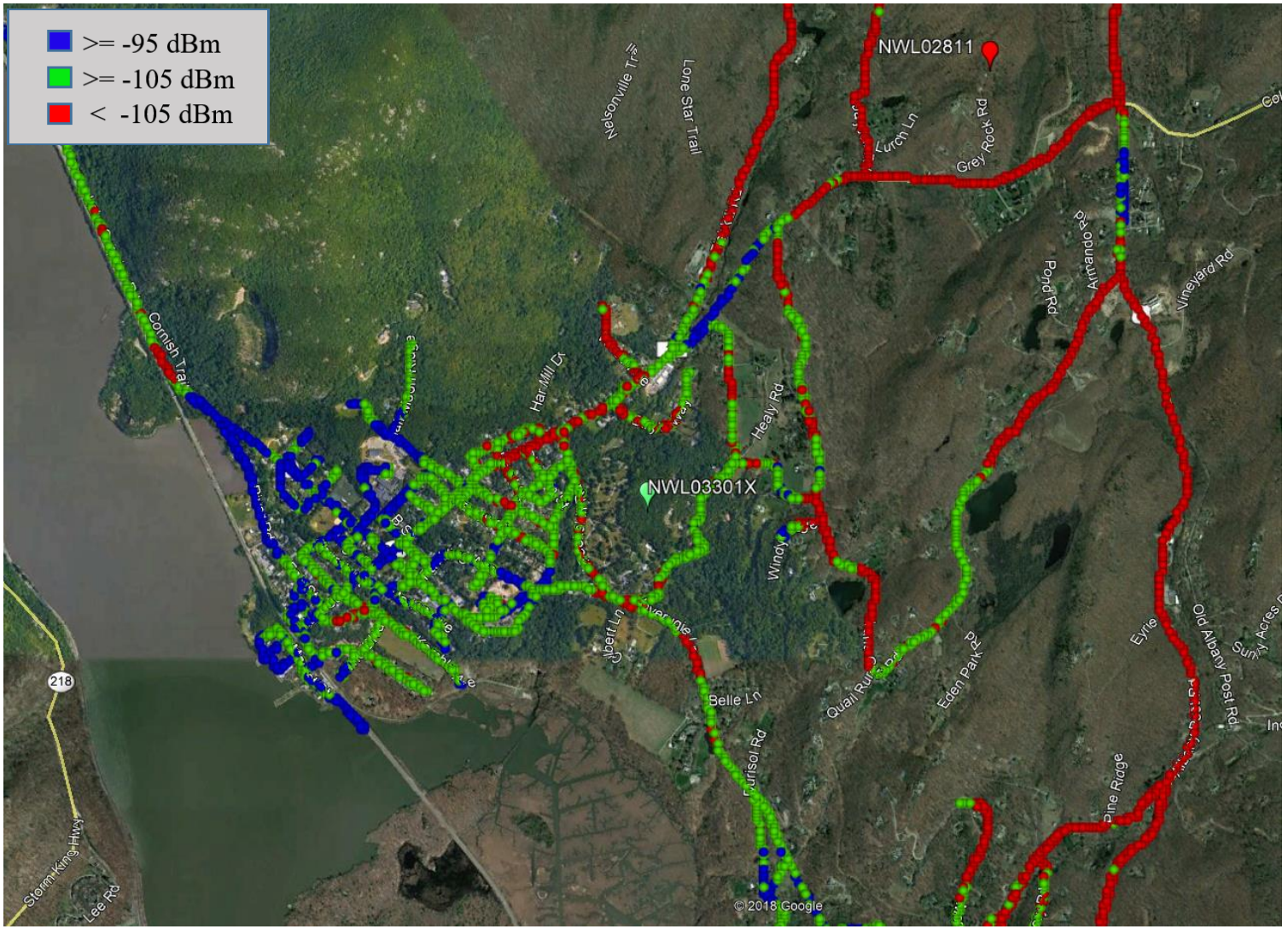
Dominic C. Villecco [03/15/19]
President
V-COMM, L.L.C.

APPENDIX A – DRIVE TEST DATA

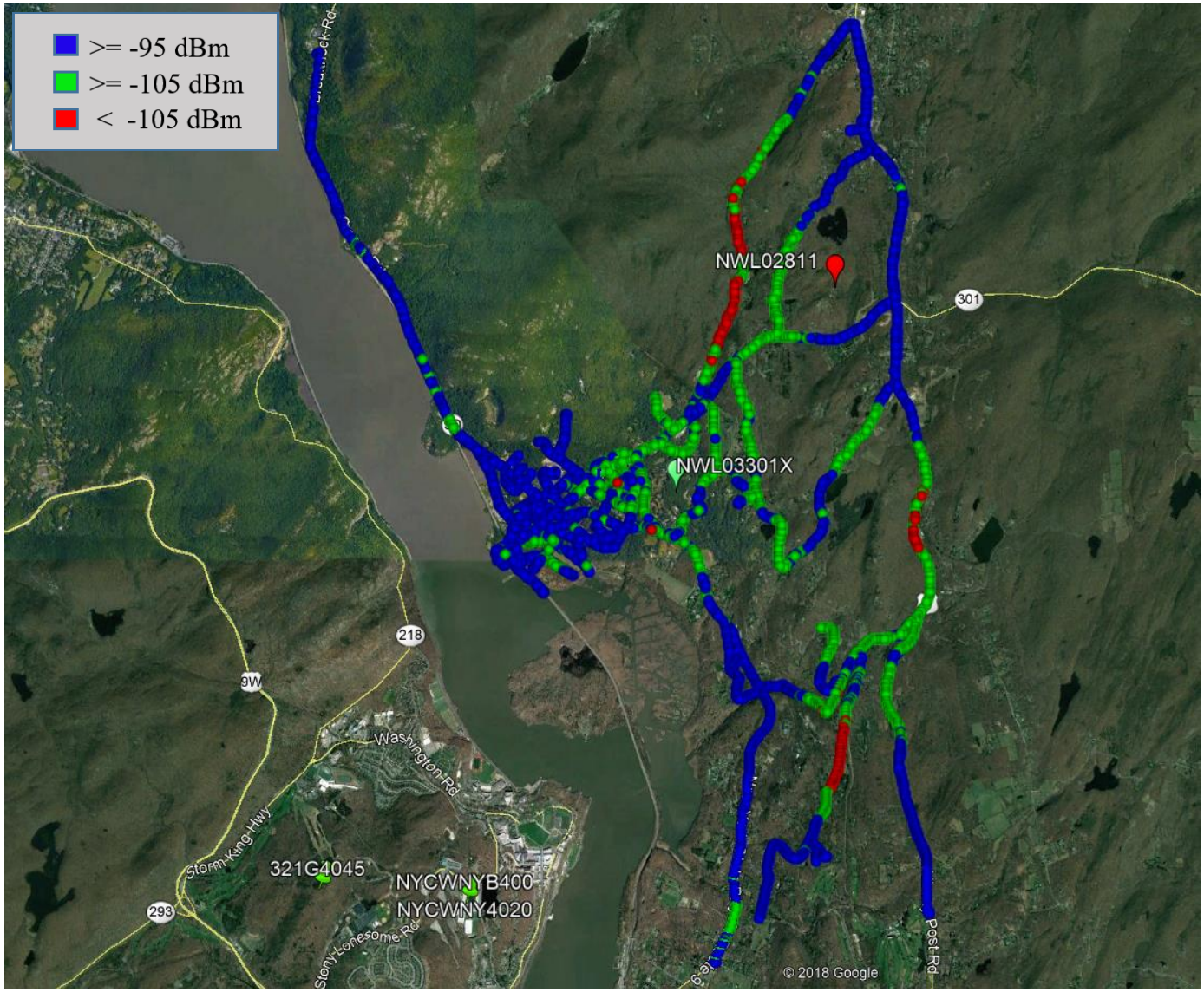
MAP 9 - 1900 MHz On-Air Drive Test Data



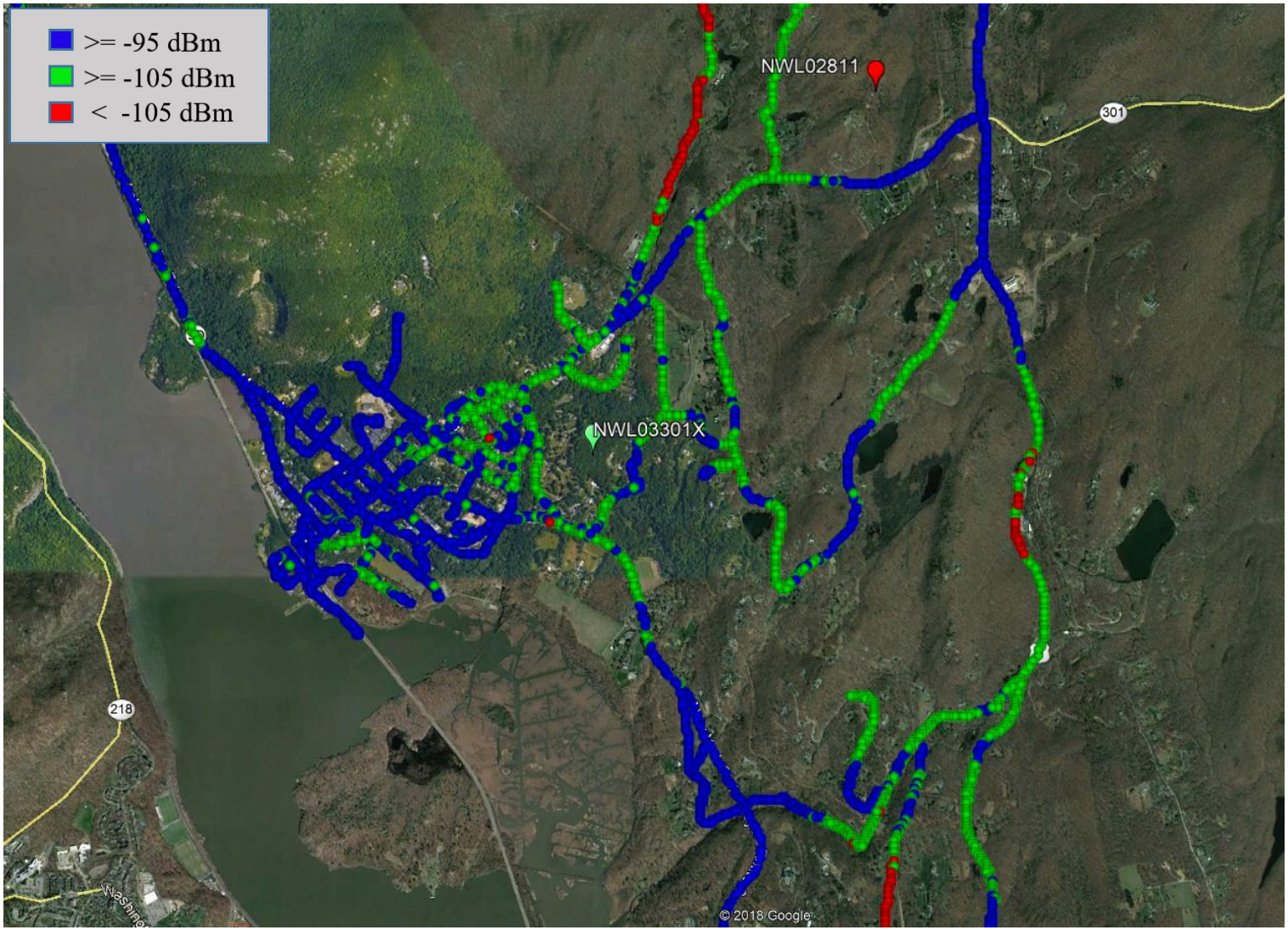
MAP 10 – Zoomed In 1900 MHz On-Air Drive Test Data



MAP 11- 700 MHz On-Air Drive Test Data



MAP 12- Zoomed In 700 MHz On-Air Drive Test Data



APPENDIX B -
DROP CALL DATA

Figure 2 - Dropped Calls for AT&T Site NWL02811 (Garrison) Gamma Sector

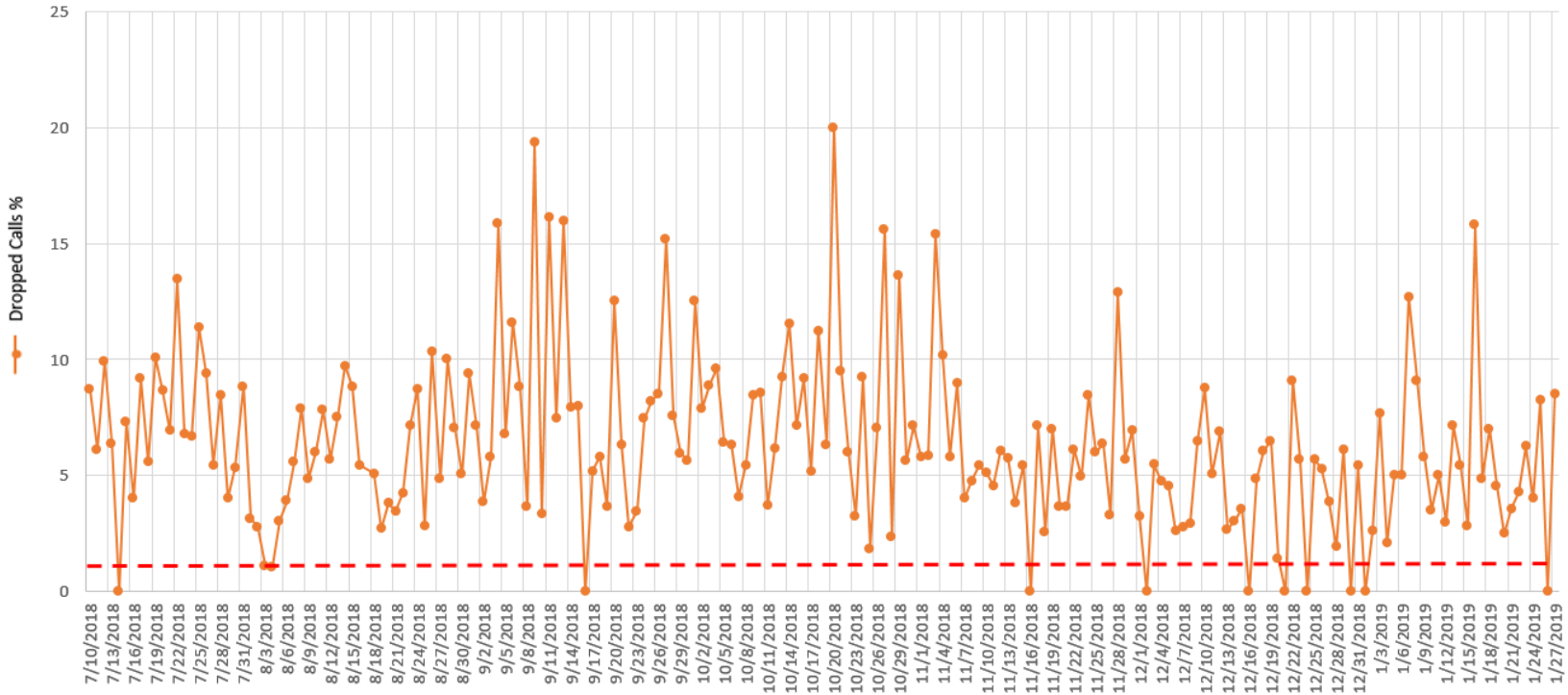


Figure 3 - Dropped Calls for AT&T Site NWL02811 (Garrison) Beta Sector

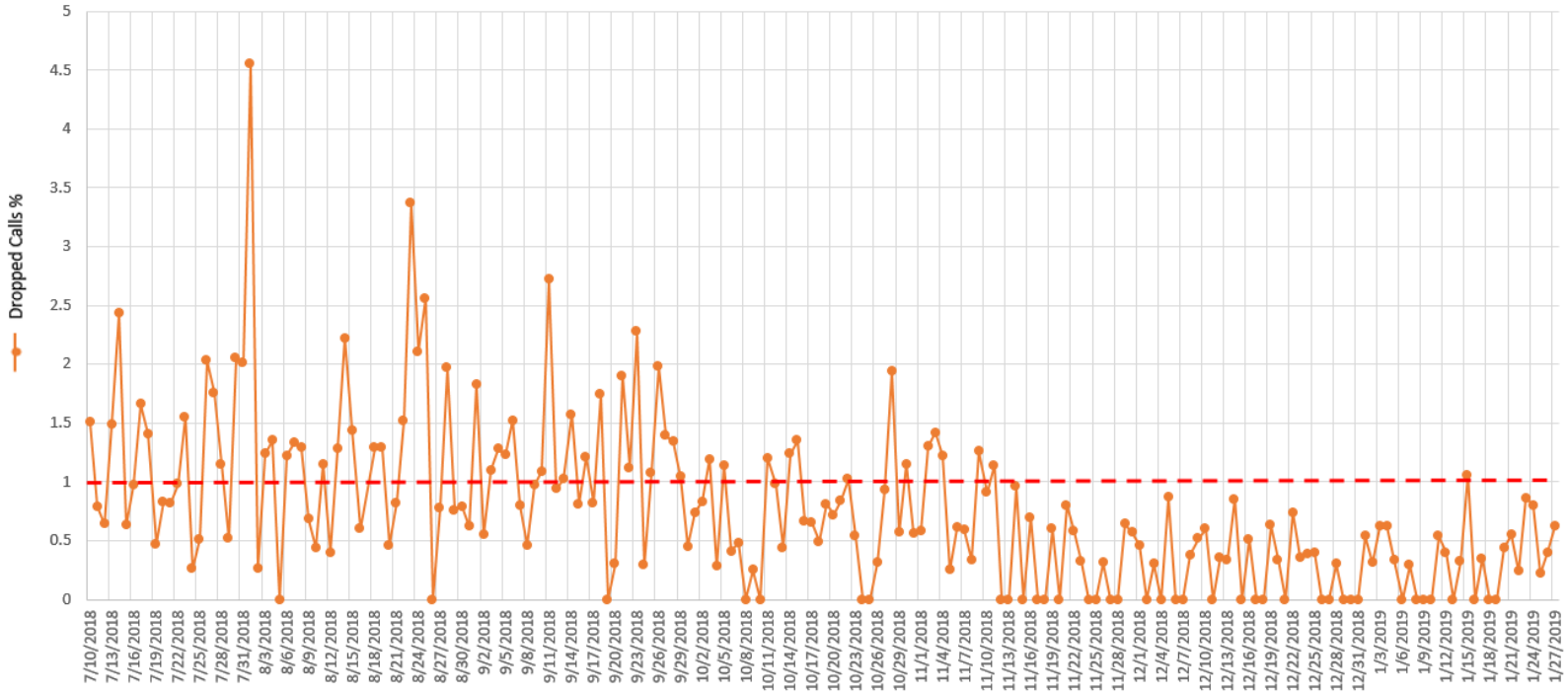


Figure 4 - Dropped Calls for AT&T Site NWL01120 (Michie Stadium) Alpha Sector

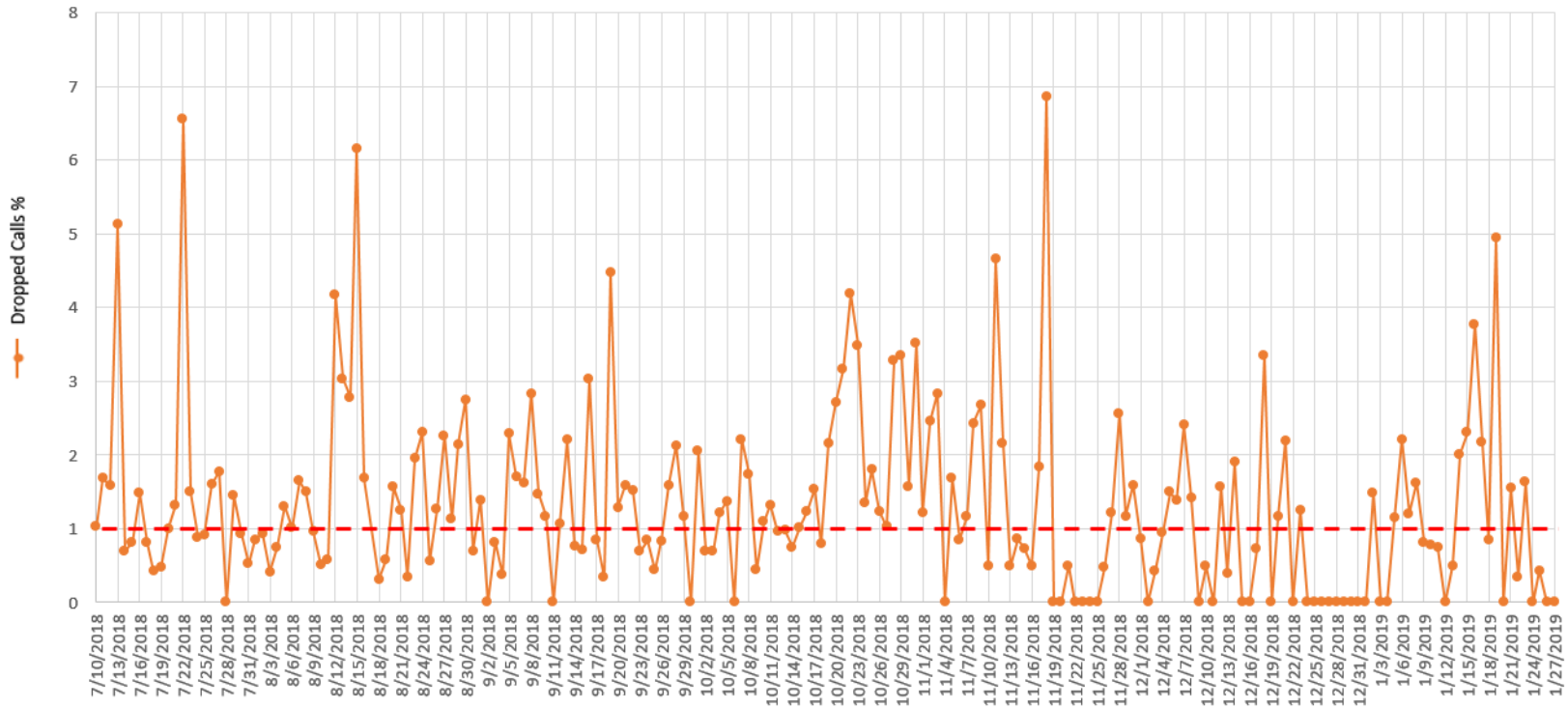


Figure 5 - Dropped Calls for AT&T Site NWL05045 (West Point) Beta Sector

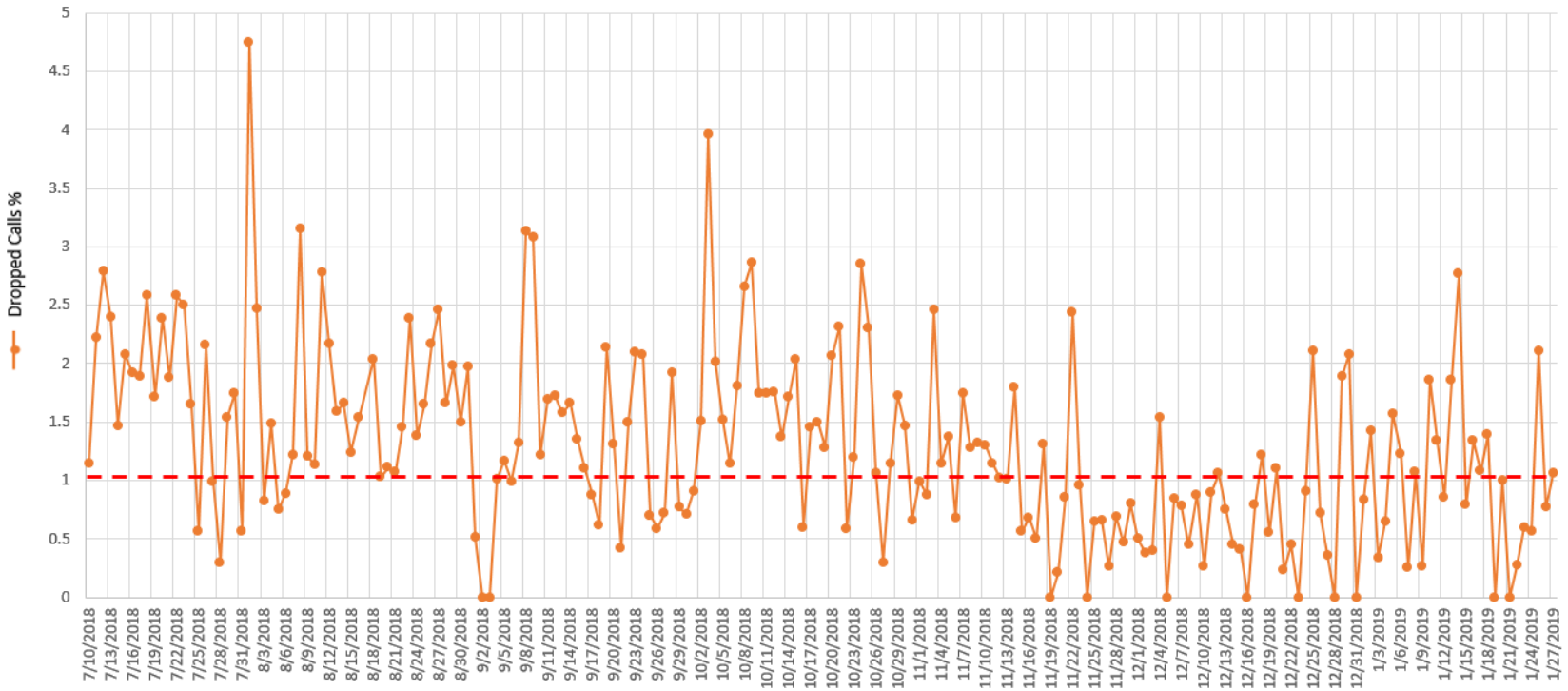
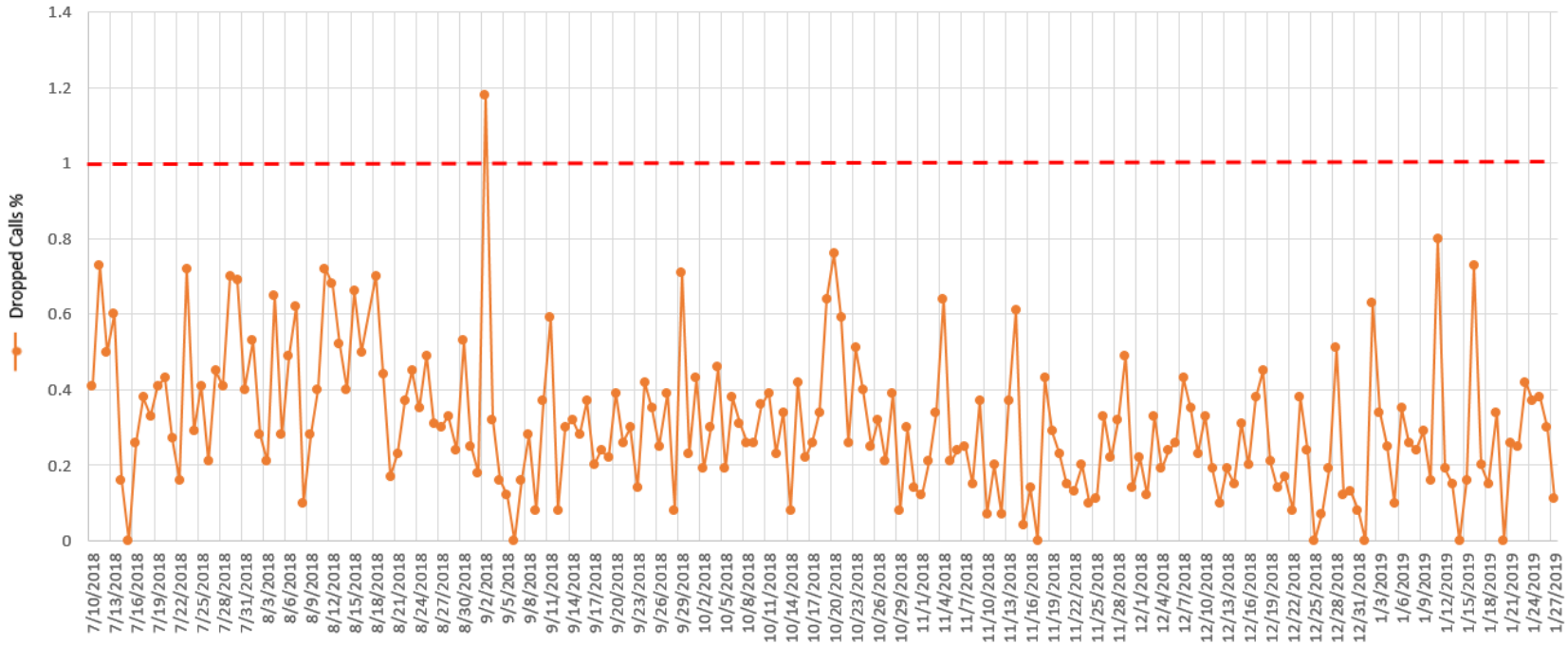


Figure 6 - Dropped Calls for AT&T Site NWL05045 (West Point) Alpha Sector



APPENDIX C
EXPERT'S BIOGRAPHY

Dominic C. Villecco
President and Founder
V-COMM, L.L.C.

Dominic Villecco, President and founder of V-COMM, is a pioneer in wireless telecommunications engineering, with 38 years of executive-level experience and various engineering management positions previously. Under his leadership, V-COMM has grown from a start-up venture in 1996 to a highly respected full-service consulting telecommunications engineering firm.

In managing V-COMM's growth, Mr. Villecco has overseen expansion of the company's portfolio of consulting services, which today include a full range of RF and Network support, network design tools, measurement hardware, and database services as well as time-critical engineering-related services such as business planning, zoning hearing expert witness testimony, regulatory advisory assistance, and project management.

Before forming V-COMM, Mr. Villecco spent 10 years with Comcast Corporation, where he held management positions of increasing responsibility, his last being Vice President of Wireless Engineering for Comcast International Holdings, Inc. Focusing on the international marketplace, Mr. Villecco helped develop various technical and business requirements for directing Comcast's worldwide wireless venture utilizing current and emerging technologies (GSM, PCN, ESMR, paging, etc.).

Previously he was Vice President of Engineering and Operations for Comcast Cellular Communications, Inc. His responsibilities included overall system design, construction and operation, capital budget preparation and execution, interconnection negotiations, vendor contract negotiations, major account interface, new product implementation, and cellular market acquisition. Following Comcast's acquisition of Metrophone, Mr. Villecco successfully merged the two technical departments and managed the combined department of 140 engineers and support personnel.

Mr. Villecco served as Director of Engineering for American Cellular Network Corporation (AMCELL), where he managed all system implementation and engineering design issues. He was responsible for activating the first cellular system in the world utilizing proprietary automatic call delivery software between independent carriers in Wilmington, Delaware. He also had responsibility for filing all FCC and FAA applications for AMCELL before it was acquired by Comcast.

Prior to joining AMCELL, Mr. Villecco worked as a staff engineer at Sherman and Beverage (S&B), a broadcast consulting firm. He designed FM radio station broadcasting systems and studio-transmitter link systems, performed AM field studies and interference analysis and TV interference analysis, and helped build a sophisticated six-tower arrangement for a AM antenna phasing system. He also designed and wrote software to perform FM radio station allocations pursuant to FCC Rules Part 73.

Mr. Villecco started his career in telecommunications engineering as a wireless engineering consultant at Jubon Engineering, where he was responsible for the design of cellular systems, both domestic and international, radio paging systems, microwave radio systems, two-way radio systems, microwave multipoint distribution systems, and simulcast radio link systems, including the drafting of all FCC and FAA applications for these systems.

Mr. Villecco has a BSEE from Drexel University, in Philadelphia, and is an active member of IEEE. Mr. Villecco also served as the Vice Chairman of the Advisory Council to the Drexel University Electrical and Computer Engineering (ECE) Department and received the 2001 Distinguished Alumnus Award from that same department. Mr. Villecco currently serves as the Vice President of the Board of Trustees of the New Jersey Wireless Association and is also its Public Safety Committee Chair.

Relevant Expert Witness Testimony Experience

Over the past twenty years, Mr. Villecco had been previously qualified and provided expert witness testimony in the following venues:

Expert Witness Zoning Testimony

- Avalon Borough, NJ
- Belleville, NJ
- Belmar, NJ
- Berkeley Heights Township, NJ
- Bernards Township, NJ
- Bernardsville, NJ
- Branchburg, NJ
- Bridgewater Township, NJ
- Brielle, NJ
- Bushkill Township, PA
- Colts Neck Township, NJ
- Cranbury Township, NJ
- Cresskill, NJ
- Cross Village / Emmett County, MI
- Cumru Township, PA
- Exeter Township, PA
- Fair Haven, NJ
- Fanwood Borough, NJ
- Franklin, NJ
- Freehold, NJ
- Garfield, NJ
- Glen Gardner, NJ
- Glen Rock, NJ
- Hampton Borough, NJ
- Hanover, NJ
- Hardyston Township, NJ
- Harrington Park, NJ
- Helmetta, NJ
- Hempstead, NY
- Highland Park, NJ
- Hoboken, NJ
- Holmdel Township, NJ
- Hopewell Borough, NJ
- Hopewell Township, NJ
- Howell Township, NJ
- Jackson Township, NJ
- Jersey City, NJ
- Kearny, NJ
- Kingston, NJ
- Lawrence Township, NJ
- Little Egg Harbor Twp., NJ
- Little Silver Borough, NJ
- Long Valley, NJ
- Lower Alsace Twp., PA
- Middletown Township, NJ
- Millstone Township, NJ
- Morris Township, NJ
- Neptune Township, NJ
- Newark, NJ
- New Castle County, DE
- New Providence, NJ
- N. Caldwell Township, NJ
- Orange, NJ
- Plainfield, NJ
- Princeton Township, NJ
- Reading Township, NJ
- Ridgefield, NJ
- Rochelle Park, NJ
- Rutherford, NJ
- Saddle Brook Township, NJ
- Sayreville, NJ
- Somers Point, NJ
- Somerville, NJ
- South Brunswick, NJ
- South Coventry Twp., PA
- South Plainfield, NJ
- Stone Harbor, NJ
- Tenafly, NJ
- Upper Allen Township, PA
- Upper Freehold, NJ
- Wall Township, NJ
- Wallington, NJ
- Wantage Township, NJ
- Washington Township, NJ
- Wayne Township, NJ
- Weehawken Township, NJ[12]

[12] This was a precedent case in New Jersey Superior Court

United States Bankruptcy Court

Nextwave Personal Communications, Inc. vs. Federal Communications Commission (FCC) [13]
Pocket Communications, Inc. vs. Federal Communications Commission (FCC) [14]

Civil Matters

Re: Estates of Peter J. Karoly and Lauren B. Angstadt, Docket Nos. 2007-0187 and 0176, Northampton County Court of Common Pleas, Easton, PA [15]

Re: COH v Cox Cable VBCC Case No: CL17-129 - Project 0264-134-102, RW-201, UPC 108041/17630, Parcel No: 026 & 032, COT No: C-516050/C-516051, Virginia Beach, VA [16]

Re: Harris Corporation vs. State of Florida Department of Management Services and Motorola Solutions, Inc., Case No.: 18-1781BID, Tallahassee, FL [17]

Criminal Matters

Ocean County Prosecutor's office, State of New Jersey vs. Robert Hill, 2005 [18]

[13] In this case, Mr. Villecco was retained by the FCC and the Department of Justice as a technical expert on their behalf, pertaining to matters of wireless network design, optimization and operation.
[14] In this case, Mr. Villecco was retained by the FCC and the Department of Justice as a technical expert on their behalf, pertaining to matters of wireless network design, optimization and operation.
[15] In this case, Mr. Villecco was retained by the Estates of Peter J. Karoly and Lauren B. Angstadt and qualified by the court as an expert in cellular system operation, call record interpretation and calling location.
[16] In this case, Mr. Villecco was retained by the Virginia Department of Transportation (through a subcontract arrangement with Subcarrier Communications) and qualified by the court as an expert in wireless telecommunications engineering.
[17] In this case, Mr. Villecco was retained by Motorola Solutions, Inc. and qualified by the court as an expert in public safety wireless communications engineering.
[18] In this case, Mr. Villecco was retained by the Ocean County prosecutor's office and qualified by the court as a technical expert on their behalf, pertaining to matters of wireless network design, optimization and operation.