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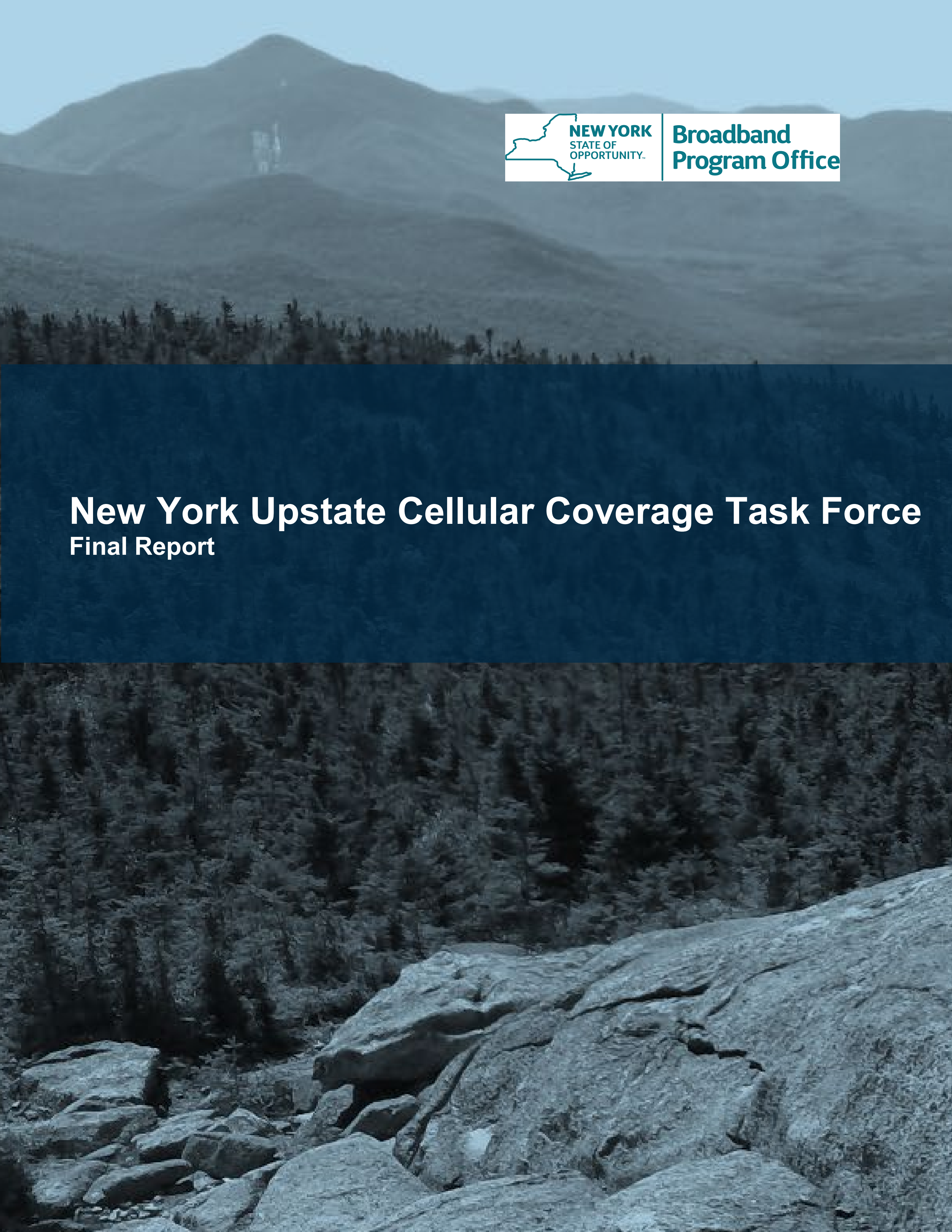

New York Upstate Cellular Coverage Task Force

Final Report

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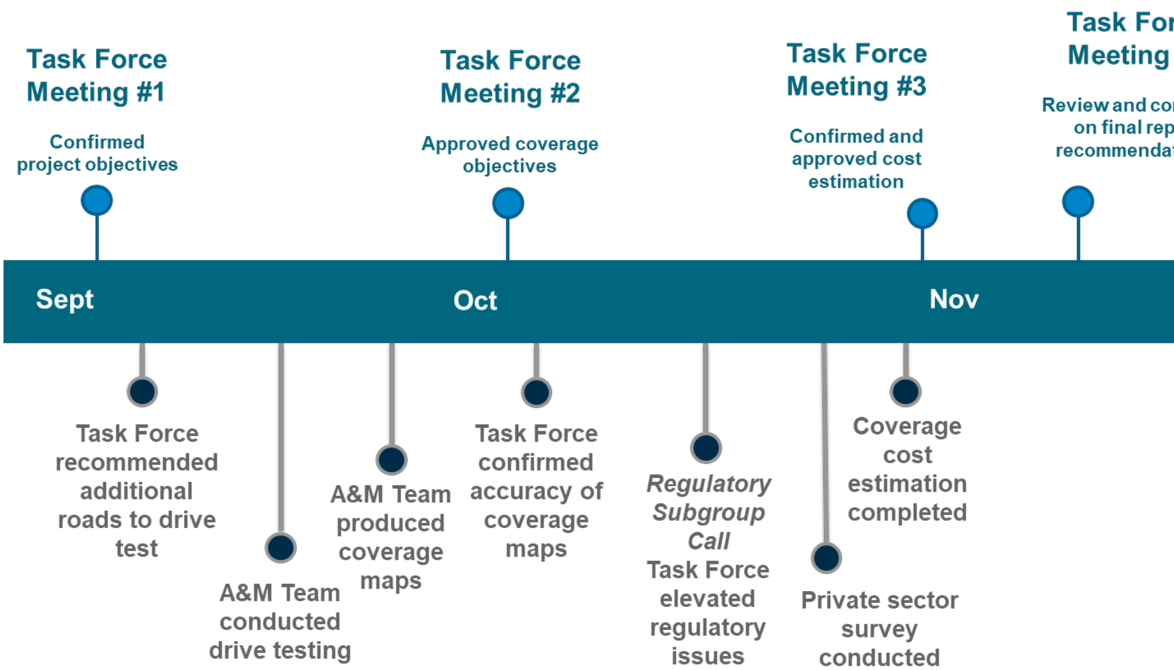
Executive Summary

In 2019, New York State established an Upstate Cellular Coverage Task Force (the Task Force) to develop implementable recommendations for enhancing cellular coverage in uncovered areas of upstate New York, including the Adirondacks and Catskills. The Task Force brought together industry experts, community leaders, government officials, environmental constituencies, and other key stakeholders. The Broadband Program Office (BPO) of Empire State Development led implementation of the Task Force mission. Over the course of four meetings, the Task Force's members reviewed existing policies, potential constraints, and available resources and funding sources for the expansion of cellular coverage (*see Figure 1 below*).

Figure 1: Task Force Activities



To inform the Task Force's deliberations and development of recommendations, the BPO engaged an advisory team led by Alvarez & Marsal P3 | Infrastructure | Real Estate Advisory (A&M) with technical expertise provided by Tilson (collectively, the "A&M Team"). The A&M Team performed analyses in the following key areas to support the Task Force:

- **Measuring Cellular Coverage:** In consultation with the Task Force, the A&M Team performed drive testing to measure cellular coverage along a subset of major roadways in the Adirondack and Catskill regions – upstate regions with the most significant coverage gaps. This drive testing provided primary data on coverage gaps in these regions, which was combined with other data sets to model cellular needs across upstate New York. Additionally, these results were compared with Mobility Fund coverage maps produced by the Federal Communications Commission (FCC), demonstrating that these previous FCC maps overstated actual coverage.[1]

- **Evaluating Regulatory Policies:** The Task Force and A&M Team reviewed regulatory policies and processes relevant to cellular infrastructure deployment in New York at the State and local levels – including steps to obtain necessary permits, approximate permitting timelines, and other barriers to cellular deployment. This review was supplemented with a survey of carriers and tower companies, consultations with relevant State agencies, and research on comparable rules in other jurisdictions. This information allowed the Task Force to identify potential areas for regulatory improvements to encourage and streamline cellular deployments.

- **Estimating Coverage Costs:** The A&M Team estimated the "per mile" infrastructure costs associated with providing reliable cellular coverage along targeted corridors where the drive tests identified coverage gaps. These estimates were used to extrapolate the range of potential costs associated with improving coverage across the state.

Coverage Goal

The Task Force recognized that the biggest barrier to cellular coverage in rural areas is low population density. Based on the analyses and consultations, the consensus of the Task Force supported a goal of eliminating cellular coverage gaps along all major upstate roadways – interstates, U.S. and state highways, as well as major county and local roads (approximately 1,950 road miles across the state). Achieving this goal will require an estimated investment of approximately $610 million – *representing the median in a cost-modeling range*, or $313,000 per mile – which may be derived through a combination of private and public funding.

Recommendations

To achieve its coverage goal and drive the necessary cellular infrastructure investment, the Task Force developed the following consensus recommendations for consideration by the State:

- **Maximize Private Sector Investment:** Encourage private cellular infrastructure investment to the greatest extent possible in areas currently lacking adequate coverage, particularly new private investment pursuant to the federal FirstNet initiative. Regulatory reform should promote and accelerate private investment. Any potential economic incentives by the State should be structured to not displace planned private investment.

- **Streamline Regulatory Processes:** Pursue regulatory improvements that address key barriers to cellular infrastructure deployments in the Adirondacks, Catskills, and other

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[1] The FCC has since published a new cellular coverage map, which is available at https://www.fcc.gov/BroadbandData/MobileMaps/mobile-map. This new map utilizes data voluntarily submitted by the major cellular carriers.

uncovered upstate areas, including easing permitting requirements, promoting access to State and local rights-of-way, and expanding land availability for cellular facilities.

- **Evaluate Potential Economic Incentives:** Consider grants for the construction of new cellular infrastructure providing coverage to uncovered areas. Potential State investments should allocate funding competitively to qualified private partners, require a private co-investment in projects, and leverage existing State and federal programs – such as the New NY Broadband Program and a potential FCC cellular coverage expansion program.

The lack of reliable cellular coverage is a challenge impacting rural communities across the country, affecting communications, public safety and economic opportunity in these areas. However, New York State successfully addressed a similar problem in rural broadband availability, ensuring that over 99 percent of New Yorkers will have access to wired broadband through the New NY Broadband Program. The State can build on the successes of this Program and address upstate cellular coverage gaps, to once again lead the nation.

Introduction

New York State has made historic investments in infrastructure and broadband availability. Most notably, the $500 million New NY Broadband Program will ensure that more than 99% of New Yorkers will have access to wired broadband. Notwithstanding this progress, however, many areas in upstate New York, particularly in the Adirondack and Catskill regions, lack adequate cellular service coverage. The lack of reliable cellular service coverage in many parts of upstate New York undermines economic growth, impacts communications and safety, limits access to 911, and inhibits adoption of 21st century infrastructure and technology. This issue has been a major local concern for upstate residents. This report describes the challenges of delivering cellular coverage in upstate New York and proposes policy recommendations to improve upstate coverage.

Task Force Purpose

The Upstate Cellular Coverage Task Force was established to address cellular coverage gaps in upstate New York. The Task Force was launched on September 10, 2019. Members of the Task Force – representing State and local government, industry, and the environmental community – are listed below (*see Table 1*).

The Task Force reviewed existing policies, potential constraints, and available resources and funding sources, with the goal of developing implementable recommendations for enhancing cellular coverage in uncovered areas, including the Adirondack and Catskill regions.

Task Force Advisors

The A&M Team was retained to advise the Task Force on the expansion of cellular coverage in upstate New York. The major elements of the A&M Team's engagement included:

- **Developing estimates of existing cellular coverage in upstate NY;**
- **Modeling estimated costs associated with expanded cellular coverage;**
- **Researching relevant regulatory and environmental policies; and**
- **Supporting the development of potential approaches to expanded coverage.**

Table 1: Task Force Members

Institution / Constituency	Delegate	Title
Executive Chamber	**Barbara Rice**	Assistant Secretary for Economic Development
Empire State Development – Broadband Program Office	**Jeffrey Nordhaus**	Executive Vice President, Innovation & Broadband
NYS Public Service Commission	**Thomas Congdon**	Chief of Staff and Executive Deputy Chair
Hamilton County	**William Farber**	Chair - Board of Supervisors
Cuddy & Feder LLP / NYS Wireless Association	**Christopher Fisher**	Managing Partner / State and Local Government Affairs Advisor
Steuben County 911	**David Hopkins**	Director
Catskill Center	**Jeff Senterman**	Executive Director
Stony Brook University	**Dr. Satya Sharma**	Executive Director - Center of Excellence Wireless and Information Technology
NYS Division of Homeland Security & Emergency Services	**Michael Sprague**	Director - Office of Interoperable & Emergency Communications
Adirondack Park Agency	**Rick Weber**	Deputy Director, Planning
Ex-officio Members		
NYS Senate	**Betty Little**	Senator
NYS Senate	**Rachel May**	Senator
NYS Senate	**Jen Metzger**	Senator
NYS Assembly	**Aileen Gunther**	Assembly Member
NYS Assembly	**Billy Jones**	Assembly Member
NYS Assembly	**Angelo Santabarbara**	Assembly Member

1. Industry Assessment

The following section will provide a foundational overview of the cellular industry and market participants, cellular networks and technologies, challenges impacting service in rural areas, and key industry trends.

1.1. Industry Background

A cellular network, also known as a mobile network, is a high-speed, high-capacity voice and data communication network. With the introduction of flat rate subscription services and an increase in cellular-connected device use, the volume of data on these networks and the level of access to them has grown rapidly over the years. Today, reliable access to mobile networks is crucial to commerce, education, public safety, community development, and other needs.

Types of Cellular Carriers

A cellular carrier, also known as a **mobile network operator (MNO)**, is a company that provides cellular communication services to an end user. The carrier owns or controls and operates all necessary components of the network in order to sell and deliver service. To broadcast their service, MNOs must acquire a radio spectrum license, or frequency allocation, from a government or regulatory entity.

Figure 2: The Major National Carriers

The most well-known MNOs are the larger nationwide carriers, which include AT&T, Verizon, and T-Mobile. These carriers generally provide the most extensive rural coverage, although there are local and regional exceptions. The coverage by these MNOs is especially important to rural areas with tourism-dependent economies. Smaller MNOs like US Cellular – the fourth-largest cellular operator in the country – and Blue Wireless – a small operator in the Buffalo, New York, and Erie, Pennsylvania areas – offer regional coverage. These carriers may provide the best coverage in some rural areas across the country. Notably, the presence in New York of smaller MNOs like these companies is very limited.

Cellular subscribers can receive coverage outside areas serviceable by their MNO by “roaming” in regions covered by another carrier pursuant to a pre-existing roaming agreement. Not every carrier has a roaming agreement with all other carriers, and not all customer phones are necessarily compatible with all networks that they may encounter. Roaming agreements allow smaller carriers to access a larger carriers’ coverage and allow national carriers to fill in holes within their national footprint. Prior to the consolidation of the cellular industry, roaming was a necessity for any company seeking coast-to-coast coverage. Today, MNOs with nationwide networks can be more selective about when and with whom their customers may roam. Carriers have a financial incentive to minimize roaming.

Some **MNOs** specialize in rural communities. These networks often help extend the coverage of larger MNOs who have not built out network infrastructure into less populated areas. National examples of such companies include Shentel, Pioneer, Commnet, and Northeast Wireless Networks. These companies generally provide wholesale service through roaming agreements in areas where they operate. In some cases, this may be the company's exclusive business, and in other cases the company may also offer retail service to customers within the areas that it serves. As a result of industry consolidation, these rural MNOs are not as common as they once were, and there are currently none in New York.[2] In recent years, however, major carriers have also sponsored new partnerships with rural MNOs in targeted rural areas, offloading responsibility for building out parts of their rural networks to their rural partner. For example, Verizon's LTE in Rural America Program[3] partners with more than 20 rural carriers across the nation.

MNOs may sell access to their network services and spectrum allocation to smaller carriers called **mobile virtual network operators (MVNO)**. The brand names of MVNOs are well-known to many consumers and include Tracfone, Straight Talk, Ting, and Google Fi. MVNOs do not, however, own the infrastructure needed to transmit service.[4] MVNOs lease access from MNOs in bulk and often at wholesale rates. In some cases, major national carriers have acquired companies that were formerly independent MVNOs and continued to operate them as distinct brands, for example Cricket Wireless via AT&T. Since these networks do not have the cost associated with building and maintaining towers, their services may cost the consumer less compared to a larger MNO. While some MVNO brands may be recognizable, they do not independently contribute to expanding coverage.

The major national carriers are important for expanding coverage because they are the most practical option and have the largest number of users. Regional and rural carriers are minimally present in New York and MVNOs are not a viable option for expanding coverage since their service relies on the presence of major carriers. Possible new market entrants, like DISH, are a long way from being considered a practical option for expanding coverage.

Network Generations

Cellular network advertising and the news often tout the benefits of service provided by "4G" or "5G" networks. The "G" in 1G, 2G, 3G, 4G, and 5G stands for Generation. First-generation networks were the original analog mobile networks and phones. Subsequent generations of network technology, summarized in Table 2, are faster and offer improved or new features. 4G is the primary version in current use, but 5G deployment is underway.

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[2] Rural Cellular Corporation (RCC) was such a company that operated in New York. Verizon Wireless acquired RCC in 2009.

[3] https://www.verizon.com/about/responsibility/product-responsibility

[4] Some cable operators have also entered the market as MVNOs, two examples of this are Xfinity Mobile or Spectrum Mobile. These cable company products typically rely on a combination of cellular networks for wide-area service and the cable operator's widely-deployed Wi-Fi hotspots in or very close to buildings or other developed areas over very short ranges.

Table 2: Cellular Network Generations

Network	Description	Status
1G	The original analog voice cellular service	Retired
2G	Digital voice service and low-speed data	Nearly Retired
3G	Moderate-speed data	Mostly Retired
4G	Higher-speed data, lower latency, voice as data	Widely Deployed
5G	Designed for a wide range of very high-speed to lower-speed data applications, low latency	Deployments Starting

Long-Term Evolution, known as LTE, is the universal language that 4G radios use to communicate. "4G-LTE" is the most broadly supported technology currently available and will continue to be for the near future, particularly in rural areas. **Therefore, when assessing coverage and service availability in upstate New York, 4G-LTE service will be the focus of this report.**

Spectrum

Cellular communication signals travel through the air via invisible radio frequencies ("RF"), commonly referred to as spectrum. Radios, GPS, TV broadcasts, Wi-Fi routers, cellphones, and many other technologies utilize spectrum to send and/or receive data. Radio waves from multiple transmitters operating in an unmanaged way in the same or similar RF bands can cause interference with each other, prohibiting clear reception, such as with Wi-Fi. Thus, many cellular systems have dedicated channels, or slivers of spectrum, on which they operate. Uses of RF spectrum are wide-ranging and subject to regulation at the federal level[5] and, to an extent, at the international level.[6]

A common distinction among different spectrum bands involves licensed vs. unlicensed operation.[7] Low-powered applications of short-range transmissions may occur over unlicensed frequencies, which are portions of spectrum set aside for the public to use. Larger, commercial operations must acquire a license to operate over specific portions of spectrum. Cellular networks operate in licensed spectrum, with different bands in a given geographic area reserved for particular MNOs. MNOs obtain their spectrum license from the FCC. The FCC controls who is operating on blocks of spectrum by auctioning off the licenses to blocks based on a variety of small or large geographical units. MNOs often purchase multiple blocks of spectrum in a variety of bands. These licenses may also be transferred, with FCC approval, in post-award secondary markets. FCC licenses to different blocks of spectrum used by cellular networks have build-out

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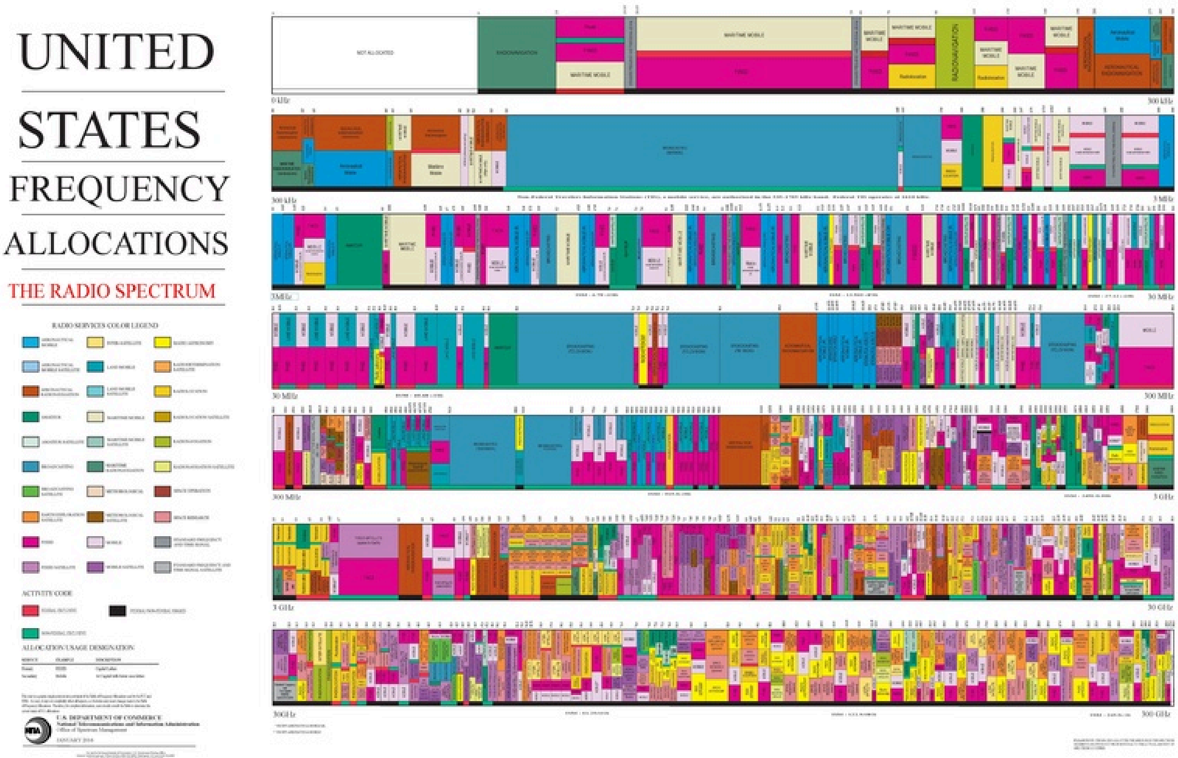
[5] 47 U.S.C.S. § 301

[6] For example, the International Telecommunications Union's Radiocommunication Sector "coordinates …radiocommunication services, as well as the international management of the radio-frequency spectrum and satellite orbits." https://www.itu.int/en/about/Pages/whatwedo.aspx.

[7] An exception to this dichotomy is the Citizens Broadband Radio Service (CBRS) spectrum, which the FCC has designated under a new "shared spectrum" model and which is now beginning to roll out. The CBRS band is shared spectrum that will be available to both licensed and unlicensed users, with priority given to licensed users. Unlicensed users will nevertheless have access so long as their use does not interfere with licensed use. See https://www.fcc.gov/wireless/bureau-divisions/mobility-division/35-ghz-band/35-ghz-band-overview.

requirements to a greater or lesser degree. Generally, license-holders are not allowed to leave their spectrum unused indefinitely. As a practical matter, few license-holders are in danger of failing to meet these requirements. It is often the case that some geographic portion of a spectrum license may remain uncovered indefinitely without running afoul of the license's build-out requirements because licenses do not require 100% build-out.

Figure 3: Spectrum Allocations in the United States as of 2016[8]



As shown in **Error! Reference source not found.**, it is possible to divide cellular spectrum used in today's current and emerging networks into three broad classes: low, mid, and high. Carriers have their own mix of spectrum licenses in a variety of bands. Note that all smartphones can use unlicensed Wi-Fi spectrum, which is very low power and only operates at short range.

Generally, there is a trade-off in spectrum between the reach (*i.e.*, coverage) of the spectrum and the amount of information that it can support (*i.e.*, capacity). Typically, more spectrum is allocated

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[8] As of November 2019, the most recent chart published by the National Telecommunications and Information Administration (NTIA) was as of January 2016. https://www.ntia.doc.gov/page/2011/united-states-frequency-allocation-chart.

to higher frequency bands.[9] Lower bands propagate further than higher bands and are less impeded by obstacles such as trees or buildings. Higher band spectrum can better support higher speeds and be used by more users simultaneously, albeit over shorter distances. In rural areas, users are spread out over greater distances and fewer people use the same frequencies simultaneously, so network planning in these areas relies more on lower bands. In a rural network, it is often best to focus on the deployment of networks supporting low-band services for basic coverage, with mid-band spectrum providing extra speed and capacity over shorter ranges.

1.2. Cellular Network Technology and Development

Cellular services depend on two key inputs: spectrum and infrastructure. Spectrum fuels cellular communications, and infrastructure – towers, poles, and other structures that support cellular antennas, as well as the other network infrastructure attached and connected to them – expands coverage and increases capacity. The increasing demand for mobile broadband requires carriers to find more spectrum and build more cellular infrastructure.

Cellular Network Infrastructure Overview

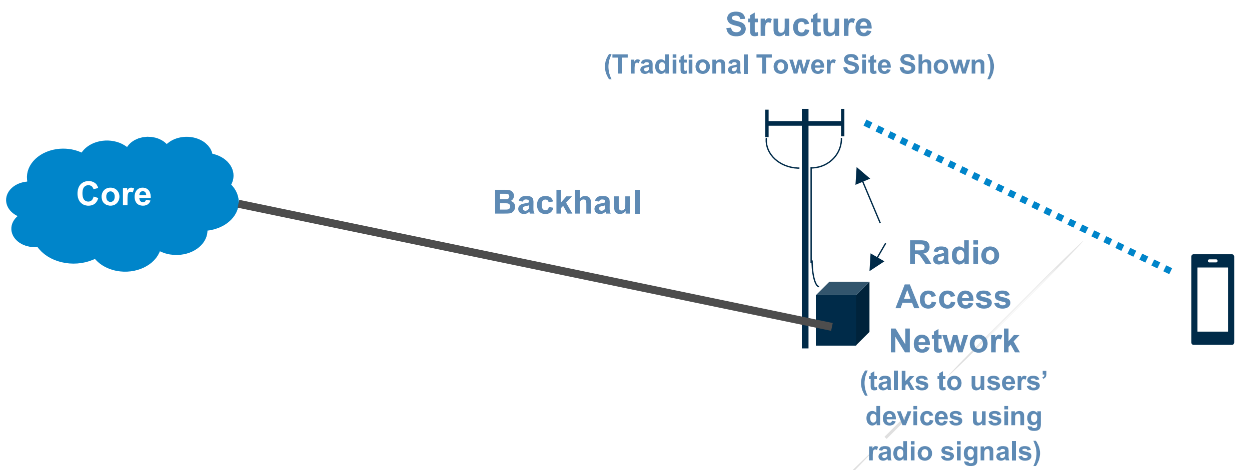
A cellular network consists of a constellation of sites which communicate to mobile user devices and are handed off from site to site. There are related communications facilities that connect this constellation of sites back to a central network, which are connected to other networks like the Internet and public telephone network. In a simplified form, the major parts a cellular network include:

- **Radio Access Network:** Creates the RF links between user equipment and cellular networks transmitting and receiving equipment.
- **Core Network:** Provides control and routing functions between cell sites and other networks, including the Internet and other cellular networks.
- **Backhaul:** Connects individual cell sites to the core network through telecommunications links, most commonly fiber optic but sometimes microwave.
- **Towers, Poles, and Support Structures:** Provide support as the physical facilities on which components of the Radio Access Network attach to better communicate with user equipment.

[9] There is a greater amount of spectrum the higher one goes up the radio spectrum (e.g. mathematically, there is only 1000 MHz of spectrum at or under 1000 MHz, but another 4000 MHz of spectrum between 1000 MHz and 5000 MHz). Therefore, higher frequency channels tend literally to have more band-width: channels are assigned a wider frequency range, allowing them to carry more information than the smaller channels that are used in lower-band services where there is simply less spectrum available to assign.

These parts, especially the Radio Access Network and Core Network, contain multiple component parts which are omitted in Figure 4 below for simplicity.

Figure 4: Conceptual Parts of a Cellular Network



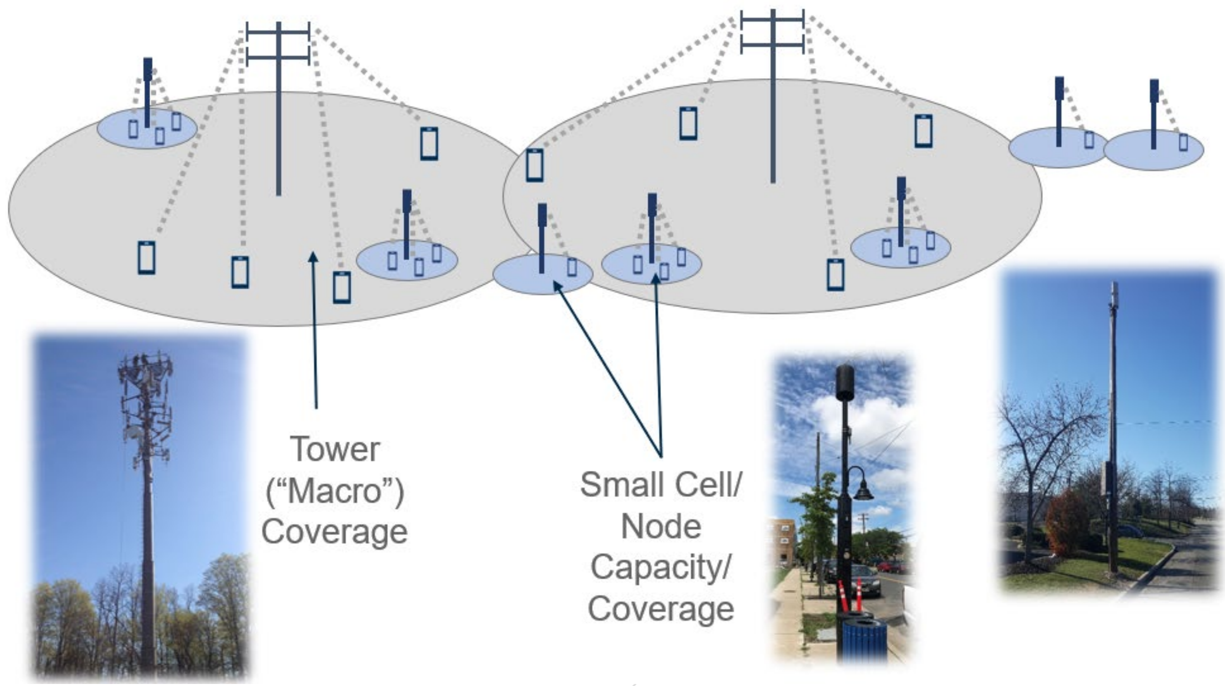
The construction of – or access to – structures and backhaul contribute to the overall costs of adding sites, as well as the equipment that is part of the Radio Access Network.

Macro Towers, Small Cells, and Network Densification

While the common perception of a "cell site" is a tower with an array of antennas attached, cell sites now include diverse forms such as "macro towers" and "small cells".

Antenna installations on towers and collocations on tall structures like rooftops are often referred to as **"macro"** sites. Macro sites are often but not always located on tower structures. These traditional cell sites form the core of a cellular network and are effective for covering large geographic areas by delivering signals miles away. Macro towers are the typical "cell towers" recognized by the general population and almost always the type of facility used to provide an area with initial cellular coverage.

Figure 5: Macro Towers and Small Cells



Small cells[10] are lower-powered cellular base stations that function much like traditional cells in a mobile cellular network, but are a fraction of the height of a macro tower and located in close proximity to the coverage target. Small cells are frequently deployed to add capacity to the cell network, offloading users concentrated in a small area from what would otherwise be an overloaded macro site, as depicted in Figure 5 above. This type of deployment is common in more densely developed areas. Less commonly, small cells can be used as a targeted coverage solution to fill gaps in limited coverage areas that would be difficult or expensive to address with a macro cell. Small cell growth is expected to be significant in the coming years as carriers are deploying tens of thousands of small cells to increase capacity in heavily populated regions.

[10] A more technical discussion would distinguish between several types of facilities which, while they share common elements of a small form factor and coverage area, have differences in how they organize and deliver the elements of a Radio Access Network. This includes Distributed Antenna Systems (DAS), Remote Radio Heads (RRHs), Centralized Radio Access Networks (C-RANs), and stand-alone small cell base stations. For the purposes of this discussion, these differences are not important, and they are grouped here under the single heading of "small cells."

Typical Macro Towers

- Antennas affixed > 100' support structure
- Monopoles, rooftops, water tanks, and lattice towers
- Radius > 1 mile; 3 or more sectors; each sector equipped with 1 or more frequencies
- Provide base-level system coverage
- Used to cover roads, commercial areas, and residential areas
- Can support three carriers on one structure
- Requires power and fiber or microwave

Typical Small Cell

- Antenna affixed to < 50' support structure
- Utility poles or decorative street lights
- Radius < 0.5 miles; 1 or more sectors; each sector equipped with 1 or more frequencies
- Augment macro coverage or offload traffic from macro network
- Used to cover topographically challenged roads and high traffic commercial areas
- Can support multiple carriers on one structure
- Requires power and fiber

The first cellular networks typically deployed macro towers designed to cover very large areas. There were fewer users, usage came at a significant price per minute, and user devices often transmitted at higher power than today's typical mobile phone. Over time, both the number of users and intensity of use have substantially increased. In part, carriers have responded by adding density to the network. In this scenario, each cell site is designed to cover a smaller area addressing a more limited set of users typically utilizing data-intensive applications such as streaming services. Today, carriers typically deploy both macro cells and small cells in a "heterogeneous network." This network densification is least pronounced in rural areas.

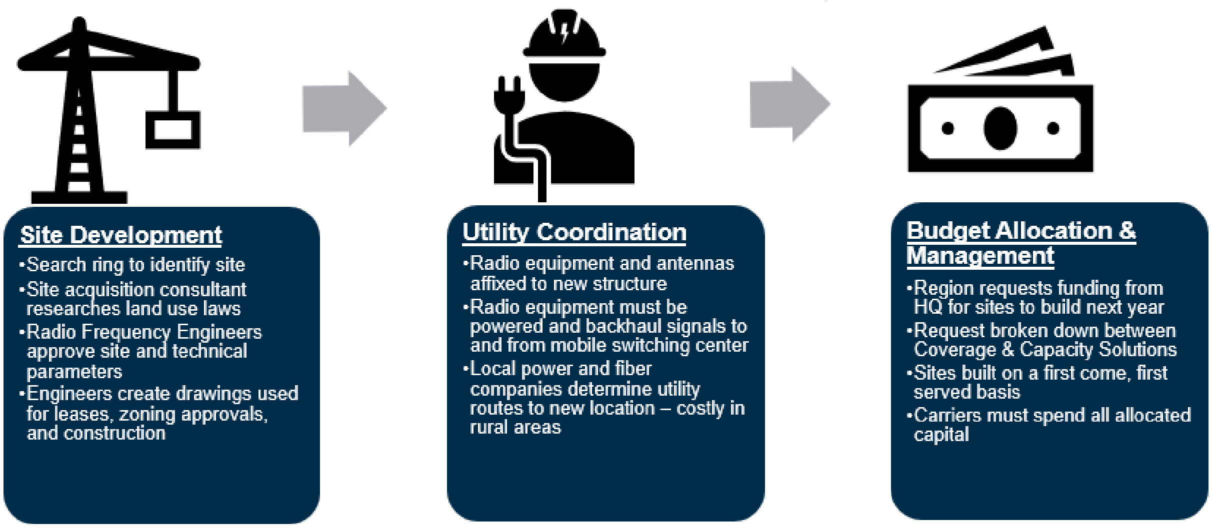
Apart from its direct effect on the number and type of sites in a given area, network densification has an indirect effect on the mix of new sites proposed and investment dollars available for sites in rural areas. The national carriers have achieved a relatively high level of basic coverage across the country. Although their footprints still leave substantial gaps in coverage when measured by landmass (including substantial gaps in parts of upstate New York similar to other rural and mountainous areas of the country), the carriers have relatively extensive coverage sites in areas with the highest density of users (often this correlates to the highest population areas). Rural communities are disproportionately affected by this investment pattern. Users are consuming ever-increasing amounts of mobile data, but each site can only accommodate so much usage at once. Even when a cell site has the reach to cover an area adequately, high usage levels by many people can cause customers to experience slow or unreliable service, which can be experienced as a complete lack of coverage. This problem is most acute outside of rural areas. Carriers respond to this trend by investing in new sites for capacity, not coverage, in a bid to keep existing customers happy and avoid defections to competitors. While investment in new coverage has not completely disappeared, the capital for new coverage sites competes in carriers' investment budgets with demands to maintain, upgrade, and densify networks in their existing coverage footprints, which is unlikely to change soon.

Cell Site Development Process and Requirements

In order to expand coverage and increase capacity, cellular carriers are always researching means to locate new network infrastructure. Budget, population size, geography, and market incentives ultimately drive the placement decision, which is outlined in Figure 6 below. A carrier's marketing department and engineering department determine priority sites that they believe will provide the most benefit to their customers and their financial bottom line.

Search rings are used to determine areas where cell phone coverage or capacity is lacking. The search ring is displayed as a map point centered within a defined area. The goal is to identify a new build location inside that ring, but if a site cannot be found within the ring, a spot will be chosen as close as possible to the ring. It is becoming increasingly difficult to find viable locations inside search rings as they are getting much smaller and the areas where new rings appear may have zoning issues and other restrictions.

Figure 6: Carriers' Cell Site Development Process



Once the area for the search ring is determined, it is then given to a site acquisition specialist. The site acquisition specialist typically works for the carrier or a subcontracted company and performs a field visit, which involves driving through the search ring area looking for land or structures suitable for equipment placement. For new site builds, the site acquisition specialist oversees completing site candidate identification, leasing packages, and any necessary zoning, permitting, and regulatory filings. The site acquisition specialist creates detailed reports on viable locations for sites and negotiates leases with owners and property managers.

If a Radio Frequency Engineer approves the chosen site and technical parameters, they will then design schematics used for leasing, zoning approval, and construction of new towers, if necessary. This may involve surveying the acquired land for optimal positioning of the towers. These data are then analyzed and used to create a custom plan for bringing the carrier's vision to reality.

Once the tower is constructed, utility coordination begins, and equipment is affixed to the tower. Wires run from the tower antennas to the base station equipment, usually concealed at ground level. The base station equipment includes amplifiers, multiplexers, system controls, and transceivers that transmit and receive radio signals through the antennas. The radio equipment must have backhaul signals to and from a mobile switching center. Local power and fiber companies determine utility routes to new location, which is typically costly in rural areas.

It is important to understand that this site development process takes place within the context of a budget allocation and management process which, in turn, determines the regions that will receive the greatest number of new sites. National cellular carriers' operations and site development activities are broken down into regional teams. Each region requests funding from company headquarters for sites to build in the next year. These requests are broken down between coverage and capacity solutions. Regions are allocated capital to spend on these sites, generally on a first come, first served basis. Regional teams have site goals and must spend all allocated capital to meet those goals. Regions that cannot spend their allocated budgets quickly and predictably have a difficult time holding on to their allocated budgets and sites. Budgets unspent in one region in a year are liable to be re-allocated to regions that do have the ability to put the capital to work. This dynamic creates a risk for regions and communities where site acquisition and permitting is lengthy, expensive, and/or unpredictable, resulting in less investment over time. While core, "non-optional" markets are less likely to lose funding, rural areas are more vulnerable. Regions and communities that can create fast and predictable paths for carriers to acquire, permit, and build sites stand to benefit when capital is re-allocated.

Shared Infrastructure and the Key Vendor Ecosystem

National carriers rely on a blend of internal and contracted resources to develop and operate cellular infrastructure. Although there are a limited number of cellular carriers operating networks in New York, this vendor ecosystem provides additional opportunities for partnership with a range of carriers who work with these companies to build their networks and, in some cases, own and operate key elements of the overall network. Becoming a qualified vendor to a major cellular carrier is not simple due to significant vendor qualification processes employed by national carriers.

Cellular carriers often rely on outside vendors to perform work related to site acquisition, permitting, and architectural and engineering services (other than RF engineering). Major cellular carriers regularly use vendors that provide access to infrastructure elements needed for the cellular networks. In many cases, this provides the opportunity for vendors to develop common infrastructure shared by multiple carriers as shown in Figure 7. At traditional tower sites, the most common vendor-supplied infrastructure includes the tower and the fiber backhaul. The tower is leased from a tower company, and the fiber backhaul may be leased from a telecommunications company such as the incumbent telecommunications company, a cable company, or other competitive telecommunications company.

Figure 7: Shared Infrastructure at Traditional Tower Sites

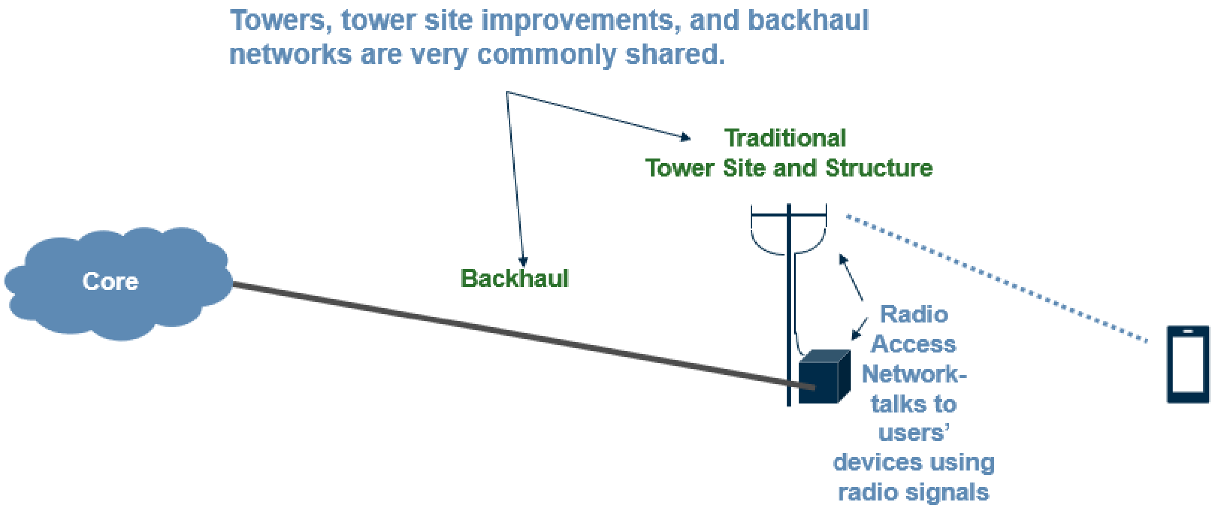
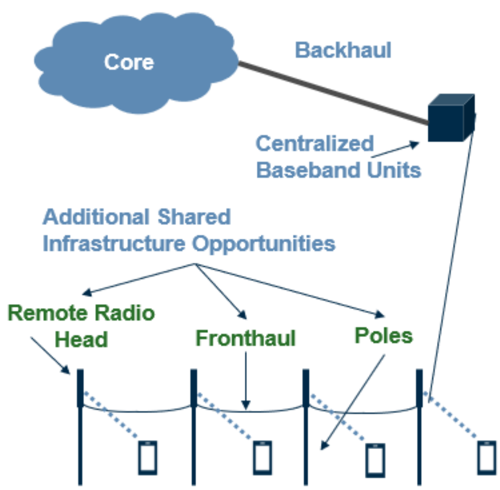


Figure 8: Shared Infrastructure Example in Distributed Radio Access Networks



In traditional tower sites, the components of the Radio Access Network sit on or at the base of the tower and are typically provided by the carriers using the tower. In the case of some types of small cell networks, this Radio Access Network is distributed in space at multiple cellular "nodes" connected back via "fronthaul" fiber to centralized network equipment. This form of infrastructure, shown in Figure 8 to the left, opens additional opportunities to develop shared infrastructure in the "fronthaul," poles for the nodes, and even the node equipment itself.

Although national carriers rely on vendors, sometimes vendor business models can create friction and prompt carriers to circumvent vendors. For example, tower companies, "turnkey" cellular node[11] companies, and backhaul providers all traditionally charge market rates in markets with few competitive options that do not align with minimizing carriers' costs in markets with few users. Moreover, not every major vendor's traditional business model is aligned with the goal of maximizing rural coverage. In areas where carriers do not see a compelling business need to expand coverage, offering access to shared infrastructure at typical market rates may provide little incentive for carriers to utilize those vendors.

[11] In a "turnkey" model, the cellular carrier leases access to a fiber network and attached nodes from a fiber provider. The fiber provider owns or controls the fiber facilities and the node.

Special Challenges for Cellular Networks in Rural Areas

Building networks in rural areas can be expensive and challenging. One key challenge in forested locations is that **dense foliage** rapidly weakens signal strength. Carriers have traditionally mitigated this issue by placing antennas well above the tree line.

Changing elevations due to diverse terrain such as mountains and hills pose another challenge. High points typically receive better coverage from towers located on hills and mountains than valley floors, where most people and roads are located. In such cases, more sites are needed on secondary ridgelines, in valleys, or small rises.

The biggest barrier to cellular coverage in rural areas is **low population density**. As mentioned previously, it is harder for carriers to make the business case for investment in areas with fewer customers and traveling users. To mitigate this issue, the overall and per-site costs must be reduced through infrastructure sharing, roaming agreements, or other means.

1.3. Future Industry Trends

Internet of Things: The telecommunications market continues to grow and transform rapidly due to the adoption of various products, services, and technological advancements. The advent of the Internet of Things (IoT) has introduced more devices to the network including smartphones, tablets, smart watches, smart meters, sensors, and monitoring devices. However, an increase in network access demand introduces issues regarding capacity and spectrum scarcity. Additionally, the high costs of these value-added connected services and maintaining cybersecurity will also pose a challenge as growth continues.

5G: LTE will continue to be the most prevalent form of cellular coverage for years to come. However, the development of a dense network of small fiber-connected nodes that began with 4G-LTE services will lay the groundwork for a set of upgradeable facilities required to rapidly roll out 5G services. 5G promises to bring faster protocols for data transfers to meet increasing data demand. Carriers are cognizant that LTE densification sets the stage for 5G by getting the fronthaul fiber and real-estate rights in place, as well as providing additional capacity that is presumed to be aggregable into a 5G service. In other words, handsets will be able to seamlessly use new 5G and older LTE at the same time.

Increased Demand: Carriers are expected to improve their network and offer expanded services to their customers by network densification and increased use of small cells. As described above, coverage is not the primary problem for which carriers are solving in outdoor networks. The trend currently driving the deployment of small cells is densification of the network for capacity to support increasing data demand on 4G and 5G networks. Increased network traffic in rural and suburban areas is traditionally solved by densifying the network with macro cell sites. In highly populated urban areas with high traffic concentration, network densification will likely come in the form of small cells. Mobile operators will also undertake large-scale “fiberization,” an effort to ensure this increased cell site count has access to fiber backhaul and fronthaul facilities. Fiber is essential to support small-cell deployment and will help networks meet capacity and latency requirements.

2. Estimated Coverage in Upstate New York

In order to map the current state of cellular service in upstate New York, the Task Force commissioned 1,382 miles of detailed drive testing. The goal of this data collection exercise was to have accurate primary data from which the Task Force could identify uncovered areas and develop cost estimates for deployment of new service coverage. The coverage maps that are presented to consumers by private carriers are designed for marketing purposes and do not tend to reflect actual coverage.

2.1. Strategies for Measuring Coverage

There are several potential approaches to measuring cellular coverage.

The FCC typically uses **population coverage** – *i.e.*, measuring the number of people "covered" by cellular networks – to assess compliance with buildout requirements for spectrum licenses, or to measure national trends. [12] This method has several drawbacks. First, it does not account for users accessing mobile networks away from home. Second, it is difficult to measure directly, as doing so requires knowledge of specific points where people live, population counts at those locations, and access to those locations. Therefore, population coverage is typically estimated and not measured, relying on predictive coverage models that may not reflect actual coverage or the true population residing in an area. Finally, assessments of the national or regional population covered by existing cellular networks will tend to obscure coverage gaps in rural areas with lower population densities.

Geographic Terminology

This report makes several references to regions or areas of upstate New York. Below are key distinctions:

Adirondack Region – Refers to the 12 counties touched by Adirondack Park in their entirety, including areas that sit within or outside the Park.

Adirondack Park – Refers exclusively to the area defined in statute as parkland.

Catskill Region – Refers to the 5 counties touched by Catskill Park in their entirety, including areas that sit within or outside the Park.

Catskill Park – Refers exclusively to the area defined in statute as parkland.

Figure 20 below provides a visual representation of these regions.

Road coverage can be directly measured, as roads are easy to access, and large numbers of point coverage measurements can be collected efficiently during drive tests. Road coverage also accounts for more users away from home and work. However, it does not directly measure the quality of cellular service a user experiences inside a building, nor does it measure the number of individuals or homes covered by a network (although most buildings and homes are located near

[12] For example, see the Federal Communications Commission, *2019 Broadband Deployment Report*, appendices 1-6. https://www.fcc.gov/reports-research/reports/broadband-progress-reports/2019-broadband-deployment-report

roads). More cell sites are typically required to achieve coverage on a high percentage of road miles than a high percentage of population because some stretches of roads have few people living along them.

Land area coverage measures the amount of land area that receives coverage and accounts for the widest range of uses. It accounts for the fact that some mobile device use not only happens at home, at work, or along roads, but that mobile devices may be used away from development in agricultural, forestry, and backcountry settings. Land area coverage is, however, also difficult to measure directly because measurements must occur at unique points and a region will include countless potential measurement points, many of which may be extremely difficult to access. Therefore, measuring land coverage also typically relies on a predictive coverage model rather than on-the-ground data collection. Additionally, large coverage areas may or may not be in desired or strategic areas, for example, New York's state wilderness areas.

The conclusions of this report primarily depend on road coverage directly measured through drive testing, which is a higher standard than the predictive coverage modeling used by the FCC's Mobility Fund coverage maps (*see section 2.2*). Drive testing provided several expected benefits including substantiation by primary data and more accurate identification of coverage gaps. The drive test results are combined with public coverage data provided by the FCC in order to generate assumptions about upstate coverage levels and, ultimately, the cost of expanding service to all major roadways.

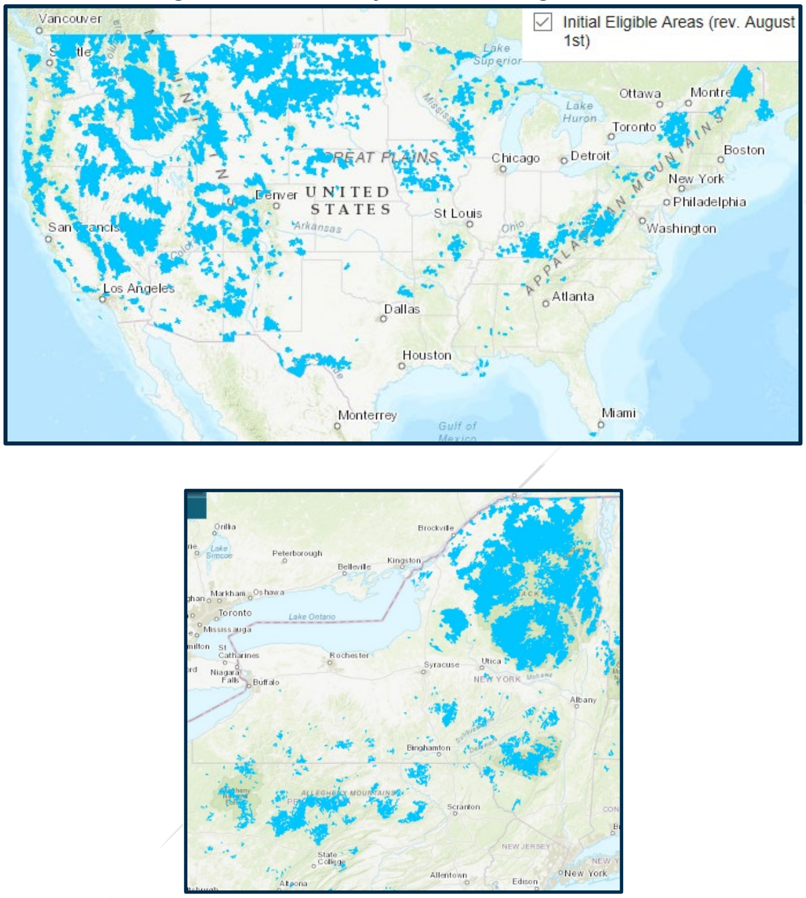
2.2. FCC Mobility Fund Eligible Areas and Limitations

In 2017, as part of a multi-stage transition of its Universal Service programs, the FCC adopted the framework of a 10-year $4.53 billion Mobility Fund-II ("Mobility Fund") to expand rural cellular coverage, but which has yet to be implemented. The FCC announced that funds would be awarded to companies through a reverse auction process – funding qualifying applicants who seek the lowest amount of federal support. This is a similar mechanism to that used by the FCC to award rural broadband funds through its Connect America Fund Phase 2 (CAF-II) program, and which New York State used in the New NY Broadband Program. The dollars available through the Mobility Fund program would be more than twice that of the CAF-II program.

On December 4, 2019, former FCC Chair Ajit Pai announced the launch of a $9 billion 5G Fund that would replace the planned Mobility Fund. The precise timeline for the launch of this initiative and most of its details are not available at this time.

The 5G Fund, or any substantially similar FCC program, represents a major opportunity to draw on federal funding to support expansion of cellular service in New York, albeit an opportunity with an uncertain timeline. For the Mobility Fund, the FCC released a map of "Initial Eligible Areas" provided in Figure 9 below which shows that New York contains some of the largest eligible areas in the eastern United States.[13]

Figure 9: FCC Mobility Fund Initial Eligible Areas



While this report is not intended to provide a comprehensive overview of the previously proposed Mobility Fund program, it is worth understanding a few key elements as context for this report and to understand the potential structure of future FCC cellular coverage initiatives.

The FCC targeted the Mobility Fund to address areas lacking 4G LTE Coverage. The FCC adopted an area-based framework, using square miles to measure coverage, and stated that it would require carriers to bid for areas encompassing at least a census block group or tract. Winning bidders would have been required to cover 85% of supported areas in a state within six years, along with interim milestones. These bidding and coverage requirements may have presented significant challenges to those competing to cover areas encompassing the Adirondack

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[13] Federal Communications Commission, *Mobility Fund II Initial Eligible Areas Map, (Aug. 8, 2018), https*://www.fcc.gov/reports-research/maps/mobility-fund-ii-initial-eligible-areas-map/

and Catskill Forest Preserve lands – areas designated as “forever wild” and which have few, if any, sites available for placement of cellular infrastructure.

The FCC developed its nationwide coverage map and an initial map of uncovered areas eligible for the Mobility Fund (the “Initial Eligible Areas Map”), through a special, one-time data collection effort from cellular carriers in 2017.[14] The data collected was based on propagation model-predicted availability of 4G LTE coverage supporting download speeds of 5 Mbps or greater.[15] The FCC used the collected data to produce the map shown in Figure 9. The FCC then subjected the data to a “challenge” process, in which challengers were invited to collect field measurements to validate the information carriers had provided. A total of 21 entities submitted valid challenges.[16] Due to the magnitude of challenges encountered during the process, the FCC opened an investigation into the accuracy of one or more carrier-submitted maps in December 2018, delaying the Mobility Fund’s implementation.[17] The investigation concluded that there were, in fact, significant overstatements in coverage from some carriers.[18]

Given the concerns raised about the accuracy of the FCC’s Initial Eligible Areas Map, it would not be prudent to rely on these maps as a representation of coverage in upstate New York.

2.3. Drive Testing

To provide more accurate estimates of uncovered areas in upstate New York, the Task Force commissioned drive testing by the A&M Team in 2019 along 1,382 miles of roadways in the Adirondack and Catskill regions – regions representing the majority of New York’s coverage gaps.[19] The Task Force utilized drive test observations in the sampled areas in conjunction with the FCC’s Initial Eligible Areas Map to estimate the number of uncovered major roadways in upstate New York.

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[14] As previously noted, the FCC has published an updated mobile coverage map with data voluntarily submitted by carriers. This map is available at https://www.fcc.gov/BroadbandData/MobileMaps/mobile-map. In describing this updated map, the FCC states: “[the map] is, however, only a subset of the full set of mobile broadband availability data that will be collected as part of the Broadband Data Collection, when mobile wireless service providers will also submit standardized coverage data for their 3G and 5G mobile broadband technologies and other details about their propagation models and technical assumptions underlying their coverage maps.”

[15] “Each polygon shall represent outdoor 4G LTE coverage, as defined by download speeds of 5 Mbps at the cell edge with 80 percent probability and a 30 percent cell loading factor. The terrain and clutter data used to generate the coverage boundaries must have a resolution or BIN size of 100 meters or smaller.” In re Instructions for Filing 4G LTE Coverage Data for Mobility Fund II Support, 32 FCC Rcd 7023, 7024 (F.C.C. Sept. 22, 2017).

[16] In re Mobility Fund Phase II Challenge Process Portal Update: November 2018, 33 FCC Rcd 11706 (F.C.C. Dec. 3, 2018).

[17] Federal Communications Commission, “*FCC Launches Investigation into Potential Violations of Mobility Fund Phase II Mapping Rules,”* (December 7, 2018) https://docs.fcc.gov/public/attachments/DOC-355447A1.pdf.

[18] Federal Communications Commission, “*Mobility Fund Phase II Coverage Maps Investigation Staff Report,”* (December 4, 2019), para 4. https://docs.fcc.gov/public/attachments/DOC-361165A1.pdf

[19] According to the FCC maps, more than 80% of the uncovered interstates, U.S. and state highways, as well as major county and local roads in upstate New York were within these two regions (*See Section 2.4*).

Methodology

Development of an approach to drive testing had two primary components: drive route selection and testing methods.

Principal through-routes were targeted in the Adirondack and Catskill regions, and a total of 1,382 miles were tested (666 miles in the Adirondack Region and 716 miles in the Catskill Region). The Task Force also solicited input from local area representatives on the routes of highest priority, and segments near tourist attractions such as major ski areas were added. A significant number of selected routes were described as “covered” by the FCC’s Initial Eligible Areas Map.

Testing methods used along these routes were performed continuously while driving. Wide-band scanning was employed, which scans up to 24 separate frequencies at the same time and provides improved identification of the different carriers along the testing areas. A range of data points were captured including Signal Strength and Signal-to-Noise Ratio (SNR). Signal Strength measures the strength or weakness of a cellular signal. SNR refers to the strength of a signal compared to competing signals in the area. As “reliable service” thresholds, the A&M Team used a Reference Signal Received Power (RSRP) greater than or equal to -100dBm, and the Carrier to Interference and Noise Ratio (CINR) greater than or equal to 5dB. LTE coverage was calculated based on both Signal Strength and SNR ratio tests.

In collecting this data, the raw scanner files were first compiled into a master database of observations and latitudinal and longitudinal location references. Additionally, the observed frequencies were matched against those used by cellular companies holding licenses in the areas tested, with filters put into place to only capture the LTE signal observations. These observations were plotted as points on a map by frequency, signal strength, and signal-to-noise metrics. The results were then reviewed and compared to expected coverage, with increased scrutiny given to larger variances. Next, the observation points were classified into the categories of “reliable signal” or “unreliable signal.” In order to declare a “reliable signal,” the observation point needed to pass both the RSRP and CINR tests described in the preceding paragraph. These data were then aggregated for each carrier into observation points at the resolution of one-tenth mile road segments, and each segment that was presented as “reliable coverage” had at least one frequency with “reliable points” at all observation points along that segment.

As a caveat, drive testing focused on a representative sample of major roadways in the Adirondack and Catskill Regions, but did not cover every road in these regions and did not extend into other regions of upstate New York. In structuring a future initiative to improve coverage, New York State may consider collecting additional data on existing coverage and coverage gaps. This will not only allow the State to more precisely estimate the number of uncovered miles but also to identify specifically where those uncovered roads are located. Additional data collection may involve some combination of additional drive testing, maps collected by carriers, and data collected by and purchased from third-party commercial sources.

Results in the Adirondack and Catskill Regions

There are several key observations that can be derived from the drive tests conducted in the Adirondack and Catskill regions.

First, areas without LTE coverage are extensive. The largest of these stretches are in challenging topologies, which include both mountains and undeveloped parkland. The Northway in the Adirondack Region and Route 17 in the Catskill Region have greater coverage, but that coverage is not continuous. There is sporadic coverage on secondary and connector roadways such as Route 3 and Route 28. Next, there are large swaths of roadways without any coverage, including Route 8 in the Adirondack Region.

Coverage is also sporadic or non-existent in areas where State lands are pervasive. Where coverage is non-existent, roadways are most commonly encumbered on both sides by State lands where towers are not permitted. An example of this is on Route 8 in the Adirondack Region. There is no coverage on Route 8 west of Speculator until the road leaves the park. State lands are pervasive along this road.

Figure 10: Adirondack Region Combined Carrier Drive Test Results

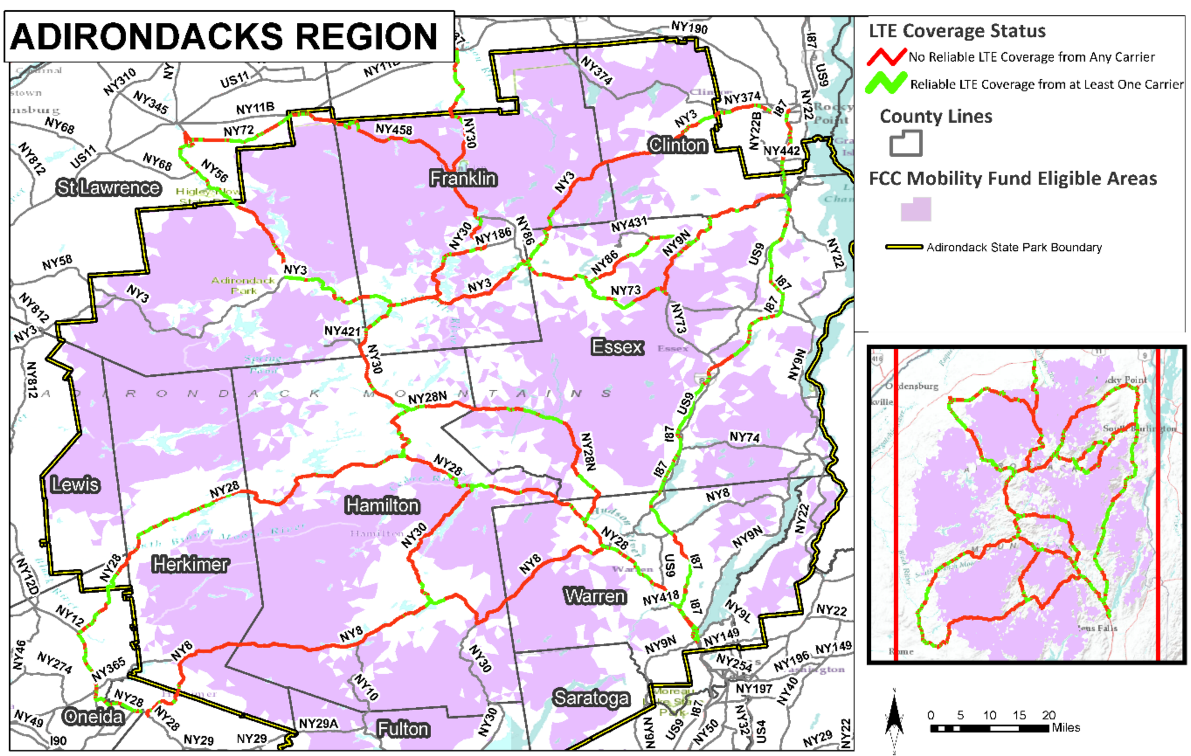


Figure 11: Adirondack Region Combined Carrier Drive Test Results, Northwest

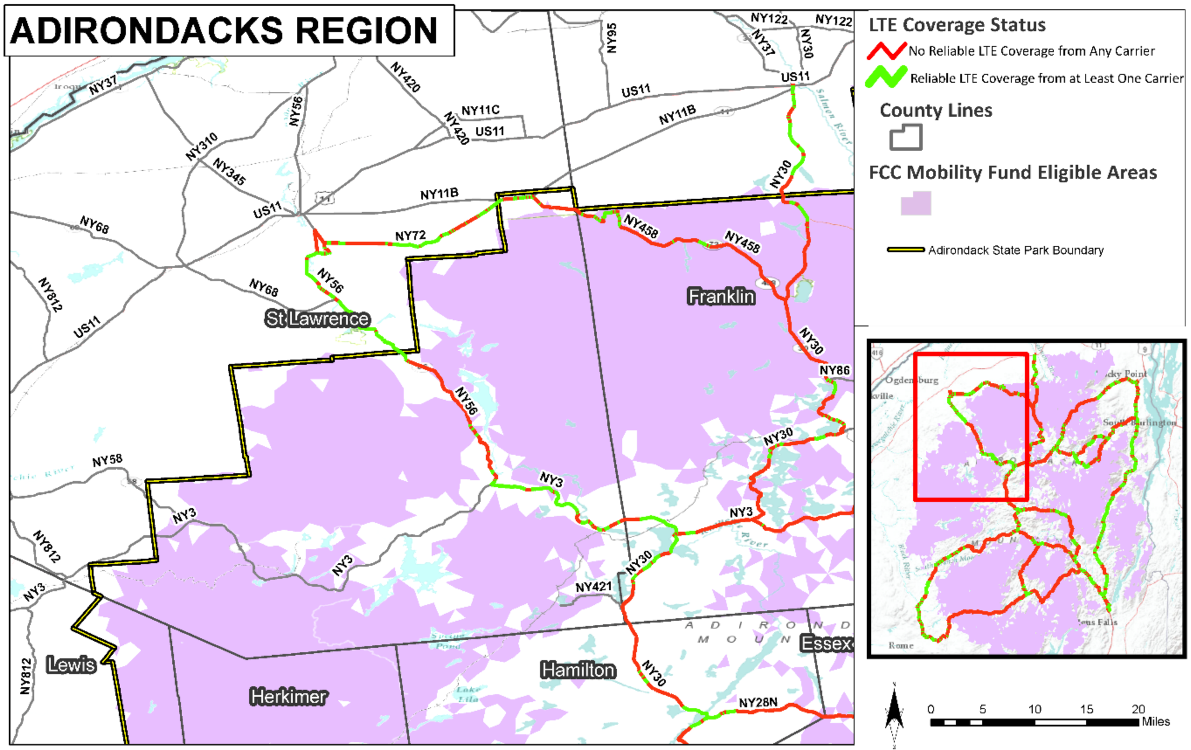


Figure 12: Adirondack Region Combined Carrier Drive Test Results, Northeast

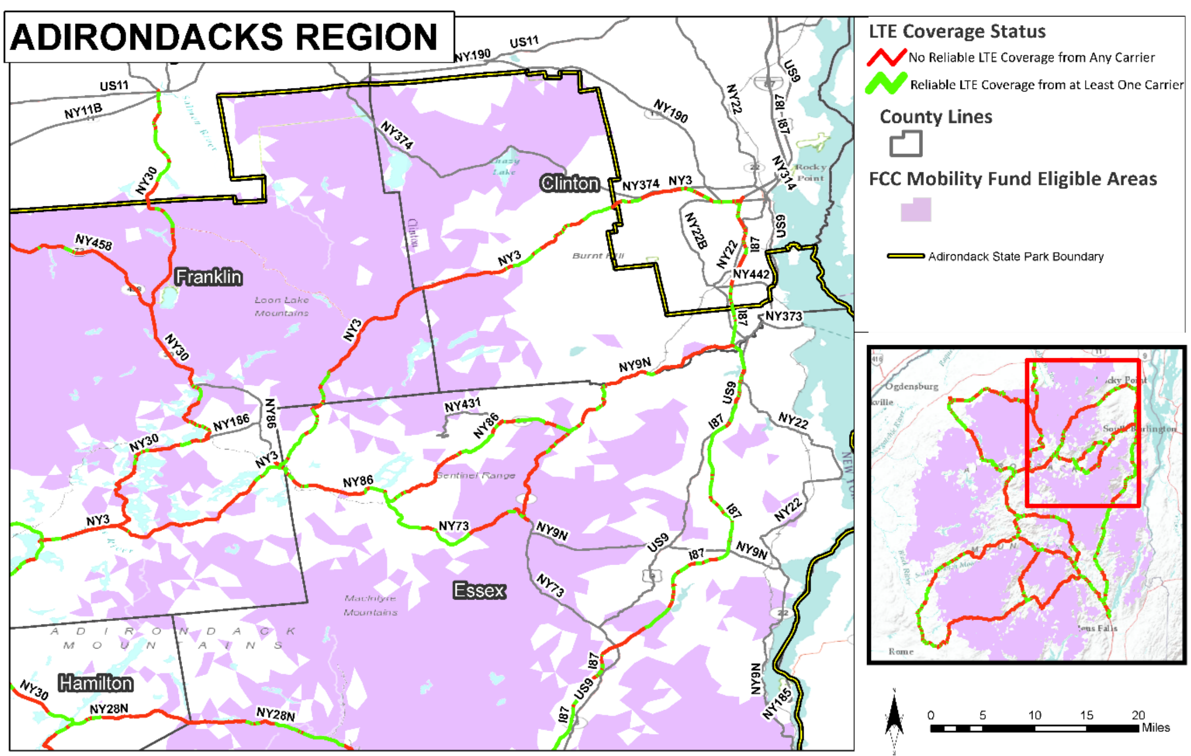


Figure 13: Adirondack Region Combined Carrier Drive Test Results, Southwest

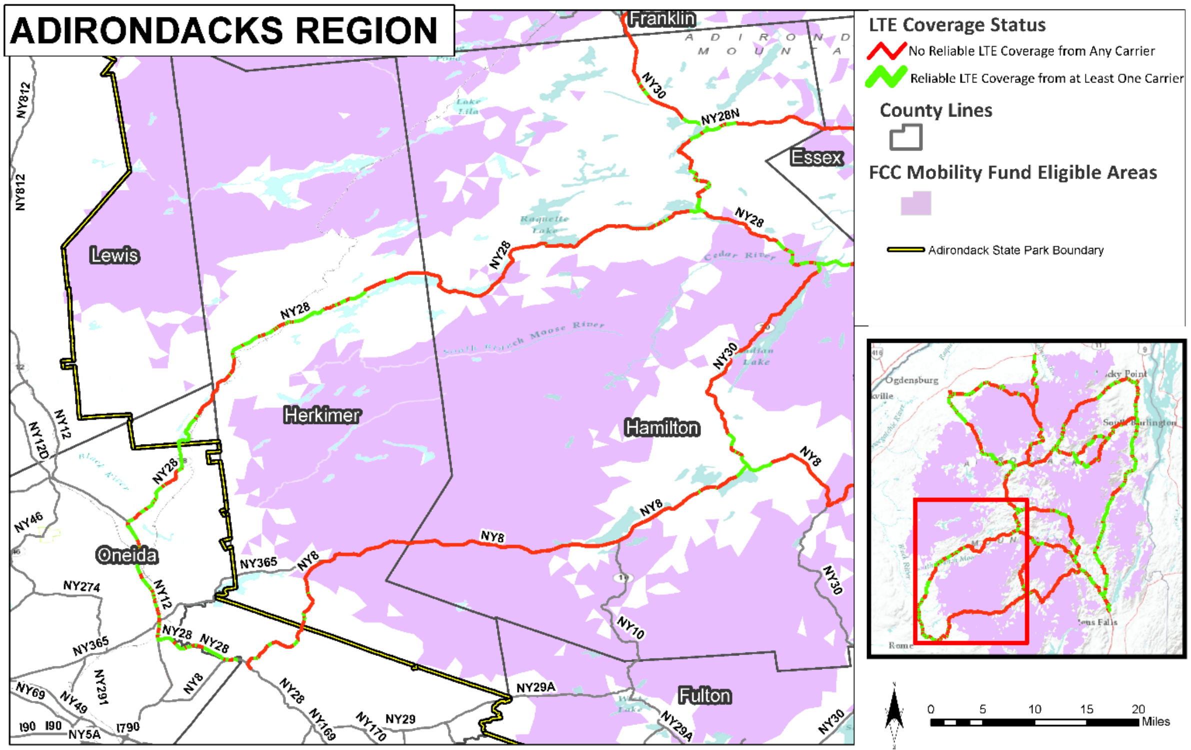


Figure 14: Adirondack Region Combined Carrier Drive Test Results, Southeast

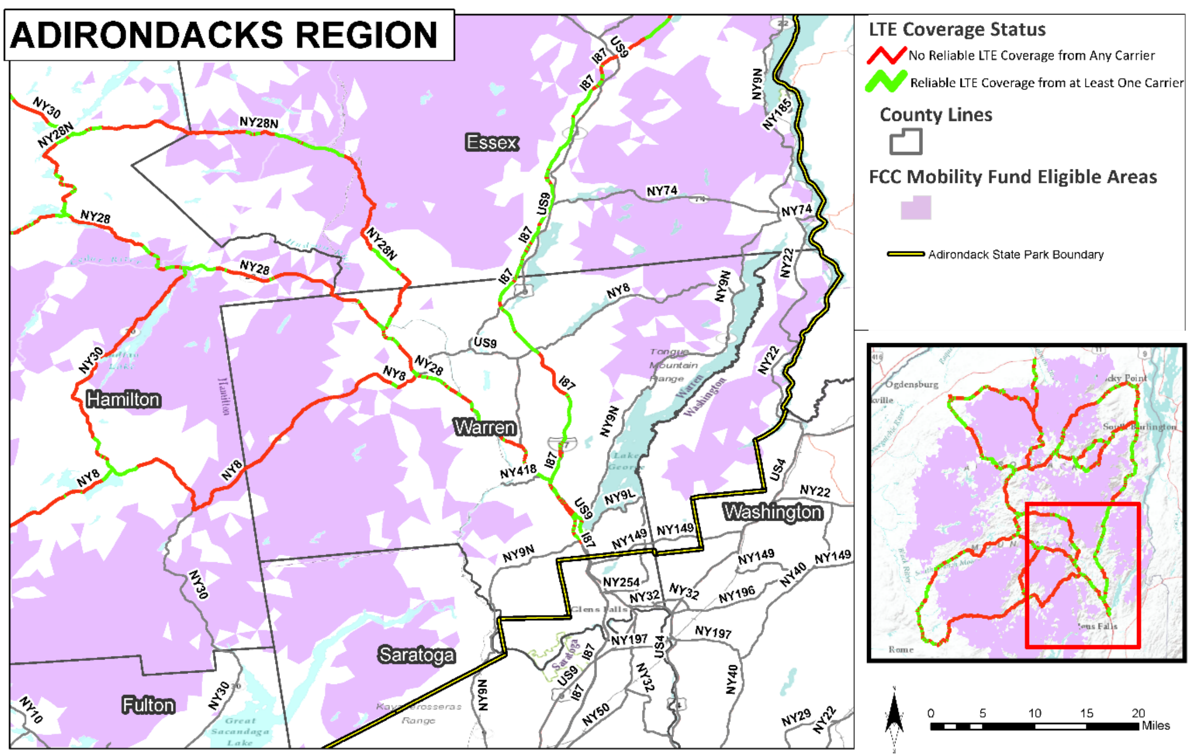


Figure 15: Catskill Region Combined Carrier Drive Test Results

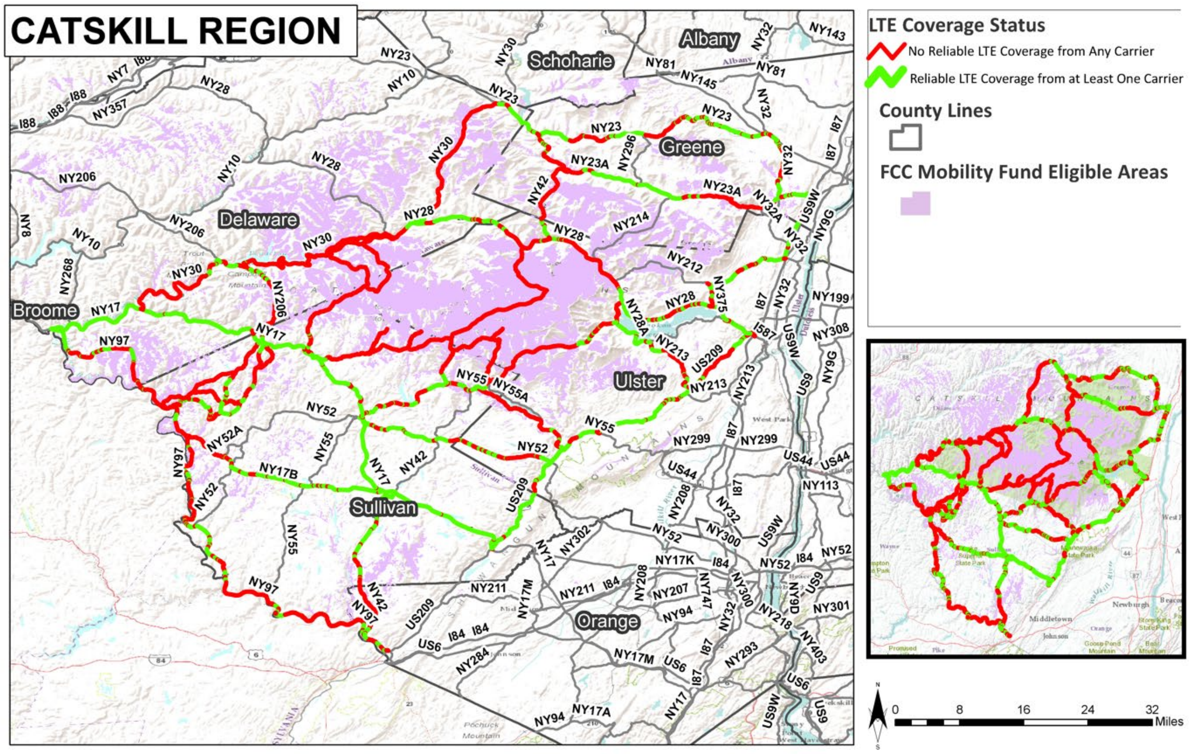


Figure 16: Catskill Region Combined Carrier Drive Test Results, Northwest

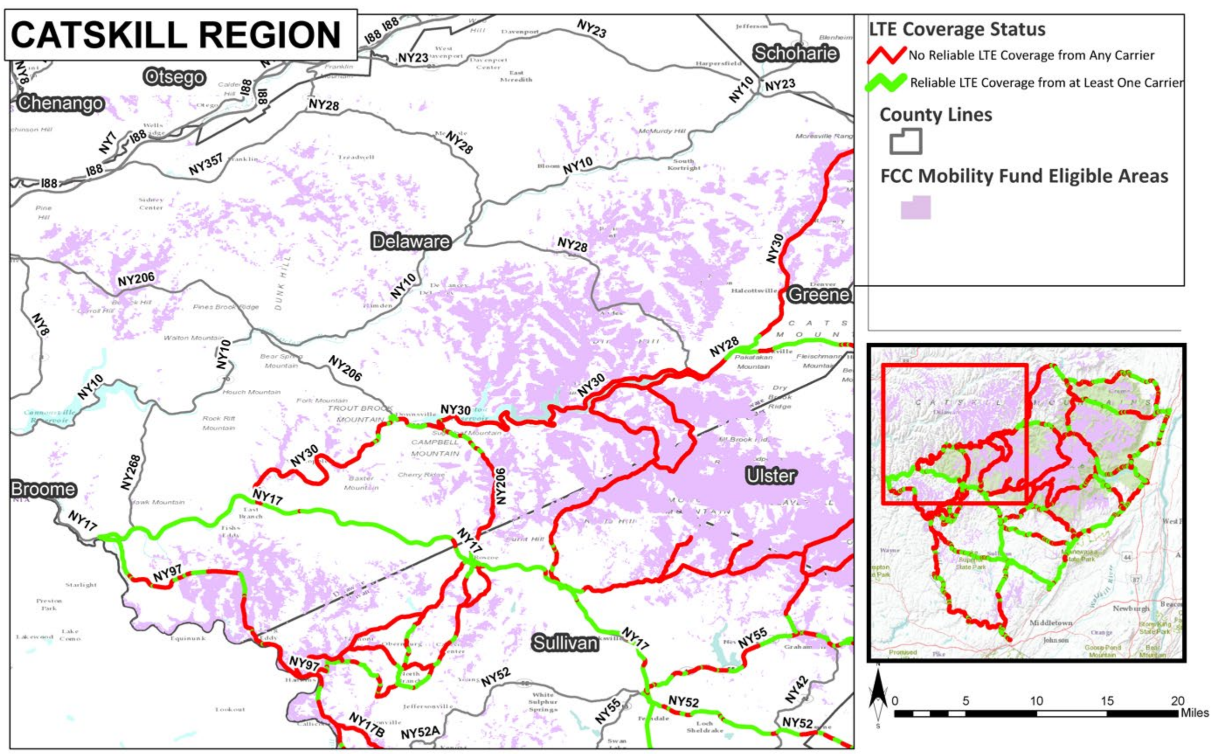


Figure 17: Catskill Region Combined Carrier Drive Test Results, Northeast

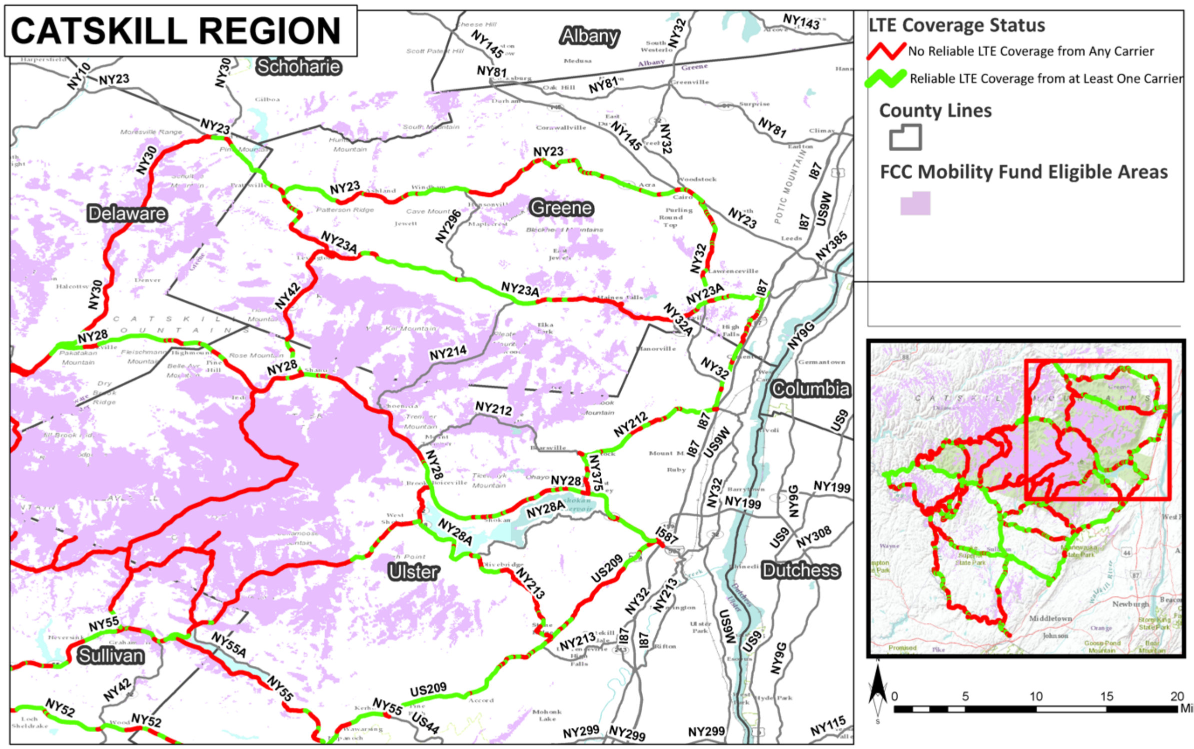


Figure 18: Catskill Region Combined Carrier Drive Test Results, Southwest

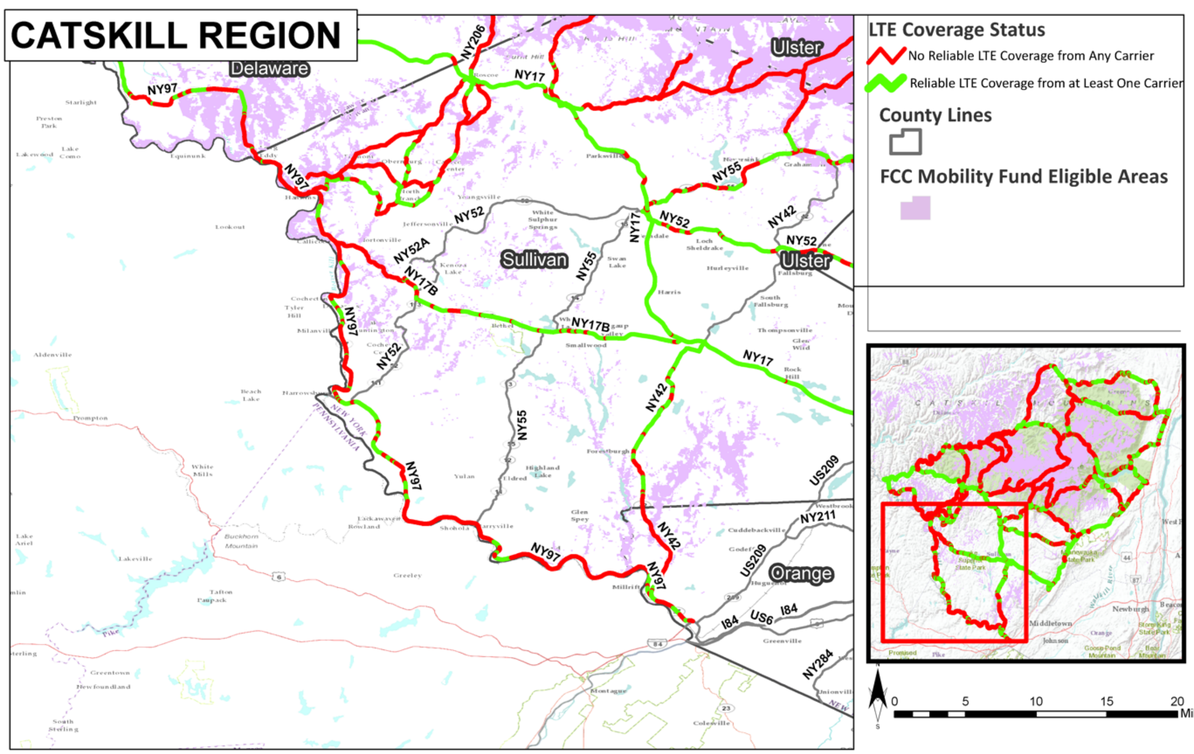
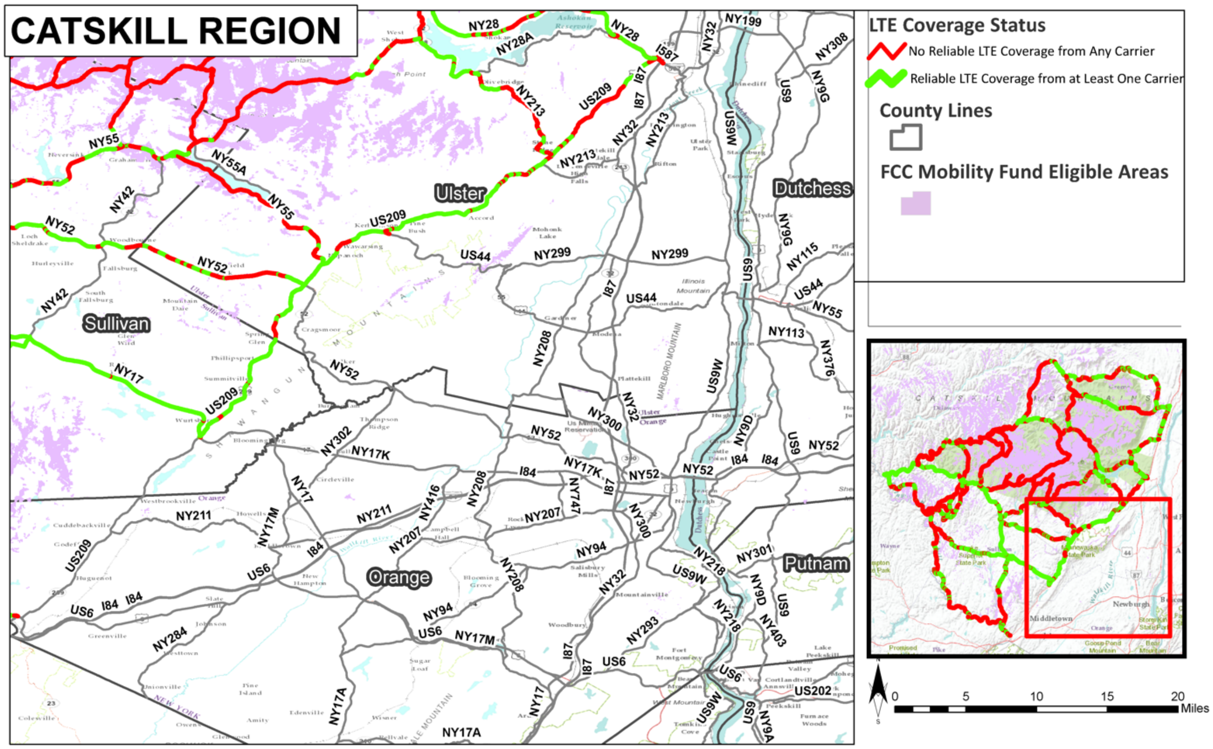


Figure 19: Catskill Region Combined Carrier Drive Test Results, Southeast



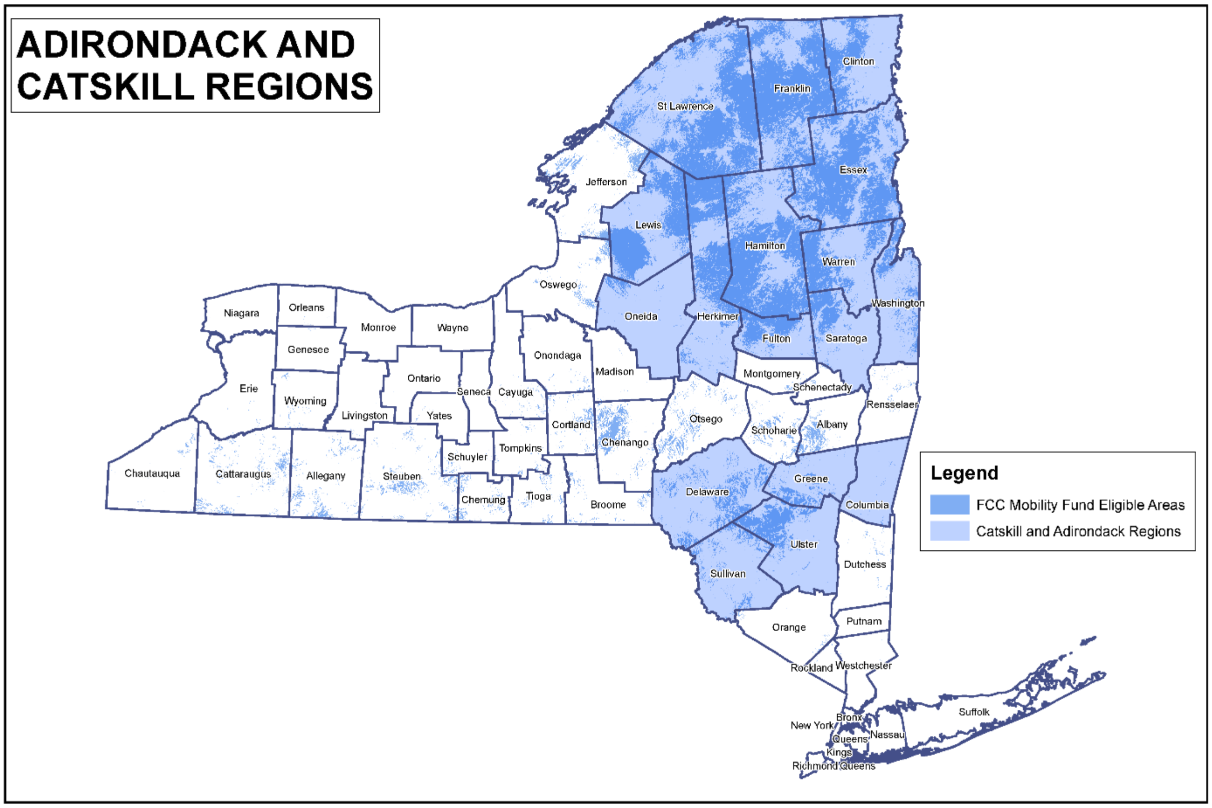
Although tourist areas such as Lake Placid and ski areas such as Windham are well covered, the roadways taking tourists to and from these areas have significant coverage gaps. An example is Route 23 as it travels east and west away from the Windham Ski area. Solidifying coverage on these roads will allow tourists to travel to and from areas of interest with unimpeded access to cellular service, greatly improving safety in the region. This will also allow tourists to research restaurants, activities, and additional areas of interest to drive the regional economy.

In both regions where drive testing was performed, the Task Force identified many areas with no reliable coverage well outside of areas eligible for the FCC Mobility Fund (“FCC Mobility Fund Eligible Areas”) – demonstrating that the FCC’s Mobility Fund maps significantly understate coverage gaps in these regions (*see Section 2.4*). By contrast, drive testing rarely showed reliable coverage within the FCC Mobility Fund Eligible Areas – *i.e.*, the FCC’s identification of areas in these regions lacking adequate coverage was generally accurate. The next section of the report quantifies this comparison.

2.4. Estimate of Upstate Coverage Gaps

Since the direct data collection of uncovered areas via drive testing was conducted in a subset of upstate New York due to limitations on cost and time, it is necessary to generate estimates of the total uncovered road miles in the region.

Figure 20: Adirondack and Catskill Regions



The FCC Mobility Fund Eligible Areas provide a statewide estimate of the extent and geographic distribution of uncovered areas in New York. However, since drive testing in the Adirondack and Catskill Regions demonstrated that the FCC's Initial Eligible Areas Map significantly understates cellular coverage gaps in these regions, it is necessary to adjust any estimates derived from the FCC's maps to account for this understatement. To do so, the Task Force compared the number of drive test miles without observations from any carrier meeting or exceeding the "Reliable Coverage" thresholds used in the analysis of the drive test results (841 miles) to the drive-tested miles falling within the FCC Mobility Fund Eligible Areas (399 miles). [20] Comparing these two numbers gives a ratio of 2.1:1 (the "Adjustment Factor"), which the Task Force used to adjust the estimate of miles without coverage across Upstate.

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[20] The Task Force estimated this mileage by using the 0.1-mile road segments used to summarize the drive test observations. Segments were classified as inside or outside the FCC Mobility Fund Eligible Areas based on whether their center point fell inside or outside those Areas.

Figure 20 above shows the distribution of the FCC Mobility Fund Eligible Areas across the state. It also shows the Adirondack and Catskill regions, defined in this report by counties, which are significantly more expansive than either the Adirondack Park or Catskill Park. The analysis presented below focused on three classes of roadways, which together account for a vast majority of total road traffic across upstate New York:

- Class 1: Interstate and U.S. Route highways
- Class 2: New York State Route highways
- Class 3: Major county or local highways

This analysis will consider both an Upstate-wide estimate and an estimate within the Adirondack and Catskill regions shown in Table 3.

For purposes of this analysis, the Task Force considered a county or local highway to be "major" if it was an Arterial or Major Collector highway under the Functional Classification System used by the New York State Department of Transportation (NYSDOT) and the Federal Highway Administration (FHWA). NYSDOT provided the GIS road layer containing the Functional Classification codes used in this analysis. The extent of these classes is shown in Figure 21 through Figure 23.

Figure 21: Road Classes in the Adirondack Region

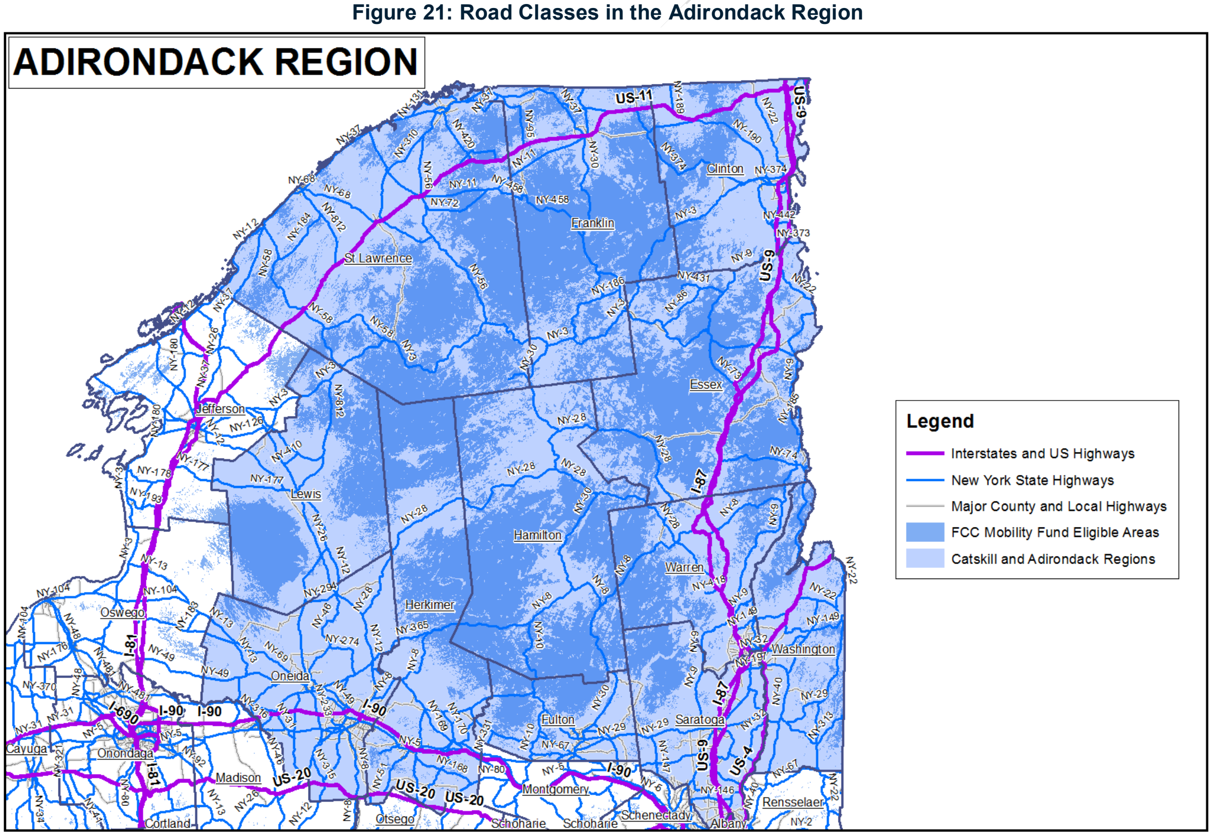


Figure 22: Road Classes in the Catskill Region

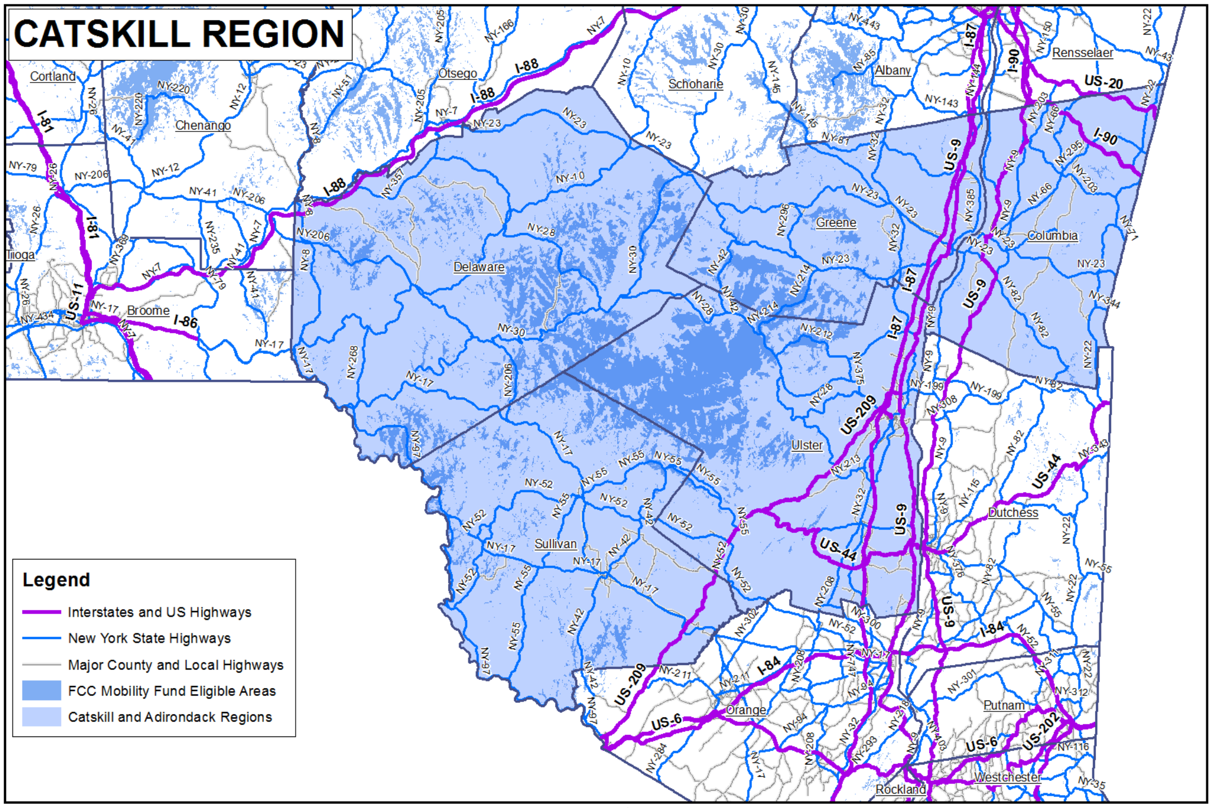
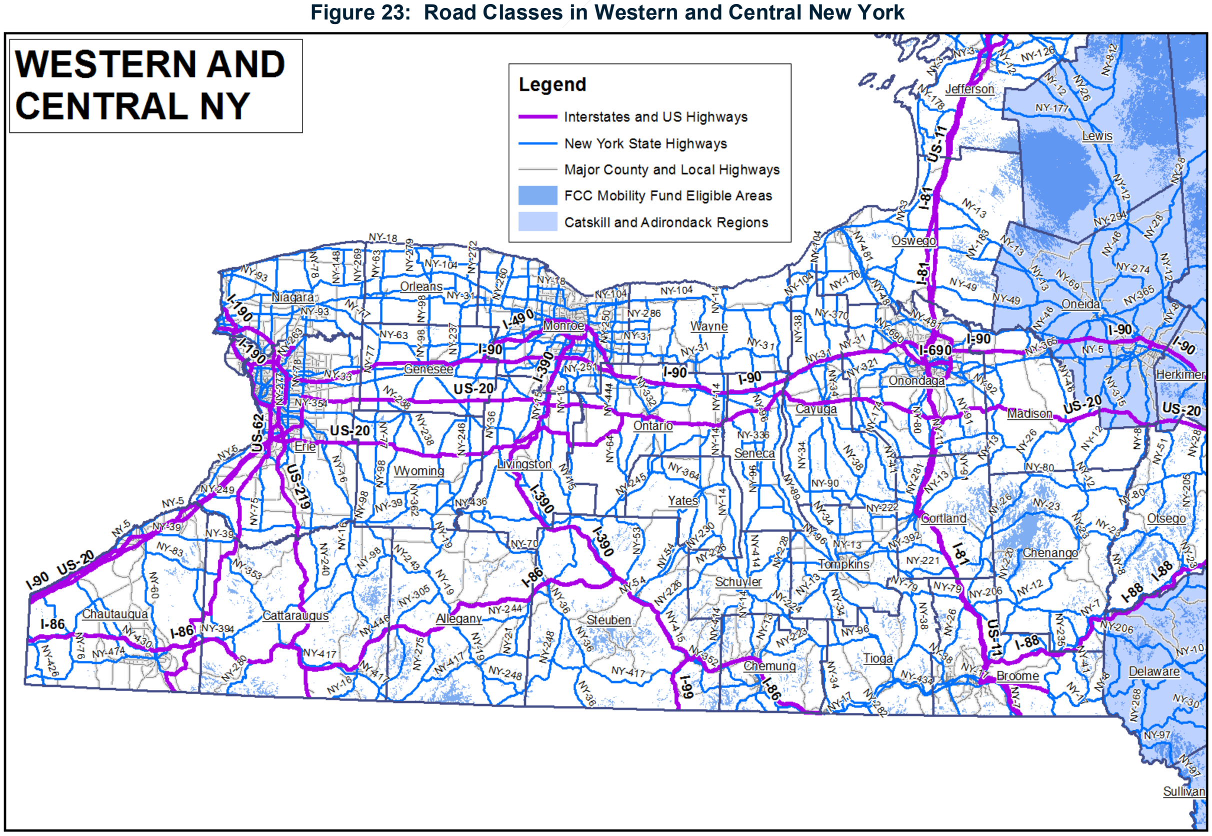


Figure 23: Road Classes in Western and Central New York



To estimate the extent of coverage gaps throughout all upstate regions, the Task Force identified the total road miles within each of these classes falling within the FCC Mobility Fund Eligible Areas and multiplied these distances by the Adjustment Factor described above. Table 3 presents the results of this calculation. For the purpose of this table, "Upstate" includes all parts of New York State except New York City, Long Island, and Westchester County.

Table 3: Upstate Estimated Uncovered Road Miles

Upstate (Includes Adirondack and Catskill Regions)				
Class	Total Upstate Road Miles	Approximate # of Miles in Mobility Fund	Adjustment Factor	Estimated # of Uncovered Road Miles
Interstates & US Highways	3,201	35	2.1	73
New York State Highways	7,521	732	2.1	1,537
Major County and Local Roads	6,841	161	2.1	339
TOTAL	17,564	928	2.1	1,949

Adirondack Region				
Class	Total Upstate Road Miles	Approximate # of Miles in Mobility Fund	Adjustment Factor	Estimated # of Uncovered Road Miles
Interstates & US Highways	612	33	2.1	69
New York State Highways	2,703	534	2.1	1,121
Major County and Local Roads	1,129	76	2.1	160
TOTAL	4,445	643	2.1	1,350

Catskill Region				
Class	Total Upstate Road Miles	Approximate # of Miles in Mobility Fund	Adjustment Factor	Estimated # of Uncovered Road Miles
Interstates & US Highways	280	0.7	2.1	1.4
New York State Highways	1,183	99	2.1	207
Major County and Local Roads	453	13	2.1	27
TOTAL	1,916	112	2.1	235

Below are a number of key points regarding upstate New York coverage estimates:

- The Adjustment Factor is applied uniformly across different parts of the state and to different road classes. Therefore, the estimate for the entirety of upstate New York is approximate;

- Approximately 11% of the miles along these three classes of highway were uncovered across all of upstate New York;

- Approximately 79% of the uncovered miles within these three classes are on New York State highways; and,

- The Adirondack Region includes approximately 25% of the three classes of roadway miles in upstate New York and 69% of uncovered miles across Upstate. The Catskill Region includes approximately 11% of the three classes of roadway miles in upstate New York and 12% of uncovered miles across Upstate.

2.5. Possible Future Deployment

FirstNet

FirstNet is a national public-private partnership to develop a nationwide, interoperable mobile broadband network for public safety users, such as local fire departments or police.

The First Responder Network Authority (FirstNet Authority) was created by Congress in the Middle Class Tax Relief and Job Creation Act of 2012.[21] The federal FirstNet Authority selected AT&T as its private partner to deploy and operate the network. States were asked to "opt-in" to the program or "opt-out" and develop their own program to connect public safety users; all states opted to participate in the program.

FirstNet is an LTE network. Public safety users buy service plans if they choose to use AT&T's network. Examples of primary users include fire departments, emergency medical services, law-enforcement, and emergency-operations-centers users. "Extended primary" users may include others who work with public safety during an emergency.

FirstNet is not a stand-alone public safety network. AT&T operates FirstNet as an extension of its commercial, publicly available network. Therefore, coverage expansion for FirstNet also benefits the general public. Although new sites deployed by AT&T are not exclusively FirstNet sites, FirstNet users receive various levels of priority access to AT&T's LTE network. AT&T's commercial customers can use FirstNet spectrum when it is not needed for priority access.

[21] Middle Class Tax Relief and Job Creation Act of 2012, 112 P.L. 96, 126 Stat. 156

AT&T received some significant benefits from the FirstNet partnership including 20 MHz of spectrum in the 700 MHz range of frequencies ("Band 14"), $6.5 billion for the initial build-out, and a 25-year contract to operate the network.

AT&T made commitments to each state in consultation with state planning officials. Examples of AT&T commitments include rural build-out requirements, site "hardening,"[22] and availability of deployable units to improve network capacity or coverage during an emergency.

The New York Division of Homeland Security and Emergency Services (DHSES) presented the commitments made by AT&T to New York to the Task Force. These commitments included 100 new Band 14 sites, for which AT&T reported the following status as of July 2021:

- 61 sites are on-air;
- 17 sites have started construction.

In addition, DHSES reported that AT&T committed to 321 new commercial sites in New York in the 2020-2021 timeframe. 171 of the upstate sites are on-air. AT&T also reported to DHSES that of the Band 14 planned Final Operational Capacity (FOC) coverage, 98.9% of rural square miles and 100% of non-rural square miles was on-air.[23]

It is reasonable to expect that AT&T's FirstNet commitments in New York, especially its commitment to 100 new Band 14 sites, will help close some of the coverage gaps identified by the Task Force. However, as illustrated in the next section, it is not clear at this time just how much expansion will occur in areas without existing cellular coverage by another provider.

Permits in Process

It is reasonable to expect that some coverage gaps identified by the Task Force will be closed by organic investments by carriers or by AT&T commitments pursuant to FirstNet. Because the Task Force lacks access to a comprehensive inventory of planned sites from the carriers or from permitting authorities across the State, it is challenging to establish definitive conclusions regarding the extent of organic private investment in the coming years. However, there are a number of applications under review within Adirondack Park, and therefore under Adirondack Park Agency jurisdiction. As such, data on permitted sites, pending applications, and sites in pre-application review for the Adirondack Park are available and provide insight into a subset of the Adirondack Region. Notably, the Adirondack Region also comprises a significant share of the uncovered areas in upstate New York.

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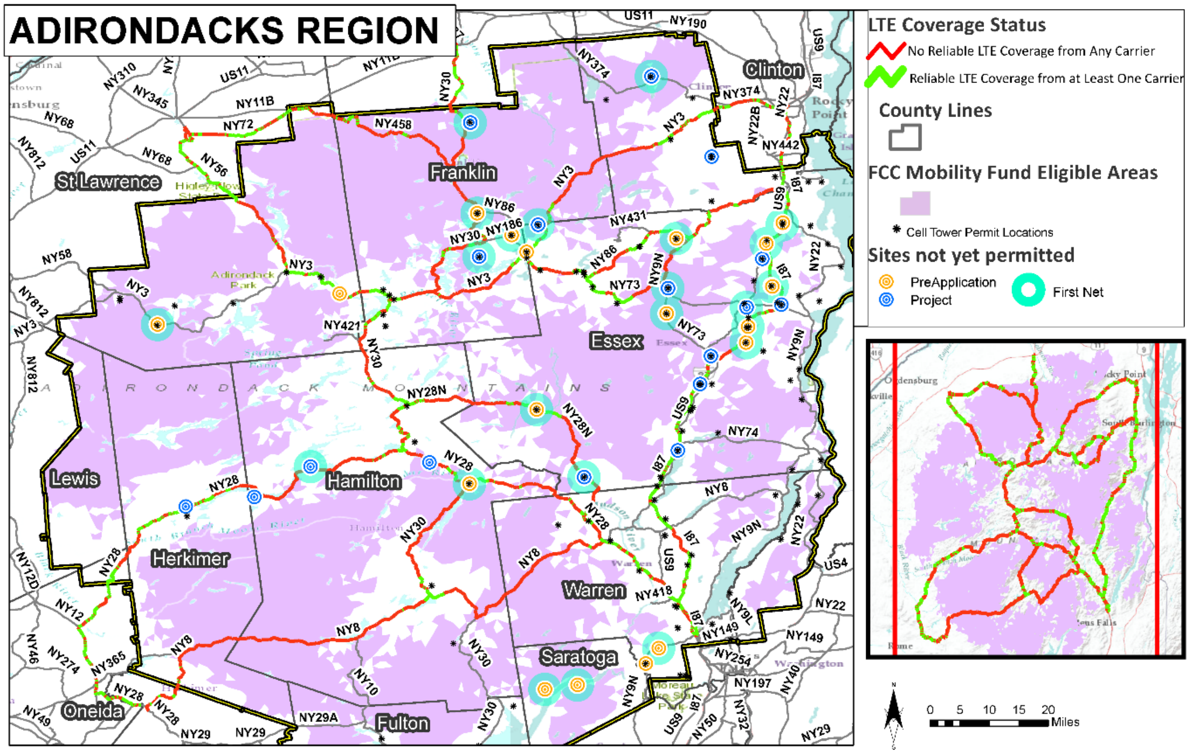
[22] This refers to steps to ensure that sites have resiliency to maintain operations in the face of adverse conditions from natural or human-caused events. Hardening a site may include steps such as achieving stronger structures, more resilient equipment installations, and enhanced back-up power availability.

[23] AT&T FirstNet Program Management Office, *New York State Commitments Update*, July, 2021.

Figure 24: Permitted and Pending Cellular Sites in the Adirondack Park



In October 2019, the Adirondack Park Agency (APA) provided the Task Force with a list of 40 permit applications for proposed private cellular sites within the park that are either at a pre-application posture or pending formal review. These applications provide helpful insights as to deployment patterns in the region. Of these 40 applications, 25 were submitted by AT&T, 12 by T-Mobile, one each by Verizon and Sprint, and one by a tower company with no cellular carrier identified.[24] Some of these applications may be for upgrades to existing equipment already located on the site.

The cellular applications indicate the proposed tower and cell heights. For 31 of the 40 proposed sites, the applications noted a tower height of less than 100' above ground level (AGL). Analysis of the applications demonstrate that seven of the proposed sites will provide new coverage, while the other 32 will provide duplicative coverage through collocation.[25]

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[24] An application for two new towers standing next to each other was submitted as part a joint application from AT&T and T-Mobile. One of the two towers is included in each of the AT&T and T-Mobile counts.

[25] Four sites are associated with AT&T, one with T-Mobile, one with AT&T and T-Mobile, and one with Verizon. The last one is an independent tower proposal at the preapplication phase that does not have a carrier associated with it, with the last activity being a June 2017 visual analysis.

AT&T, through its FirstNet commitments, is the applicant on 24 out of the total 40 cellular applications.[26] Of those 24 applications, five will provide new coverage. While these proposed sites will have a limited impact on overall coverage in the Adirondack region, there are still towers left to be sited and planned in connection with implementation of FirstNet in New York State, and these may target areas uncovered by any carrier.

[26] The one non-FirstNet AT&T site is a potential collocation at the preapplication stage with a 90' tower height that was last acted upon in 2014 (before AT&T entered into the FirstNet partnership). Nearby this site is another pre-application site listed as a new tower near an existing tower with a tower light of 75'. That the older site proposal may be dormant is a reasonable conclusion.

3. Regulatory Policies

This section outlines the existing regulatory requirements at the State and local levels impacting cellular infrastructure deployments in New York.

3.1. Understanding Current New York State Policy

Regulatory requirements and processes are a critical factor impacting the speed and cost of cellular infrastructure deployments. Key elements of an efficient regulatory structure are clarity, predictability, and an effective balancing of interests. By contrast, indefinite requirements, lengthy permitting timeframes, and rules restricting land availability and access to sites for cellular installations increase cost, create uncertainty, and extend completion horizons. In order to assess the current regulatory environment affecting cellular deployments in New York, the Task Force conducted a legal review of existing New York statutes and regulations, surveyed models in other states and jurisdictions, met with relevant State agencies including the APA and Department of Environmental Conservation (DEC), and conducted a survey of industry representatives.

This regulatory review identified three major issue areas impacting cellular coverage development in upstate New York:

- Certain land use permitting requirements and processes are duplicative or burdensome and hinder cellular service expansion;
- Access to State and local rights-of-way (ROWs) is complex and varied with little predictability; and
- Land availability is significantly constrained by the amount of protected State lands in certain upstate areas in addition to a lack of information regarding available and appropriate locations for cellular project development, adding to increased project risk and site identification expense.

Permitting Complexity

In the absence of statewide small cell or macro tower citing regulations in New York, carriers are required to navigate a complex and inconsistent patchwork of municipal and State regulations and ordinances, including inconsistent treatment of cellular communications facilities pursuant to the State Environmental Quality Review Act (SEQRA). The lack of uniformity across New York jurisdictions was cited by industry respondents as a significant issue because unclear permitting processes delay the deployment of cellular infrastructure.

Challenges to ROW Access

The State and local ROWs that bisect upstate New York are the most reasonable places to begin closing existing coverage gaps. They represent already hardened landscapes where much of the commercial activity is funneled, and serve as logical points of connection between and through population centers. However, pole attachment and new facility siting in existing ROWs was identified by industry representatives as a significant impediment to cost-effective coverage expansion. In addition, statewide programs for managing access to ROWs, while successful in other areas of the state, can create more barriers to investment in the Adirondack and Catskill Regions due to low commercial viability of cellular projects and lack of population density in the regions. Licensing and permitting programs designed to maximize revenue for the State may create a disincentive for investment where the economics of projects are marginal.

Limited Availability of Land
Barriers to accessing property owned by the various instrumentalities of the State of New York takes a variety of forms. As discussed below, access to forest preserve land and State Forest land is rarely, if ever, possible for commercial communication facilities. Other State lands are more readily accessible for infrastructure expansion but may have prohibitive regulation or unfeasible timelines.

3.2. Key FCC Policies

The FCC has taken affirmative steps to issue regulations and rulings that require State and local permitting agencies to act on telecommunication permit applications within specific periods of time. The Telecommunications Act of 1996 requires that:

> State or local government or instrumentality thereof shall act on any request for authorization to place, construct, or modify personal wireless service facilities within a reasonable period of time after the request is duly filed with such government or instrumentality, taking into account the nature and scope of such request. [27]

In 2009, the FCC issued what is commonly referred to as the “Shot Clock Order” to define a “reasonable period of time,” stating that a state or local government should act on a new telecommunications tower permit application within 150 days of receipt, and a vertical collocation application within 90 days.[28]

In 2018, the FCC took additional steps to use its authority to coordinate siting regulations across federal, state, and local jurisdictions. The FCC explicitly stated that it was taking these additional steps for the advancement of a national strategy to promote the timely buildout of new telecommunications infrastructure across the country. The primary goal of the 2018 ruling was to eliminate regulatory impediments that may add delays and costs to cellular deployment.

Specifically, the 2018 FCC ruling sought to streamline deployment of small cellular facilities by:

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[27] 47 U.S.C.S. § 332(c)(7)(B)(i)(I).
[28] In re Petition for Declaratory Ruling to Clarify Provisions of Section 332(c)(7)(B) , 24 FCC Rcd 13994 (F.C.C. November 18, 2009).

- Setting timeframes for application review and processing of small cell facilities to 60 days for collocations;
- Restricting State and local permitting fees to no greater than a reasonable approximation of the cost;
- Establishing greater uniformity of siting standards;
- Expanding access to municipal infrastructure in the ROW
- Defining permissible aesthetic and undergrounding requirements; and
- Clarifying that failure by a State or local permitting agency to act on a permit application constitutes a presumptive prohibition on service as defined by the Telecommunications Act of 1996.[29]

The FCC also aimed to limit environmental and historic reviews for telecommunications facilities pursuant to the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA).

In practice, the impact of these actions by the FCC, especially in hard to serve areas such as upstate New York, have been inconsistent at best. Permitting timelines shared by industry often do not meet FCC shot clock requirements and little progress has been made at the local level to improve uniformity of design, aesthetic, and siting restrictions. This is in part the result of ongoing legal challenges by municipal, state, environmental, and other stakeholders. Notably, efforts to streamline applicability of NEPA and NHPA requirements were invalidated by federal courts after challenges by environmental and tribal stakeholders.[30]

3.3. Special Considerations in the Adirondack and Catskill Parks

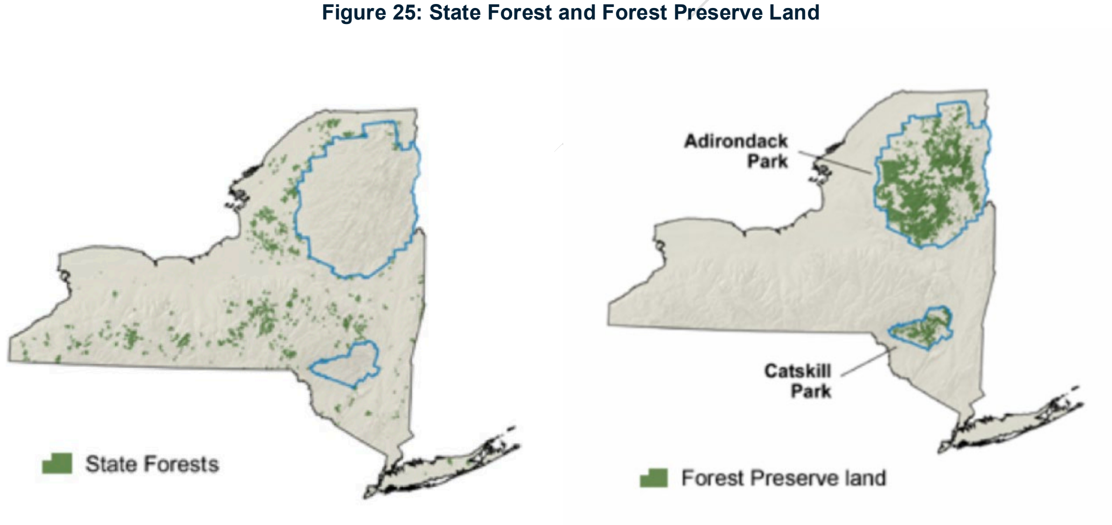
One of the challenges to significantly increasing cellular connectivity in upstate New York relates to protection of two valued state parks: Adirondack Park and Catskill Park. These parks uniquely consist of constitutionally-protected forest preserve lands, along with private and other public landholdings. The two parks collectively comprise over 6.7 million acres across 16 counties - over 20% of the land area of upstate New York, and include several major transportation corridors connecting upstate with downstate regions. The natural scenic character and beauty of both parks

[29] In re Accelerating Wireless Broadband Deployment by Removing Barriers et al., 30 FCC Rcd 9088 (F.C.C. September 27, 2018).
[30] United Keetoowah Band of Cherokee Indians in Oklahoma. v. FCC, 933 F.3d 728 (D.C. Cir. 2019).

is considered by many to be essential to the quality of life and economy of the regions, and they have been long-recognized as valuable state and national treasures.[31]

The New York State Constitution mandates that forest preserve lands in the Adirondack and Catskill parks be kept "forever wild" (*i.e.*, in their natural state). DEC is charged with ensuring that constitutionally protected forest preserve lands, as well as state forest lands, are properly managed. While conservation requirements protect the value of these wild lands, they also pose special challenges to improving cellular coverage. Although allowances exist for certain administrative buildings and historic properties added to the preserves in recent decades, opportunities to expand coverage through use of the forest preserves would, in most cases, require an amendment to the State Constitution. The Task Force considered use of existing commercial sites within the parks but found such an effort to be undesirable as it would be unlikely to expand coverage, require extensive legal review, or require new legislation.[32]

Figure 25: State Forest and Forest Preserve Land



Adirondack Park

The Adirondack Park is a mountainous region of public and private lands in upstate New York. The Adirondack Forest Preserve encompasses over 2.6 million acres within the larger 6-million-acre area of the Adirondack Park. The APA, established by New York State under the 1971 Adirondack Park Agency Act, oversees certain development in the privately-owned portion of the

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[31] Adirondack Park Agency, Policy Procedures & Guidance System, *Policy on Agency Review for New Telecommunications Towers and other Tall Structures in the Adirondacks Park,* (February 15, 2002) https://apa.ny.gov/documents/Policies/Telecom_Towers_Tall_Structures.pdf; *see also* Catskill Center Website,, http://catskillcenter.org/.

[32] Friends of Van Cortlandt Park v. City of New York, 750 N.E.2d 1050, 1053-54 (N.Y. 2001) (citing Miller v. City of New York, 15 N.Y.2d 34, 37 (1964)); Avella v. City of New York, 2017 N.Y. Slip Op. 04383.

park. The APA is instrumental in the approval process of large developments and infrastructure, including telecommunications towers and facilities.

Section 809 of the Agency Act establishes a development review process and areas of jurisdiction which is based on five review criteria and 37 specific development considerations.[33] As relevant to this report, the APA has permitting jurisdiction over the siting and modification of all structures taller than 40 feet in most private land use areas within the park, in addition to projects identified as "major public utility projects,"[34] which include most telecommunications projects.

APA Standard of Review for Proposed Cellular Sites

To approve a permit application falling within APA jurisdiction, the APA must find that the proposal is consistent with its Land Use and Development Plan, compatible with the character description and policies for each land use area, and that the project creates no adverse scenic and aesthetic impacts to Park resources. The 2002 Telecommunications Towers and Tall Structures Policy (Towers Policy), provides guidance on APA interpretation of this "no adverse impact" standard.[35] The primary goal of the Towers Policy is to protect Park resources while maintaining compliance with federal siting requirements.

The key regulatory review standard for siting in Adirondack Park is a Towers Policy requirement stipulating that telecommunications facilities be located in such a manner as to be "substantially invisible." In addition to photo simulations and limited drone flights, the primary mechanism for conducting fact finding related to whether a proposed project will meet this "substantially invisible" standard involves balloon tests at a proposed tower site, which must be observed from pre-selected, publicly sensitive vantage points. This process can be logistically complex.

APA Review Process and Timeframes

For the siting of new towers at new sites, the APA review and approval timeframes are clearly established in statute and regulation. They provide a 15-day timeframe for the review of an application for completeness. The 15-day clock also applies to review of a response to a Notice of Incomplete Application (NIPA) though APA generally reviews NIPA responses within ten days under the FCC shot clock rule. Upon a determination that an application is complete, the APA must publish a notice of completion and public comment period in the Environmental Notice Bulletin, and mail the notice to the Local Government Review Board, the chair of the county planning board, the chair of the appropriate regional planning board, and to the chief elected officer, clerk, and planning board chair of the local government.

The APA must close public comment and issue a determination within 90 days of receiving a complete application. If a public hearing before the APA Board is required, the APA Board must

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[33] N.Y Consolidated Laws, Article 27 Section 809; https://www.nysenate.gov/legislation/laws/EXC/809.8

[34] The jurisdictional scope of APA purview of small cell permitting is not clearly defined.

[35] Adirondack Park Agency, Policy Procedures & Guidance System, "Policy on Agency Review for New Telecommunications Towers and other Tall Structures in the Adirondacks Park," (Feb. 15,ruary 2002) https://apa.ny.gov/documents/Policies/Telecom_Towers_Tall_Structures.pdf.

authorize the hearing and notify the applicant of the decision to hold the hearing within 60 days of receiving a complete application. After the hearing, a decision on the application must be rendered within 90 days. No permit may be denied without a hearing and no public hearing has been held on a tower application in the past 14 years.

The APA has two General Permits for telecommunications collocations, which streamline the permitting process and eliminate the requirement for a public comment period. The Agency will notify the applicant within 10 business days if additional information is needed and will issue the General Permit within 10 business days of completion.

One General Permit is for horizontal collocation, for situations in which a tower is being replaced or a new tower is proposed on a site with existing towers. The other telecommunications General Permit applies when a provider is seeking to replace existing antennas or install new antennas on an existing tower with no new visual impacts. Many applications to the APA are eligible for one of these General Permits.

The APA application process also includes a voluntary pre-application consulting process designed to ensure that applications submitted are sufficiently complete to allow for efficient review and build the case for a positive Agency determination on the application. Because it can substantially ease the application process by improving clarity, the vast majority of applicants elect to utilize the pre-application process. The most common review issue addressed during a pre-application process is a balloon or drone test to determine the location and height of a proposed tower, and to provide an assessment of potential visual impact. Other issues may also be raised related to proposed road construction involving steep slopes and wetlands. The exact content and duration of the pre-application process is application-dependent, and industry survey respondents indicated that this could generate a lack of clarity when planning a new project. APA staff noted that the average pre-application process requires approximately 6.5 months. The most time-consuming element of this process is the visual assessment required under the “substantial invisibility” criteria, which could involve one or more field “balloon tests” requiring coordination among several parties.

Table 5 below provides a basic outline of permitting timelines in areas under APA jurisdiction as well as corresponding FCC shot clock rules.

Table 4: Permitting Timelines

Site Type	FCC (from app complete)	APA	Carrier Experience	Notes
Macro New	120 days	Pre-app: 6.5 months App review: 90 days	6-24 months (carriers note significant variability)	Lack of clarity when clock starts
Macro Collocation	60 days	60 days	60 days – 3 months	More consistency but municipal delays exist

Small Cell New	90 days	Jurisdiction to be determined	6-24 months (carriers note significant variability)	Lack of clarity of municipal process and ROW access
Small Cell Collocation	60 days	Jurisdiction to be determined	60 days from ROW access	ROW agreements and fair access major issues

Modernizing and simplifying the APA permit review process could encourage more investment in cellular infrastructure within the Park by improving predictability and cost-effectiveness. As described in the section above titled "Cell Site Development Process and Requirements," carriers are more likely to deploy capital were certainty and predictability prevail.

Adding to permitting complexity within the Park, individual municipalities may adopt additional regulations or restrictions for tower siting and conduct SEQRA review in addition to a concurrent APA review process which has the same intended effect – potentially subjecting proposed cellular deployments to dual environmental reviews by different entities.

Catskill Park

The Catskill Park is a mountainous region of public and private lands in southeastern New York. The Catskill Forest Preserve encompasses over 287,000 acres, or 41% of the total land in the Park. The Catskill Park is also the primary home to the largest unfiltered water supply in the United States, which supplies New York City with approximately 40% of its water, commonly referred to as the "West of Hudson" supply. Unlike Adirondack Park, the Catskill Park does not have a unified jurisdictional land use entity. Public forest lands are managed by the DEC and local municipalities have jurisdiction over a majority of private and public holdings outside of the State-owned forest.

One key consideration is that more than 135,149 acres of land in the Catskill Park are owned by New York City and regulated by the NYC Department of Environmental Protection (DEP). Under State law, the DEP has regulatory authority over 1 million acres in this region and holds revocable land use permits with approval of land disturbances of over two acres, such as road construction. The Catskills Watershed Corporation manages the water resources as a quasi-governmental body. The combination of forest preserve and water resource land create a significant constraint on the availability of land for the development of telecommunications facilities outside of ROWs and municipal population centers.

Based on industry feedback, the Adirondack and Catskill Parks involve significantly longer entitlement and permitting timeframes when compared to other upstate New York regions. There are significantly more environmental, visual, and aesthetic review costs for projects subjected to zoning agency jurisdiction in the Catskill Park, when compared to other areas.

3.4. Local Zoning and Other Local Regulations

The nature of cellular networks requires consistent placement of infrastructure throughout a service area. However, this can be challenging when municipal boundaries with vastly different regulatory regimes must be crossed. A survey of local permitting regimes in New York reveals a range of approaches that are extremely variable, inconsistent, and discretionary. For example, one municipality may have administrative approval over most aspects of placement or construction of telecommunications facilities, but an adjacent municipality may not – requiring legislative action or approvals from multiple boards and necessitating several public hearings. If municipal consultants are part of the approval process, it can add substantial delays and concerns among applicants over which entity has ultimate authority.

Although the FCC has attempted to standardize approval timeframes and permissible local restrictions on deployment, this effort has not resulted in consistent outcomes across the country. As of 2019, 27 states have adopted some level of statewide standardization of the permitting process for deployment of cellular facilities.[36] Recent state-level legislative and regulatory activity across the country has focused on small cell deployments. As an example, in 2019, Connecticut adopted state legislation that seeks to streamline leasing of state lands for small cells as well as towers.[37]

In New York, municipal independence (*i.e.*, "Home Rule") has been a constitutional principle for well over a century.[38] This principle grants significant discretion to local municipalities to adopt local ordinances and regulations when not specifically pre-empted by State action. The Municipal Home Rule Law and the Statute of Local Governments further describe this municipal prerogative, and empower municipalities to adopt, amend, and repeal a variety of land use regulations through the adoption of local laws. The primary mechanism by which cities, towns, and hamlets exercise this authority is through the adoption of local zoning.[39] Additionally, municipalities may review projects under local site plan ordinances, design guidelines, local historic regulations, and ROW and street opening permits. When attempting to generate a unified, consistent, and fair approach to achieving universal cellular connectivity, this variability among local jurisdictions is a very significant policy obstacle.

Relative to municipal permitting rules and processes, there are several important variables within each jurisdiction that can have a dramatic impact on the incremental cost of infrastructure deployment. These variables include:

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[36] In 2018, legislation was proposed in New York to adopt siting standards at the State level. The legislation would create a uniform process with timelines and fees established by the State, but administered by local municipalities, maintaining municipal control while creating a standardized process.

[37] 2019 Bill Text CT H.B. 7152.

[38] New York State Bar Association, *Report and Recommendations Concerning Constitutional Home Rule, (April 2, 2016)* https://www.nysba.org/homerulereport/

[39] N.Y. Gen. City Law § 20(24), (25); Town Law, Article 16, and Village Law, Article 7.

- Land use goals;
- Local regulatory structure;
- Local political and community sentiment;
- Economic development policies;
- Aesthetic and natural resource siting requirements;
- Wetlands and sensitive landscapes requirements; and
- Historic and cultural resource sensitivity.

Any effective attempt to streamline or unify a regulatory approach across multiple jurisdictions will require an understanding of the key issues listed above.

Discussing municipal siting regulations requires a distinction between macro tower siting and small cell siting. Most, if not all, municipalities treat macro towers as they would any significant land use such as a residential structure or retail establishment. The zoning ordinance identifies areas of the municipality where such a use is allowed and applies review standards in a similar fashion as with other land uses. In some cases, the review criteria and process are outlined in the zoning ordinance itself and, in other instances, a standalone communications facility ordinance exists. Given municipalities have decades of permitting experience with macro facilities, local approaches to regulation tends to be more clearly codified. However, the timeframe, cost, and review criteria remain dramatically different from one jurisdiction to another. In the Task Force's research, some municipalities permit a tower facility with as little as a building permit, while others aggressively restrict land availability through ordinance, and have lengthy review periods involving several municipal review boards and, in some instances, the legislative body. Also, as the lead agency under SEQRA, municipalities have significant discretion: one municipality may require a tower application to complete a simple Environmental Assessment form while a similarly situated tower in a neighboring municipality may require a full Environmental Impact Statement. Such regulatory differences can significantly impact the timeframes for deployment. Because completion of Environmental Assessments and Environmental Impact Statements can be time consuming and expensive, the unpredictability of what to expect when beginning a project is an inherent deterrent to investment. A company is more likely to invest where predictable regulatory regimes exist.

Small cell technology emerged more recently and its review by municipalities is even less consistent than macro facilities. Currently, regulatory approaches to cellular siting in New York can be broadly categorized into three approaches. First, some municipalities have adopted local ROW access requirements generally consistent with the FCC's recent small cell rules described in Section 3.2 above. These municipalities also tend to have clear zoning ordinances. Second, there are municipalities where small cell access requirements are procedurally consistent with requirements for other telecommunications service providers using the ROW, but compensation methods – *i.e.,* application fees and recurring access payments – are not cost-based. And third, there are municipalities where access requirements are codified into zoning and other highly discretionary regulatory processes like those applied to tower facilities.

In addition to more traditional land use, projects will often require municipal review for license to access municipal ROWs and street opening approvals for small cell sites, as well as historic and design review for aesthetic and contextual appropriateness. These review regimes serve dramatically different public interests and may be contradictory. Without an overarching statewide regulatory regime that addresses telecommunication deployment, it is difficult for companies to predict the timeline and requirements because they vary so greatly from place to place.

3.5. State Environmental Quality Review Act

SEQRA applies to most projects, activities, or discretionary approvals by a New York State agency or unit of local government. The main purpose of the statute is to ensure an assessment of the environmental significance of all government actions.

There are several potential environmental impacts considered during a SEQRA review. These include both traditional impacts to land, water, and wildlife, as well as aesthetic experience and health concerns. In general, SEQRA requires an environmental assessment to determine what, if any, environmental impacts may occur if the government action proceeds, as well as an examination of methods to avoid or reduce those impacts. The procedures required for SEQRA compliance are typically delineated by DEC.[40] SEQRA regulations addressing the scope of assessments required were recently revised and new regulations took effect in 2019.[41]

Outside of the Adirondack Region,[42] municipal zoning agencies typically act as the lead agency for performing SEQRA reviews of cellular facilities, including towers. Many municipalities will require a full environmental assessment form (Full EAF) be completed, either by regulation or request. This is often the case even when the action is not "Type I," requiring a "Full EAF," and use of the simplified or "Short EAF" would be permitted.[43]

There can be delays in the adoption of SEQRA determinations and requests for additional information by local zoning agencies for proposed tower sites that may extend permitting

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[40] Department of Environmental Conservation, *Stepping Through the SEQR Process,* (last visited Nov. 15, 2019) http://www.dec.ny.gov/permits/6189.html.

[41] Department of Environmental Conservation, *Appendix: Summary of Changes to the SEQR Regulations,* (last visited Nov. 15, 2019) http://www.dec.ny.gov/docs/permits_ej_operations_pdf/part617smmrychngs.pdf

[42] As noted above, the APA typically oversees SEQRA review for jurisdictional projects within the Adirondack Park.

[43] Department of Environmental Conservation, *SEQR Handbook,* (last visited Nov. 15, 2019) *https*://www.dec.ny.gov/permits/6188.html

timeframes. This is often the case despite the timing and submission requirements set forth in SEQRA regulations and FCC cellular siting regulations.

3.6. Access to Utility Poles

The FCC regulates utility pole attachments but is prohibited from doing so for pole attachments that are regulated by a state.[44] The New York State Public Service Commission (PSC) has taken several steps over the past two decades to promote standard rates and processes for wireline attachments to utility poles.[45] A primary goal of PSC regulation of utility poles is to create a consistent and transparent mechanism for attachment and clear expectations regarding timeframe and cost.

Cellular attachments to existing utility poles are subject to pole attachment agreements and licensing. Over the past decade, larger utilities have developed standard attachment agreements for cellular attachments. Even so, timelines for agreements and licensing and fees for cellular attachments often lack consistency when compared with similar wireline attachers and agreements between utilities. Moreover, design and engineering standards set by utility companies can often exceed industry requirements and national best practices, which can make identifying existing, usable infrastructure for small cell siting challenging. This drives carriers to seek placement of new utility poles for their use, leading to longer and more difficult permitting in many municipalities where there is almost universal preference to attach to existing infrastructure in the public ROW. The PSC itself recently noted that existing application, make-ready, and construction timelines and processes for cellular pole attachments are inefficient and should be improved.[46]

In 2019, in response to a petition filed by the Wireless Association (CTIA), the PSC reexamined cellular pole attachment requirements. The PSC issued an order seeking standardization of cellular pole attachment procedures in line with federal law, prior PSC decisions, and State policy.[47] The PSC recognized that a shift in the technology requirements of evolving networks and growth of cellular usage required that rules for cellular attachment be updated and made consistent. Accordingly, the PSC issued an order adopting a uniform mechanism for measuring pole rental space, establishing new timelines for approval, adopting the same dispute resolution process as used for wireline attachments, and instituting a pole attachment rate with updated cost calculations.[48] In addition, the PSC continued the proceeding to “allow for innovative and new

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[44] 47 U.S.C. §.224(c).

[45] N.Y. Pub. Serv. Law § 119-a.

[46] New York Department of Public Service, Case 16-M-0330, Petition of CTIA to Initiate a Proceeding to Update and Clarify Wireless Pole Attachment Protections, Notice Seeking Comments (November 12, 2019).

[47] New York Department of Public Service, Case 16-M-0330, Petition of CTIA to Initiate a Proceeding to Update and Clarify Wireless Pole Attachment Protections, Order Approving Petition in Part and Seeking Update (March 14, 2019).

[48] *Ibid.* at p. 32-35.

approaches (to pole attachment policy) and, where appropriate, further streamline processes to improve the efficient and safe deployment of communications infrastructure across New York."[49] Further action is likely from the PSC in years to come.

3.7. Access to State and Local Rights-of-Way

Given the necessarily interconnected nature of a functioning cellular network, access to public ROWs are an important consideration for providers building out tower or small cell infrastructure.

For State-owned ROWs, access is subject to the NYSDOT access or permitting requirements. Facility siting on NYSDOT roadways must also comply with "clear zone of recovery" requirements, which operate like setbacks. The size of these clear zones increases with the speed limit of the particular roadway and the size of the installation. Clear zones limit the amount of available land that can be utilized for facility development outside of the travel way and the ROW boundary, and particularly so in the Adirondack and Catskill regions, where the ROW is often bound by forest preserve or other protected lands on both sides.

The predominant and most unique characteristic of ROW access in New York is the use of an exclusive third-party private partner to manage telecommunication access. Since 1997, the permitting and licensing of telecommunications on most State-owned land has been managed by Crown Castle, a national real estate and infrastructure provider, pursuant to a telecommunications site manager agreement (TSMA).[50] The TMSA includes provisions for licensing and permitting of third-party towers on State land, development of towers by Crown Castle for the State, as well as licensing, permitting, and collocation of third-party equipment on these towers. Although the agreement was originally entered by the New York State Police, twelve additional agencies – including the Department of Transportation, Office of General Services, State University of New York, Department of Environmental Conservation, and Office of Parks, Recreation and Historic Preservation – have adopted the TMSA through execution of separate memorandums of understanding. The original term of the TMSA ran from 1997 through 2017 and was renewed through 2022 when the State executed the first of four five-year options.

As of 2018, over 1,250 antennas have been licensed under the agreement across a variety of State lands. In addition, Crown Castle has developed over 72 cellular infrastructure sites, including 27 new State-owned towers. Under the TMSA's revenue sharing model, the State has received millions of dollars from the licensing of State sites, and according to a 2018 report by the SUNY Office of Capital Facilities, the State receives approximately $10 million in revenue annually.

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[49] *Ibid.* at p. 34.

[50] The TSMA applies broader amounts of State-owned land than ROW, such as state police barracks, NYSDOT maintenance depots, etc.; however. for the purposes of this section focus was given to the ROW impacts.

County or municipal entities have their own highly individualized ROW access or permitting requirements, processes which are variable and can be costly and time consuming for the private sector. These approvals generally involve a broader ROW access or master license agreement, and often require additional approvals for each individual installation.

3.8. Industry Feedback

Carriers and tower companies were surveyed to obtain facts about several facets of the cellular infrastructure construction and regulatory process. In general, surveyed companies stated the following:

Permitting Process

- Local permitting is inconsistent and discretionary.
- Municipalities do not always have the resources or capabilities needed to perform permit reviews, and consultants may present an additional roadblock to deployment.
- In the Adirondack Park, lack of available land in key locations and the variability of the pre-application process where balloon testing is required are significant hurdles.
- ROW access across jurisdictions from NYSDOT to local public works entities presents a large obstacle.
- Access agreements may take a long time to obtain.

Permitting Timeline

- The overall process in both the Adirondack and Catskill regions, particularly within the parks, is longer compared to other areas of upstate New York due to additional layers of regulatory approvals and lack of a streamlined process.
- Lengthy permitting processes consume a company's time, expense, and present a significant opportunity cost because resources are prevented from being deployed elsewhere.

Additional Issues

- Some projects in process by one or more of the respondents were either abandoned altogether or substantially delayed due to lack of clarity on regulations (introducing additional expense), existing State laws limiting tower heights, or the economics of the population density. Although no respondent could provide specific data or case studies regarding permitting timeframes and numbers of new towers commissioned annually, they did cite zoning issues, APA restrictions, and additional iterative analyses with municipal consultants as the most prominent regulatory hurdles. The industry's experiences with attachment and rates in New York ranged from compliance with national standards in fairness and clarity, to restrictive agreements out of line with federal law.

4. Estimating Coverage Costs

The Task Force utilized coverage data and analysis of the regulatory and permitting environment for cellular deployments in New York to develop estimates of the capital costs necessary to expand service on major roadways without reliable coverage. These estimates are necessarily high-level and indicate the approximate size of the investment needed to improve service across upstate New York.

4.1. Methodology for Calculating Costs

To estimate the cost of achieving a mile of new cellular coverage, the Task Force generated detailed models of cellular infrastructure deployment along “Target Corridors” selected from among the roadways where the A&M Team’s drive testing revealed coverage gaps. In order to calculate this cost per mile of new coverage metric, the Task Force considered the following:

- Specific siting conditions and the regulatory environment;
- Costs associated with each site type;
- Necessary improvements to fill coverage gaps; and
- Models of general upstate coverage costs

The study considered the use of three broad types of new sites: new towers, collocations, and small cells. Ultimately, the study only considered new towers and small cells due to a lack of likely collocation sites in uncovered areas.

The Task Force depended on the A&M Team’s industry knowledge and experience to develop a schedule of granular cost factors for each type of cellular infrastructure site such as land use fees, permitting, legal, and construction. These cost factors were aggregated to generate an overall average cost per site for each site type.

Next, the Task Force identified three Target Corridors (*see Section 4.2 below*) with significant coverage gaps. Target Corridors were selected to represent a variety of regions, terrain, vegetation, land use, State land ownership, settlement density, and patterns that can be found across uncovered areas in upstate New York.

After identifying the Target Corridors, the Task Force estimated the quantity of each type of new site required to fill coverage gaps. To achieve this estimate, the Task Force generated specific siting models of the number and type of cell sites required to provide reliable coverage along each Target Corridor. Such models considered a variety of local factors including terrain, permitting constraints, site availability, and access constraints. Because actual infrastructure deployment would likely differ from the models due to onsite conditions, this report does not identify hypothetical site locations. Moreover, it is important to note that the study objective was to indicate approximate overall costs, not to develop a prescriptive set of site counts, types, or locations. Ultimately, the analysis sought to model the overall effect of various constraints on the quantity of sites required for reliable coverage (*e.g.*, the impact of cell tower height constraints on the number of towers required to ensure reliable coverage) in order to generate reliable estimates of areas beyond the Target Corridors.

Modeling the average cost per type of site, as well as the quantities of each site type required for reliable coverage along the Target Corridors, enabled the Task Force to calculate the approximate average capital cost to adequately serve each Target Corridor. This allowed the Task Force to determine the cost per mile of new coverage in upstate New York:

$$Cost\ per\ mile\ of\ new\ coverage = \frac{Total\ capital\ cost\ along\ Target\ Corridors}{Total\ miles\ with\ unreliable\ coverage}$$

The study utilized this cost per mile metric in conjunction with drive test data and FCC Mobility Fund maps to estimate the total cost of serving uncovered areas of upstate New York.

4.2. Target Corridor Costs Case Studies

Approach to Site Type Selection

In order to determine the cost to provide reliable coverage in upstate New York, it was necessary to develop specific case studies using Target Corridors within the Adirondack and Catskill Regions that provided diverse geographical features, land use, and regulatory regimes. Once identified, a pragmatic approach was taken to designing an infrastructure solution in these targeted corridors that would achieve reliable coverage. Two roadways in the Adirondack Region and one in the Catskill Region were chosen for this study.

Adirondack Region Roadway #1

Most of this roadway runs through State-owned lands, is devoid of major development surrounding the road, and lacks power and fiber (utilities) through significant stretches. The design approach for this roadway heavily favored small cells for several reasons. First, properly placed small cells can cover 0.25-0.5 mile stretches of roadway since they are located next to the roadway and do not have to overcome significant terrain. Small cells struggle to cover areas off the road due to the low overall height of the structures on which they are sited, which are often 40 feet in height or less. However, on this roadway, there are few residences or commercial entities off the main road, making small cells compatible. Small cells are also advantageous here because multiple carriers can be collocated on them using shared radio and antenna equipment. Finally, since most of this roadway runs through State-owned lands, there may be regulatory factors that favor the placement of small cells over full tower sites.

A limited number of tower sites were selected where more extensive coverage could be achieved. Industry standards require that collocation would need to be accomplished by erecting two or more towers. However, such sites would be saddled by high development costs as they would require significant support infrastructure including roads and utilities. Regulations in the Adirondack Park would require towers to be “substantially invisible,” which the Task Force assumed would limit tower heights to approximately 10 feet above the existing tree line along this corridor. The Task Force also assumed that commercial towers were excluded from the State lands which surround significant portions of this road.

Adirondack Region Roadway #2
This roadway has a mix of geography and land types. There are spans of this road that go through State lands, areas with very challenging terrain, locations with population, and milder terrain fluctuations. There are several existing towers that provide limited coverage to this road.

The design philosophy for this road included a mix of tower sites and small cells. Small cells were placed along the stretches of roadway that went through State lands or encountered extreme terrain fluctuations. Areas where the roadway ran through State lands did not have facilities or address points to cover off the main road. Small cells are located along the road and can be strategically placed to mitigate terrain fluctuations. Areas with extreme terrain fluctuations cannot be covered by towers located within the park due to tower height limitations. Generally, it is also much more expensive to locate towers in areas of extreme terrain due to the lack of development and corresponding infrastructure (*e.g.*, roads and utilities) needed to support a tower.

One interesting item noted from the drive test of this road was the inability of one of the existing towers to adequately cover the road and population located underneath it. This tower is located on a 1,950' Above Mean Sea Level (AMSL) hill and cannot cover the road underneath it, which is at 1,550' AMSL. This necessitated the need for several additional small cells. A higher tower height at this location could solve this coverage issue.

Catskill Region Roadway #1
This roadway runs through a river valley. Population surrounds this roadway, utilities are readily available, and there are fewer restrictions on tower placements since State lands are not as close to this roadway. For these reasons, this stretch of roadway was designed with new tower placements.

New towers on the order of approximately 120 feet above ground level (AGL) are appropriate on this roadway because of their larger coverage areas and limited State lands. Towers would cover the homes and businesses surrounding the road, whereas small cells would primarily cover the road. Towers are permissible in this area since the State lands are not as prevalent along this stretch of roadway. Because most of this area is developed, road construction and utility pulls to the new sites would not be as cumbersome as in a less developed area. Although terrain is still a factor along this roadway, the coverage gaps can be remedied if the new towers are placed in alignment to the road.

Key Cell Site Cost Variables and Assumptions

The Task Force's estimate of the average cost per mile of coverage depends on several assumptions about what each site would cost. Since a full cost assessment for hypothetical sites was beyond the scope of this report, the Task Force developed estimated average costs per site.

Table 5: Estimated Average Site and Additional Corridor Costs

Estimated Average Cost Per Site	
New Towers	$965,575
Collocations / Existing Sites	$282,350
Small Cells	$138,865
Additional Estimated Costs Per Corridor	
Wireless RF Engineering and Network Planning	$100,000
Small Cell Headend	$300,000

The Task Force developed an estimate of average per site costs for each of the three site types, detailed in

Table 5. Figure 26 breaks down these overall costs into major cost categories. It is worth noting that there is a high degree of variability in many of the costs that go into these estimates. Costs for individual sites would likely vary significantly from site to site. Generally, the Task Force erred towards more conservative estimates (*i.e.* estimating that costs may be higher). Key considerations included the following:

- Under "Site Improvements," the Task Force assumed that construction of new towers would include substantial costs for site improvements (*e.g.*, roads and power to reach advantageous sites in a relatively undeveloped landscape). The Task Force also assumed a substantial cost in this category for small cells because fiber backhaul or fronthaul would need to be constructed or acquired for each site and, in some cases, utility power would also be necessary.

- Under "Structures and Structure Modification," the Task Force assumed that many new tower sites would need to be in a monopine[51] style because of permitting requirements, which is more expensive than a conventional monopole structure.

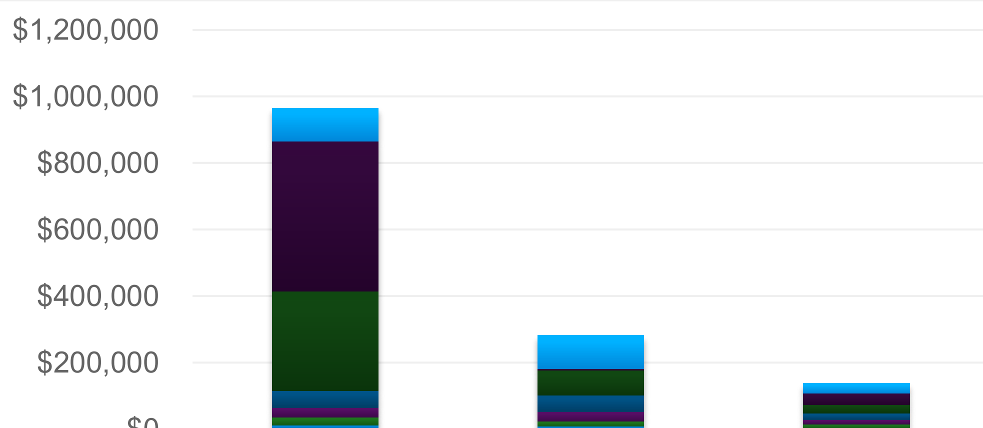
[51] A monopole-type tower with camouflage intended to simulate a tall pine tree.

- In the Adirondack Region, the Task Force assumed that new towers would be limited in height, generally just above the tree line.

- Small cells are assumed to be placed on wooden utility pole-type structures located within highway ROWs.

- The Task Force estimated higher cost levels for categories of Legal, Regulatory and Permitting, as well as elements of Architectural and Engineering than might otherwise be expected in most rural jurisdictions due to the rigors of permitting in the many environmentally sensitive areas of the Adirondack and Catskill regions. Additionally, the Task Force considered the costs associated with the APA permitting process.

Figure 26: Breakdown of Costs by Site Type



	New Towers	Collocations/ Existing Sites	Small Cells
Equipment	$100,000	$100,000	$30,000
Site Improvements (incl. road, power, telco)	$450,000	$5,000	$35,000
Structures & Structure Modification	$300,000	$75,000	$25,000
Legal	$50,000	$50,000	$20,000
Regulatory and Permitting	$28,350	$28,100	$13,200
Architectural and Engineering	$24,425	$14,700	$12,670
Site Acquisition	$12,800	$9,550	$2,995

Overall, the Task Force estimated that a new tower development would be more than six times the cost of a small cell. However, the number of small cells required to cover a stretch of corridor is greater.

The Task Force also included certain costs that were not strictly dependent on the number of sites. It assumed $100,000 per corridor (not per site) for overall cellular planning and engineering.

The Task Force also assumed corridors with a large number of small cells would require a dedicated small cell headend containing centralized baseband equipment for the small cells.

Key Constraints and Cost Drivers

Macro towers, which tend to be thought of as the traditional means to disperse cellular signals, are characterized by antennas affixed at greater than 100 feet above a support structure. These include monopoles, rooftops, water tanks, and lattice towers. Their cellular coverage radius is typically greater than one mile and can have three or more sector antennas – with each containing one or more frequencies – giving them the capability to support up to three separate carriers on one structure.

Small cells include lower-powered stations that can be placed in more flexible locations to either augment macro tower coverage or offload traffic from a macro network to help increase network capacity. Typically, these antennas are affixed to locations lower than 50 feet on a support structure, which can include both indoor and outdoor buildings, utility poles, or decorative streetlights. Small cells' cellular coverage radius is typically less than half a mile and they have reduced capabilities. Small cells can, however, be very effective when used to cover topographically challenged roads and high-traffic commercial areas.

Both macro towers and small cells require power and fiber connectivity to operate. While use cases vary from site to site, towers generally provide greater overall coverage, especially in cases where coverage is needed in areas surrounding larger roads and highways. Towers are also better equipped with backup power solutions and can tolerate brownouts or short-duration power outages. These advantages, however, come at a cost. Towers are typically located near developed areas to limit costs and aligned to major roads to facilitate easier access. Small cells have more flexibility from an installation standpoint and are more cost-effective. Additionally, small cell costs can be further reduced by sharing the equipment among carriers using a Distributed Antenna System (DAS) model. Although they are more dependent on utility and landlord power, small cells circumvent issues that may plague macro towers, such as locating towers on State lands and tower height limitations.

Overall Cost Estimate and Cost Per Mile of New Coverage

As detailed in Table 6 below, the Task Force estimated the total capital cost for the studied Target Corridors based on the required number of sites. This calculation resulted in an estimated cost of $313,000 per mile[52] of corridor coverage. Figure 27 displays a breakdown of the total cost estimate for the three Target Corridors by major cost category.

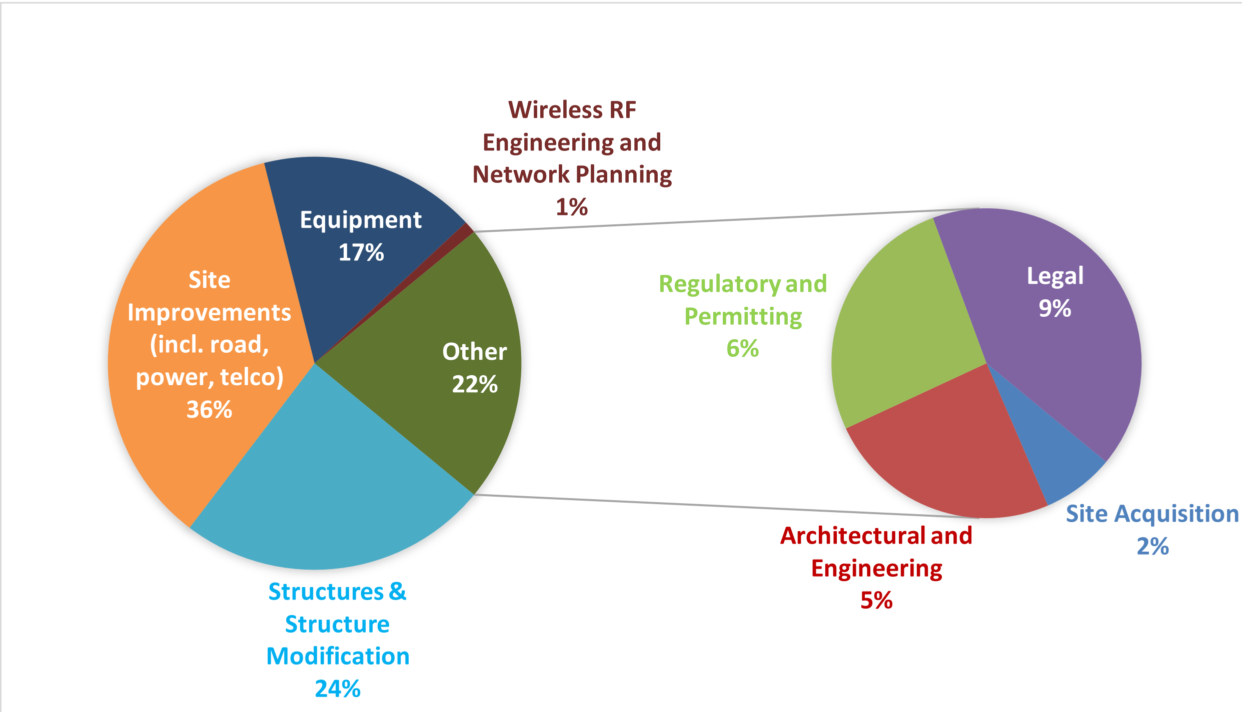
Table 6: Target Corridors Coverage Capital Cost Estimate

Total Estimated Cell Sites (Three Target Corridors)	**117**
Estimated New Towers	*17*

[52] Upstate cost estimates in this report will use this round number so as not to imply a false precision in the cost per mile estimate.

Estimated Collocations/ Existing Sites	*0*
Estimated New Small Cells	*100*
Estimated Capital Cost	**$31,201,275**
Wireless Corridor Miles	**99.8**
Estimated Cost per Mile of Corridor Coverage	**$312,638**

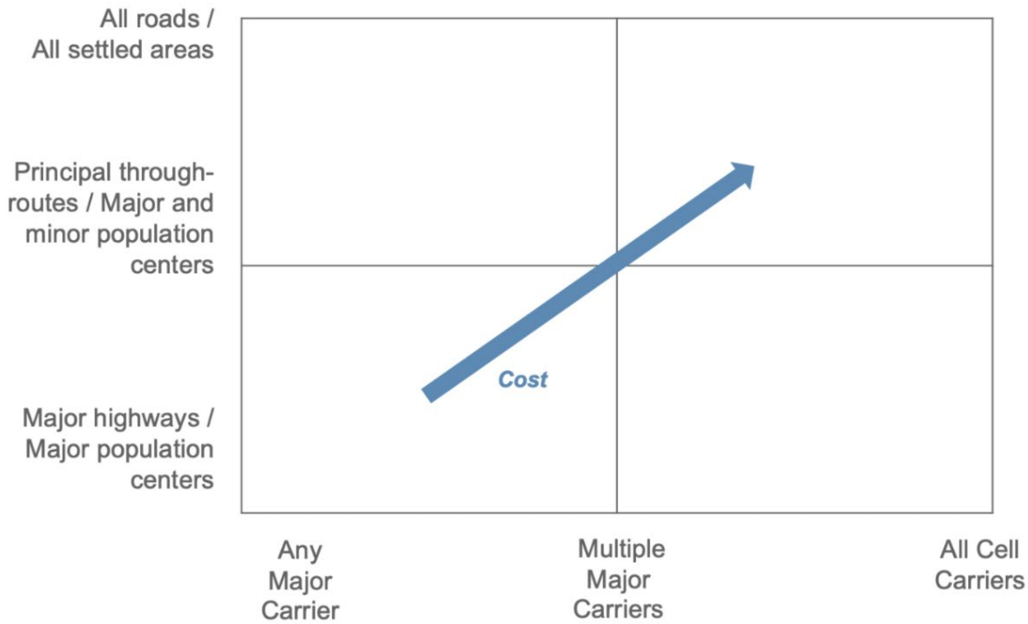
Figure 27: Cost Categories for Combined Target Corridor Cost Estimate



4.3. Potential Upstate Coverage Goals

Section 2 of this report discussed several ways of measuring cellular coverage, including population covered, roads covered, and land area covered. Similarly, a coverage objective can be expressed in any of those metrics and may include other considerations – *e.g.*, ensuring coverage of key tourist attractions or areas for public safety.

Figure 28: Examples of Coverage Objectives



The analysis presented here considers the cost to meet potential coverage objectives in connection with a range of road classes. While the three road classes proposed for coverage do not include 100% of all roads, these are principal corridors along which people live and travel. Using roads allows the analysis to leverage the primary drive-testing data collected by the A&M Team. Presentation of this roads-based analysis does not preclude consideration of other coverage targets, such as population centers or major tourist attractions, when setting geographic coverage objectives in the structuring of a program. However, population centers and major tourist attractions are generally connected by the road classes identified in this analysis, thereby making the road-based analysis a strong starting point for cost estimation.

The cost estimate presented below focuses on filling gaps in road segments lacking reliable coverage from any cellular provider.

4.4. Estimated Adirondacks, Catskills, and Upstate Coverage Costs

The estimates presented here model the costs of expanding cellular coverage on all major upstate roadways – across all upstate areas, in the Adirondack Region, and in the Catskill Region – by multiplying the estimated number of uncovered road miles (*see Section 2.3*) by the estimated per-mile coverage costs derived from the Target Corridor case studies.

Table 7: Estimated Capital Cost to Close Coverage Gap

Upstate (Includes Adirondack and Catskill Regions)				
Class	**Total Upstate Road Miles**	**Estimated # of Uncovered Road Miles**	**Estimated Cost Per Mile of New Coverage**	**Estimated Total Cost ($ Millions)**
Interstates & US Highways	3,201	73	$313,000	$22.7
New York State Highways	7,521	1,537	$313,000	$481.2
Major County and Local Roads	6,841	339	$313,000	$106.0
TOTAL	**17,564**	**1,949**	**$313,000**	**$610**

Adirondack Region Only				
Class	**Total Upstate Road Miles**	**Estimated # of Uncovered Road Miles**	**Estimated Cost Per Mile of New Coverage**	**Estimated Total Cost ($ Millions)**
Interstates & US Highways	612	69	$313,000	$21.7
New York State Highways	2,703	1,121	$313,000	$350.7
Major County and Local Roads	1,129	160	$313,000	$50.1
TOTAL	**4,445**	**1,350**	**$313,000**	**$422.6**

Catskill Region Only				
Class	**Total Upstate Road Miles**	**Estimated # of Uncovered Road Miles**	**Estimated Cost Per Mile of New Coverage**	**Estimated Total Cost ($ Millions)**
Interstates & US Highways	280	1.4	$313,000	$0.4
New York State Highways	1,183	207	$313,000	$64.9
Major County and Local Roads	453	27	$313,000	$8.4
TOTAL	**1,916**	**235**	**$313,000**	**$73.7**

As with the Adjustment Factor discussed in Section 2.3, the cost per mile of new coverage is applied uniformly across different parts of the State and to different road classes. This upstate estimate is approximate. Because these are not site-specific cost estimates, it is useful to look at how they would vary along with key inputs. Table 8 and Table 9 examine the sensitivity of these overall cost estimates to changes in the cost per mile of new coverage and to changes to the Adjustment Factor used to estimate the number of upstate road miles lacking reliable cellular coverage.

Table 8: Sensitivity Analysis for Total Cost for Interstate, US and NYS Highways

Estimated Total Cost ($ Millions) for Interstate, US and NYS Highways									
		FCC Mobility Fund Adjustment Factor							
		1.80	1.90	2.00	2.10	2.20	2.30	2.40	
Cost per Mile of New Coverage	$237,000	$327	$345	$363	$382	$400	$418	$436	Approx. 25% reduction in cell sites required or cost per site
	$256,000	$353	$373	$393	$412	$432	$451	$471	
	$275,000	$380	$401	$422	$443	$464	$485	$506	
	$294,000	$406	$428	$451	$473	$496	$518	$541	
	$313,000	$432	$456	$480	$504	$528	$552	$576	Est. using base cost per site and site count assumptions
	$332,000	$458	$484	$509	$535	$560	$585	$611	
	$351,000	$484	$511	$538	$565	$592	$619	$646	
	$370,000	$511	$539	$567	$596	$624	$652	$681	
	$389,000	$537	$567	$596	$626	$656	$686	$716	Approx. 25% increase in cell sites required or cost per site

Table 9: Sensitivity Analysis for Total Cost for Interstate, US and NYS Highways, and Major County and Local Roads

Estimated Total Cost ($ Millions) for Interstate, US, NYS Highways, and Major County and Local Roads									
		FCC Mobility Fund Adjustment Factor							
		1.80	1.90	2.00	2.10	2.20	2.30	2.40	
Cost per Mile of New Coverage	$237,000	$389	$411	$432	$454	$476	$497	$519	Approx. 25% reduction in cell sites required or cost per site
	$256,000	$423	$446	$470	$493	$516	$540	$563	
	$275,000	$456	$481	$507	$532	$557	$583	$608	
	$294,000	$489	$517	$544	$571	$598	$625	$653	
	$313,000	$523	$552	$581	$610	$639	$668	$697	Est. using base cost per site and site count assumptions
	$332,000	$556	$587	$618	$649	$680	$711	$742	
	$351,000	$590	$622	$655	$688	$721	$753	$786	
	$370,000	$623	$658	$692	$727	$761	$796	$831	
	$389,000	$656	$693	$729	$766	$802	$839	$875	Approx. 25% increase in cell sites required or cost per site

As detailed in Table 7 above, the estimated cost to cover the three classes of roads is nearly $423 million in the Adirondack Region and nearly $74 million in the Catskill Region. The estimated cost to cover all interstate, U.S. and state highways, as well as major county and local roads in upstate New York, is approximately $610 million.

5. Recommendations

There is no silver bullet to closing cellular coverage gaps in upstate New York. There are, however, a series of initiatives that together can work to significantly expand cellular coverage.

This section presents a recommended strategy based on the Task Force's work to date that would address several key barriers to the deployment of cellular infrastructure in upstate New York.

Broadly, the Task Force recommends a three-pronged State-led strategy to meet the coverage goals discussed in Section 5.1 below. This strategy should focus on:

- Maximizing private investment in upstate cellular coverage;
- Streamlining regulatory processes for deployment of new cellular infrastructure; and
- Evaluating potential economic incentives to encourage investment in uncovered areas where private providers would not otherwise expand coverage.

5.1. Upstate Coverage Goal

The Task Force recommends that New York State frame its coverage goal in terms of key roads to be covered – specifically to ensure reliable coverage along 100% of:

- Interstate and U.S. Highways
- New York State Highways
- Major County and Local Roads[53]

Achieving this goal will provide coverage to both population centers and travelers along most major upstate roads, including those serving major tourist locations. In total, the Task Force estimates that the goal will ensure coverage for more than 75% of total trip miles in currently uncovered areas. The Task Force notes that a goal to provide complete universal cellular coverage is likely not economically feasible nor practical at this time. Covering every roadway or person in an uncovered area would result in substantially increased costs and diminishing returns for each dollar invested.

It is the Task Force's belief that the above coverage goal, while ambitious, is reasonable and achievable. The Task Force estimates that achieving this goal will require a total capital investment of approximately $610 million, which could be realized through a combination of funding sources.

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[53] "Major" County and Local Roads are defined here as those that have a Functional Classification as an Arterial or a Major Collector.

5.2. Maximizing Private Investment

The Task Force recommends that any strategy to improve upstate cellular coverage focus first and foremost on leveraging private sector investment. Maximizing private sector investment in the near-term will not only speed cellular infrastructure deployment but establish a favorable environment that continues to attract investment in the years ahead.

Creating a favorable environment for investment can be accomplished through various avenues such as regulatory streamlining, potential economic incentives (*detailed in Sections 5.3 and 5.4*), as well as deliberate and proactive action by the State to collaborate with cellular carriers to leverage capital budget allocations. Carriers will deploy more capital in regions where they know they will be able to find sites and permit those sites within reasonable and predictable timeframes.

One such example of how the State can leverage private investment is with AT&T's FirstNet commitment to expand coverage in rural areas of upstate New York beyond the levels in its ordinary commercial build plans. This commitment is a major opportunity to gain investment with federal support. The Task Force recommends the State work with AT&T to encourage coverage that does not only duplicate that of other carriers but also generates new coverage. Regulatory reforms will promote and accelerate additional private investment.

Although economic incentives may play a role in attracting additional private investment, these incentives should be designed to not displace planned private investment. Instead, the State should proactively collaborate with cellular carriers to identify sites that expand coverage without exceeding normal capital budgets.

5.3. Streamlining Regulatory Processes

As described in this report, State and local policy and regulations have a major impact on the deployment of cellular infrastructure. As such, the Task Force recommends streamlining regulatory processes as a key initiative to expand cellular coverage. The Task Force also recognizes that doing so should not jeopardize the important natural and scenic resources many of these processes were designed to protect.

In evaluating existing State and local regulatory processes, the Task Force performed substantial legal review, examined cellular deployment strategies in other states and jurisdictions, consulted with relevant stakeholders and State agencies, and surveyed industry representatives. The Task Force's evaluation identified three areas of focus:

- **Permitting:** Certain land use permitting requirements hinder cellular service expansion;
- **ROW Access**: Access to State and local ROWs can be streamlined and expedited; and
- **Land Availability**: Proactive steps can be taken to encourage access to additional land for tower development.

The below recommendations center on preserving the unique and valuable natural context while improving the efficiency and coordination of the siting process. Focus was given to areas where increased clarity, predictability, and proportionality of the project review could be accomplished in the near future. The Task Force took great care to generate recommendations that would not require statutory or constitutional changes but could achieve measurable improvements to the existing process.

Increase Permitting Efficiency and Agency Coordination
The Task Force recommends adopting measures to increase the efficiency of existing permitting and agency coordination processes to reduce the length of review and improve process legibility without deviating from existing policy goals.

To do so, the Task Force recommends focusing on innovative ways to improve processes either with technology, the creation of new approval pathways, or through collaboration. The creation of guides or protocols could increase the clarity of the process and better communicate expectations to applicants. Encouraging the adoption of standardized ordinances and permits would make the permit process more consistent and predictable across jurisdictions.

Finally, the Task Force recommends devising ways to facilitate and coordinate reviews by various agencies contemporaneously and combining multiple project approvals into single applications in order to improve the overall efficiency of the permitting process.

Streamline and Expedite ROW Access
To address ROW access challenges and facilitate corridor connectivity, the Task Force recommends standardizing and expediting siting in public ROWs. The ROWs that bisect the Adirondack and Catskill regions are the most logical place to begin closing existing coverage gaps. They represent already hardened landscapes where much of the commercial activity is funneled and serve as reasonable points of connection between and through the population centers. Theses ROWs have the additional benefit of being owned and regulated by relatively few entities, with the key areas identified in this report primarily under the control the NYSDOT and approximately a dozen counties.

Enhance Land Availability
Land availability for cellular deployment represents a major constraint on expansion of coverage in rural areas, particularly in areas with large tracts of highly valued and well-protected forest preserve. Therefore, as a third strategic area of improvement, the Task Force recommends enhancing land availability by identifying and facilitating access to additional land appropriate for project development. This proactive approach will help reduce siting costs and increase the speed of project deployment.

The Task Force also recommends collaboration between the industry and key stakeholders and government officials to identify appropriate locations outside of forest reserve land for the siting of cellular infrastructure in advance of deployments, proactively ease the permitting process, and devise a framework to guide cellular infrastructure development activity in those areas.

Recommendations Specific to the Adirondack Region and the Catskill Regions

The Task Force provides the following recommendations specifically for the Adirondack and Catskill regions. Primary focus was given to proposing recommendations for the Adirondack Region[54] as it accounts for approximately 70% of cellular coverage gaps in upstate New York. Additional recommendations that focus on the Catskill Region and the remainder of upstate New York follow. Unlike the Adirondack Region, where recommendations focus on improvements to the APA process regulating activity within Adirondack Park, the recommendations for the Catskill Region and the rest of Upstate are broader and will require additional work to identify relevant stakeholders and mechanisms for standardizing the siting process.

Recommendations for the Adirondack Region

Permitting Efficiency Recommendations

- **Visual Simulations:** Standardize and simplify visual simulation processes used in assessing projects. A major factor slowing the permitting process in areas under APA jurisdiction is the visual impact assessment process. Currently, this review process is primarily carried out through balloon testing in multiple locations. With delays caused by weather and other logistics, this process can require up to six months and can involve multiple assessments. Adoption of improved technology and standard methodology should significantly reduce the duration and cost of this phase of the pre-application process without reducing the quality of the assessment.

- **Pre-Application Handbook:** Review existing processes and timeframes for pre-application review to create a graphically-based pre-application handbook. In many cases, the requirements of the APA application and voluntary pre-application process lack specificity – making site identification a challenge to applicants and also significantly extending the permit process. Establishing a handbook with graphic explanations of successful siting approaches should allow applicants to understand the process more clearly and make the path to a successful application more predictable.

- **Batch Permitting:** Utilize "batch" applications to approve multiple projects under one application. Allowing multiple project sites to be reviewed under one application would allow the APA to more efficiently allocate resources to reviewing projects, and allow the APA to understand project coverage goals and scope of deployment more carefully. Most importantly, it could add advantages in terms of economies of scale to the application process and facilitate proactive planning on the part of the APA.

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[54] For the purposes of this report, the Adirondack Region encompasses all of the twelve counties that are within the Adirondack Park, in whole or in part. Only two of those counties are entirely within the Park- Essex and Hamilton, and many of the highways counted in the Adirondack Region are outside the Park and APA jurisdiction, including US Routes 11 and 20 and the New York State Thruway (I-90).

ROW Access Recommendations

- **ROW General Permits:** Establish expedited permitting procedures for projects in the public ROW. Creating General Permit categories for towers meeting certain criteria in public ROWs and creating a Major Utility Project General Permit process for small cell installations would establish a standardized and predictable review regime for projects along established ROWs. This work could be done in coordination with development of a broader cellular plan (*see below*). Applicants would gain clarity and predictability of project approval since eligible projects meeting the standards of the General Permit would facilitate an expedited review process.

Land Availability Recommendations

- **Adirondack Park Cellular Plan:** Establish a plan outlining the Adirondack Park's cellular policy in order to help align private sector expectations with park values. The development of similar plans has been successful in other jurisdictions such as Yellowstone National Park and Pinelands National Reserve in New Jersey.[55] The plan should facilitate collaboration between industry and regulators to identify areas in deficient corridors appropriate for cellular facility siting, as well as to establish parameters for development design and intensity to expedite subsequent review. Cellular planning could also support implementation of the other recommendations in this section. The overall goal of this planning would be to clearly articulate an approach to cellular infrastructure deployment in the Park as well as to increase the clarity and predictability of the siting process, coordinate different regulatory bodies, and expedite project review.

Recommendations for the Catskill Region and other Upstate Locations

Permitting Efficiency Recommendations

- **Reduce Duplication:** Evaluate ways to streamline requirements across jurisdictions to reduce duplication and consolidate reviews. Duplicative and sometimes incompatible review processes were a major issue identified in discussions with industry representatives. Further examination into mechanisms to combine or allow similar reviews to occur contemporaneously could significantly reduce the economic inefficiency of the process while maintaining review standards.

- **Model Ordinances:** Incentivize the adoption of a model ordinance by municipalities. Inconsistent reviews across municipalities was one of the major issues identified during the Task Force's survey of barriers to cellular infrastructure deployment. Establishing a standard ordinance for both macro and small cell siting will provide more uniformity across jurisdictions while maintaining the strong home rule approach to land use favored in New York. Adoption could be incentivized through various grant programs. A model ordinance

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[55] The Yellowstone National Park "Wireless Communications Services Plan can be found at https://parkplanning.nps.gov/projectHome.cfm?projectID=12023 and information on the Pinelands wireless communication planning can be found here: https://www.nj.gov/pinelands/landuse/current/wireless/index.shtml

process and incentives could be targeted at key communities in corridors with significant coverage gaps.

ROW Access Recommendations

- **Standardize ROW Access:** Create clear and consistent processes and timelines for accessing State and local ROWs (*e.g.,* master-lease agreements). In some areas, ROW access may be streamlined and straightforward, while, in others, red tape and timelines are prohibitory. The cellular pole attachment process before the PSC is another example of adding clarity and predictability to make wireless and wireline pole attachment processes more standardized and uniform.

- **Cost Reduction:** Consider exempting State-supported cellular projects from certain ROW fees. One approach to consider would be to evaluate waiving or offsetting certain siting fees, or exploration of a shift to a cost-based review and licensing process in key corridors.

Land Availability Recommendations

- **FirstNet:** Take immediate steps to accelerate deployment of FirstNet infrastructure with emphasis on shepherding permits related to new tower construction. This could include exploring ways to allow FirstNet or private cellular facilities primarily serving a public safety purpose to collocate on certain public safety towers.

- **Catskill Corridor Cellular Plan:** Design and implement a cellular planning process in the Catskill Region. Although engaging in this type of planning exercise would present unique challenges in comparison to other jurisdictions under a centralized authority (such as Adirondack Park or Yellowstone Park), it could still be an important step to expediting siting in this region. As an alternative to a park-wide plan, the NYSDOT alone or in collaboration with county authorities could consider the development of corridor plans for key roadways in the region where they exercise exclusive authority. Despite the lack of a clear lead authority, the Catskill Corridor Cellular Plan could be an important tool to coordinate the disparate jurisdictional entities, land owners, and industry interests. This process could also serve as a vehicle to engage with the City of New York about its landholdings in the region.

5.4. Evaluate Potential Economic Incentives

Even with implementation of the regulatory improvements described above, the economics of cellular infrastructure deployment in many rural areas is challenging. The magnitude of the cost to close coverage gaps across upstate New York suggests that State financial incentives, in combination with private investment and federal support, would likely be required to achieve coverage goals. All three of these categories of funding – private, State, and federal – were vital parts of New York's universal broadband push in the New NY Broadband Program.

It is not the objective of this report to define the specific parameters of a State-led financial incentive program. Nevertheless, several key concepts are worth consideration.

- **Funding Disbursement:** State grant funding should require private co-investment. Grant funding should also be allocated based on a reverse auction, as was the case with the New NY Broadband Program, or other competitive process.

- **Funding Model:** Identifying an appropriate funding model will be critical, especially since direct State investments to improve rural cellular coverage are far less common than broadband programs. Important options to consider include a one-time appropriation and potential revenue-generating opportunities through public-private partnerships.

    - Two approaches that may warrant further research include the FCC's Universal Service Fund and recent efforts by the State of Vermont. The Universal Service Fund is paid for by telecommunications companies who contribute a percentage of their interstate end-user revenues.[56] Vermont passed legislation in 2018 in which the State appropriated funds directly to support cellular infrastructure.[57]

- **Additional Resources:** The State should identify opportunities to leverage past investments in broadband infrastructure as well as federal funding.

    - The $500 million New NY Broadband Program remains the nation's largest and most ambitious state investment in broadband expansion. A significant portion of the total program grants went to support Fiber-to-the-Premise projects. As a result, with State support, there is now or soon will be fiber in many areas currently lacking cellular coverage. Fiber for backhaul and fronthaul is essential to the deployment of today's cellular infrastructure.

    - The FCC's Mobility Fund auction or a substantially similar FCC program within the Universal Service Fund is a potential opportunity to leverage federal funding for cellular infrastructure deployment. By reducing uncertainty in companies' ability to site infrastructure and potentially buying down the cost of supporting infrastructure, the State can make it more feasible to bid on areas in New York that may be eligible for support, and make it possible to bid more aggressively. This could result in making it more likely that uncovered areas in New York will receive funding through the auction process.

While there are structural obstacles in the design of FCC mobile coverage initiatives for carriers serving New York, these same obstacles may create opportunity if the State establishes an aggressive program to expand cellular coverage, as described in this report and recommended by the Task Force. These structural obstacles arise from the fact that the FCC tends to distribute

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[56] Explanation of the FCC Universal Service Fund's Contribution Factor: https://www.fcc.gov/general/contribution-methodology-administrative-filings

[57] Sec. 14 of Act No. 190 (2018) An act relating to capital construction and State bonding budget adjustment: https://legislature.vermont.gov/Documents/2018/Docs/ACTS/ACT190/ACT190%20As%20Enacted.pdf

funding based on land coverage and many eligible areas in New York may be located in parkland or forest preserve land in the Adirondack or Catskill regions. Delivering on geographic coverage in parklands and forest preserve land may not be possible due to challenging terrain and constitutional limitations.

However, these unique circumstances in combination with an aggressive State financial incentive program could provide the basis for a waiver request for New York, similar to the waiver request successfully obtained by the State in the Connect America Fund Phase 2 (CAF-2) broadband reverse auction. That waiver request allowed New York to run its own auction to select winning bidders for federal CAF-2 funding, and to do so on an accelerated basis.

Conclusion

Cellular coverage is no longer a luxury but a necessity. It is essential for public safety, tourism, and economic development. It is woven into the fabric of everyday life, and necessary for communities in upstate New York to thrive. Gaps in coverage are a fact of life across many rural communities in New York, but especially so in the Adirondack and Catskill regions.

As described in this section, closing coverage gaps should include careful consideration of the natural landscapes that make many areas of upstate New York special places for residents and the many who visit, especially within State parklands. Charting a balanced approach to extending cellular coverage has been a key focus of the Task Force in drafting its recommendation.

Increasing coverage while protecting New York's natural and scenic resources will require engagement and careful planning. And marshalling available State and federal financial resources will draw attention to rural areas that have too often been passed over for investment. The Task Force recommends the strategic investment of financial resources, as well as a concerted effort to seek out public-private partnerships in all phases of cellular infrastructure deployment – from planning to permitting to capital expenditure. This approach was successful in ensuring broadband Internet access across the state under the New NY Broadband Program.

In establishing ambitious cellular coverage goals, and providing the State resources and support needed to meet them, New York has an opportunity to lead the nation.