

Vermont 10-Year Telecommunications Plan

TELECOMMUNICATIONS & CONNECTIVITY DIVISION

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VERMONT

DEPARTMENT OF PUBLIC SERVICE

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Section 1: Executive Summary

The Vermont Department of Public Service (PSD) presents this 2024 10-Year Telecommunications Plan to the Vermont public, lawmakers, officials, and telecommunications stakeholders. This Plan, created in accordance with 30 V.S.A. § 202c¹ and 30 V.S.A. § 202d,² provides actionable recommendations for public sector leaders to work toward Vermont's statutory telecommunications goals.

This Plan comes at a moment of rapid change to the telecommunications landscape in Vermont. Since the publication of the 2021 10-Year Telecommunications Plan, both private and public entities have expanded broadband coverage, and the state has dedicated significant federal and state funding to reaching every Vermonter with fiber-to-the-premises (FTTP) broadband.

The Broadband Equity, Access, and Deployment (BEAD) Program – part of the Infrastructure Investment and Jobs Act (IIJA) of 2021 – has allocated federal funding to Vermont to deploy universal fiber broadband in the most challenging rural areas of Vermont. The BEAD legislation requires the state to perform extensive high-speed internet deployment planning and program design, which is being done by the Vermont Community Broadband Board (VCBB) in parallel with the creation of this Plan.³ According to the VCBB's plan, BEAD Program resources for broadband construction will be awarded to infrastructure builders at the end of 2024, and recipients of funding will have four years to complete construction.

¹ 30 V.S.A. § 202c. Available at <https://legislature.vermont.gov/statutes/section/30/005/00202c>. Accessed January 15, 2024. Reproduced in Appendix A.

² 30 V.S.A. § 202d. Available at <https://legislature.vermont.gov/statutes/section/30/005/00202d>. Accessed January 15, 2024. Reproduced in Appendix A.

³ Vermont Community Broadband Board (2023) *Vermont's Digital Equity Plan*. Available at <https://publicservice.vermont.gov/sites/dps/files/documents/VT%20Digital%20Equity%20Plan%20Public%20Comment%20Draft.pdf>. Accessed December 15, 2023.

Between the BEAD Program⁴ and funding available to Vermont through the Capital Projects Fund⁵ and American Rescue Plan Act,⁶ the state is in the process of facilitating approximately \$670.8 million in broadband grants, which will result in every on-grid Vermonter having access to 100/100 megabits per second (Mbps) service by January 2029.

Importantly, the funding available in the state is doing more than connecting Vermonters to world-class internet; the funding has also enabled state and local institutions to build significant capacity and expertise in the telecommunications field. The capabilities built to deploy wireline broadband today will bolster the state's ability to meet additional telecommunications goals, as stakeholders and institutions expand their work to address additional connectivity challenges.

This Plan addresses all items required by statute and provides recommendations in support of all of the state's telecommunications goals. In addition, it places special focus on elements of telecommunications planning that are not addressed in the simultaneous work being done as part of the BEAD Program, like mobile broadband deployment, public safety communications systems, mobile and fixed affordability, and building a robust broadband construction workforce. In doing so, this Plan avoids devoting resources to the duplication of work and instead provides the state with specific analysis and recommendations in service of state goals that build on the momentum created by the BEAD Program and other federal resources made available to the state.

1.1 Summary of Surveys and Stakeholder Feedback

A cornerstone of this Plan is a robust survey of Vermont residents and interviews with over 55 public and private stakeholders. Information from surveys and interviews was critical to assessing the telecommunications needs in Vermont – again with a focus on mobile wireless broadband – as well as shaping the analysis

⁴ NTIA (2023) "Biden-Harris Administration Announces State Allocations for \$42.45 Billion High-Speed Internet Grant Program as Part of Investing in America Agenda." Available at <https://www.ntia.gov/press-release/2023/biden-harris-administration-announces-state-allocations-4245-billion-high-speed>. Accessed November 21, 2023.

⁵ U.S. Department of the Treasury (2023) *Capital Projects Fund Award Fact Sheet: Vermont*. Available at <https://home.treasury.gov/system/files/136/VT-CPF-Award-FactSheet.pdf>. Accessed February 26, 2024.

⁶ Office of Governor Phil Scott, "Governor Scott's Transformational Investments for American Rescue Plan Funds." Available at <https://governor.vermont.gov/arpa>. Accessed December 6, 2023.

presented in this Plan and ensuring the recommendations fit the nature and culture of the state.

The following summary of surveys and feedback focuses on the most salient findings that support the recommendations in this Plan; full survey results and analysis can be found in Section 2 and Appendices D-G.

A scientific phone survey of Vermonters performed for this Plan reached a statistically valid sampling of both landline and mobile users and found that mobile broadband service is critical to the work, safety, and quality of life of Vermonters and that Vermonters strongly believe the state should play a bigger role in facilitating better mobile broadband coverage:

- 84 percent of respondents need a cell phone to perform their job duties.
- 38 percent of respondents with school-aged children reported that the quality of a mobile connection affects their children's ability to complete homework.
- 14 percent of respondents who have called 911 from a cell phone were unable to connect to emergency services on the first attempt.
- 53 percent of respondents are not satisfied with mobile wireless coverage along Vermont roadways.
- 64 percent of respondents strongly agreed that the state should use public funds to do more to improve mobile wireless coverage.

A contemporaneous online survey sent to Vermont businesses found that the vast majority of businesses have employees and customers who rely on mobile broadband service, and report that better service would improve the efficiency and effectiveness of their businesses:

- 83 percent of respondents stated that customers rely on mobile cell coverage to access or use their services.
- 97 percent responded that better mobile broadband coverage is needed to help their business grow, be more efficient, or be more effective.
- 80 percent of respondents felt that Vermont's mobile wireless coverage is inadequate for their business needs.

An online survey of healthcare professionals from across the state revealed that mobile broadband is used extensively to deliver services, and is especially important for contacting and serving vulnerable populations:

- 65 percent of respondents found that their ability to perform their job is hindered by poor cell service at least multiple times a week.
- 88 percent indicated that they work with vulnerable populations, and 93 percent of those respondents felt that better mobile cell service would result in more efficient or effective care for that population.
- When vulnerable populations are unable to connect via mobile broadband, healthcare professionals reported having to resort to less reliable communication methods, such as mailed correspondence or communicating through patients' families and friends.

An online survey of public safety professionals found that mobile broadband remains a critical tool for protecting and serving Vermonters, and challenges with gaps in mobile service exist in jurisdictions throughout the state:

- 89 percent of respondents agreed that a lack of mobile cell coverage negatively impacts both first responders' and residents' safety daily.
- 80 percent agreed that increasing mobile cell coverage in Vermont will improve public safety services.
- 69 percent felt that increasing mobile wireless coverage would reduce costs or improve efficiency.

In addition to the quantitative data gathered from these surveys, stakeholder interviews across the public and private sectors, with Vermont congressional leadership, and with members of the Joint Information and Technology Oversight Committee (JITOC) were instrumental in identifying connectivity needs, informing this Plan's analysis, and refining recommendations.

The willingness of so many individuals to provide serious, thoughtful input for this Plan is a testament to the collaborative, community-focused approach Vermonters take to problem-solving. However, the widespread interest in telecommunications is also a testament to the deep impact that telecommunications policy and practice has on individuals, businesses, and institutions, and indicates that communications infrastructure in the state is a work in progress.

The following section summarizes the findings and analyses that support the recommendations in this Plan.

1.2 Summary of Findings and Analysis

In addition to the stakeholder feedback summarized above, this Plan used significant qualitative and quantitative data to develop and support the recommendations and Action Plan. The following is a summary of the major findings and analysis presented in detail throughout the Plan.

Fiber broadband coverage is expanding rapidly, while mobile wireless service has increased in speed, but has not meaningfully increased in coverage.

- The number of households with access to 100 Mbps symmetrical speeds increased from approximately 18 percent of all premises in the state to 39.87 percent between 2021 and 2023.
- Drive tests performed in 2018 and 2022 show that where mobile coverage exists, speeds have increased significantly (by approximately sixfold, on average) due to technological upgrades.
- Almost no new mobile deployments happened between 2018 and 2022 in areas where the drive tests were performed.
- Approximately 412 miles of road in Vermont do not have mobile wireless coverage from any provider — a public safety issue.

Engineering analysis demonstrated that prioritizing minimally visible, small wireless facilities is the most economical way to expand mobile broadband service.

- Achieving ubiquitous fiber along Vermont roadways will reduce the cost of mobile wireless deployments.
- With ubiquitous fiber presence, a single 140-foot tower costs an estimated \$240,000 — including design, backhaul, power, and installation — while a single 50-foot wireless facility costs an estimated \$97,000.
- Strategically placed 50-foot wireless facilities achieve almost the same coverage efficiency as 140-foot towers due to the topology of Vermont and the curvature of the Earth.
- Closing the easiest 50 percent of mobile wireless coverage gaps in Vermont would require 107 wireless facilities that are 50 feet tall at a total cost of

approximately \$10,379,000; doing so with 140-foot towers would require 98 towers at a total cost of about \$23,520,000.

Vermont needs to grow its broadband construction workforce to meet construction sector demands over the next five years.

- Between 2018 and 2022, Vermont saw a 12 percent reduction in the broadband deployment workforce, while the same sector only shrank by 4 percent nationally.
- Wages for most broadband construction roles are currently lower in Vermont than the national averages for those positions.

Public Safety Answering Point (PSAP) consolidation is a complex topic currently being considered by some lawmakers.

- PSAP consolidation could improve coverage and flexibility in staffing, provide some economies of scale, simplify the budgeting process, and provide more resources for statewide emergencies, among other benefits.
- The challenges with PSAP consolidation could include a reduction of local control and knowledge, the need to develop significant new governance systems and processes, and a large up-front cost of system migration.
- New England states are varied in their levels of consolidation; some states (New Hampshire and Rhode Island) have consolidated PSAPs into a single primary location but have left dispatching to localities, while others (Connecticut and Massachusetts) have done little to no consolidation.

The affordability of wireline and mobile services is a challenge in Vermont and may get worse in the near future.

- Federal funding for the Affordable Connectivity Program (ACP), which offered eligible households a \$30 monthly subsidy for home internet or cellular service, expired in 2024, affecting over 24,000 Vermont households enrolled for monthly benefits.
- 12 percent of persons with a disability and 37 percent of income-based government assistance recipients participate in the ACP.
- 16 percent of survey respondents under the age of 45 reported that the cost of their mobile cell bill often or always affects what essential items they can afford.

Vermont telecommunications statutes are at times unspecific and could be better aligned with the current state strategy.

- Many of the goals in 30 V.S.A. § 202c contain overlapping concepts, all in service of promoting quality, future-proof infrastructure expansion.
- Broadband speed definitions and minimum deployment parameters in statute are not fully aligned and are now starting to lag behind some other jurisdictions.
- The statutorily mandated end date for the VCBB is before significant BEAD Program monitoring, auditing, and enforcement activities must happen.
- The statutory goals of competition and promotion of open access are in partial opposition to the goals of universal coverage, due to the extra costs that meeting those goals would require in very rural areas.

1.3 Summary of Recommendations

To meet the needs of Vermont residents, businesses, and institutions, the state must continue taking actions that advance its connectivity goals. The following is a summary of the major recommendations contained in this Plan.

Text in parentheses following each recommendation indicates the entities this Plan suggests be involved in the associated action.

Continue taking action to make the ongoing wireline fiber deployments as efficient and effective as possible.

- Establish a predictable timeline and process for permitting on state-owned land (suggested lead: Agency of Natural Resources, in collaboration with the VCBB).
- Leverage state-owned rights-of-way by providing right-of-way rent waivers to infrastructure builders deploying in unserved and underserved areas until Vermont meets its broadband goals (suggested leads: Agency of Transportation [AOT] and VCBB).
- Better leverage the scale of the Vermont Communications Union District Association (VCUDA) to provide savings to members in the procurement of services (suggested lead: VCUDA).

- Consider renewing the Temporary Unserved Location Broadband Deployment Rider program, which has been an effective tool for enabling deployments to unserved areas (suggested leads: Green Mountain Power [GMP] and Vermont Electric Coop).

Pilot a small-facilities mobile wireless grant program to test and optimize strategies for supporting mobile wireless deployments with minimal visible impact.

- Dedicate \$2 to \$3 million to an initial pilot grant program (suggested lead: Vermont Legislature).
- Encourage small-facilities wireless deployments and allow for shared infrastructure and neutral host structures (suggested lead: PSD).
- Use the flexible grant structure detailed in Section 10.2.3 to accommodate different solutions for different towns (suggested lead: PSD).
- Collect data on proposed itemized costs of deployment, the use of the 248a exemption, the impact that potential legal challenges have on costs, and the comfort of carriers with small internet service providers (ISPs) and infrastructure owners to calibrate future iterations of the program (suggested lead: PSD).
- Invite existing utility infrastructure owners to a working group to analyze opportunities for mutual benefit and collaboration with mobile wireless deployments (suggested leads: PSD, GMP, Vermont Electric Power Company [VELCO], and others).

Ensure both wireline and wireless service are affordable for low-income Vermonters, especially as the federal ACP funding expired in 2024.

- Establish a state-run subsidy program to provide \$67 per month to low-income Vermonters for both a wireline and wireless broadband subscription (suggested lead: funded by the Vermont Legislature; implemented by the Vermont Agency of Human Services).
- Use the eligibility criteria of LI-HEAP (185 percent of poverty guidelines), or of Lifeline (135 percent) if there are budget constraints (suggested lead: Vermont Legislature).
- Establish a program to provide fully subsidized mobile devices and mobile subscriptions to unhoused Vermonters to ensure continuous access to

services (suggested lead: Vermont Legislature, in partnership with local social services providers).

Ensure Vermont's workforce is skilled, qualified, and ready to execute construction over the next five years and beyond.

- Use the analysis of anticipated workforce needs in Section 8 to calibrate the scale of nascent state training programs (suggested lead: VCBB, in collaboration with the Department of Labor [DOL] and Vermont State Colleges).
- Set a goal to recruit three times as many critical workers to training programs as required, to account for turnover and retention challenges inherent to the industry (suggested leads: VCBB, DOL, and VT State Colleges).
- Consider extending or adapting an existing workforce incentive program to grow and maintain the broadband construction workforce (suggested lead: Agency of Commerce and Community Development).

Strengthen the state's emergency communications systems.

- Use the analysis of PSAP consolidation factors in Section 9.5.4 to inform the ongoing work of the Public Safety Communications Task Force, including whether to pursue a dedicated, comprehensive consolidation study with estimates of initial costs of consolidation and potential long-term savings (suggested lead: Public Safety Communications Task Force).
- Dedicate state resources to ensure progress can be made on Statewide Communication Interoperability Plan priorities in instances where there are no federal grants available to drive progress (suggested lead: Vermont Legislature, in collaboration with the Department of Public Safety, Radio Technology Services, and others).

Ensure the fiber deployments happening today are resilient, sustainable, and able to support future technology needs.

- Ensure that new networks built with BEAD funding are resilient and redundant, in line with best practices for disaster resiliency (suggested lead: VCBB).

- Perform a detailed analysis of the likely future costs for infrastructure owners to bury utilities in conjunction with GMP's efforts to bury a substantial amount of their infrastructure as part of their plan for zero outages by 2030; provide an analysis of the impact on customer prices as well as recommendations for savings opportunities, efficiencies, and collaboration (suggested lead: VCBB).
- Over the next 10 years, encourage the development of enterprise-grade and carrier-grade service capabilities for Vermont ISPs and infrastructure owners to increase the viability of future mobile wireless deployments (suggested leads: VCBB and PSD).

Update data collection practices to strengthen state planning abilities and better measure progress.

- Repeat the 2022 wireless broadband drive test every two years, using the best practices described in Section 10.2.1 (suggested lead: PSD).
- Establish a crowdsourced drive-test practice to collect data on Class 2 and 3 roads (suggested lead: PSD).
- Request that 248a permit recipients notify the PSD upon completion of tower builds and report usage (suggested lead: PSD).

Modernize the telecommunications statutes to better guide practices and align with state strategies.

- Ensure statutory goals in 30 V.S.A. § 202c and 30 V.S.A. § 202d are specific, discrete, and aligned with Act 71⁷ (suggested lead: Vermont Legislature).
- Extend the VCBB's end date to allow the VCBB to provide adequate oversight and monitoring of BEAD deployments (suggested lead: Vermont Legislature).
- Consider adjusting state goals related to competitive choice to focus on the benefits of competition (better speeds, lower costs, and better customer service) rather than competition itself to align with current state strategy and difficult economics for even one provider in rural areas (suggested lead: Vermont Legislature).

⁷ Act 71 (2021). Available at <https://legislature.vermont.gov/Documents/2022/Docs/ACTS/ACT071/ACT071%20As%20Enacted.pdf>. Accessed November 21, 2023.

Section 11 provides an in-depth exploration of Vermont's telecommunications statute, and recommendations are explained in greater detail and organized according to statutory goals in the Action Plan in Section 12.

Section 2: Needs Assessment Overview

Because connectivity touches almost every aspect of life, the positive impacts of good connectivity range across all sectors. The state has made significant accomplishments over the past three years, particularly with the deployment of fiber-to-the-premises across the state. The deployments are creating jobs; enabling remote work, education, and healthcare; and bringing competition to users who previously did not have a choice of service provider.

However, the telecommunications landscape's shortcomings still challenge Vermont's people, businesses, and institutions. The challenges identified here (as noted by survey respondents and stakeholders across sectors) contextualize the impacts of incomplete connectivity and lend urgency to the work yet to be done – again with a primary focus on elements not being addressed via the parallel BEAD planning process.

2.1 Residential Survey Results and Analysis

A random sample survey of Vermont households was conducted in late 2023 to develop a profile of mobile cell service and needs in the state. The telephone survey received 478 valid responses, which translates to a 4 percent margin of error at a confidence level of 95 percent.

2.1.1 Use of Mobile Service Is Virtually Universal in Vermont

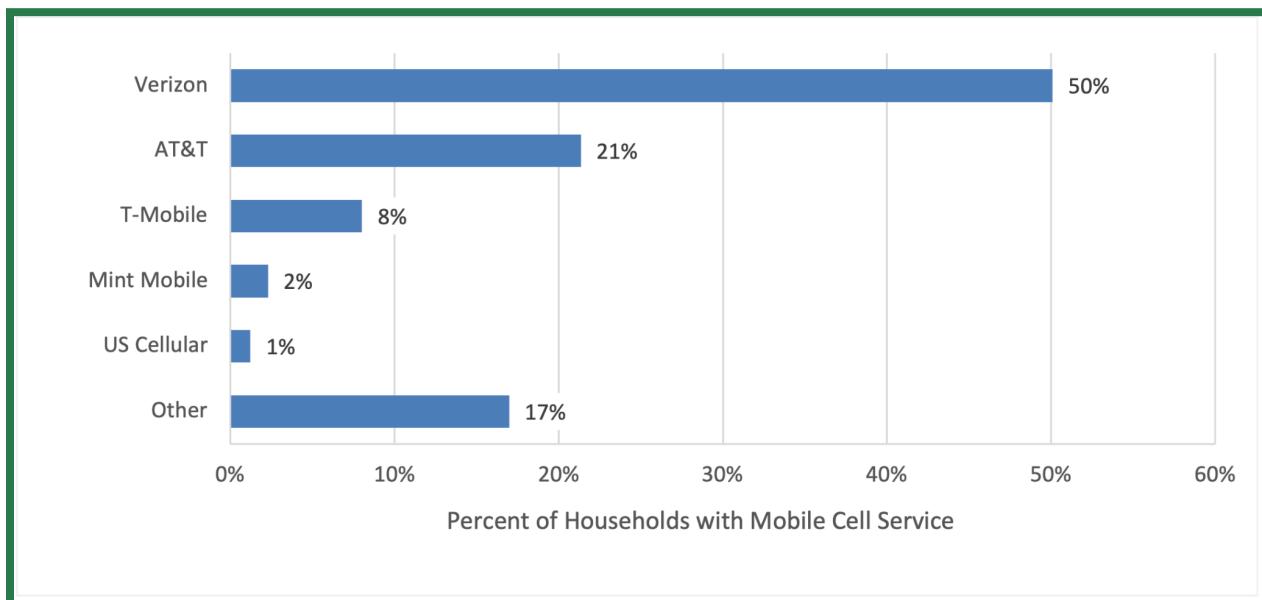
Almost all respondents (99.7 percent) reported using and owning a mobile phone. This is in line with national numbers on cell phone use, which is estimated at 97 percent.⁸ Since the survey was conducted based on a database of a mixture of mobile and landline numbers, one would expect this number to be slightly higher than numbers resulting from mail surveys. At the same time, the results illustrate that mobile phones are clearly a basic necessity for functioning as a citizen in modern society.

⁸ Pew Research Center (2021) “Mobile Fact Sheet.” Available at <https://www.pewresearch.org/internet/fact-sheet/mobile/>. Accessed January 31, 2024.

2.1.2 The Mobile Market Is Dominated by the “Big 2” Providers

Half of the surveyed households subscribe to Verizon, with AT&T following substantially behind at a fifth of the overall market share. T-Mobile and other providers’ shares are in the single-digit percentages.

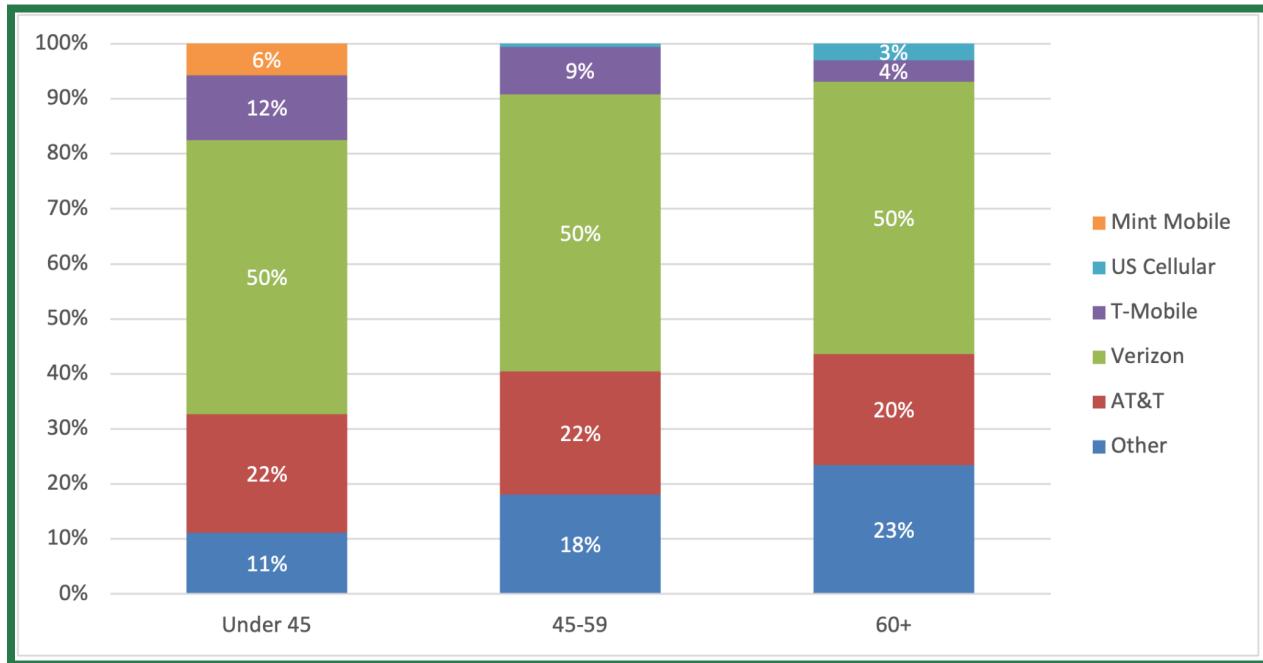
Figure 1: Reported primary mobile cell service provider



2.1.3 Young People Are More Likely to Pick Mint Mobile and T-Mobile, While Older Residents Are More Likely to Look to Alternative Providers

Younger respondents are more likely to have Mint Mobile and T-Mobile, while older respondents are more likely to have “Other” providers, including a variety of services, such as Straight Talk, Consumer Cellular, and Xfinity. While there seems to be variation by age – as smaller providers target certain demographics and older respondents are more likely to bundle cellular with cable or other broadband subscriptions – market shares of the “Big 2” (Verizon and AT&T) are practically identical across age groups.

Figure 2: Mobile cell provider by respondent age

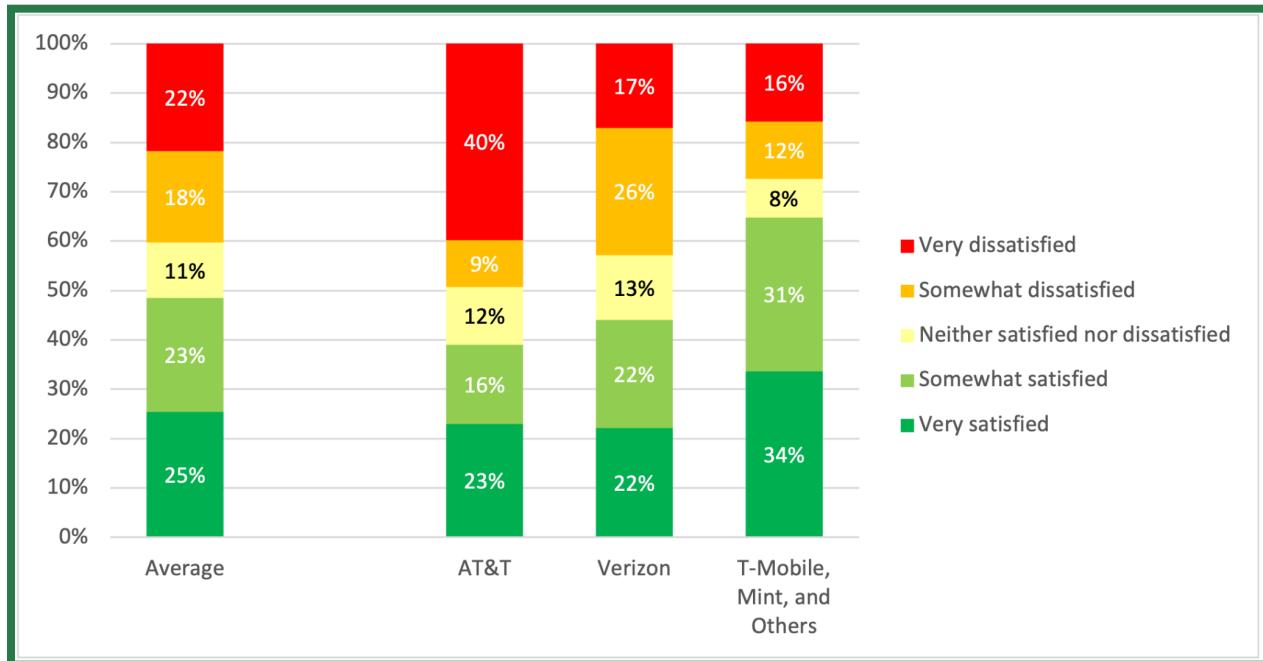


2.1.4 Satisfaction With Cell Service Coverage Varies, but Alternative Providers Fare Best

At residences, AT&T has higher dissatisfaction rates compared to other providers. US Cellular was omitted from these results as it had too few respondents and differed substantially from this aggregated category.

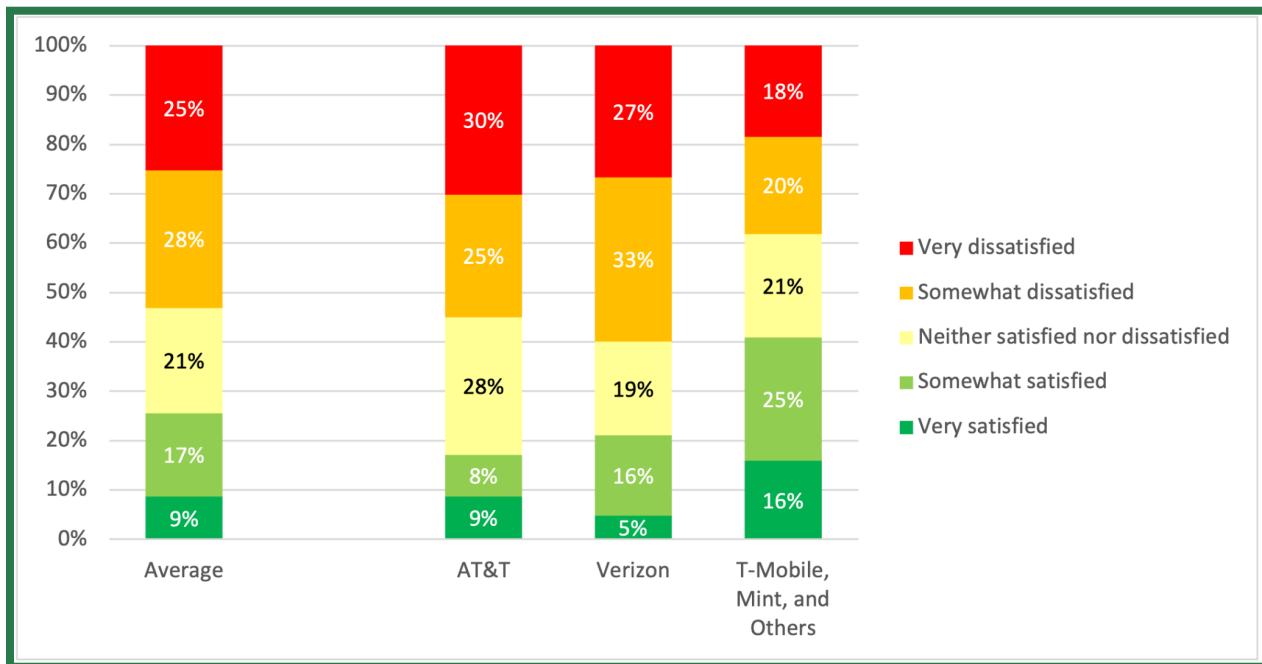
Although respondents expressed more dissatisfaction with AT&T coverage at their residences, the state's drive tests conducted in 2022 showed that AT&T had more expansive areas of coverage than Verizon. The satisfaction with alternative providers could be a function of better pricing rather than coverage, call quality, or reliability.

Figure 3: Satisfaction with mobile cellular coverage at place of residence by provider



AT&T fares slightly better in terms of satisfaction with coverage along roadways, while Verizon has a higher share of dissatisfied subscribers along roadways than inside residences — although AT&T continues to have the fewest satisfied subscribers. The alternative providers, however, significantly outperform the “Big 2.”

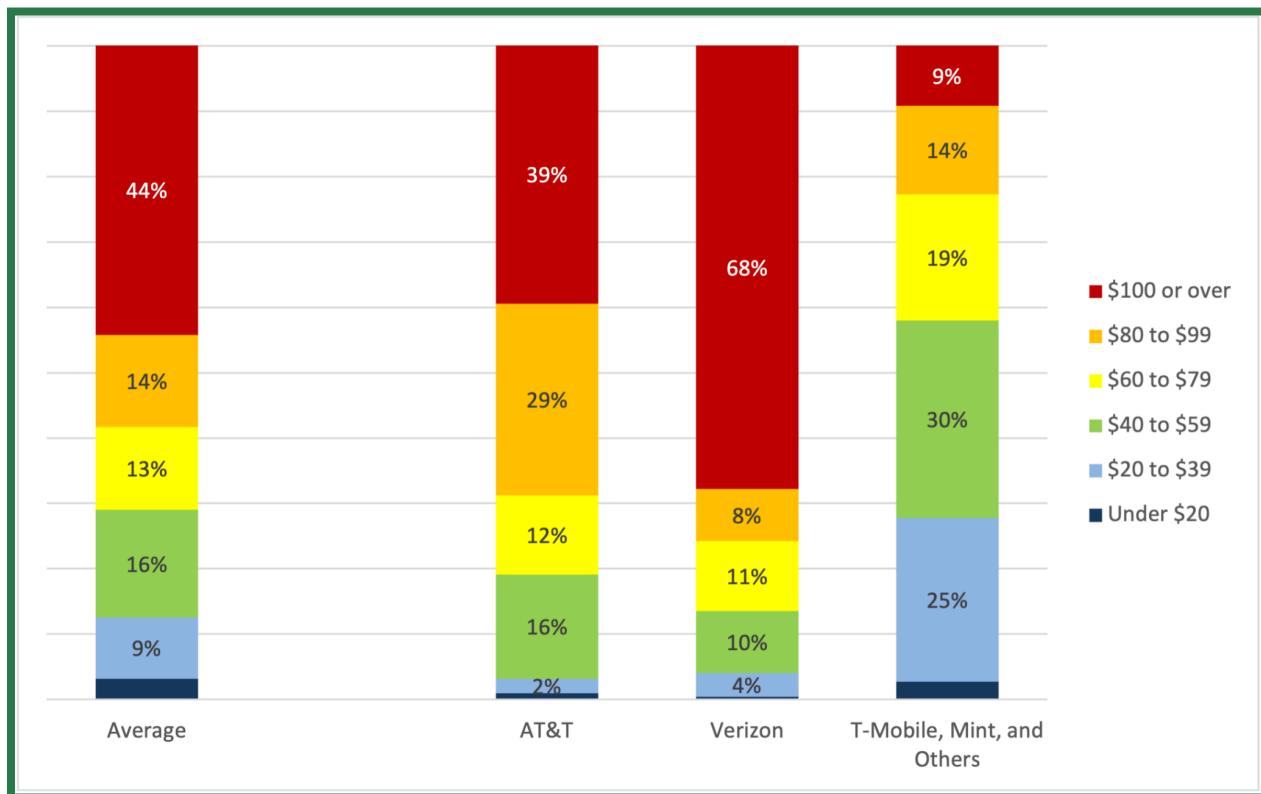
Figure 4: Satisfaction with mobile cellular coverage along roadways in Vermont by provider



2.1.5 Monthly Costs Are Greater for Verizon and Lower for Alternative Providers

Verizon customers tend to pay significantly more than other customers for their mobile service, with the majority paying more than \$100 per month for a single phone line. Conversely, as one would expect, those who subscribe to alternative providers typically pay less than \$60 per month, with only 9 percent paying \$100 or more per month. This may suggest a need for more competitive service and pricing to be expanded in the state, given that roughly half of all Vermonters with a cellular plan use Verizon.

Figure 5: Monthly cost for single phone line of mobile cellular service by provider

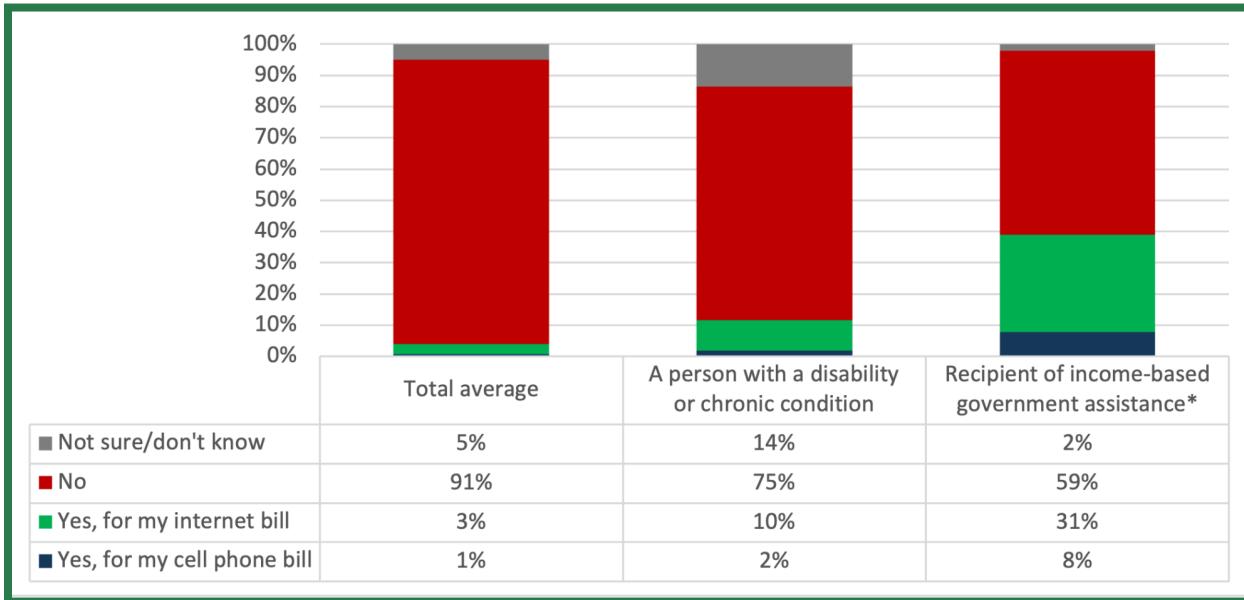


2.1.6 Low-Income Challenges Include Low ACP Enrollment and Some Impact of Cell Phone Bill on Being Able to Afford Essentials

Across the state, only 4 percent of survey respondents reported enrollment in the Affordable Connectivity Program (which provides qualifying households a monthly subsidy for home internet or cellular service). This is notably lower than the Universal Service Administrative Company (USAC)-reported enrollment rate of 10 percent of all households statewide,⁹ but still can illuminate trends within low-income households. According to the survey results, 12 percent of persons with a disability and 37 percent of income-based government assistance recipients participate in the ACP. However, federal ACP funding expired in 2024, as discussed in Section 5.2.

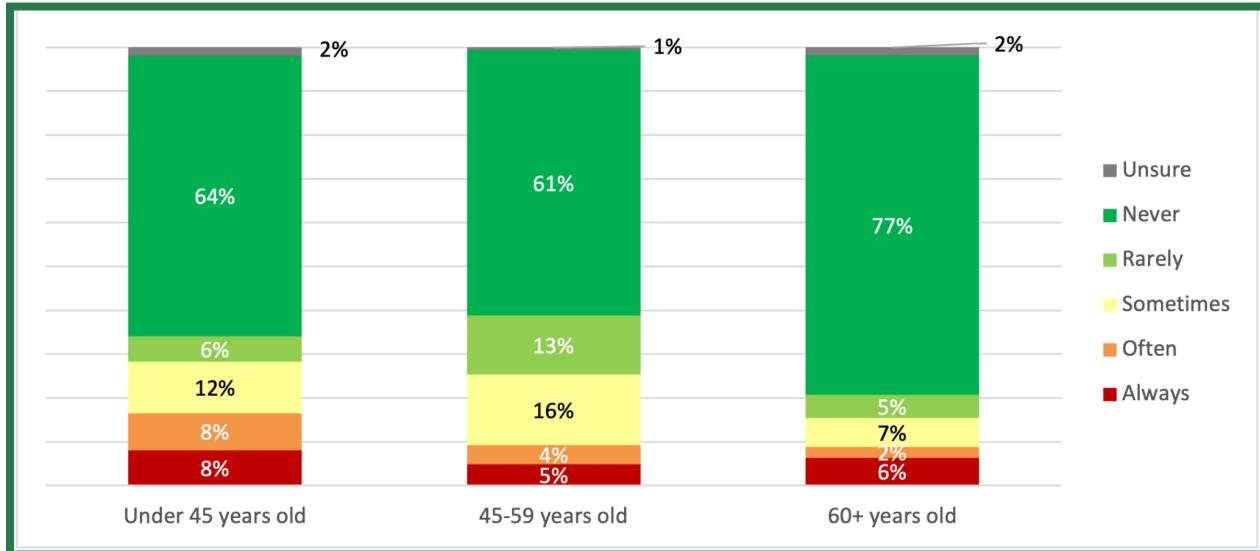
⁹ Universal Service Administrative Co., “ACP Enrollment and Claims Tracker.” Available at <https://www.usac.org/about/affordable-connectivity-program/acp-enrollment-and-claims-tracker/>. Accessed January 31, 2024.

Figure 6: Whether household participates in the ACP



The need for subsidies (or lowered cellular costs by other means) for low-income households is illustrated by Figure 7; 16 percent of survey respondents under the age of 45 reported that the cost of their cell phone bill often or always affects what essential items they can afford. While this rate drops to 9 percent and 8 percent for those 45 to 59 years old and those older than 59, respectively, it is still well above the ideal rate of zero percent.

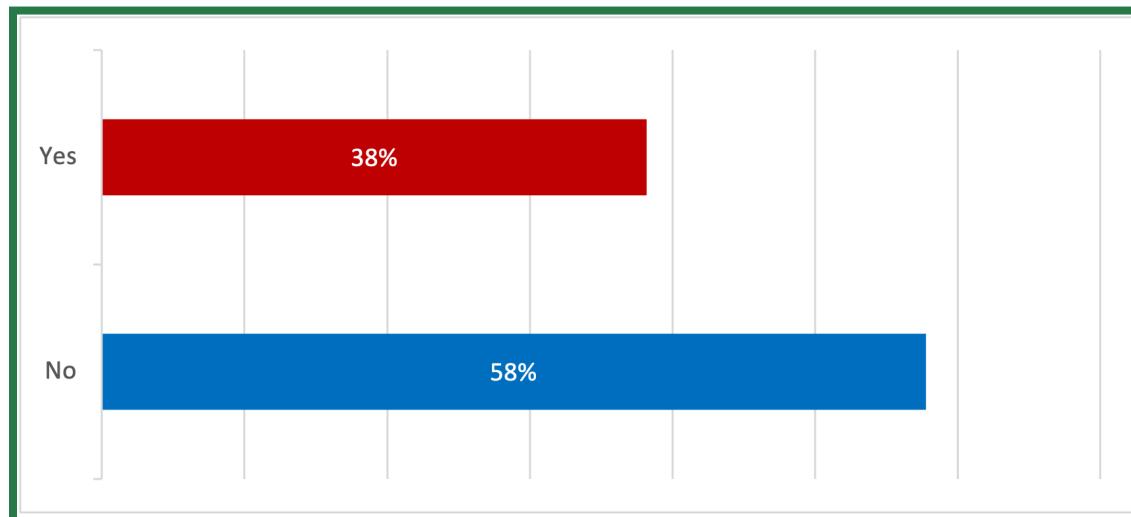
Figure 7: How often cost of cell phone bill impacts ability to afford essential items



2.1.7 School-Aged Households Report Impact of Mobile Connection on Ability to Do Homework

About a quarter of households reported they had school-aged children. Of those, about a third reported that the quality of a mobile connection would affect their ability to complete homework.

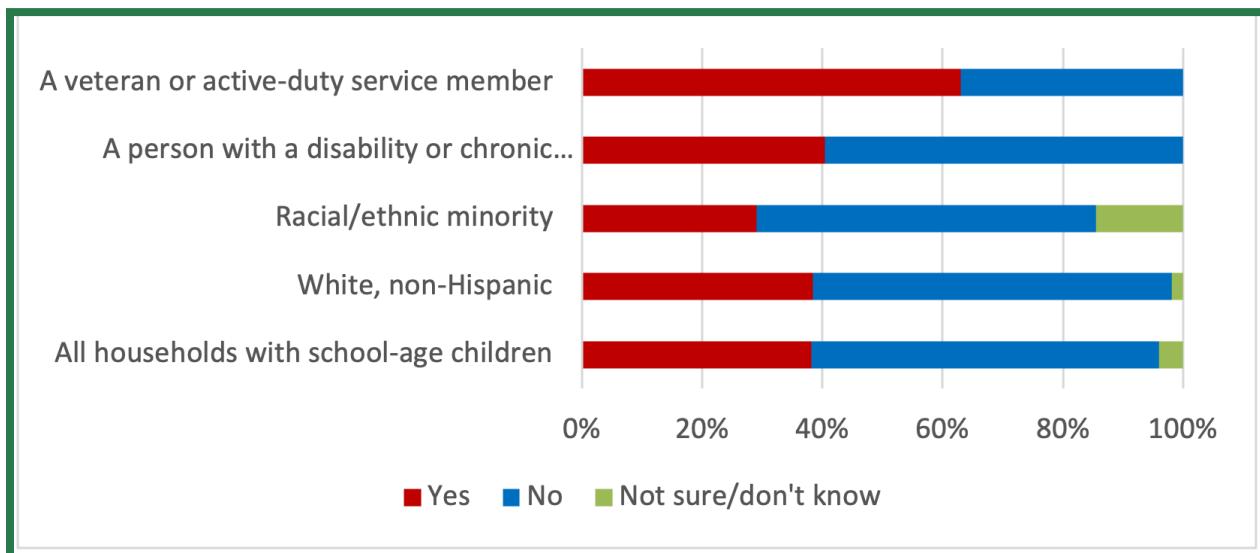
Figure 8: Whether mobile connection quality affects school homework



This finding did not vary much by provider, but it did vary for some subgroups for which there were enough responses to draw conclusions. In particular, in

households with active-duty or veteran members, the quality of cell phone connectivity was important for a majority of respondents. This could be because frequent relocations involve greater dependence on mobile cell phones to communicate about and potentially even submit homework. In addition, while racial minorities reported lower negative impact of poor cell phone connectivity, they also reported a much higher degree of uncertainty about whether there could be a negative impact.

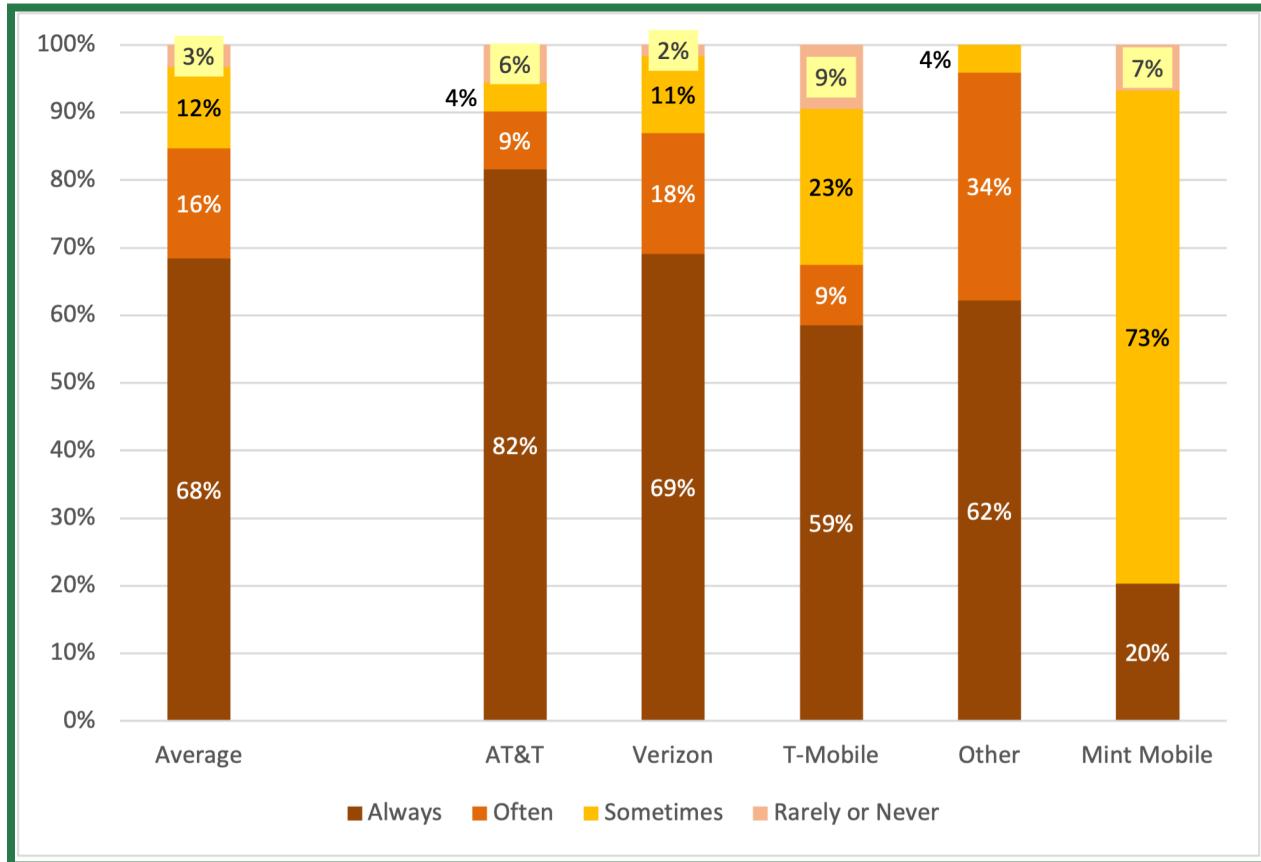
Figure 9: Whether mobile connection quality affects school homework, by population group



2.1.8 Work Requirements Mean Lower-Income and Other Population Groups Have Greater Need for Cell Phone Coverage for Their Profession

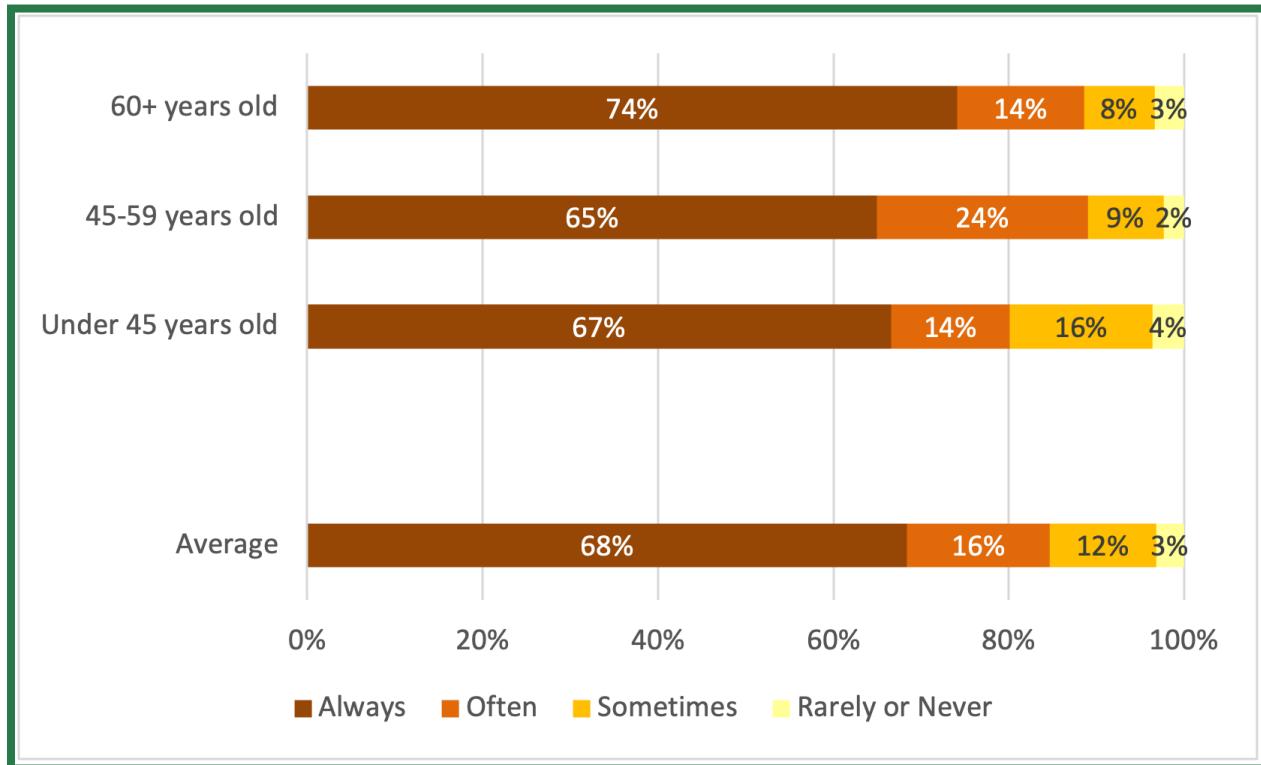
Roughly 84 percent of survey respondents reported that cell phone coverage was always or often needed to execute responsibilities related to their profession. This rate notably lowered to 20 percent for subscribers to Mint Mobile, which may be related to the younger ages and lower incomes associated with Mint Mobile subscribers.

Figure 10: Frequency of need for mobile coverage to complete job responsibilities



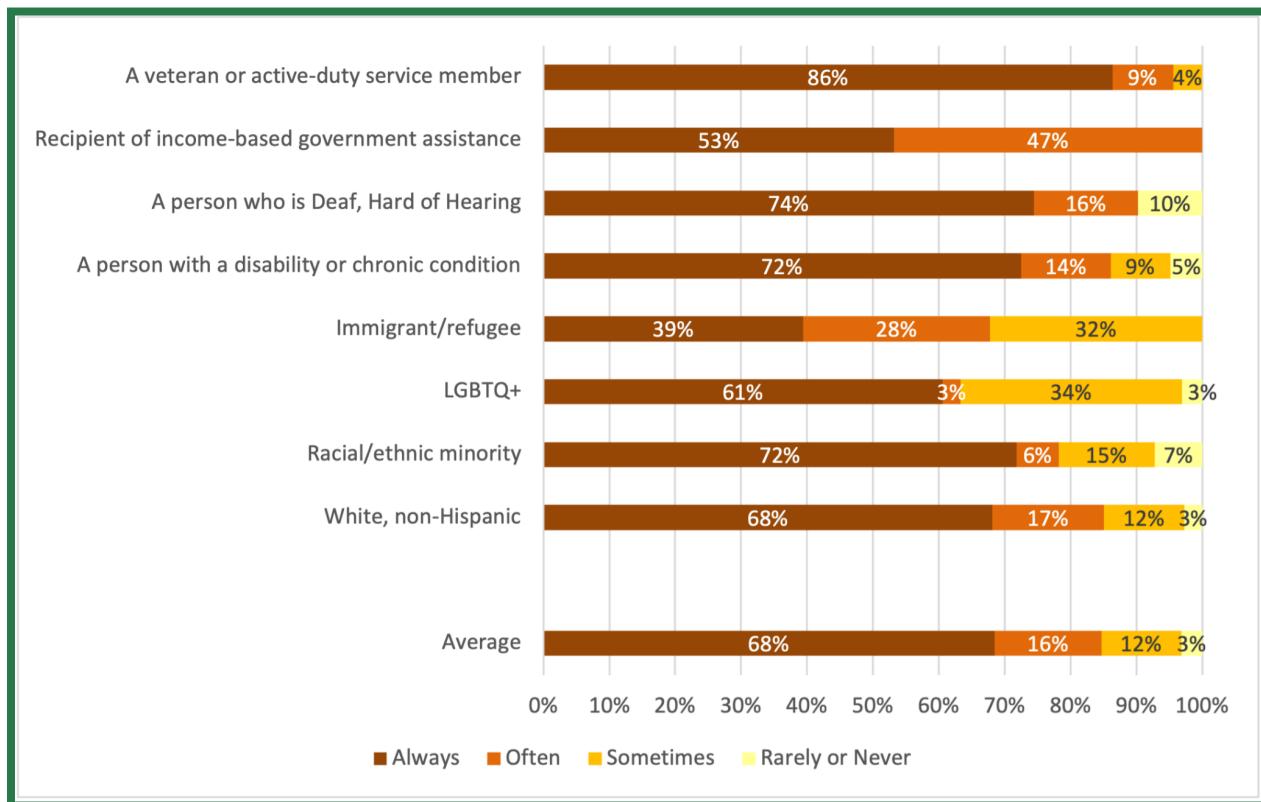
The portion of respondents who reported mobile coverage was always or often needed to complete their work responsibilities did not vary substantially by age. For those under 45 years old, 81 percent of respondents required mobile coverage for work, increasing to 89 and 88 percent for those between the ages of 45 and 59 and those 60 and older, respectively.

Figure 11: Mobile coverage needed to complete job by age



The more urgent findings are revealed when evaluating the importance of cellular coverage to completing work responsibilities split out by different socioeconomic demographics. For example, 100 percent of income-based government assistance recipients reported that mobile coverage was always or often needed to complete their work responsibilities. Similarly, 95 percent of veterans, 90 percent of deaf persons, and 86 percent of those with a disability or chronic condition reported strong need for mobile coverage while working. Policy interventions and outreach could lower the cost of cellular coverage for these groups. Contrasting these findings, only 64 percent of LGBTQ+ and 67 percent of immigrants and refugees report mobile coverage as necessary for completing their jobs.

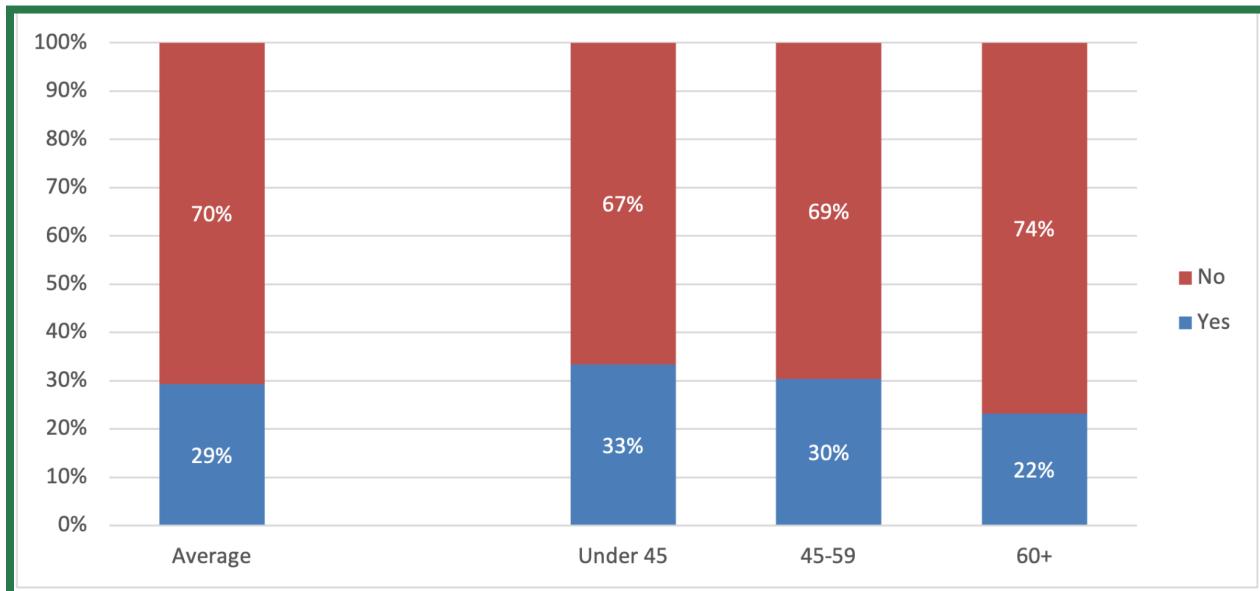
Figure 12: Mobile coverage needed to complete job by population group



2.1.9 Minority, Low-Income, and Other Vulnerable Groups Have Greater Need to Call 911 Than Other Groups

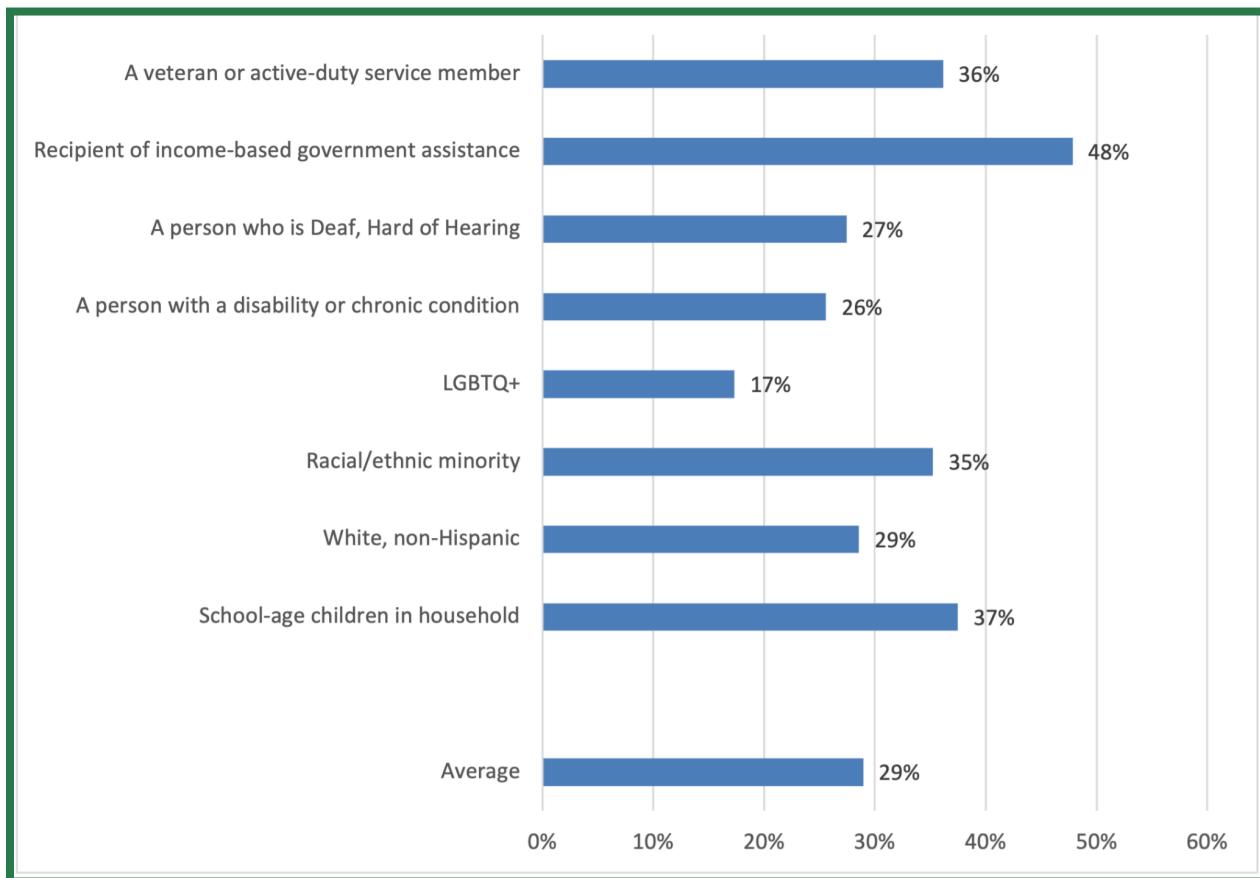
To gauge the need for cellular coverage for public safety, the rates of 911 calls using mobile cellular networks were analyzed: 29 percent of respondents reported ever having called 911 using a mobile cellular network. While this is a minority of the total respondents, there is near universal benefit to expanding access to wireless service, which will result in improved access to 911.

Figure 13: Ever called 911 on a cell phone by age



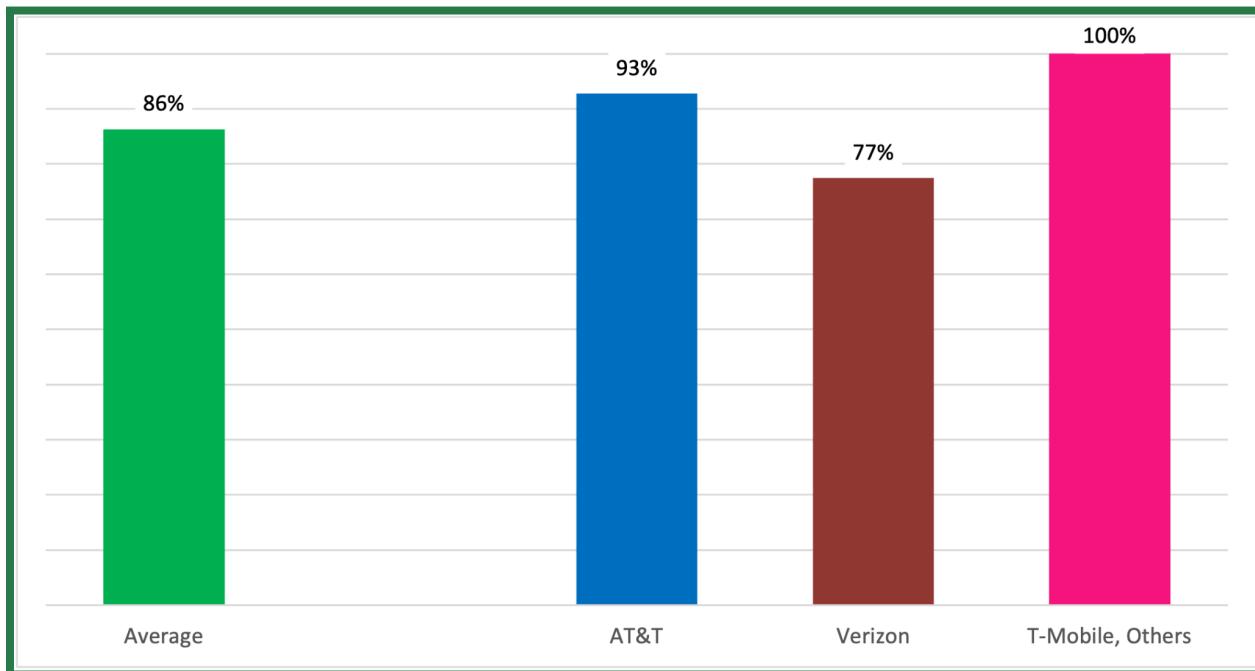
Just under half of all income-based government assistance recipients have called 911 using a mobile network. Similarly, 35 percent of racial or ethnic minorities, 36 percent of veterans, and 37 percent of individuals in households with school-aged children have used a mobile network to call 911. These data suggest that these groups may present the most urgent needs in terms of mobile coverage for public safety. However, once again, virtually every person benefits from increased access to public safety communications.

Figure 14: Ever called 911 on a cell phone by population group



Among those who have used a mobile subscription to call 911, 86 percent were able to connect to 911 on the first attempt. Unfortunately, only 77 percent of those calling using Verizon, the most common provider in the state, were able to connect on a first attempt.

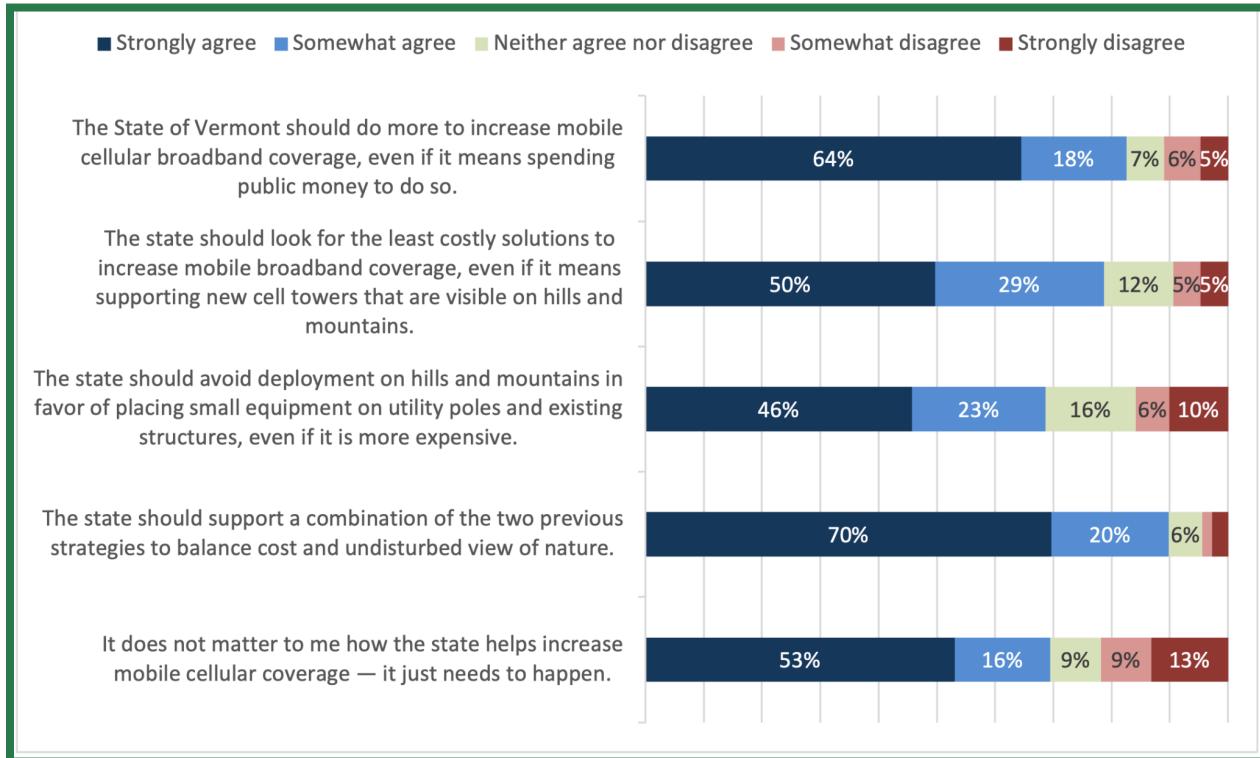
Figure 15: Able to connect to 911 on first attempt, by provider



2.1.10 Expressed Policy Preferences for Investments in Mobile Cellular Coverage

The survey included a series of questions regarding coverage investments to better inform public policy in this area. The findings suggest there is strong support for the state to take a leadership role to ensure better mobile coverage and use public funds to do so; 64 percent strongly agree that the state should use public funds to do more to improve coverage and only 11 percent disagree with this statement.

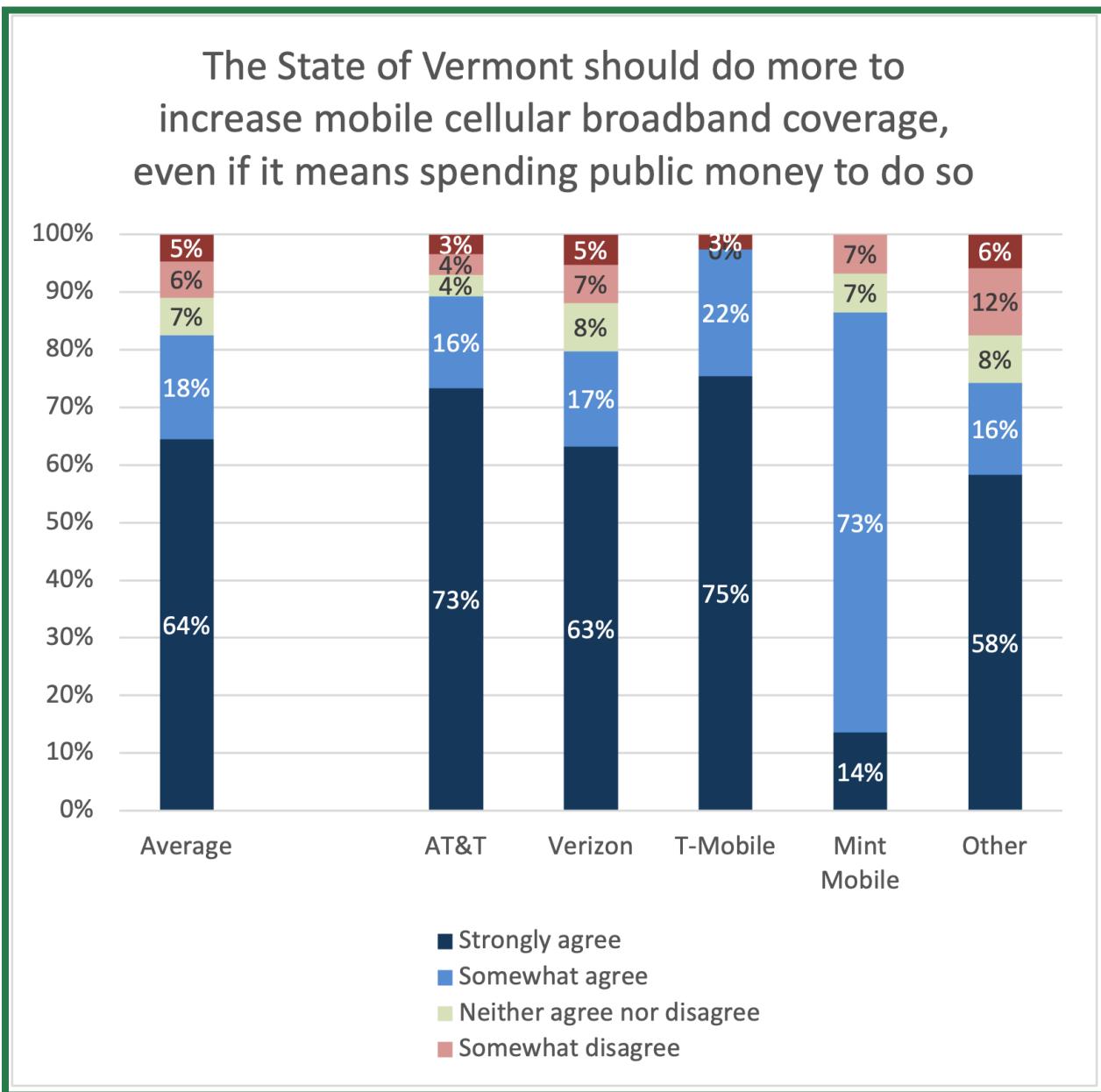
Figure 16: Levels of support for state investment in mobile coverage



2.1.10.1 There Is Popular Support for Spending Public Money to Increase Mobile Cellular Coverage

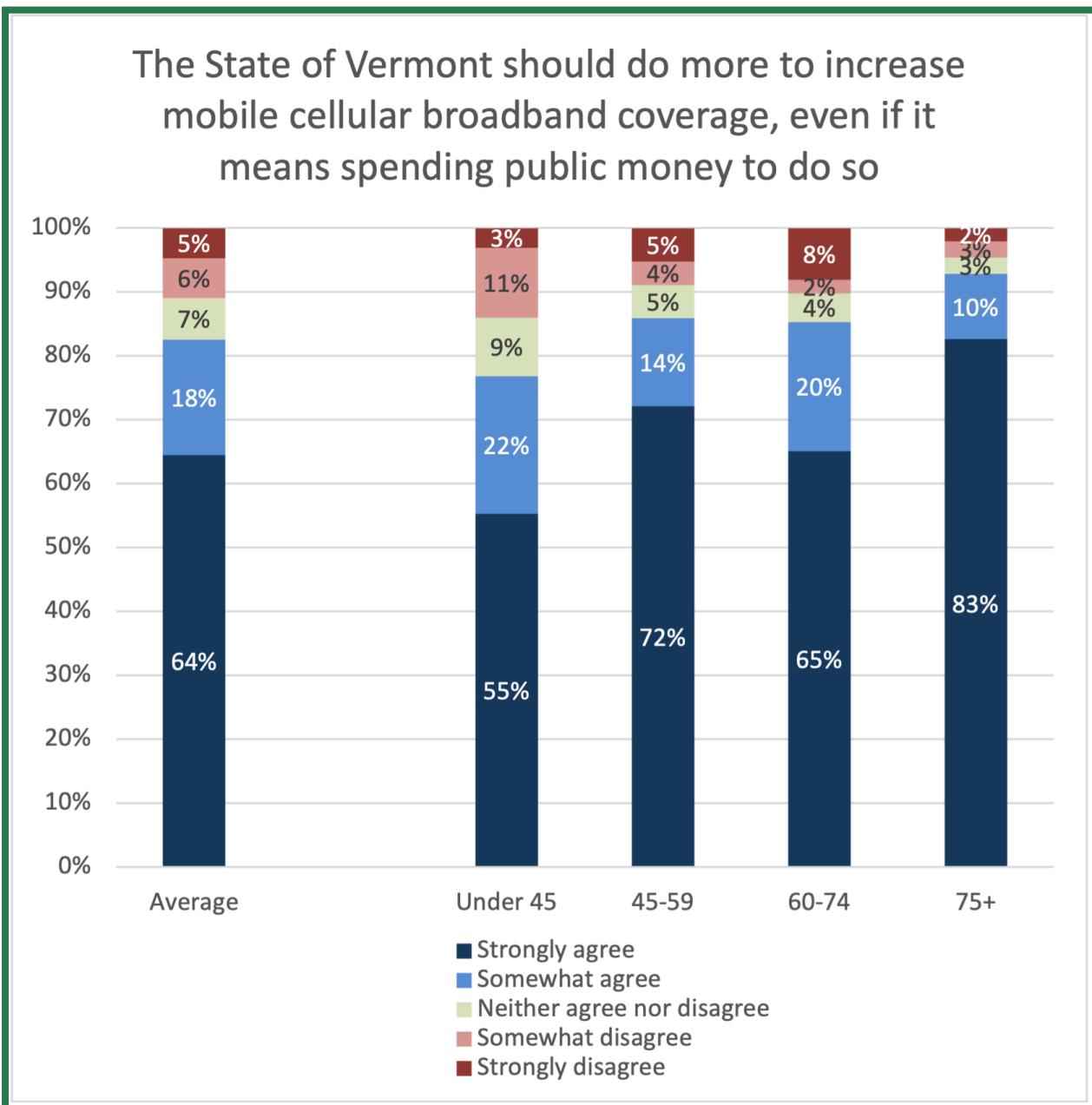
82 percent of respondents either strongly or somewhat agreed that the state should do more to increase mobile cellular broadband coverage even if it means spending public money to do so. Further, the distribution of opinions remained relatively consistent across different customer bases, except for T-Mobile subscribers (97 percent of which expressed support for the proposition) and Mint Mobile subscribers (only 14 percent of which strongly agreed with the proposition).

Figure 17: Levels of support for state investment in mobile coverage by provider



Respondents under the age of 45 expressed the least interest in the state expending public funds to expand cellular network coverage, but the majority of the age group still strongly agreed with the proposition. All older age groups expressed greater interest than the average response from across the state.

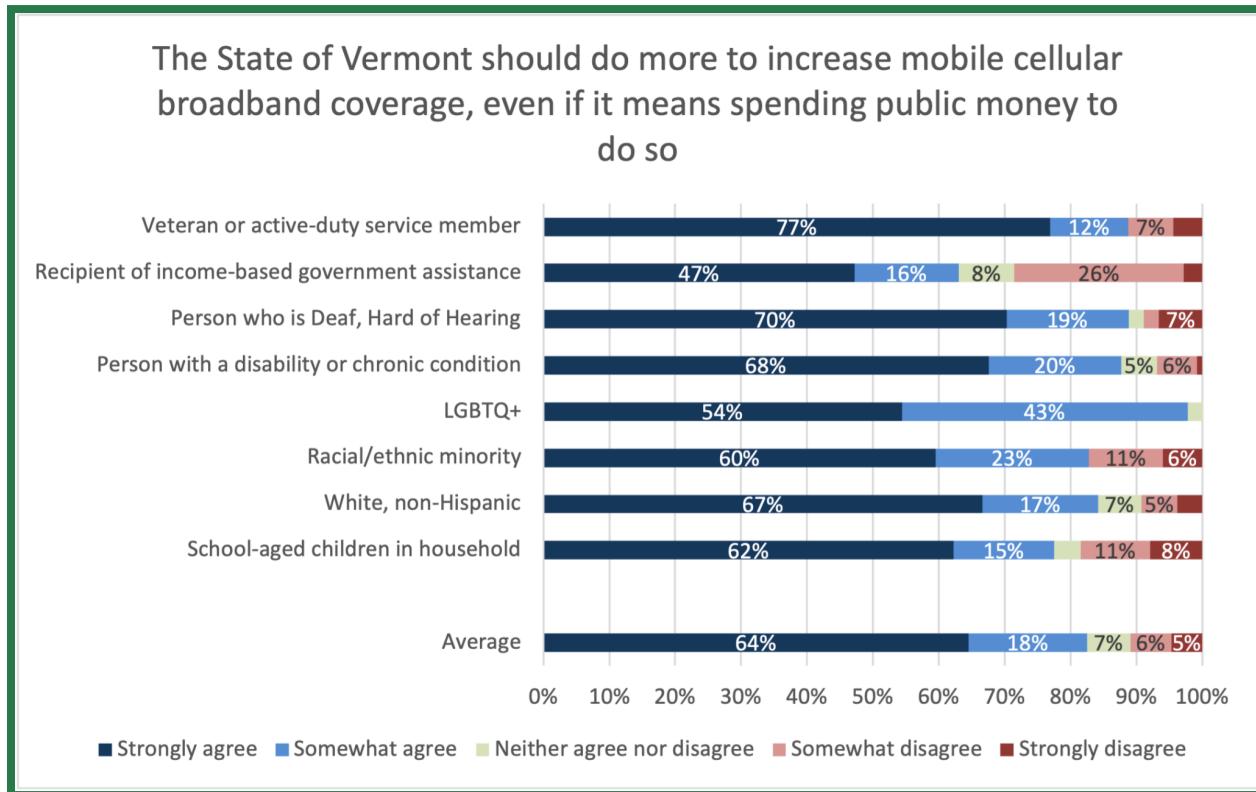
Figure 18: Levels of support for state investment in mobile coverage by age group



Among the polled groups, veterans expressed the highest rate of strong support, and LGBTQ+ respondents expressed the highest rate of strongly or somewhat agreeing with the proposition. Recipients of income-based government assistance reported the least enthusiasm towards the proposition, with only 63 percent strongly or

somewhat agreeing with the proposition. It is unclear why this group may be skeptical of the proposition, but analyses of cellular network use for public safety and work requirements suggest that low-income populations may be the greatest beneficiaries of the proposed policy.

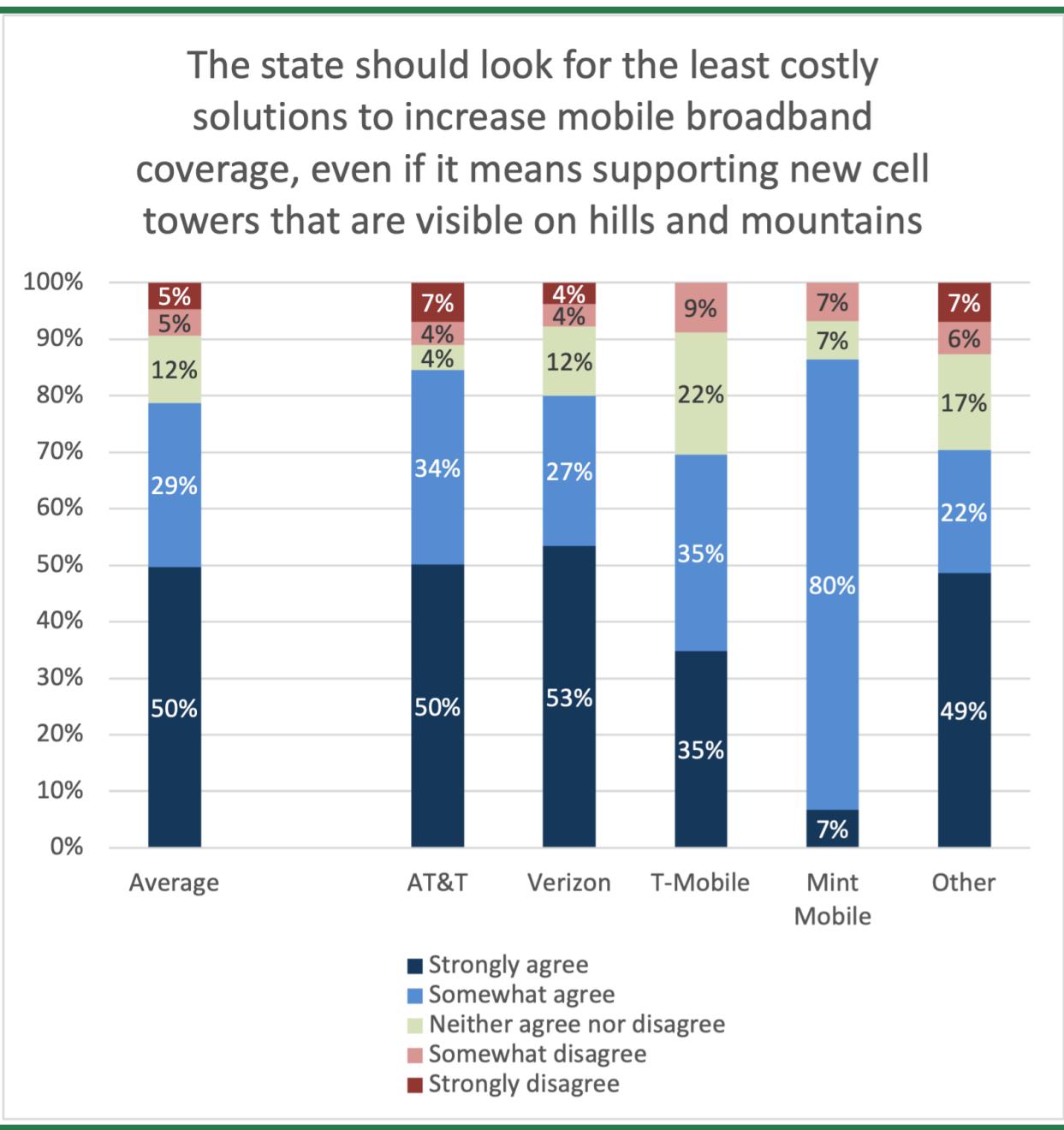
Figure 19: Levels of support for state investment in mobile coverage by population group



2.1.10.2 There Is Popular Support for Efficient Investment in Mobile Broadband Expansion Even at the Expense of Aesthetics

Roughly half of residents in the state appear to strongly support the state prioritizing financial efficiency over aesthetic preservation if the state were to invest in mobile broadband expansion, and an additional 29 percent somewhat support this policy. Across the various customer bases, there is little variation in opinion once more, except for those subscribed to Mint Mobile (only 7 percent of which strongly agreed with the proposition).

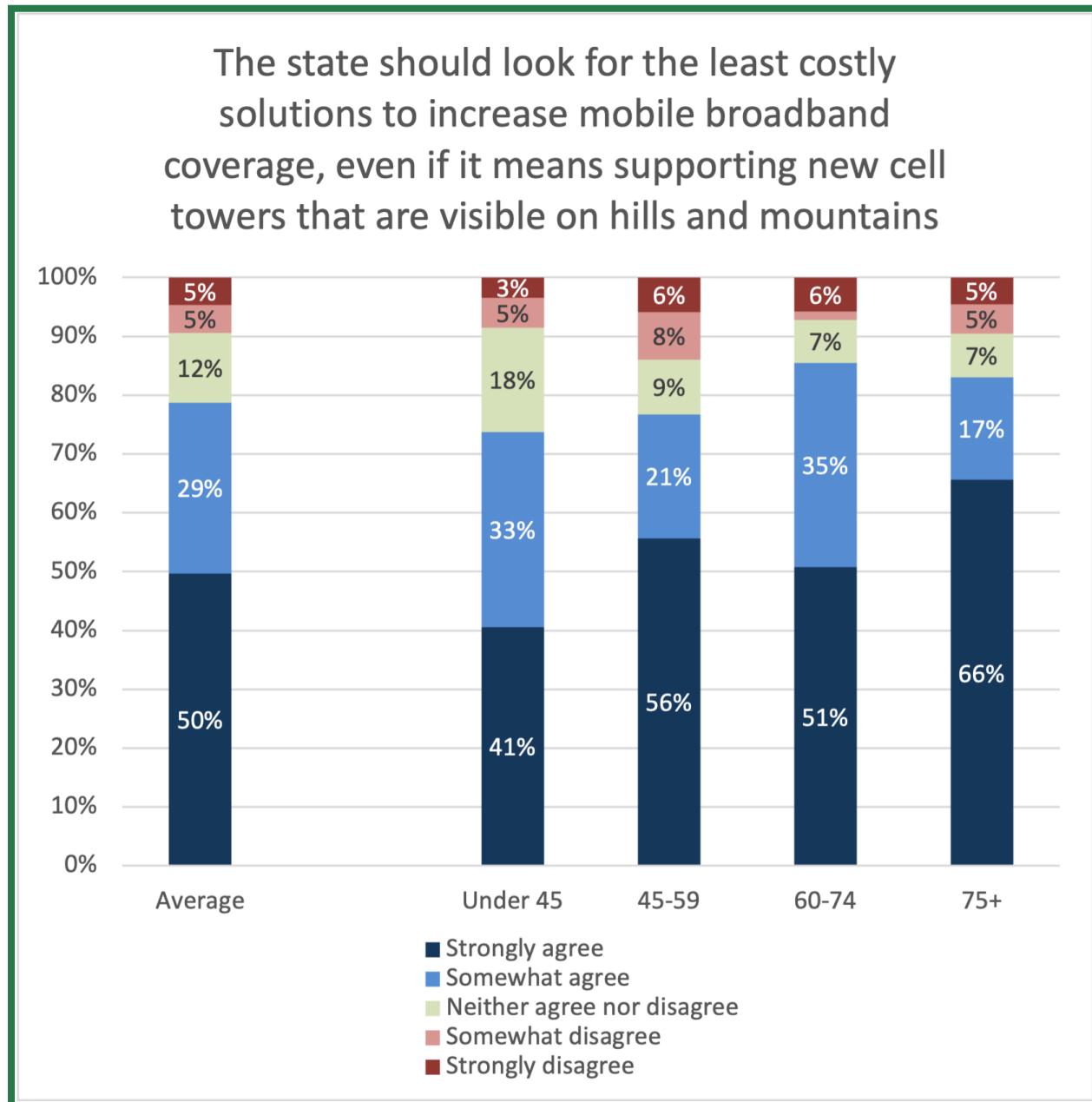
Figure 20: Levels of support for prioritizing lower-cost investments over aesthetics, by provider



Vermonters younger than 45 voiced the least support for the policy, as only 41 percent strongly agreed with the proposition. It still may be popularly supported by this age bracket, as an additional 33 percent somewhat agreed with the proposition. All other age brackets had greater support for the policy than the average state

resident, with a majority of all other age brackets strongly agreeing with the proposition.

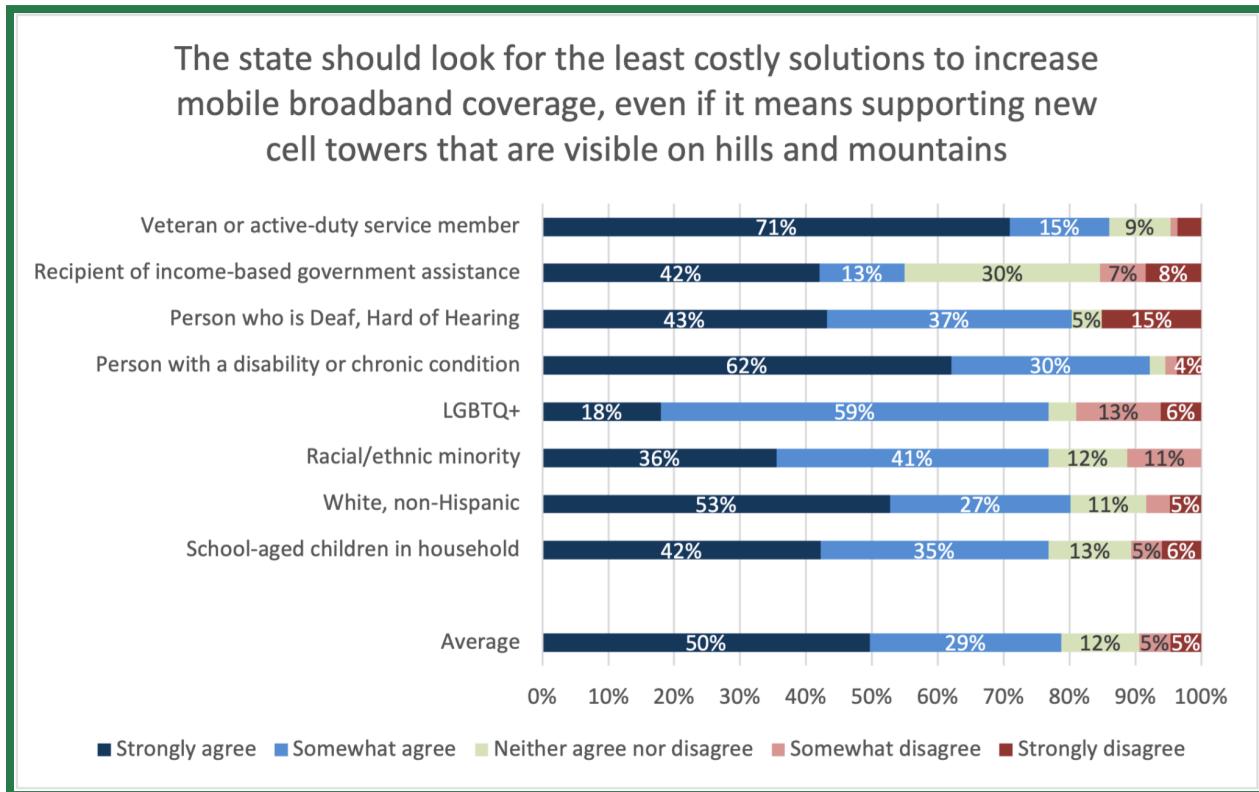
Figure 21: Levels of support for prioritizing lower-cost investments over aesthetics, by age group



Veterans and persons with disabilities expressed the strongest agreement with the proposition while recipients of income-based government assistance were again the

most hesitant (only 42 percent strongly agreed with the proposition). For low-income populations, it is unclear to what extent this policy opinion is motivated by a priority placed on maintaining public aesthetics as opposed to a greater hesitance with spending public funds.

Figure 22: Levels of support for prioritizing lower-cost investments over aesthetics, by population group



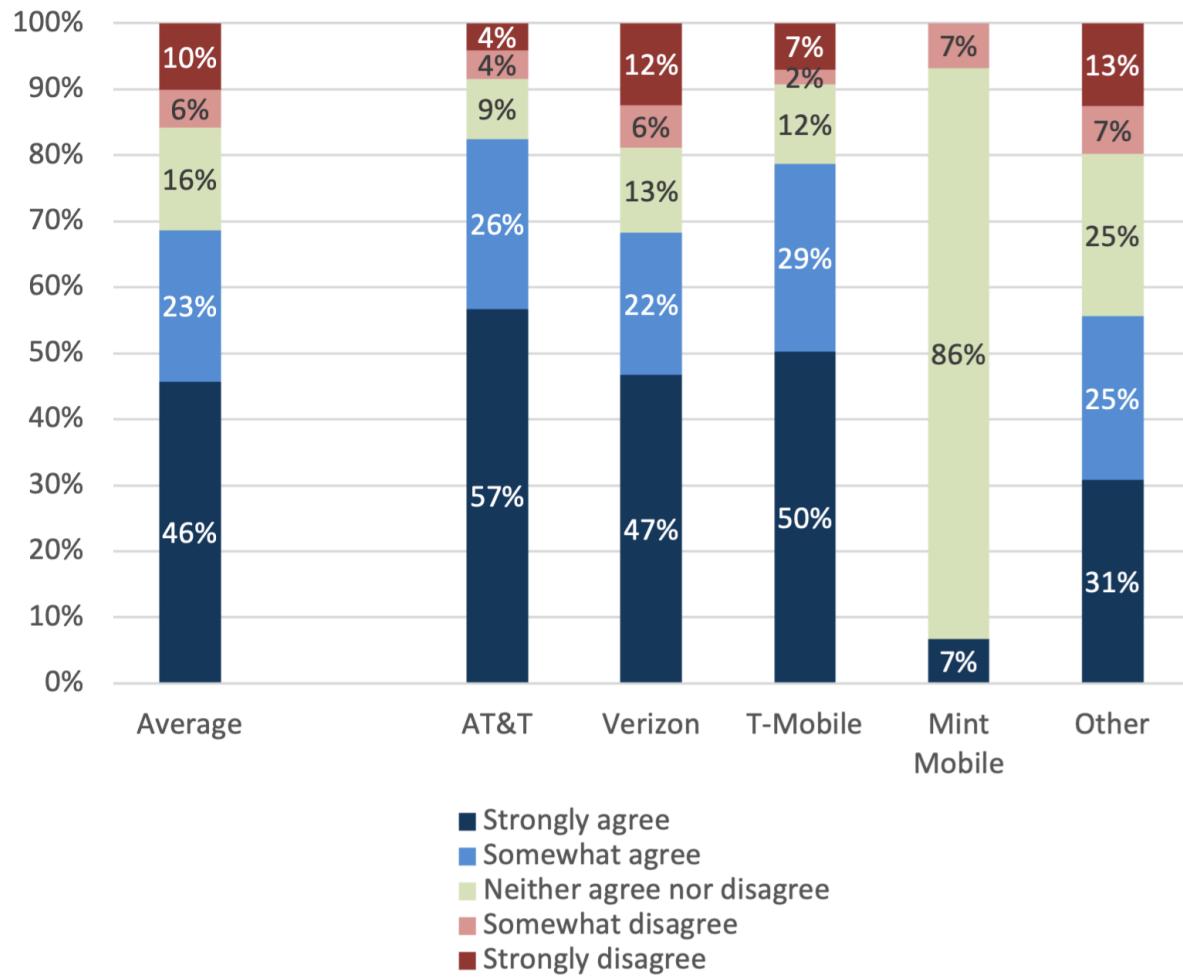
2.1.10.3 There Is (Slightly Less) Public Support for Prioritizing More Expensive but Smaller Equipment in Cellular Infrastructure Deployment

According to the survey results, 46 percent of respondents strongly agree that the state should avoid deployment on hills and mountains in favor of placing small equipment on utility poles and existing structures, even if it is more expensive. Additionally, 23 percent somewhat agree. These proportions illustrate less support for the prioritization of aesthetics when compared to enthusiasm for prioritization of financial efficiency. However, the margin is slim enough that the two are comparable.

Across different customer bases, Mint Mobile's base expressed a largely unconcerned sentiment, as 86 percent of respondents neither agreed nor disagreed with the proposition.

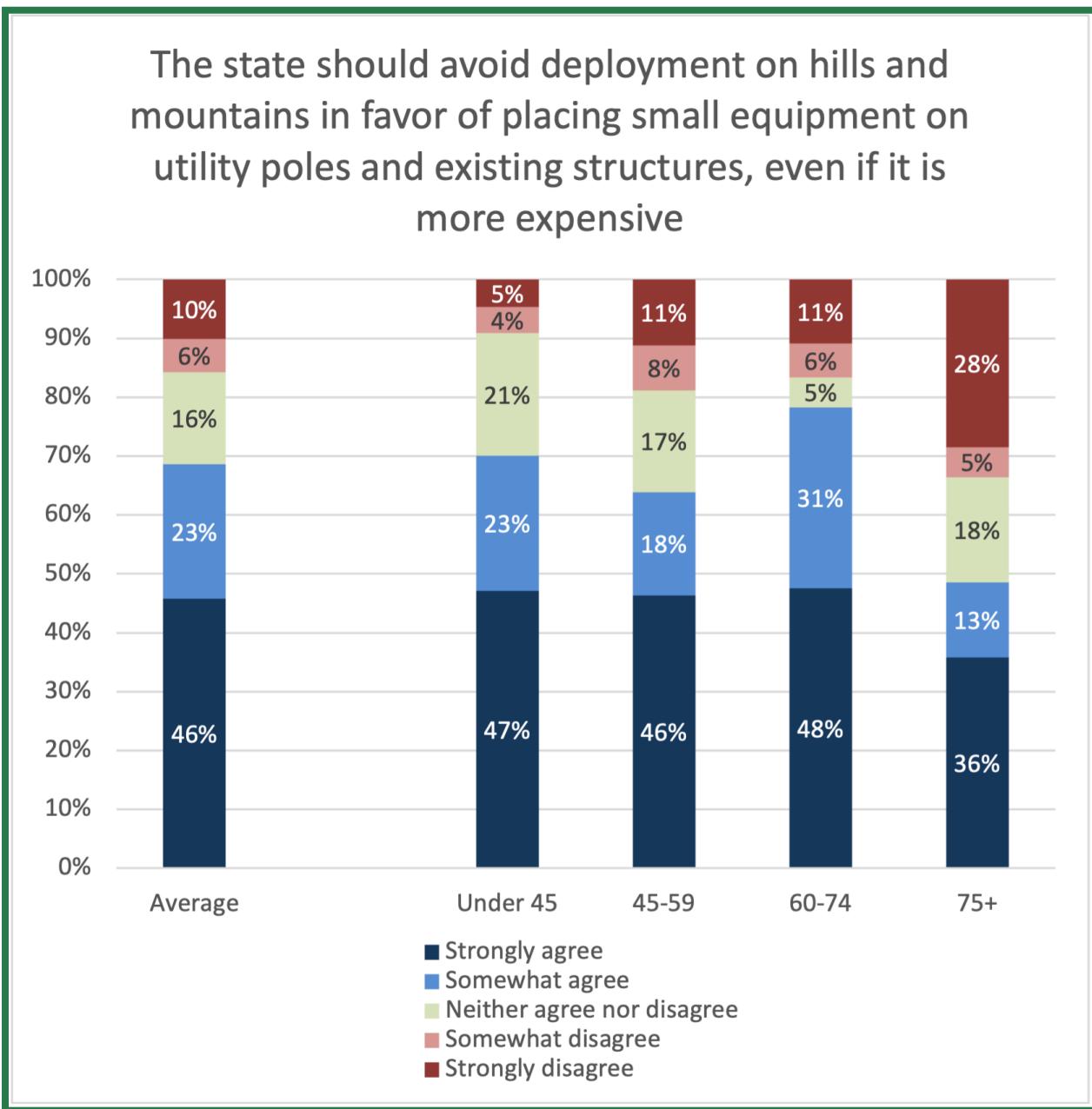
Figure 23: Levels of support for prioritizing aesthetics over lower-cost investments, by provider

The state should avoid deployment on hills and mountains in favor of placing small equipment on utility poles and existing structures, even if it is more expensive



Most age groups displayed similar levels of support for the proposition, with elderly Vermonters standing in opposition. 28 percent of Vermont residents at or above the age of 75 expressed strong disagreement with the proposition and only 36 percent expressed strong agreement. Depending on where older Vermonters are located, this preference may suggest a more location-specific approach in terms of policy priorities.

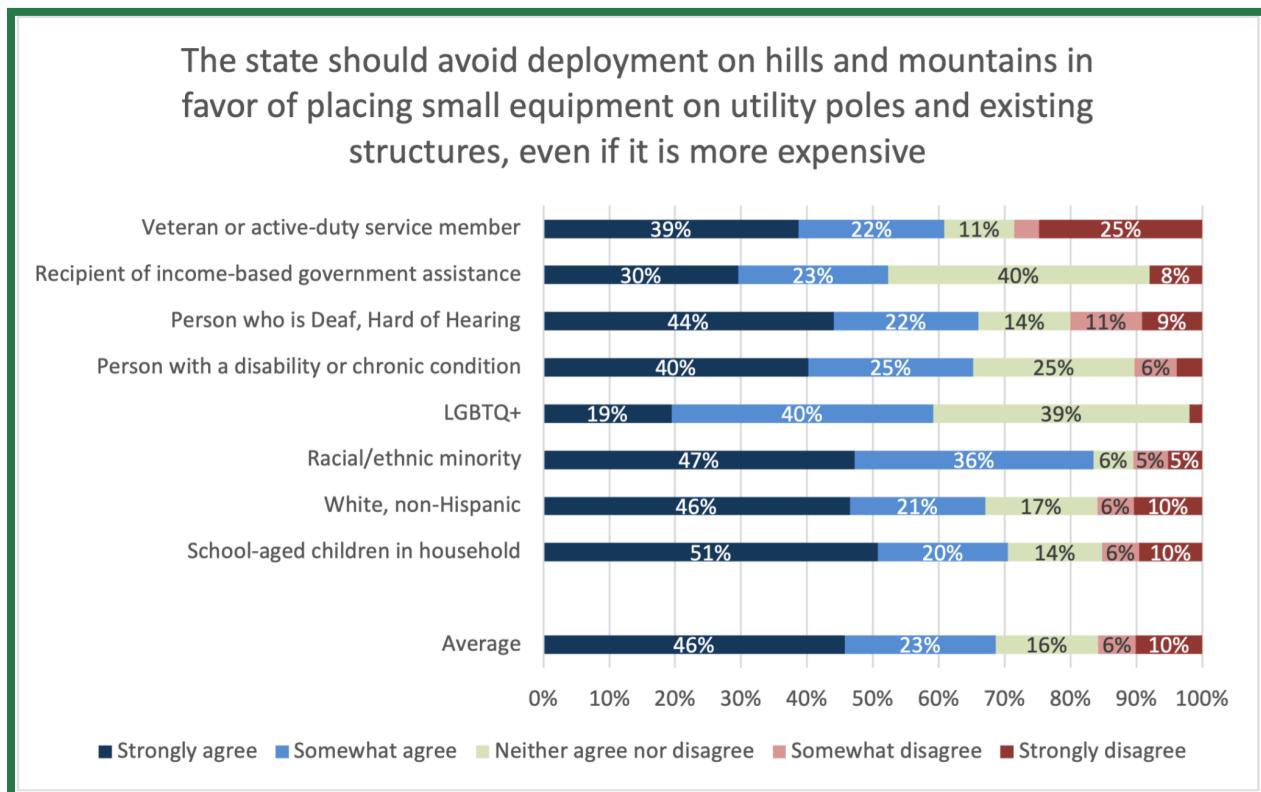
Figure 24: Levels of support for prioritizing aesthetics over lower-cost investments, by age group



Of the polled socioeconomic groups, racial and ethnic minorities express the most support for the proposition, as 83 percent either strongly or somewhat agreed that the state should prioritize aesthetics over lower-cost investments. Recipients of income-based government assistance and LGBTQ+ populations had the least agreement with the proposition, with only 30 percent and 19 percent strongly

agreeing, respectively. Furthermore, although 39 percent of veterans strongly agreed with the proposition, they voiced the most opposition, with 25 percent strongly disagreeing.

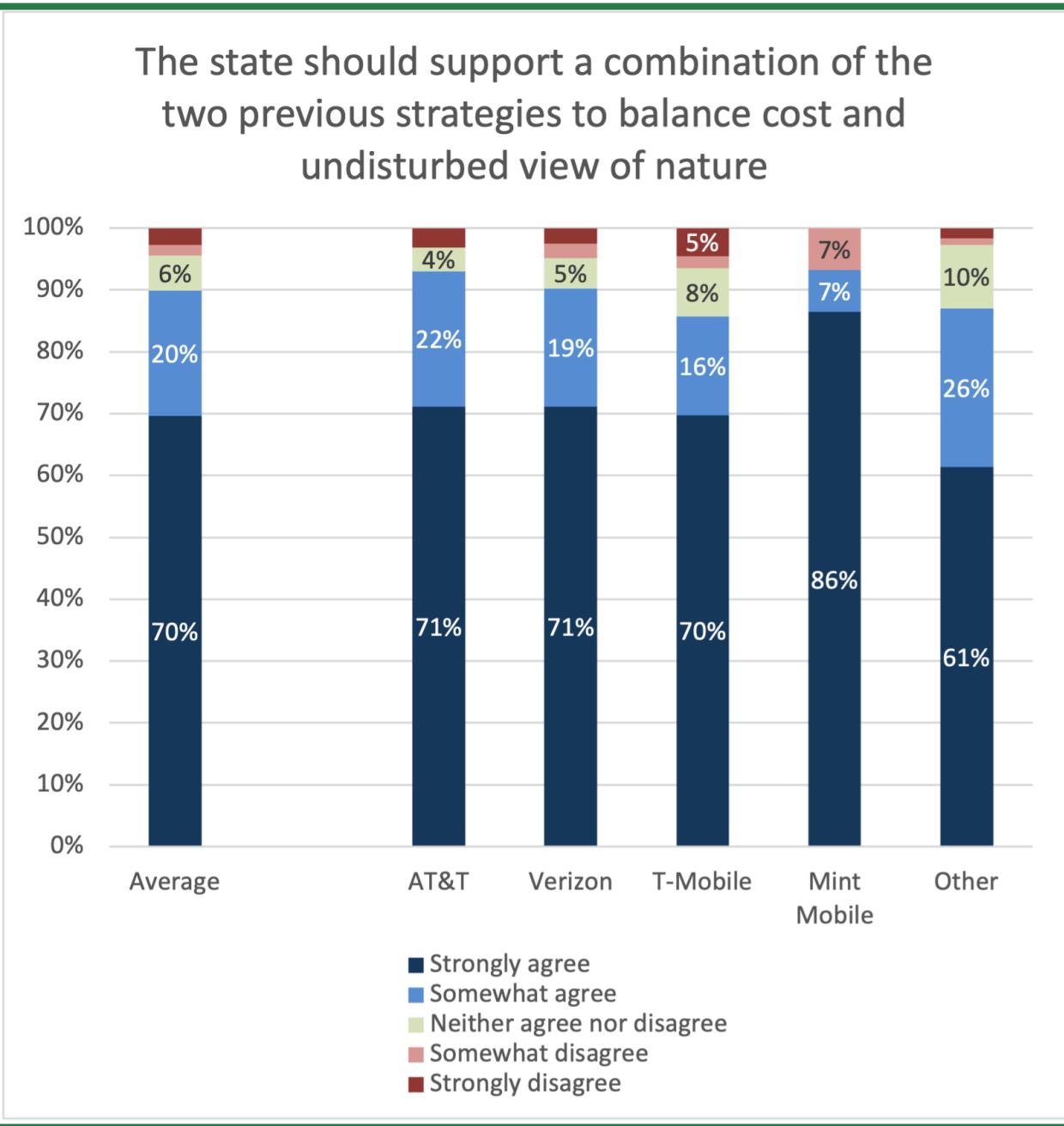
Figure 25: Levels of support for prioritizing aesthetics over lower-cost investments, by population group



2.1.10.4 There Is Broad Support for a Balanced Approach to Cellular Broadband Expansion

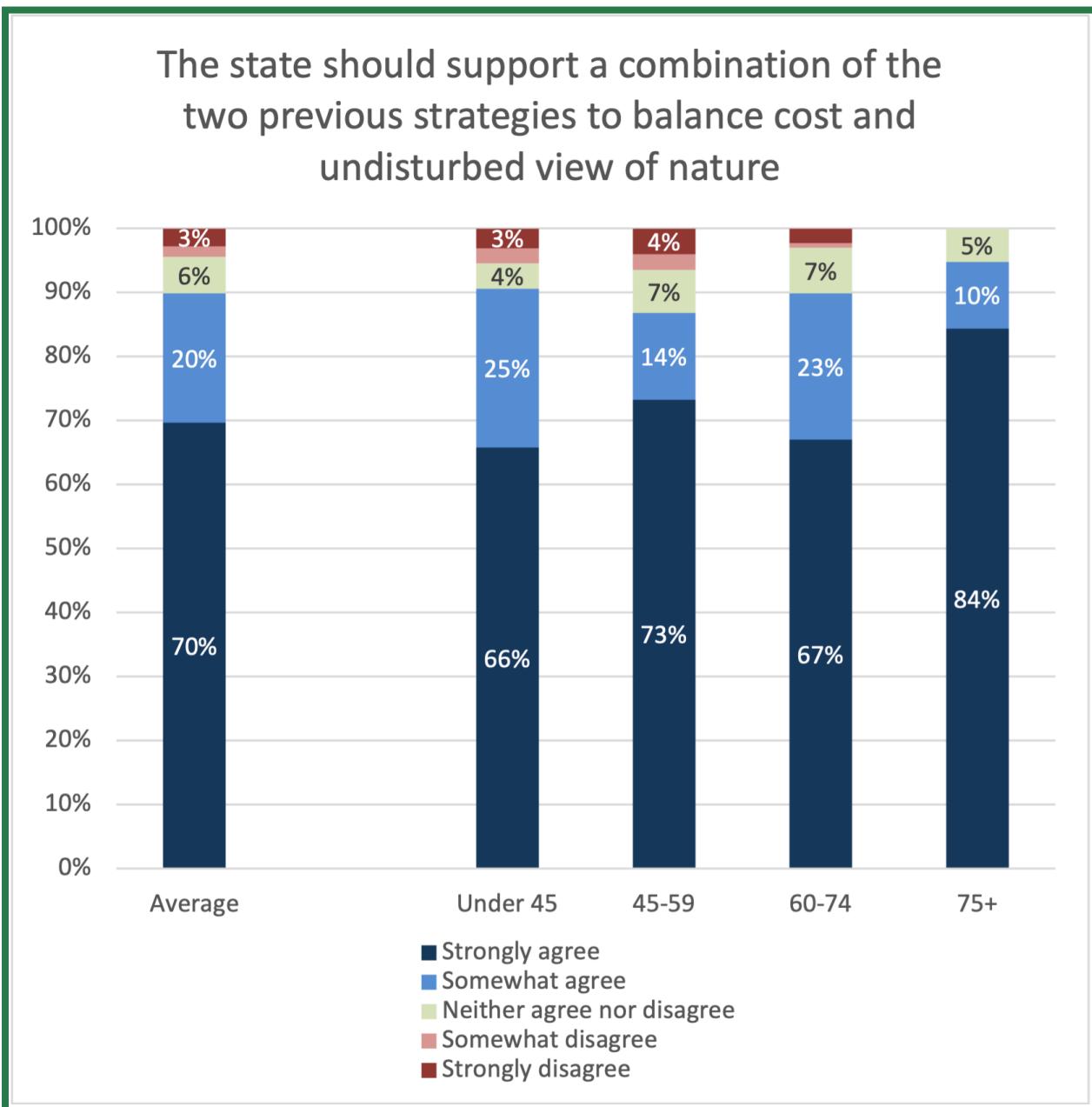
Residents have almost reached consensus that the state should adopt an approach that balances the cost of expansion with minimizing the impact on Vermont's natural aesthetic, as 70 percent of respondents strongly agreed with the proposition and an additional 20 percent somewhat agreed. There was no specific customer base that voiced substantial disagreement.

Figure 26: Levels of support for balancing cost and aesthetics, by provider



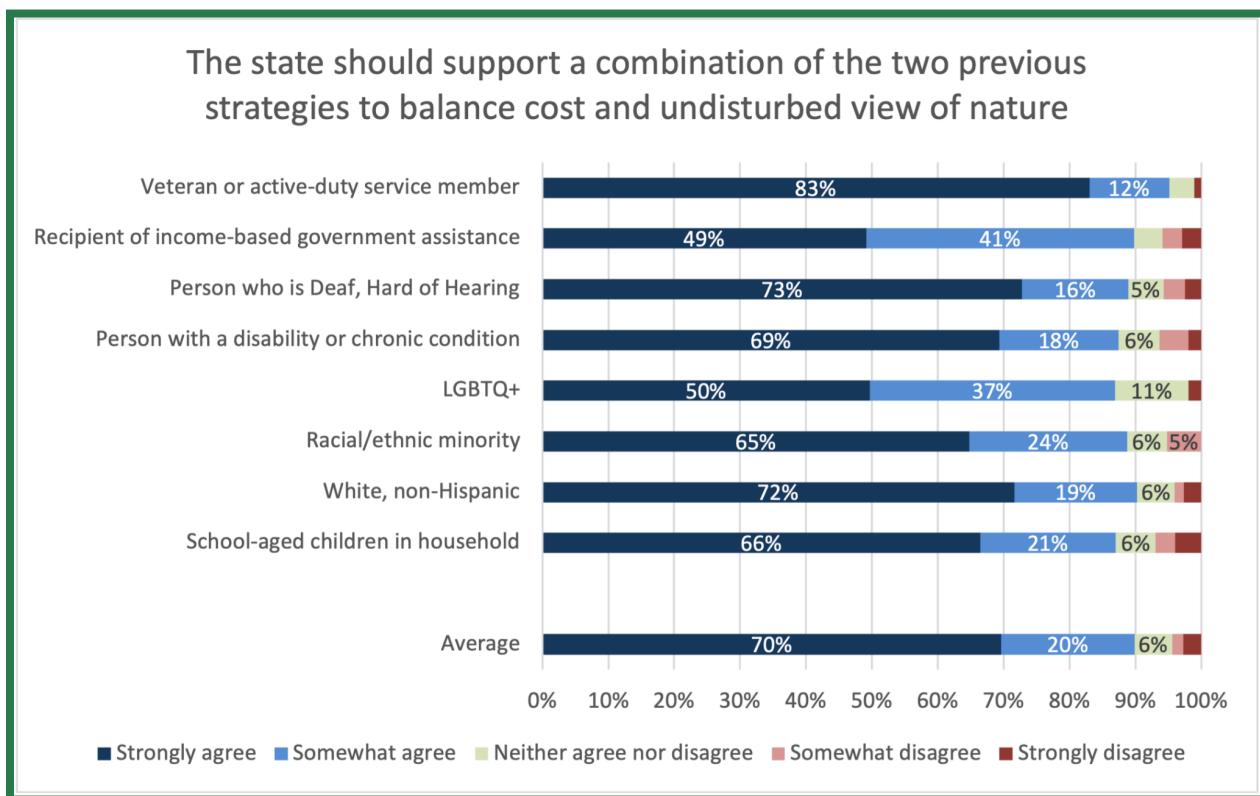
Similar to the above finding, support for the balanced policy position is widespread across age groups. Those at or above the age of 75 expressed the greatest degree of agreement, as 84 percent strongly agreed with the proposition, but all age groups reached a majority in strong agreement.

Figure 27: Levels of support for balancing cost and aesthetics, by age group



There was similar support for the policy position across all surveyed demographic groups, but there was some variability in the extent to which they agreed. For example, recipients of income-based government assistance had the lowest rate of strong agreement with the proposition at 49 percent. Despite this, only 6 percent of recipients of income-based government assistance expressed disagreement of any degree, which signals its palatability, if not outright popularity.

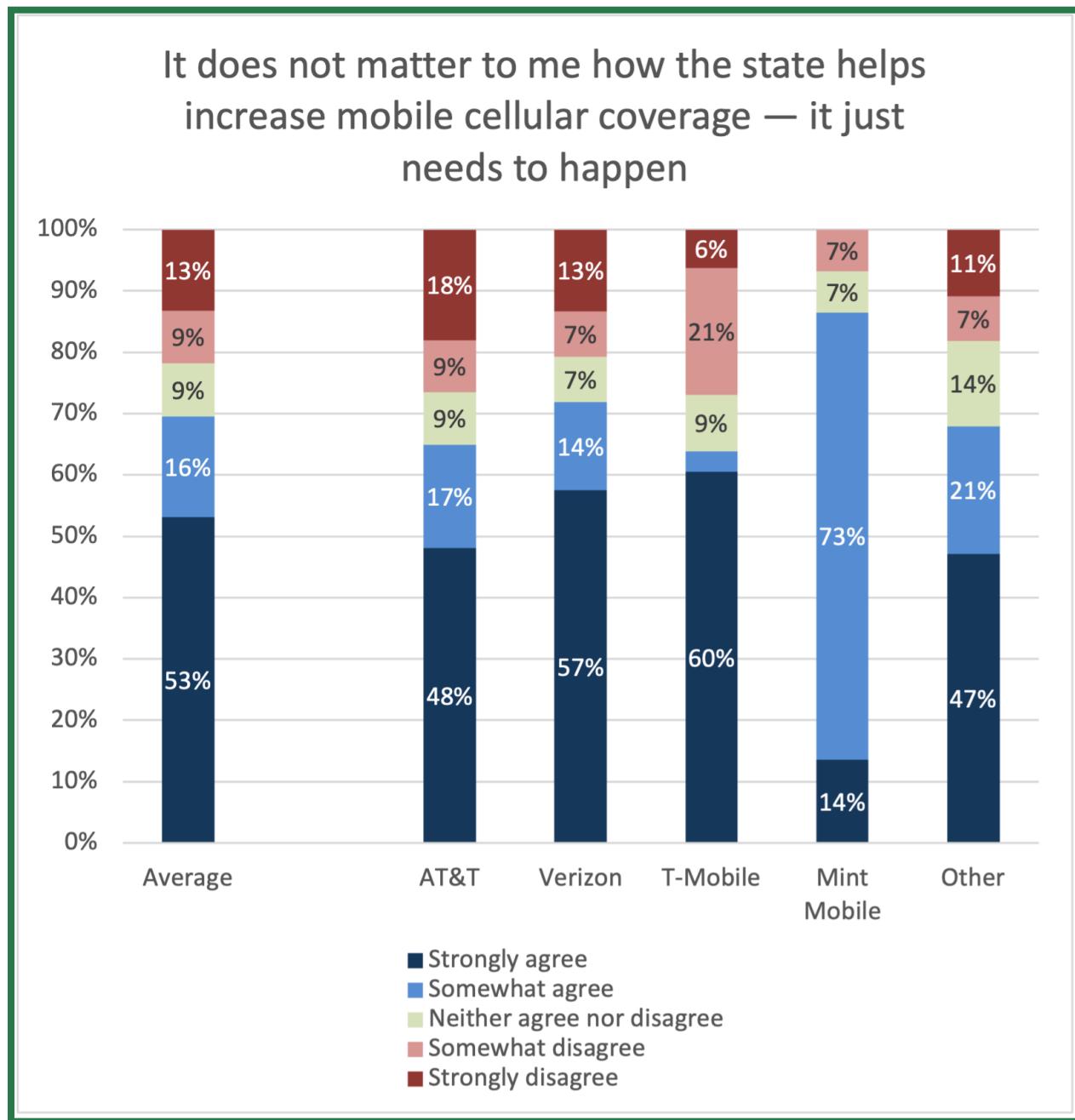
Figure 28: Levels of support for balancing cost and aesthetics, by population group



2.1.10.5 A Majority of Vermonters Strongly Agree With the Expansion of Mobile Cellular Coverage by Any Means Necessary

Survey results suggest that over half of Vermonters strongly agree that it does not matter to them how the state helps increase mobile cellular coverage – it just needs to happen. This support is shared across all customer bases except Mint Mobile's, only 14 percent of which strongly agreed with the proposition (although 73 percent somewhat agreed). While this policy position is popular, it also has critics, as 13 percent expressed strong disagreement.

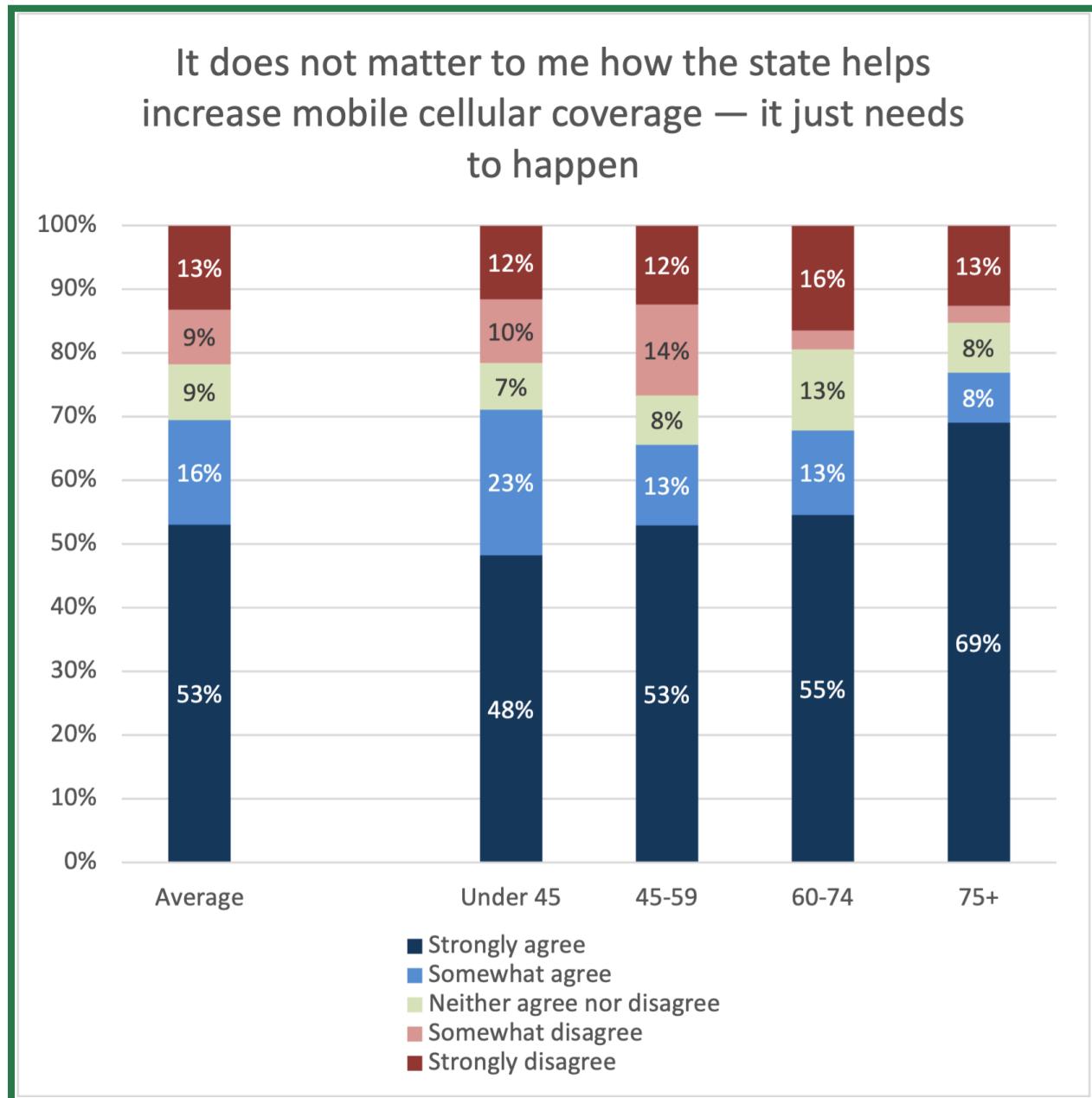
Figure 29: Levels of support for prioritizing improvement regardless of method, by provider



Similar to the above, support for cellular coverage expansion through any means is widespread across age groups. Those at or above the age of 75 expressed the greatest degree of agreement, as 69 percent strongly agreed with the proposition. Those

under the age of 45 expressed the least enthusiasm, although 48 percent of the group still expressed strong agreement with the prompt.

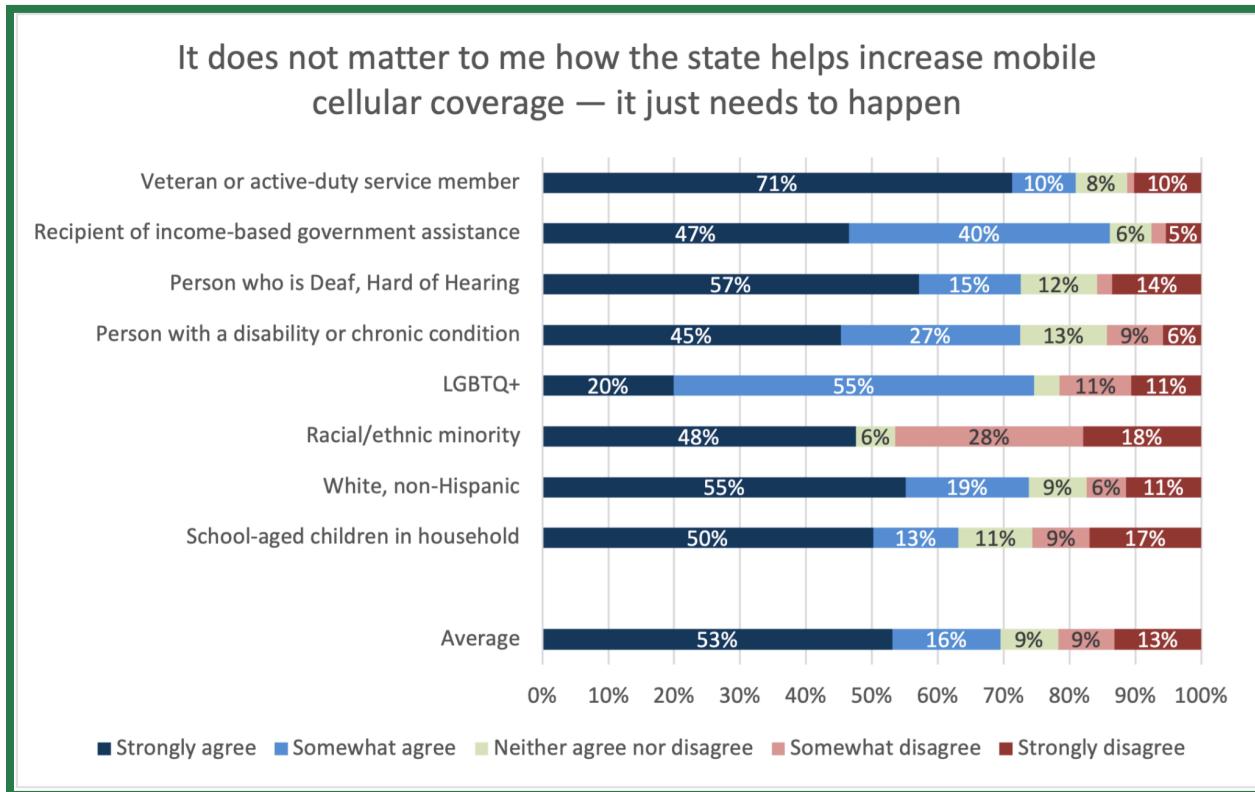
Figure 30: Levels of support for prioritizing improvement regardless of method, by age group



Veterans were the surveyed demographic group that voiced the strongest agreement with the proposition, at 71 percent. On the other hand, racial and ethnic

minorities stand out as more hesitant: 46 percent reported strongly or somewhat disagreeing with the proposition. Therefore, it may be important to more deeply understand racial and ethnic minorities' opinions before setting a policy agenda.

Figure 31: Levels of support for prioritizing improvement regardless of method, by population group



2.2 Healthcare

In a survey of healthcare workers in the state, clear evidence emerged that improving mobile connectivity would improve healthcare delivery. First, use of mobile broadband is widespread among healthcare workers; 75 percent of healthcare workers surveyed said they use a mobile device as part of their job. Notably, more than 65 percent of those surveyed said that challenges with mobile broadband coverage hindered their work either daily or multiple times a week. During an interview, the Secretary of Human Services reported that the lack of connectivity can also be a safety concern for healthcare workers who provide services in an individual's home.

This healthcare work is vitally important — often for the most vulnerable of Vermonters: 88 percent of respondents reported working with vulnerable populations. Part of the reason mobile broadband challenges are so acute with vulnerable populations is that lower-income households use mobile broadband as their sole means of accessing the internet more often than wealthier households.

According to the Pew Research Center, “as of early 2021, 27 percent of adults living in households earning less than \$30,000 a year are smartphone-only internet users — meaning they own a smartphone but do not have broadband internet at home,” and that percentage has more than doubled since 2013.¹⁰ Vulnerable populations more often seek services via mobile devices (e.g., calling to make an appointment or attending telehealth appointments), so a lack of adequate cell phone signal strength is therefore particularly impactful for those who cannot afford a home connection. According to an interview with the Director of Outreach for AARP, the lack of connectivity affects older residents’ ability to use telehealth services, which can both increase costs and risks when traveling during winter months.

Perhaps due to these realities, in a strong endorsement of the importance of mobile broadband coverage, 93 percent of surveyed healthcare workers asserted that better cell service would result in more efficient and effective care.

2.3 Public Safety

Connectivity — especially mobile broadband — is a public safety issue. In locations along roadways without mobile service, motorists need a cellular signal to call for help after an accident or if their vehicle breaks down, particularly along the state’s 8,550 miles of dirt road,¹¹ where distances between houses may be greater and traffic volume lower.

Similarly, people in emergency situations inside homes may also need to call 911 using a cell phone due to not subscribing to a landline, lack of immediate access to a landline, or needing to seek help discreetly in domestic violence situations.

¹⁰ Emily A. Vogels (2021) “Digital Divide Persists Even as Americans With Lower Incomes Make Gains in Tech Adoption.” Available at <https://www.pewresearch.org/short-reads/2021/06/22/digital-divide-persists-even-as-americans-with-lower-incomes-make-gains-in-tech-adoption/#:~:text=As%20of%20early%202021%2C%2027.increase%20from%202012%25%20in%202013>. Accessed November 29, 2023.

¹¹ Agency of Transportation (2023) “General Statistics.” Available at <https://vtrans.vermont.gov/planning/maps/stats>. Accessed February 28, 2024.

Premises without mobile coverage may not be able to reach 911 during an emergency if no landline is available.

Of almost 500 respondents in a survey of Vermont residents, 29 percent reported having called 911 using a mobile phone; however, 14 percent of those who called were not able to connect to a call-taker on their first call.

These issues extend to first responders as well. In a survey, 33 percent of first responders said they lose cell service multiple times a day on their way to or from a call, while 22 percent lose service multiple times a week. The Windsor County Sheriff expressed concerns about officer safety when responding to potentially dangerous situations; without cell service, he may not know the current location and status of dispatched officers. Not only does a lack of mobile service impact first responder safety, it greatly decreases operational efficiencies; when asked if improving mobile broadband would reduce costs and improve efficiencies, 68.5 percent of surveyed employees said yes.

2.4 Business Connectivity Needs

Vermont has a long and robust history of small businesses being the backbone of the state. There are over 77,000 small businesses across the state that employ 61 percent of the private workforce.^{12,13} Small businesses are a major factor in Vermont's economic development. Businesses can overcome geographical constraints with an online presence that could include a broader range of services or products, solicitation of customers, and online sales.

According to a survey of business owners throughout Vermont, 80.8 percent stated that employees use mobile broadband to perform core job functions, and yet 78.2 percent also stated that mobile cell service in Vermont was inadequate for their needs. While 42 percent of rural small businesses have trouble using technology, only 25 percent of larger rural businesses experience technology problems,

¹² Maria Lara Bregatta, et al. (2023) "Small Business Owners: Solving the Child Care Crisis Will Take Courage," *VTDigger*. Available at <https://vtdigger.org/2023/04/10/small-business-owners-solving-the-child-care-crisis-will-take-courage/>. Accessed December 12, 2023.

¹³ Vermont Business Magazine (2022) "2022 Vermont Small Business Profiles Available," *VermontBiz*. Available at <https://vermontbiz.com/news/2022/september/02/2022-vermont-small-business-profiles-available>. Accessed December 12, 2023.

indicating that rurality “magnifies the technological challenges faced by the smallest of small businesses.”¹⁴

In addition, businesses without adequate connectivity miss out on advancements that can make them more efficient. A recent study by Pennsylvania State University and the National Science Foundation found that adopting cloud-based software services drove innovation of business services by 6 percent in both rural areas and urban areas where businesses had access to robust connectivity, but that businesses in rural areas without connectivity were unable to achieve those gains tied to cloud-based software.¹⁵ In other words, robust connectivity has meaningful and measurable impacts on business efficiency and innovation; businesses without broadband access do not perform as well as businesses with access.

Lack of connectivity impacts the customers that support Vermont businesses as well. In a survey of Vermont business owners, 83 percent stated that their customers use mobile broadband to access or use their services. Given small businesses are supported by Vermonters, and Vermonters are supported by small businesses, it is essential to improve the connectivity that enables these relationships.

2.5 Remote Work

One of the most compelling and urgent reasons to meet the state’s goals of universal wireline and wireless broadband service is to ensure that the population of remote workers continues to grow in the state.

Remote work provides specific benefits to workers that are often amplified in rural areas. According to research reported by *Forbes*, “54 [percent] of employees say they would change jobs for one that offered them more flexibility, which results in an average of 12 [percent] turnover reduction after a remote work agreement is offered.”¹⁶ Considering that a business’s approximate cost of losing a single employee

¹⁴ Lorien Zhao (2023) “How the Digital Divide Affects America’s Rural Small Businesses,” *Notes from the Field*. Available at <https://www.clevelandfed.org/publications/notes-from-the-field/2023/nftf-20230907-how-the-digital-divide-affects-americas-rural-small-businesses>. Accessed December 12, 2023.

¹⁵ Kirsten Devlin (2023) “Digital Divide Hinders Rural Innovation, Study Shows.” Available at <https://www.psu.edu/news/research/story/digital-divide-hinders-rural-innovation-study-shows/>. Accessed December 15, 2023.

¹⁶ Laurel Farrer (2020) “5 Proven Benefits of Remote Work for Companies,” *Forbes*. Available at <https://www.forbes.com/sites/laurelfarrer/2020/02/12/top-5-benefits-of-remote-work-for-companies/?sh=5a614fda16c8>. Accessed January 9, 2024.

is one-third of that position's annual salary,¹⁷ any reduction in turnover can save a business significant funds over the tenure of the employee.

Remote work opportunities also help Vermonters find jobs that fit their skills and experience, allowing them to stay in Vermont and contribute to the state's economy and culture. As an aging state, Vermont can use remote work opportunities to attract and retain young professionals who will make Vermont their home.

Veterans can greatly benefit from remote work opportunities. Veterans make up over 5.3 percent¹⁸ of Vermont residents. Remote work can allow those with disabilities from their service – 21 percent¹⁹ of Vermont veterans – to find meaningful work. For example, remote work can afford veterans with post-traumatic stress disorder a more welcoming workspace and flexibility to attend medical appointments.²⁰

Remote work opportunities also allow Vermont businesses to hire and retain highly qualified employees in situations where local workforce supply is insufficient. For example, information technology (IT) professionals are needed in a variety of sectors and can execute significant portions of their work remotely. With sufficient broadband service, Vermont businesses can hire IT professionals from other parts of the country, allowing those businesses to access vital services.

Vermont benefits from remote workers in dual-earner households. A job-seeker can accept an in-person position in a rural location, filling in-demand roles such as healthcare professionals and teachers, without the undue stress of their partner needing to find an appropriate position if they are able to retain their remote

¹⁷ Yaren Fadiloglulari, "2023 Employee Turnover: Statistics, Trends & Reasons," *Gomada*. Available at <https://www.gomada.co/blog/statistics-on-employee-turnover#:~:text=The%20cost%20of%20employee%20turnover%20is%20estimated%20to%20be,%25%20of%20employees%27%20base%20pay.&text=9>. Accessed January 9, 2024.

¹⁸ Vermont Community Broadband Board (2023) *Vermont's Digital Equity Plan*. Available at <https://publicservice.vermont.gov/sites/dps/files/documents/VT%20Digital%20Equity%20Plan%20Public%20Comment%20Draft.pdf>. Accessed December 15, 2023.

¹⁹ Vermont Community Broadband Board (2023) *Vermont's Digital Equity Plan*. Available at <https://publicservice.vermont.gov/sites/dps/files/documents/VT%20Digital%20Equity%20Plan%20Public%20Comment%20Draft.pdf>. Accessed December 15, 2023.

²⁰ Davis Winkie (2020) "Remote Work Could Be Silver Lining of Pandemic for Some Veterans, Including Those With PTSD," *Army Times*. Available at <https://www.armytimes.com/news/your-army/2020/11/27/remote-work-could-be-silver-lining-of-pandemic-for-some-veterans-including-those-with-ptsd/>. Accessed January 9, 2024.

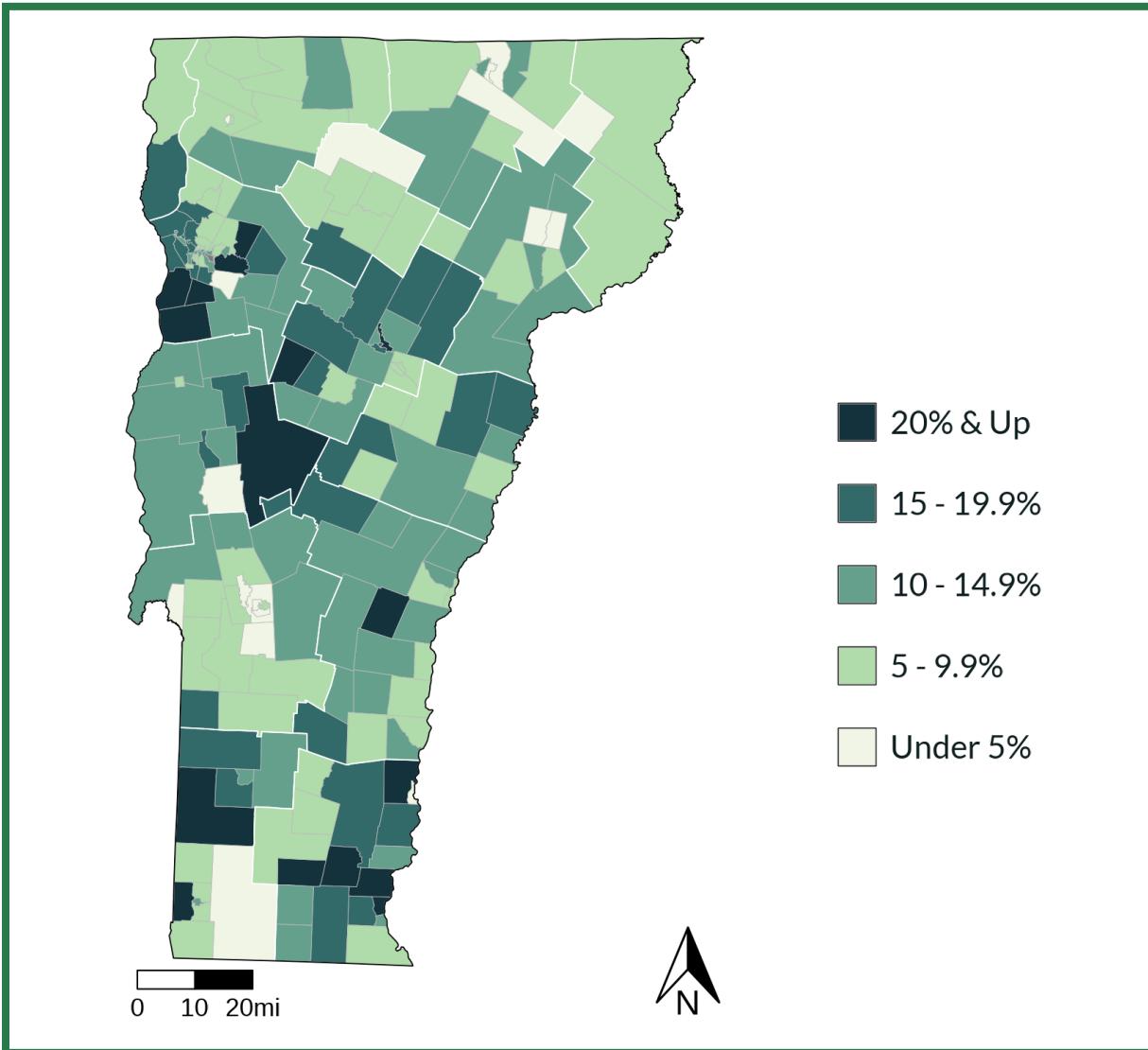
employment.²¹ According to an interview with the Vermont Principals' Association, there have been numerous incidents where a teacher or administrator must either not take or resign from a position because their partner cannot find appropriate work and their location does not have the reliable high-speed broadband connection necessary for remote employment.

Vermont has a marginally higher rate of residents working from home than the nation overall – 11 percent of employed Vermonters versus 10 percent of employed Americans. The number of residents working remotely will likely continue to grow, both from people relocating to the state but keeping their remote job and from Vermonters seizing the economic opportunities provided by remote roles. The map below shows the percentage of telecommuters by census tract.

²¹ Prithwiraj Choudhury (2020) "Our Work-From-Anywhere Future," *Harvard Business Review*. Available at <https://hbr.org/2020/11/our-work-from-anywhere-future>. Accessed January 9, 2024.

Figure 32: Work-from-home metrics by Vermont census tract

The share of employed Vermonters who work from home (11 percent) is outpacing the share of employed Americans who work from home (10 percent)



Source: American Community Survey 5-year estimates (2021)

Some census tracts have over 20 percent of their employed population working from home, while others have under 5 percent. Even the tracts with the lowest percentage of remote workers still represent significant populations doing business from home, and remote workers have become a sizable share of the economy and tax base. Because these jobs are mobile, ensuring the state's connectivity landscape meets their needs now and in the future will be essential to growing and maintaining that workforce.

Section 3: Current State of Telecommunications Infrastructure and Coverage in Vermont

This section provides an overview of the current state of telecommunications providers and coverage in Vermont, including background information on ISPs, speeds, and technologies, as well as mobile and fixed broadband coverage across the state.

3.1 ISPs and Infrastructure Owners in Vermont

A wide array of providers operate throughout Vermont, from large national corporations like Comcast, Verizon, AT&T, and T-Mobile to local companies such as VTel, Waitsfield Champlain Valley Telecommunications, and many others. This section focuses on aspects of the provider landscape that are new, emerging, or particularly relevant to the stakeholders and readers of this Plan and the ability of the state to meet its telecommunications goals.

3.1.1 Communications Union Districts

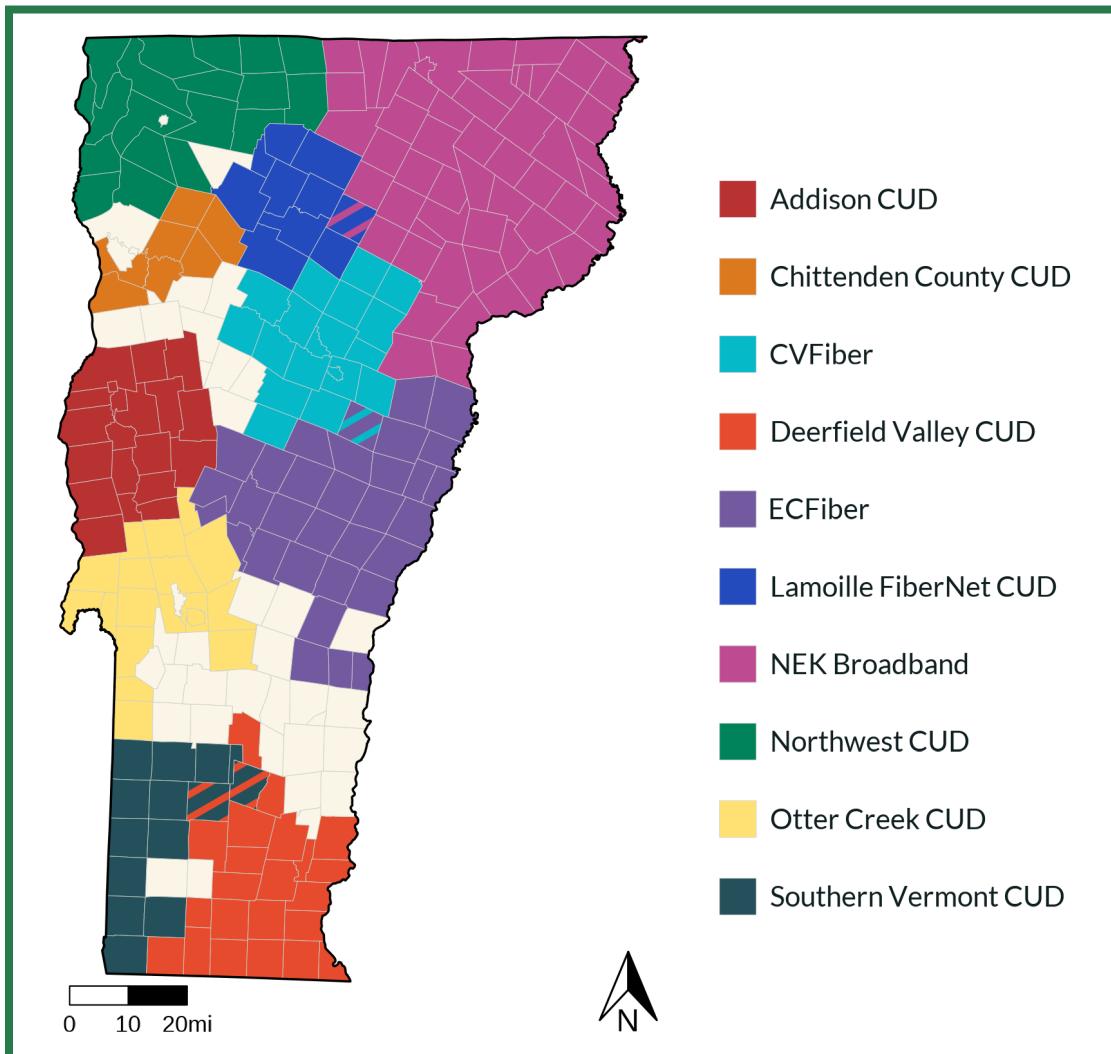
In 2015, the Vermont Legislature authorized the formation of Communications Union Districts (CUD),²² enabling two or more towns to join together as a municipal entity and build infrastructure, giving more control to communities over the broadband solutions implemented in their area and providing a mechanism for expanding broadband in the most rural areas of the state. Much like a water and sewer or solid waste district, CUDs allow towns to aggregate demand for a service, find efficiencies by sharing the operation of the district, and leverage their combined purchasing power.

There are currently ten CUDs representing 216 member towns – more than 76 percent of the state’s population and 93 percent of unserved premises²³ – illustrated in the map below.

²² 30 V.S.A. § 3051. Available at <https://legislature.vermont.gov/statutes/section/30/082/03051>. Accessed January 15, 2024.

²³ Vermont Community Broadband Board, “Communications Union Districts.” Available at https://publicservice.vermont.gov/sites/dps/files/documents/Vermont%27s_CUDs_to_Post.pdf. Accessed November 30, 2023.

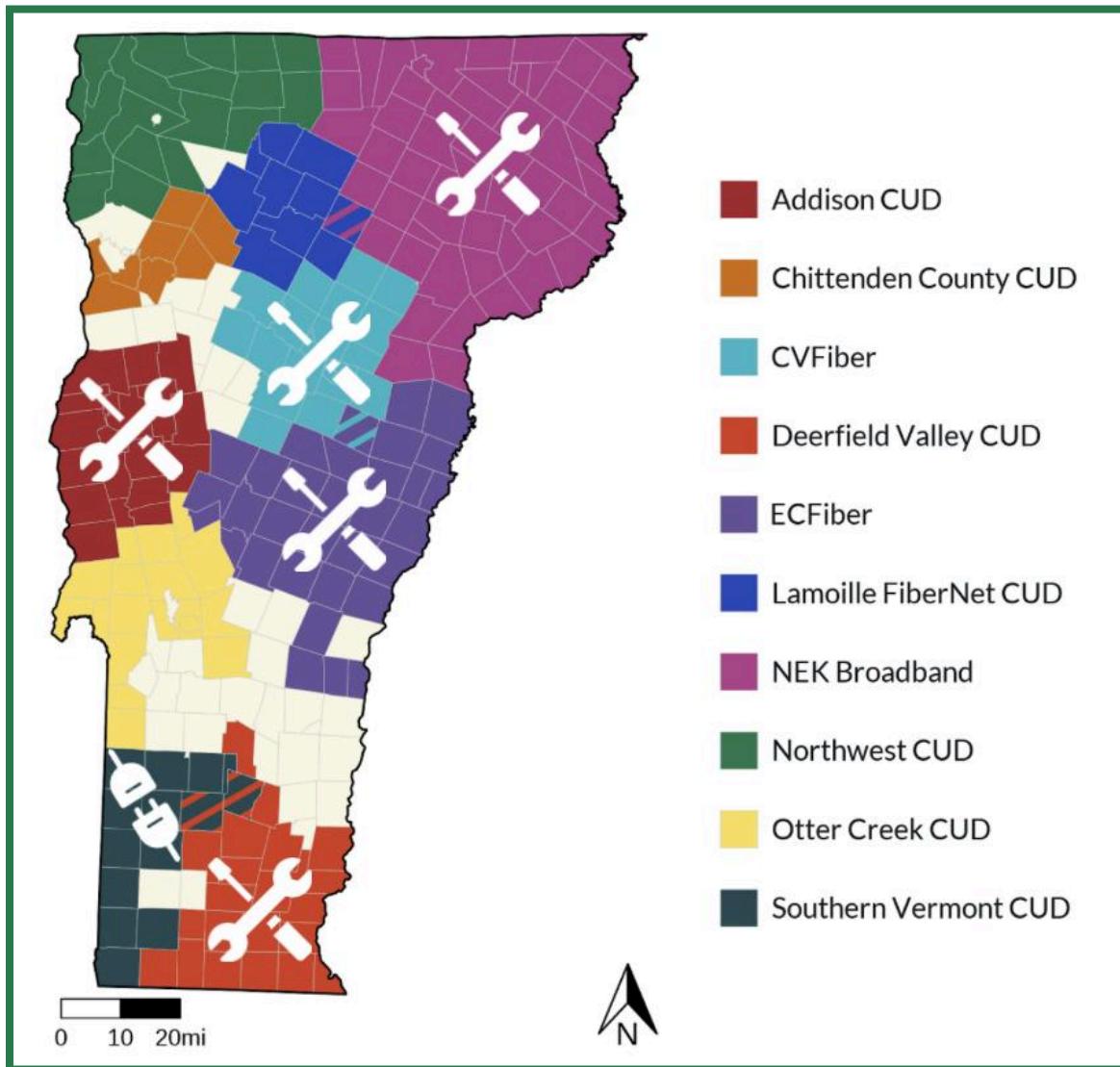
Figure 33: Vermont's Communications Union Districts



Source: Vermont Department of Public Service (Feb. 2023)

CUDs are committed to achieving universal service, prioritizing all unserved on-grid addresses. Infrastructure construction is underway or planned throughout the state; as of the publication of this Plan, SoVT CUD and ECFiber have completed their network builds in line with their original missions, and other CUDs have begun building their networks – like CVFiber, DVFiber, Maple Broadband, and NEK Broadband. Deployments are reportedly planned for the spring and summer of 2024 for Chittenden County CUD, Lamoille FiberNet, Northwest Fiberworx, and Otter Creek CUD. The following map shows which CUDs have builds in progress or completed:

Figure 34: Construction in Vermont's Communications Union Districts



Source: Vermont Department of Public Service (Feb. 2023)

Notes: Wrench icon indicates construction is in progress. Plug icon indicates construction is complete and service is available. No icon indicates construction has not yet started.

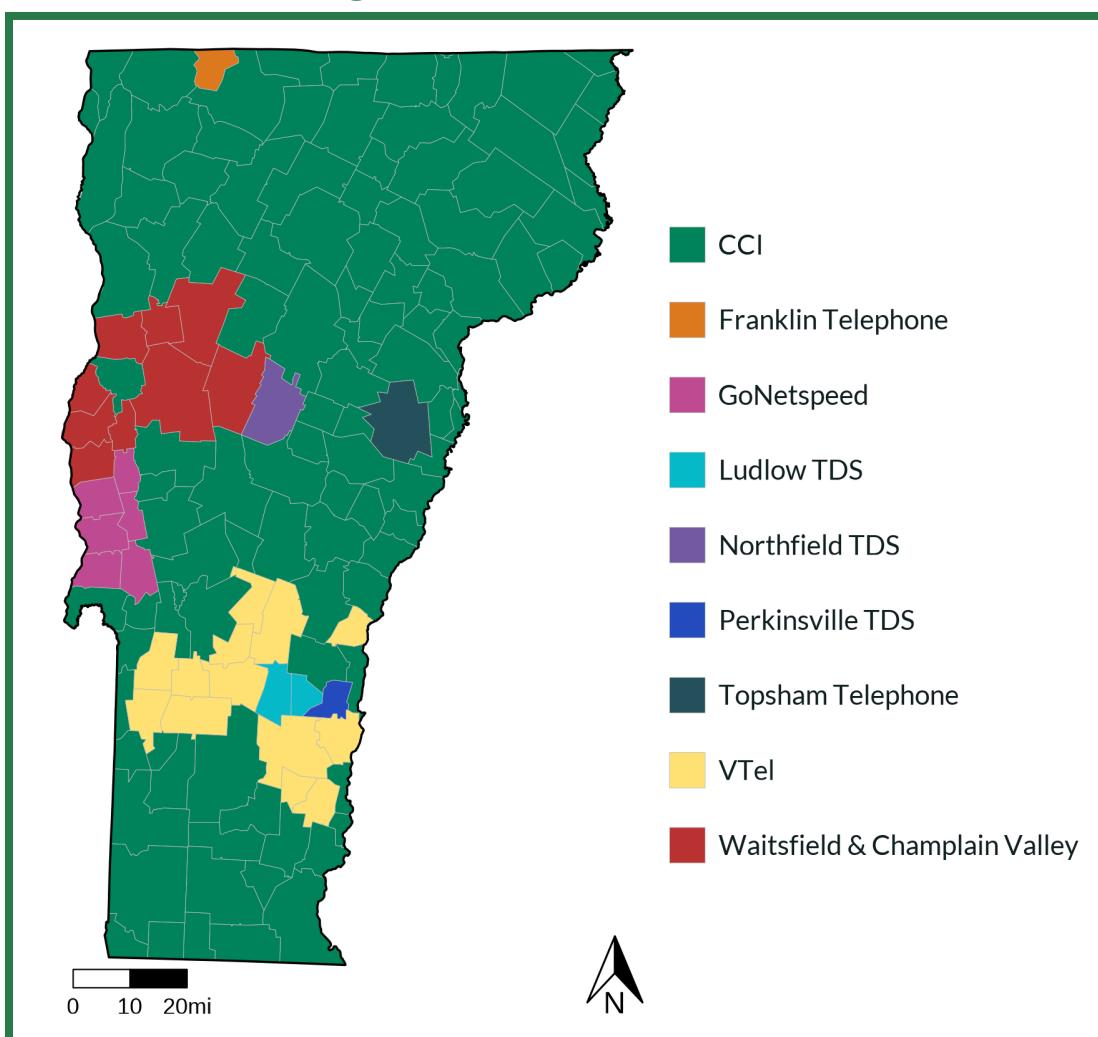
Importantly, every CUD is working with an ISP partner to provide service over the CUD's network. Several ISPs are also implementing various forms of an "open access" model, which would allow multiple providers to serve the same pool of customers using CUD infrastructure.

3.1.2 Incumbent Local Exchange Carriers

Incumbent Local Exchange Carriers (ILECs) are landline telephone companies that were originally part of AT&T before their monopoly was split up into seven regional companies in 1984. They provide local voice services to everyone in a jurisdiction, traditionally over copper wires, and typically offer internet service using the same infrastructure (i.e., dial-up and DSL). ILECs have major community infrastructure presences and are increasingly providing fiber broadband by overlaying fiber onto their old copper cables.

Vermont's ILECs and their coverage areas are shown in the map below.

Figure 35: Vermont's ILEC areas



Source: Vermont Department of Public Service (2019)

Vermont's largest ILEC is Consolidated Communications (CCI), which makes DSL available to approximately 64 percent of state premises (representing the areas in green above) — and offers fiber to a growing number of premises under the name Fidium.

New England has been a central focus of CCI's FTTP expansion efforts. Of the approximately 1.6 million fiber passings they have targeted, about 1.1 million will be in Northern New England (Maine, New Hampshire, and Vermont). While it is unclear exactly how many of those 1.1 million passings will be in Vermont, CCI has estimated that 114,000 Vermont addresses should have access to their Fidium fiber service in early 2024.²⁴

This expansion has been in part enabled by CCI's comparatively low costs per passing when utilizing the pole space and attachment rights from their existing copper plant. CCI's Fairpoint assets, acquired in 2017, have provided a cost-effective springboard for their fiber builds according to CCI leadership, and it is reasonable to assume they will continue to focus on building in areas where the cost per passing is lowest.²⁵

Additionally, CCI targets builds in areas where they can anticipate a favorable competitive landscape. According to public information and presentations to investors,²⁶ the company benefits from having little overlap with other fiber providers and from operating in duopolies where they compete against a single

²⁴ Fidium Fiber (2023) "Fidium Adds 10,000-Plus New Fiber Internet Locations in Vermont; More Than 114,000 Vermonters Will Have Multi-Gig Access by Year's End." Available at <https://www.consolidated.com/about-us/news/article-detail/id/909/fidium-adds-10000-plus-new-fiber-internet-locations-in-vermont-more-than-114000-vermonters-will-have-multi-gig-access-by-years-end>. Accessed December 12, 2023.

²⁵ In investor presentations, CCI highlights their relatively low cost per fiber passing and direct cost to connect, and notes that their existing pole access arrangements gives them "aerial fiber access to 80% of Northern New England." See Consolidated Communications (2023) "J.P. Morgan Global High Yield & Leveraged Finance Conference," slide 7. Available at https://lufax.q4cdn.com/131964560/files/doc_events/2023/Mar/07/jpm_2023_final.pdf. Accessed February 2, 2024.

²⁶ Consolidated Communications (2023) "Consolidated Communications to Be Acquired by Searchlight and BCI." Available at https://lufax.q4cdn.com/131964560/files/doc_presentations/2023/10/cnsl_transaction-presentation_final_10-16-23.pdf. Accessed January 31, 2024.

cable provider in 90 percent of their markets.²⁷ Their stated target penetration rate is 40 percent^{28,29} by year five after passing a market with fiber.

3.2 Unserved, Underserved, and Served Premises

Infrastructure deployment is occurring rapidly throughout the state, as roughly \$441.8 million of fiber construction is happening concurrently with the writing of this Plan from American Rescue Plan Act (ARPA)³⁰ and Capital Projects Fund (CPF)³¹ awards. Therefore, the information presented in this Plan represents a snapshot in time based on the most up-to-date data currently available, but readers should note that the maps presented here almost certainly underestimate the actual coverage at the time of publication.

Vermont Act 71 defines premises as “served” if they have access to broadband infrastructure capable of delivering speeds of at least 25 Mbps download and 3 Mbps upload, “unserved” premises have access to speeds below 4 Mbps download and 1 Mbps upload or no access at all, and “underserved” premises have access to speeds between 4/1 Mbps and 25/3 Mbps.³² The map below shows the locations of premises that are currently unserved or underserved, per the Act 71 definition.

²⁷ Nicole Ferraro (2022) “Consolidated CEO Cheers Limited Competition in Fiber Markets,” *LightReading*. Available at <https://www.lightreading.com/fttx/consolidated-ceo-cheers-limited-competition-in-fiber-markets>. Accessed February 2, 2024.

²⁸ For new fiber builds, CCI targets 14% in year one, 24% in year two, and 33% in year three, with a terminal penetration target of 40% by year five. See Consolidated Communications (2023) “Q2 2023 Earnings,” slide 10. Available at https://lufax.q4cdn.com/131964560/files/doc_financials/2023/q2/Q2-23-CNSL-Earnings-Presentation_FINAL_2.pdf. Accessed February 2, 2024.

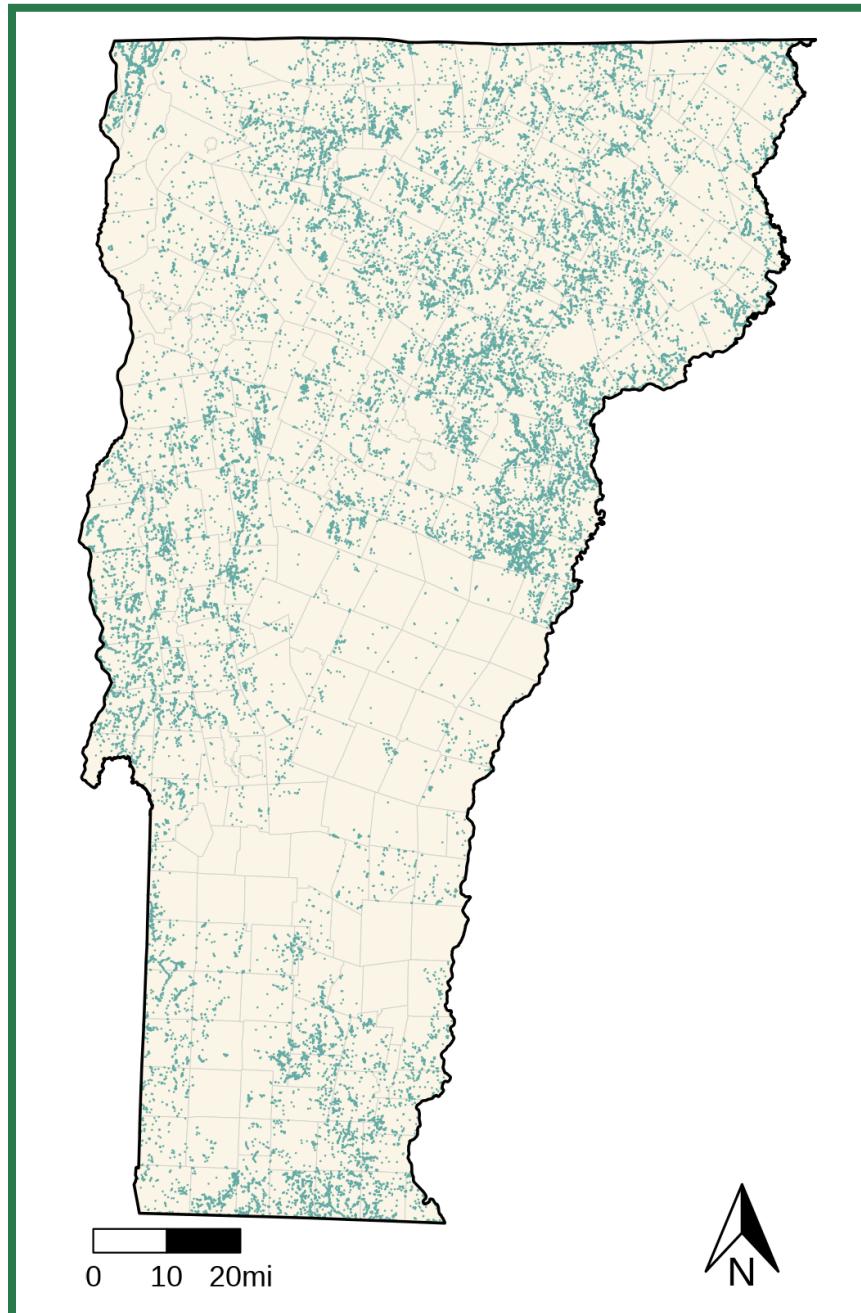
²⁹ Sue Marek (2021) “Consolidated Aims for 40% Fiber Penetration Rate in Four Years,” *FierceTelecom*. Available at <https://www.fiercetelecom.com/telecom/consolidated-aims-40-fiber-penetration-rate-four-years>. Accessed January 31, 2024.

³⁰ NTIA (2023) “Biden-Harris Administration Announces State Allocations for \$42.45 Billion High-Speed Internet Grant Program as Part of Investing in America Agenda.” Available at <https://www.ntia.gov/press-release/2023/biden-harris-administration-announces-state-allocations-4245-billion-high-speed>. Accessed November 21, 2023.

³¹ U.S. Department of the Treasury (2023) *Capital Projects Fund Award Fact Sheet: Vermont*. Available at <https://home.treasury.gov/system/files/136/VT-CPF-Award-FactSheet.pdf>. Accessed February 26, 2024.

³² Act 71 (2021). Available at <https://legislature.vermont.gov/Documents/2022/Docs/ACTS/ACT071/ACT071%20As%20Enacted.pdf>. Accessed November 21, 2023.

Figure 36: Vermont premises currently unserved or underserved by broadband



Source: Vermont Department of Public Service (Dec. 2023)

Notes: Unserved and underserved premises do not have access to speeds of 25/3 Mbps or better.

This map reveals a particularly high concentration of unserved and underserved premises in Vermont's Northeast Kingdom into the surrounding counties, western Addison County into northwest Rutland County, and Windham County.

However, in 30 V.S.A. § 202c, the state set the goal of extending infrastructure capable of 100 Mbps symmetrical speeds to *every* on-grid E-911 residential and business location by the end of 2024.³³ The state also allows grant funding to fund infrastructure to premises with less than 100/20 Mbps.

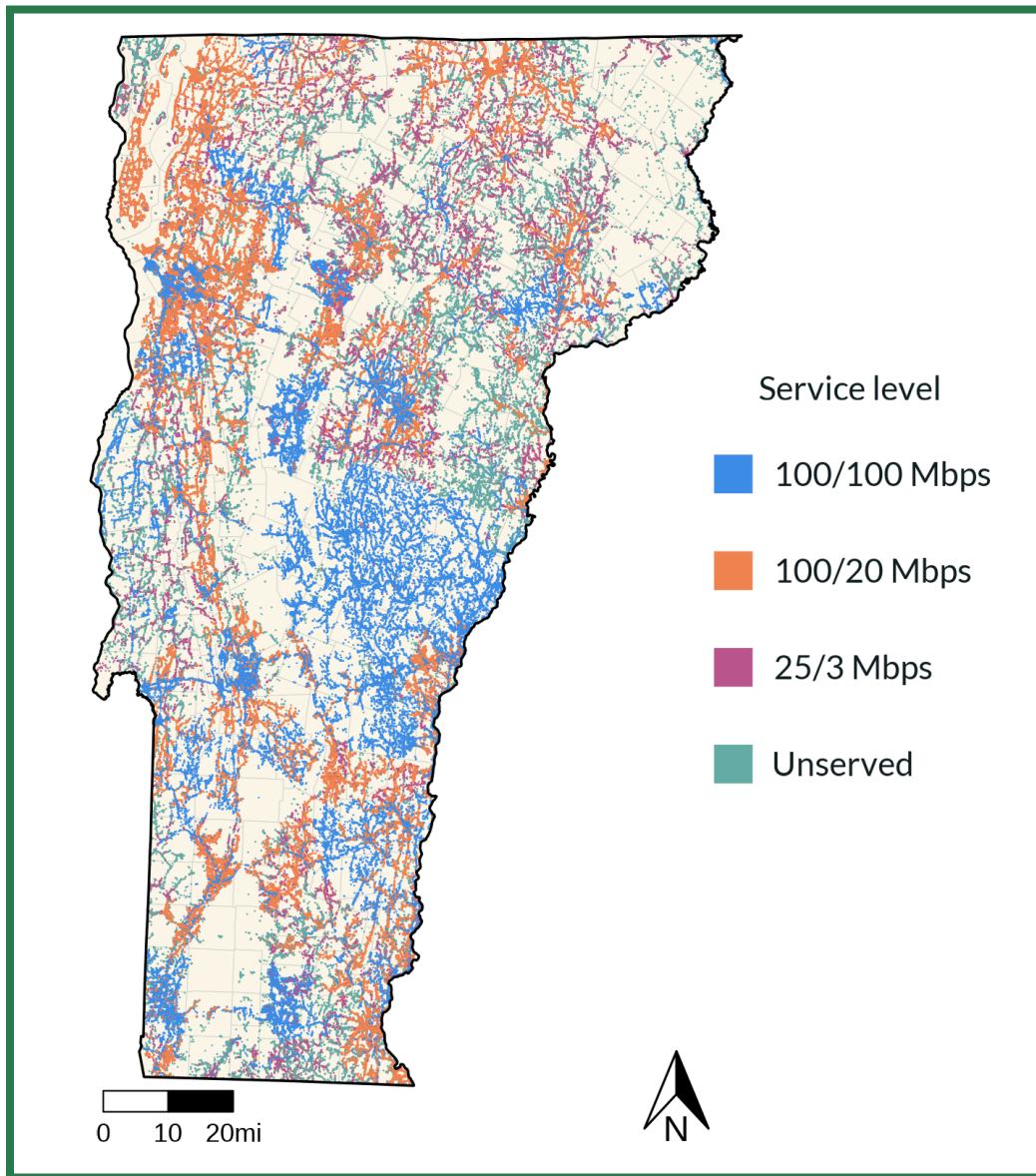
These increased state criteria were recently adopted at the federal level. On March 14, 2024, the Federal Communications Commission (FCC) raised the threshold for a premise being considered served from 25/3 Mbps to 100/20 Mbps.³⁴

The following map shows premises-level service tiers that conform to the state's grant programs and statutory goals.

³³ 30 V.S.A. § 202c. Available at <https://legislature.vermont.gov/statutes/section/30/005/00202c>. Accessed November 21, 2023.

³⁴ Federal Communications Commission (2024) "FCC Increases Broadband Speed Benchmark." Available at <https://docs.fcc.gov/public/attachments/DOC-401205A1.pdf>. Accessed April 26, 2024.

Figure 37: Premises in Vermont by broadband service level



Source: Vermont Department of Public Service (Dec. 2023)

At the time of passage of Act 71,³⁵ there were approximately 254,000 premises – representing 82 percent of the state’s addresses – lacking access to 100 Mbps symmetrical speeds in 2021. In 2022, there were 243,408 premises (or 70.4 percent of all addresses in the state) remaining. By 2023, that number dropped to 189,506 premises, or 60.13 percent of all addresses in the state, which represents the most

³⁵ Act 71 (2021). Available at https://legislature.vermont.gov/Documents/2022/Docs/ACTS/ACT071_ACT071%20As%20Enacted.pdf. Accessed November 21, 2023.

recently available data. The following chart describes the full distribution of service levels in Vermont households from that data:

Table 1: Premises in Vermont by broadband service level in 2023

Speed Tier	Served	Percent	Not Served	Percent
100/100 Mbps	125,686	39.87%	189,506	60.13%
100/20 Mbps	256,668	81.43%	58,524	18.57%
25/3 Mbps	287,758	91.30%	27,407	8.70%
4/1 Mbps	313,435	99.44%	1,757	0.56%

Source: Vermont Department of Public Service (2023)

3.3 Wireline Broadband Coverage

This section discusses the wireline broadband currently available in Vermont either through coaxial cable infrastructure or fiber optic infrastructure and provides context for the current fiber expansion throughout the state.

3.3.1 Coaxial Cable and Hybrid Cable/Fiber Coverage

Coaxial cable broadband is used by a significant portion of internet users in the state who subscribe to cable television providers such as Charter or Comcast – and in new construction especially, these providers are also building hybrid cable/fiber systems.

Cable and hybrid cable/fiber internet speeds can vary by typical network factors like congestion and oversubscription, and by the generation of electronics used on the ends of the network, which is referred to as the Data Over Cable Service Interface Specifications (DOCSIS). The most common DOCSIS version available today is DOCSIS 3.1, which provides asymmetrical speeds that range from 100 Mbps to 1 Gbps download and typically up to 20 Mbps upload speeds. In some urban markets, cable providers have been deploying DOCSIS 4.0, which they advertise can provide symmetrical speeds of 1 Gbps or better; however, due to its lack of population density, Vermont is unlikely to see widespread cable upgrades to DOCSIS 4.0 ahead of urban markets.

3.3.2 Fiber Coverage

Fiber-to-the-premises (FTTP, otherwise known as fiber-to-the-home [FTTH]) technology provides fast, symmetrical service, and the vast majority of new deployments in Vermont and in the nation use this infrastructure. FTTP is the easiest infrastructure to scale to provide faster speeds as bandwidth needs increase.

The two basic FTTP architecture types are Active Ethernet, which provides a dedicated fiber strand for each customer, and Passive Optical Networks (PONs), which allow users to share strands. Both Active Ethernet and the latest widely used PON networks (known as XGS-PON) network types can provide symmetrical speeds of 10 Gbps, and some providers, such as EPB in Chattanooga, Tennessee, have started making symmetrical 25 Gbps service available.

PON networks tend to be less expensive to deploy in rural areas, and either architecture (i.e., PON or Active Ethernet) allows for future scalability over the multidecade life of the infrastructure. PON networks also do not rely on powered cabinets; since PON networks can operate only with power at the central office and major hubs, they can be less susceptible to extended power outages (with appropriate backup power at the hub). Significant research and design work is being done on PON technology in anticipation of ISPs wanting to offer even faster speeds in the future, and this technology is expected to remain scalable and robust for decades to come.

3.3.3 Fiber Expansion Plans

As discussed, the fiber landscape in Vermont is rapidly changing. The following summarizes the primary drivers of infrastructure expansion in the state, which are all either ongoing or will begin shortly.

In December 2020, the FCC announced that five companies won RDOF awards to collectively serve approximately 18,400 E-911 physical addresses scattered in census blocks across the state: Charter Fiberlink, ECFiber, Kingdom Fiber, SpaceX/Starlink, and Consolidated Communications.³⁶ Since then, SpaceX's award has been retracted because their technology was not able to deliver promised speeds and latencies. The

³⁶ Department of Public Service, “Rural Digital Opportunity Fund.” Available at <https://publicservice.vermont.gov/telecommunications-and-connectivity/rural-digital-opportunity-fund>. Accessed November 21, 2023.

remaining winners must complete the deployments to all locations within their award areas by the end of 2026.³⁷

Second, Consolidated Communications, Inc., intends to build their fiber network out to thousands of additional passings by 2026. Their investment strategy to date has focused on winning over customers who are currently subscribed to cable broadband in markets where they can be the first to offer a fiber optic connection, so they will primarily be overbuilding in locations where cable service already exists.

Third, as discussed, the state is awarding approximately \$441.8 million via ARPA³⁸ and Capital Projects Fund³⁹ allocations to fiber deployments. These awards are ongoing and supporting the majority of deployments in the rural, unserved areas of the state.

Lastly, the National Telecommunications and Information Administration (NTIA) has designated approximately \$229 million in grant funds to Vermont via the BEAD Program.⁴⁰ Vermont will be making competitive awards to BEAD Program subgrantees for last-mile broadband deployment, and intends for awardees to begin construction in 2025.

Collectively, this signals that the wireline landscape in Vermont is changing rapidly, with fiber deployments being the vast majority of new construction.

This ongoing construction is a critical factor underpinning the analysis, strategy, and recommendations in this Plan. With so much fiber construction happening, the state has the opportunity to focus next on improving wireless broadband – and in particular mobile broadband connectivity. Mobile broadband expansion is made more feasible by a greater penetration of fiber because greater fiber penetration

³⁷ Department of Public Service, “RDOF Award Areas in Vermont.” Available at <https://publicservice.vermont.gov/sites/dps/files/documents/Connectivity/RDOF%20VT%20Map.pdf>. Accessed November 21, 2023.

³⁸ Office of Governor Phil Scott, “Governor Scott’s Transformational Investments for American Rescue Plan Funds.” Available at <https://governor.vermont.gov/arpa>. Accessed December 6, 2023.

³⁹ U.S. Department of the Treasury (2023) *Capital Projects Fund Award Fact Sheet: Vermont*. Available at <https://home.treasury.gov/system/files/136/VT-CPF-Award-FactSheet.pdf>. Accessed February 26, 2024.

⁴⁰ NTIA (2023) “Biden-Harris Administration Announces State Allocations for \$42.45 Billion High-Speed Internet Grant Program as Part of Investing in America Agenda.” Available at <https://www.ntia.gov/press-release/2023/biden-harris-administration-announces-state-allocations-4245-billion-high-speed>. Accessed November 21, 2023.

into rural areas reduces the cost of fiber backhaul. The following section describes the current state of wireless broadband in Vermont.

3.4 Wireless Broadband Coverage

Recognizing the importance of mobile broadband, Vermont set a goal of achieving universal mobile access along roadways and near universal availability in premises throughout the state in 30 V.S.A. § 202c. This section describes the primary wireless technologies in the state, with a focus on mobile broadband in particular.

This focus does not detract from the role of fixed wireless broadband service in the connectivity landscape of the state, especially for consumers with clear sightlines to towers, consumers who do not have a need for multi-hundred megabit speeds, consumers with no access to or need for symmetrical speeds, and in some cases price-conscious consumers. However, fixed broadband for residential service is a technology that is most relevant to the BEAD planning efforts and is not able to provide symmetrical speeds in line with state goals. Therefore, this section focuses on mobile wireless broadband foremost.

3.4.1 Mobile Broadband

4G LTE technology is the current widely available mobile broadband technology used by carriers across the country.⁴¹ This technology provides strong signals and – with a clear line of sight from the cell tower to the mobile device and a manageable level of network traffic appropriate for the capacity of the radio and backhaul – can exceed 100 Mbps download and 20 Mbps upload, typically providing a good user experience for mobile broadband activities such as using navigation applications or sending and receiving pictures and videos.

Fifth generation (5G) LTE is a term that generally describes the latest generation of commercially available wireless technology, which can take a few forms. 5G LTE typically uses higher frequencies, as well as a wider range of frequency bands – including millimeter waves for the very highest speeds – and wider channels. All of this serves to provide users with higher speeds than was possible with 4G LTE, under the right conditions.

⁴¹ Petroc Taylor (2023) “Market share of mobile telecommunication technologies worldwide from 2016 to 2030, by generation,” Statista. Available at <https://www.statista.com/statistics/740442/worldwide-share-of-mobile-telecommunication-technology/>. Accessed December 11, 2023.

However, the limitations of this technology (i.e., its inability to penetrate materials) coupled with Vermont's hilly and wooded landscape means that carriers have not prioritized the deployment of 5G technology in many areas of the state. Stakeholders interviewed noted that some deployments have been made in dense areas like Burlington and on ski hills, but beyond that, there are almost no 5G LTE deployments in the state. In addition, carrier behavior (and in some cases, official carrier policy), has not shown that rural 5G deployments are not financially viable.⁴²

To understand the status of mobile broadband coverage in Vermont, the state performed drive tests in both 2018 and 2022, recording speeds and other factors along major roadways. Drive tests are used to measure the quality and usability of mobile broadband service in an area and are best performed during high-demand periods such as the morning and evening commute windows. Typically, drive tests performed by carriers use vehicles equipped with sophisticated and specific equipment to measure factors such as:

- Signal strength
- Signal quality (i.e., stability)
- Dropped calls

Together, the data points offer insight into where users can access mobile broadband services along roadways and at what quality. Drive tests are the most robust methods Vermont has to record the quality of mobile broadband service along roads across the state, not just on major highways. In Section 10.2.1, this Plan provides detailed recommendations for enhancing the state's drive test data collection.

In late 2018, the Department of Public Service undertook a drive test using six cell phones – each from a different carrier and with the same drive test application installed. In 2022, the Department again performed the test but used a more sophisticated application (Ookla Wind⁴³) that did not require multiple cell phones. Both tests, and the comparison between the two, provide an overview of where there

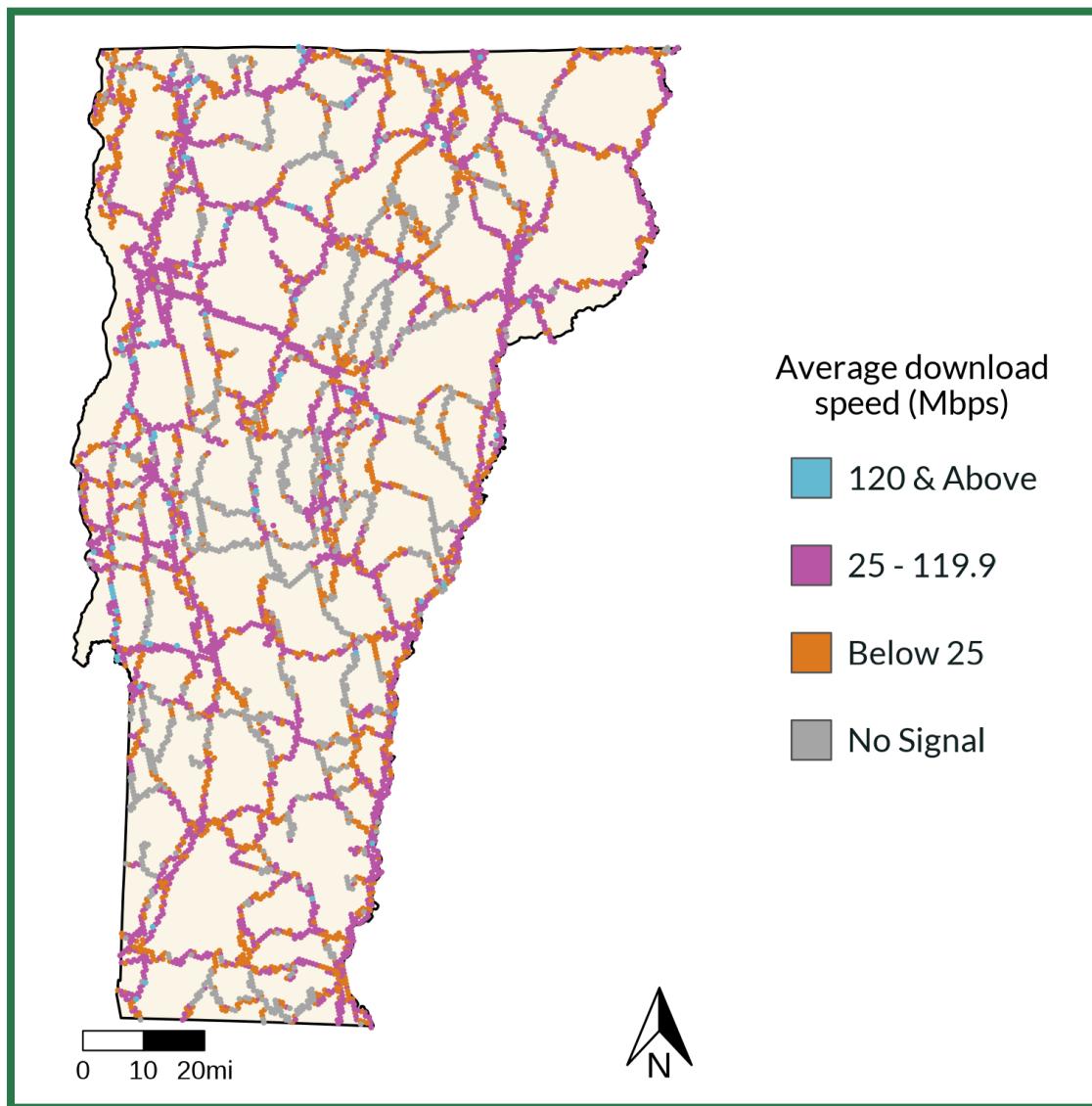
⁴² Jon Brodkin (2019) "Millimeter-wave 5G will never scale beyond dense urban areas, T-Mobile says," *Ars Technica*. Available at <https://arstechnica.com/information-technology/2019/04/millimeter-wave-5g-will-never-scale-beyond-dense-urban-areas-t-mobile-says/>. Accessed January 24, 2024.

⁴³ Ookla, "Ookla Wind." Available at <https://www.ookla.com/wind>. Accessed January 24, 2024.

is quality mobile broadband service, where it has improved since the last test, and where service is still needed.

The following map shows the average download speed by location along roadways in 2022, with places without mobile service marked in gray:

Figure 38: Average mobile wireless download speeds for all tested providers on Vermont roadways in 2022



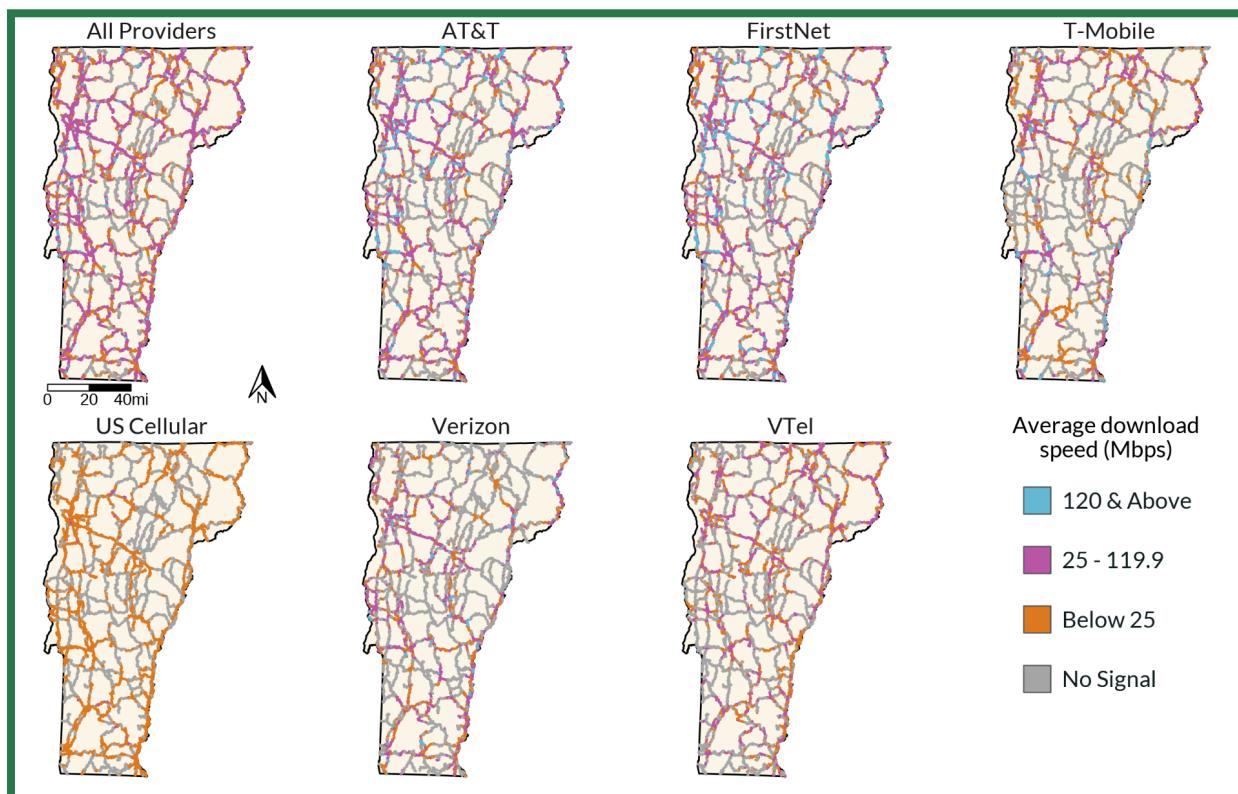
Source: Vermont Department of Public Service (2022)

Notes: Roads that were not tested in 2018 were removed. 2022 data includes drive test results for AT&T, FirstNet, T-Mobile, US Cellular, Verizon, and VTel.

The map shows almost complete coverage along Interstates 89 and 91, with the primary exception of a stretch of road around Exit 3. Many stretches of smaller highways show a clear lack of coverage, like Route 100 in Plymouth, which the Windsor County Sheriff confirmed is a long stretch of road with no service at all, including radio (which is used in addition to 4G LTE for emergency communications).

The 2022 drive test separated the data by cell phone provider, detailed in the maps below. Please see Appendix K for full-size versions of the maps.

Figure 39: Average mobile wireless download speeds on Vermont roadways in 2022 by provider



Source: Vermont Department of Public Service (2022)

Notes: Roads that were not tested in 2018 were removed. Please see Appendix K for full-size versions of the individual provider maps.

Over the past few years, AT&T has undertaken notable expansion efforts, fueled in part by their federally funded FirstNet obligations (please see Section 9.5.2 for more information on FirstNet). A representative of AT&T reported exceeding its FirstNet

obligations, deploying over 50 new towers in the state as well as numerous equipment upgrades at existing sites. Their sites have both commercial and FirstNet-specific equipment installed.

Due to the FirstNet deployments and network, AT&T has some coverage in areas that others do not, as does VTel. Verizon also has strong coverage in much of the state but shows less robust coverage in the Northeast Kingdom according to the drive tests. US Cellular does not have significant mobile coverage or speeds in the state, while speeds provided by other carriers are largely dependent on location.

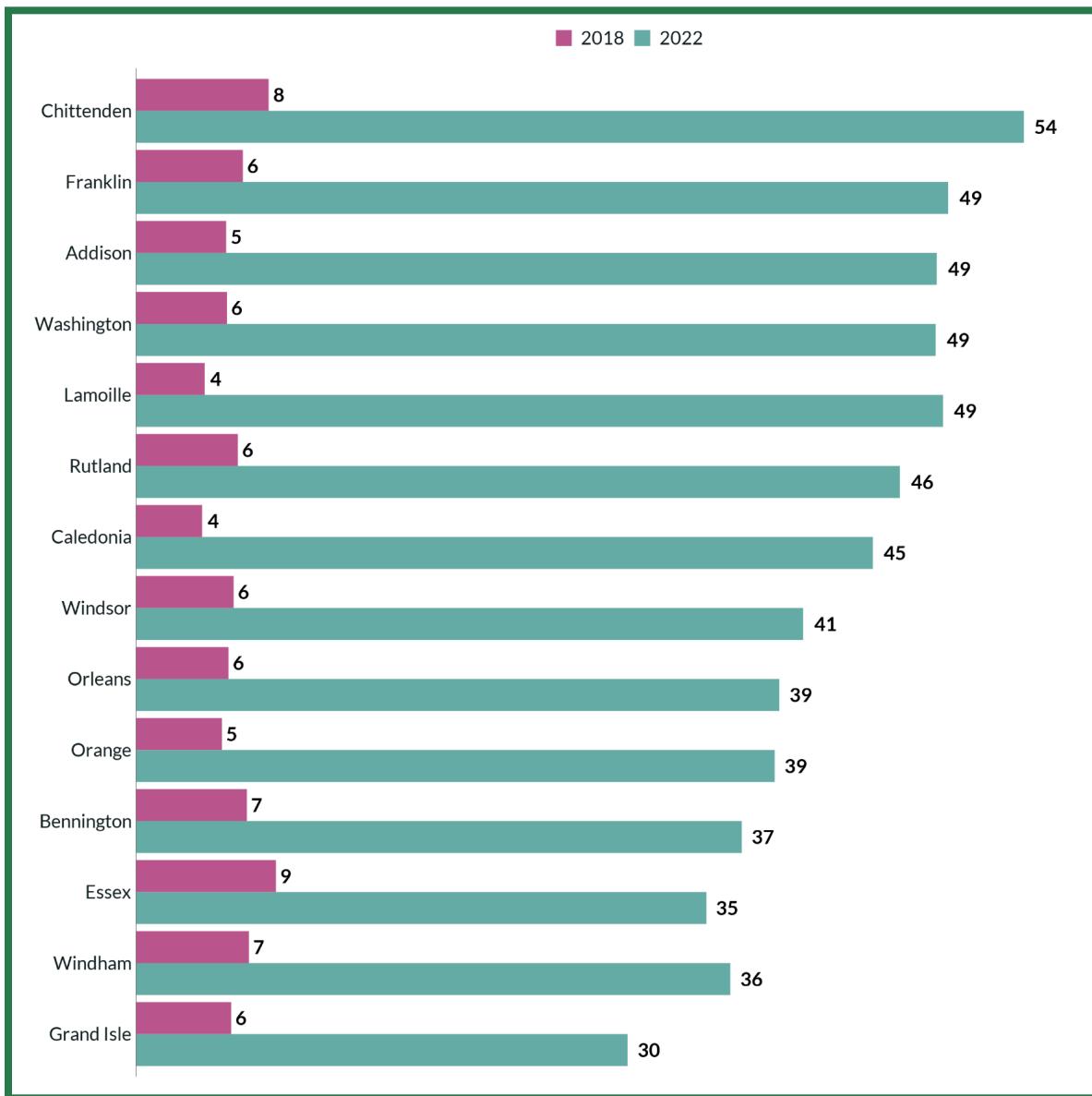
Another way to understand mobile coverage is to examine how public safety staff use mobile broadband. Public safety staff have to work on every road in the state, and are most effective when they can maintain communication the entire time. Notably, despite the significant deployments under the FirstNet program, usage of FirstNet by public safety staff in Vermont is still mixed, and in a survey of 54 public safety employees around the state, most responded that they use multiple devices to access the widest coverage; specifically, 63 percent use Verizon devices provided by their employer, 39 percent use AT&T devices provided by their employer, and 44 percent use their personal devices. Across all of those respondents, 92.3 percent reported spots without a cell phone signal in their service area. Findings from the survey of public safety officials are presented in full in Appendix G.

Of course, safety concerns due to poor cell service apply to Vermonters beyond public safety workers. For instance, the state librarian regularly visits public libraries throughout the state and needs to be reachable on her cell phone. She expressed concern for her personal safety while driving through spots without cell phone service. Other residents may experience the same concerns or may find themselves in need of urgent communication in areas without service, as described in Section 2.3.

Fortunately, there are signs of progress in increasing the strength and coverage of mobile broadband networks over the past five years. Changes in mobile broadband in Vermont over time are evident in comparisons of the data from the 2018 and 2022 drive tests. Although these drive tests used different methodologies and so some nuanced analyses cannot be performed credibly, the two drive tests conclusively show several changes.

First, comparing the two tests shows that average download speeds increased by significant margins between 2018 and 2022. The following chart shows the average speed for *successful* tests by county in 2018 and in 2022.

Figure 40: Average mobile wireless download speeds (Mbps) increased on roadways in all Vermont counties between 2018 and 2022



Source: Vermont Department of Public Service (2018, 2022)

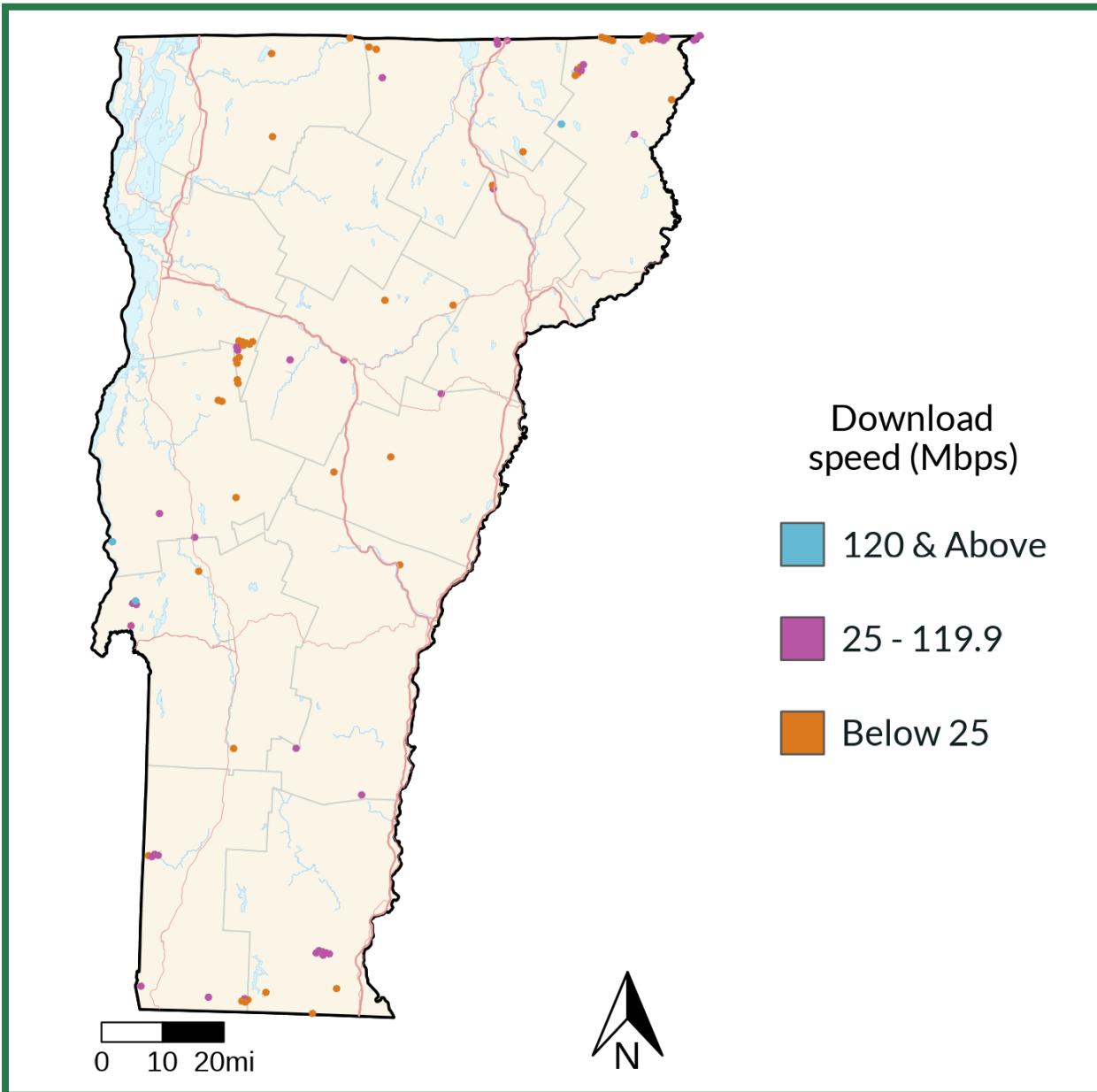
Notes: 2018 data includes mobile wireless drive test results for AT&T, Sprint, T-Mobile, US Cellular, Verizon, and VTel. 2022 data includes mobile wireless drive test results for AT&T, FirstNet, T-Mobile, US Cellular, Verizon, and VTel.

Note that areas with no signal were not included in this analysis; in other words, where service exists, speeds have improved dramatically. However, Vermont still has significant areas throughout the state with no service.

Speed improvements could be attributed to the construction of new towers, installation of new radios, and equipment upgrades, or to the different methodologies or time of year during which the drive tests were performed. Regardless, the tests show that mobile speeds are increasing throughout the state.

Second, the two tests can be compared to show which locations went from no recorded download speeds in 2018 to some download speeds in 2022. Cases reflecting incremental progress might be due to a weak signal that was picked up at the edge of a radio's range in 2022 that was not recorded in 2018; in other instances, large increases in service are likely the result of a new deployment. To demonstrate this, the following map shows locations that went from no service to some service, shaded by the degree to which the recorded speed changed.

Figure 41: Average mobile wireless download speeds in 2022 for locations that had no recorded service in 2018



Source: Vermont Department of Public Service (2022)

Notes: Locations that were not tested in 2018 were removed. 2022 data includes drive test results for AT&T, FirstNet, T-Mobile, US Cellular, Verizon, and VTel.

While this map shows pockets of new service, it also demonstrates that the pace of deployment in the state is slow. There are multiple factors that contribute to the slow pace of deployment, but the challenge of building new towers in Vermont coupled

with the lack of a sufficient customer base to entice the private market to act are two primary factors.

In January 2024, the Department of Public Service conducted a study to compile recommendations for revisions to the permitting process for new towers (30 V.S.A. § 248a). Feedback provided by individuals and towns demonstrated varying levels of familiarity and satisfaction with opportunities for revision. After gathering a wide range of views, the PSD has not identified a consensus on beneficial modifications to the process or the underlying statute. The report is publicly available on the Legislature of the State of Vermont website.⁴⁴

3.4.1.1 Possibility of Expanding Mobile Coverage Through the FCC's 5G Fund

The FCC established the 5G Fund for Rural America⁴⁵ (5G Fund) in October 2020 to continue the FCC's efforts to bridge the rural digital divide. The fund has up to \$9 billion available to bring 5G mobile wireless service to rural areas where these deployments would be unlikely without grant funding. Similar to the Rural Digital Opportunity Fund (RDOF),⁴⁶ the 5G Fund will use a multi-round reverse auction process to distribute the funds to areas that meet the criteria, which are still pending as of the publication of this Plan.

Although the fund was established in 2020, the implementation of the fund was placed on hold while new mobile coverage data were submitted to the FCC's Broadband Data Collection (BDC) program.⁴⁷ The FCC has published the new data submitted via the BDC program and renewed work in determining the process for distributing the funds.

In September 2023, the FCC started the formal public comment process to define the eligible areas and the metrics used to accept bids and identify winning bids. The comment period has since closed, and the FCC will likely issue the final rule later in

⁴⁴ Vermont Department of Public Service (2024) *Act 20: 2023 Report on the Process of Siting Telecommunications Facilities Under 30 V.S.A. § 248a*. Available at <https://legislature.vermont.gov/assets/Legislative-Reports/0111.24-H110-legislative-report.pdf>. Accessed January 25, 2024.

⁴⁵ Federal Communications Commission (2023) "5G Fund." Available at <https://www.fcc.gov/5g-fund>. Accessed February 13, 2024.

⁴⁶ Department of Public Service, "Rural Digital Opportunity Fund." Available at <https://publicservice.vermont.gov/telecommunications-and-connectivity/rural-digital-opportunity-fund>. Accessed November 21, 2023.

⁴⁷ Federal Communications Commission (2024) "Broadband Data Collection." Available at <https://www.fcc.gov/BroadbandData>. Accessed February 13, 2024.

2024. The authors of this Plan expect the reverse auction process to occur in 2026 and anticipate that winners will have to meet various build-out milestones, culminating in 85 percent of award areas covered by the end of year six, with a closeout date of 2032.

That being said, the impact the 5G Fund will have on Vermont's mobile broadband landscape cannot be forecasted at this time because the eligibility criteria and auction rules are still being determined, and there is a significant chance that Vermont may not have substantial eligible areas according to the FCC. If the FCC allows eligibility maps to be challenged by drive tests, Vermont's eligible areas would increase. However, if the FCC restricts eligibility criteria to places that lack 4G coverage based on the current BDC maps, Vermont's eligible areas may be minimal.

The Department of Public Service is closely monitoring the FCC's communications and supplying public comment to the Commission whenever possible to provide the FCC with Vermont's perspective on mobile broadband connectivity to try to ensure that the state benefits meaningfully from the 5G Fund.

3.4.2 Fixed Wireless

Fixed wireless connectivity is transmitted via radio waves broadcast from towers to receiving antennae affixed to buildings. As such, a fixed antenna needs a clear line of sight to the tower, which can be affected by topography, the presence of other buildings, inclement weather, and inadequate proximity to the tower.

The biggest local fixed wireless access provider is Vermont Telephone Company, Inc. (VTel), which owns about 150 towers. According to VTel representatives, the company engaged in a statewide testing effort to demonstrate that they provide 25/3 Mbps service to 10,000 customer locations. The company has been improving this service by adding radio bands and making other equipment upgrades.

VTel also entered into an agreement with AT&T and T-Mobile to provide mobile services within VTel's footprint. VTel also provides roaming to Verizon during moments of service disruption on Verizon's own network.

3.4.3 Low Earth Orbit Satellite

Low Earth orbit (LEO) satellite service is a small but important part of the Vermont connectivity landscape because it is most useful for off-grid locations and premises without a sufficient wireline solution and is not dependent on the location of towers, fiber, or power. Satellite communications services can be compared to a cellular tower site in the Earth's orbit, beaming signals down and receiving signals from the surface of the Earth. The best connectivity LEO satellite service can provide requires a clear view of the sky free of hills or foliage.

In the late 2010s, the capabilities of satellite broadband improved immensely after hundreds of LEO satellites were launched. The satellites individually serve a smaller area of the Earth and therefore provide significantly higher speeds to each user than geosynchronous satellites which are in a much higher orbit. The relative proximity of the satellites sharply reduces signal delay time. Laser technologies provide connections between LEO satellites to balance capacity and enhance the backhaul connection from the satellite to the Earth.

One major LEO satellite provider, SpaceX's Starlink, has several million subscribers worldwide, with a relatively high rate of subscriptions on a per capita basis in Vermont compared to other states. According to an interview with SpaceX's Senior Manager of Global Government Affairs, the company expects faster speeds and cheaper pricing in the future. The speeds that Starlink markets to customers in Vermont range from 60 to 155 Mbps download and 9 to 18 Mbps upload.⁴⁸

While the residential broadband applications being used by many Vermonters is an important part of the connectivity landscape, future applications of this technology are most relevant for Vermont policymakers to understand. In brief, Starlink is collaborating with T-Mobile and other terrestrial wireless providers to develop a commercially available service that uses the frequencies of terrestrial mobile providers to communicate with low Earth orbit satellites. This service is intended for subscribers of mobile services on conventional phones with standard data plans.

There is currently no conclusive timeline for voice-over-satellite technology. Starlink anticipates the first implementation of the service will be for asynchronous

⁴⁸ Starlink, "Availability Map." Available at https://www.starlink.com/map?view=upload&referral=RC-14217-27291-55&utm_source=paid_b2c_ww_search_google_brand_starlink_2023_10_25_evergreen. Accessed January 5, 2024.

communications such as text messages and email, where the message is short and not as time-sensitive. The service is intended for areas with no existing cellular service, and T-Mobile users will be routed to towers when possible.⁴⁹

3.5 Statewide Connectivity Metrics and Benchmarks

This section benchmarks additional telecommunications metrics in the state that demonstrate quality service and support state telecommunications goals: competition among broadband providers available at premises in the state, the costs associated with different service options, customer service quality, and the speeds available from ISPs in Vermont.

3.5.1 Competition

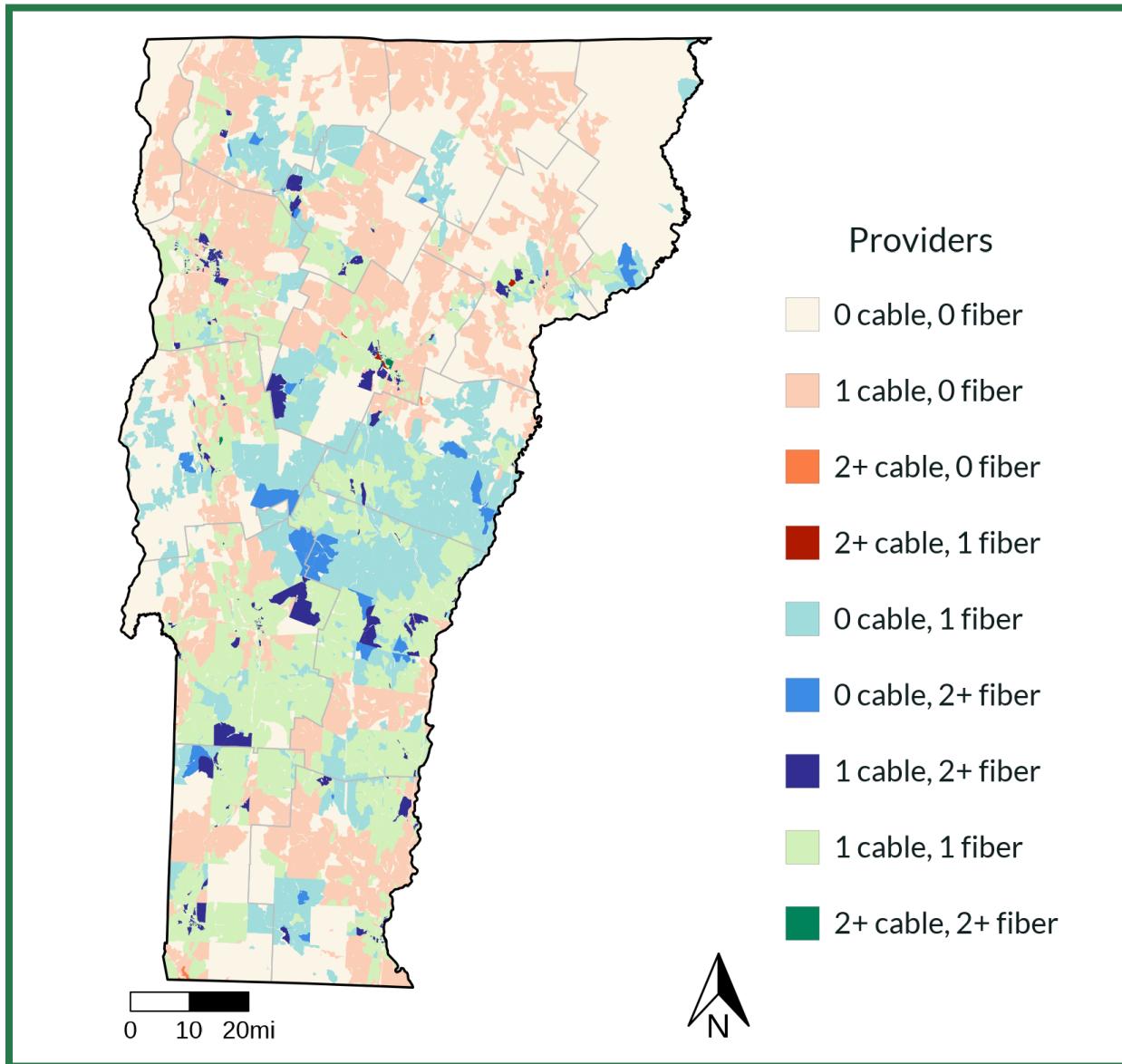
One of the goals specified in 30 V.S.A. § 202c is to “support competitive choice for consumers among telecommunications service providers.” Given that Vermont statute also specifies that infrastructure should be capable of delivering speeds of at least 100 Mbps symmetrical, this section characterizes competition in the state among cable and fiber providers – both of which can achieve 100 Mbps symmetrical speeds with updated electronics and equipment.

Unfortunately, there is no publicly available dataset of service offerings at a level granular enough to characterize the current status of competition on a premises-by-premises basis; however, this Plan uses the best data currently available to characterize competition generally. However, to truly understand the competitive landscape in Vermont, the PSD should consider collecting data by households that have access to more than one fiber or cable based ISP.

The FCC requires ISPs to file broadband availability data at the premises level; however, publicly available datasets aggregate service availability by provider at the block level. As a result, while the following analysis shows which blocks have multiple wireline providers, there is no guarantee that the listed service is available at every premise within the census block.

⁴⁹ Elon Musk (2022) “T-Mobile Takes Coverage Above and Beyond With SpaceX.” Available at <https://www.t-mobile.com/news/un-carrier/t-mobile-takes-coverage-above-and-beyond-with-spacex>. Accessed November 28, 2023.

Figure 42: Number of cable and fiber ISPs present, by census block (2023)



Source: FCC (June 2023)

As demonstrated by the map above, the majority of census blocks with multiple providers have one cable and one fiber provider; however, in rare other cases, competition exists between multiple fiber providers or multiple cable providers. This pattern fits with the majority of rural areas in the country, where fiber providers and cable providers avoid overlapping, but a competitive fiber provider has built into areas with cable to provide differentiation in product offerings.

The following chart approximates the total number of premises with and without competition by aggregating the data displayed in the above map:

Table 2: Approximate number of premises with and without competition

Number of cable or fiber providers present in census blocks	Number of premises
0	33,602
1	131,245
2+	120,486

Source: FCC (June 2023)

Notes: This table only includes premises for which the FCC has data.

Regardless of the data granularity, it is clear that the state has not yet met its goal of competitive service at residential premises. However, the significant ongoing construction will support increased competition in already served areas, as providers build through served areas to reach unserved areas. In other instances (including the more rural areas), CUDs intend to use an open access model – where multiple ISPs use the same infrastructure – which can provide a level of competition if multiple providers can be enticed to use the same network.

All of this said, the benefits that competition creates for consumers – such as better customer service quality, faster speeds, and lower costs – can also be reliably achieved through means other than competition. In fact, given the very challenging business case in the most rural areas of Vermont for a single good broadband provider, much less multiple, Section 11.3.2 recommends that the state focus foremost on tracking the *outcomes* that competition can improve, rather than competition for competition's sake. This tracking and evaluation can be done in the following ways:

Customer Service Quality: By measuring online customer reviews, and consumer complaints and resolutions at the ISP level, the Department of Public Service in collaboration with other agencies can evaluate the quality of service ISPs are providing in the state.

Speeds: By using speed tests, and comparing consumer-reported speeds to advertised speeds, Vermont can assess whether ISPs are providing consumers with speeds that meet their needs and are aligned with ISP marketing claims.

Costs: As part of the strategies presented in the BEAD Proposals related to long-term affordability, Vermont can track the cost of connectivity from different service providers. Importantly, as the BEAD Proposals suggest, the state should prioritize tracking and evaluating against long-term affordability goals to understand if ISPs are exerting downward pressure on prices or driving prices up.

3.5.2 Speeds

Though the rapid expansion of fiber broadband across the state also means that speeds should improve substantially over the next few years, the following chart compares median fixed (both wireline and fixed wireless) and mobile speeds in Vermont with peer New England states. Speed test data is collected and made available by Ookla (data retrieved December 11, 2023).

Table 3: Median fixed and mobile speeds in Vermont and peer New England states

State	Fixed Download	Fixed Upload	Mobile Download	Mobile Upload
Vermont	135.42 Mbps	23.26 Mbps	40.46 Mbps	4.49 Mbps
Connecticut	243.70 Mbps	36.24 Mbps	92.98 Mbps	9.84 Mbps
Massachusetts	224.58 Mbps	23.99 Mbps	101.99 Mbps	11.88 Mbps
Maine	192.13 Mbps	17.46 Mbps	42.88 Mbps	5.94 Mbps
New Hampshire	232.32 Mbps	27.73 Mbps	56.28 Mbps	7.22 Mbps

Vermont ranks last in three of the four metrics shown in the chart above. The reason for this may be mostly because New England states have different topology and urban-rural population distributions (with more residents living in urban areas, more residents are likely to have better service, meaning more tests are likely taken in urban areas and statewide speed test averages may be higher). However, that does not change the fact that the average broadband user experience in Vermont may be less robust than in peer New England states. A similar comparison is recommended

in subsequent years to understand the impact of Vermont policies and practices on internet speeds and quality experienced by Vermonters.

Section 4: Challenges with Expanding Telecommunications in Vermont

Vermont will encounter wide-ranging, diverse challenges when expanding telecommunications infrastructure over the next decade and beyond. This section describes the challenges that are most relevant to the state legislature and other policymakers, including challenges related to Vermont's geographic and demographic conditions, climate change, and regulatory constraints.

4.1 Geographic Challenges

Vermont's landscape and rurality play a major role in the capital expenses needed to meet the state's connectivity goals.

The state's mountainous terrain and world-famous foliage impede clear sightlines from towers broadcasting radio waves to mobile cellular devices and fixed wireless receiving antennas on buildings, as well as from satellites to receiving dishes. Signals are attenuated by hills and mountains, which means additional towers or repeaters are necessary for a signal to travel over or around an obstacle. Forests cover 78 percent of the state,⁵⁰ and as foliage changes with the seasons, signal strength varies accordingly.

In addition, the state's hilly, wooded topography and winding rural roadways (more than half of which are unpaved⁵¹) present challenges for deploying fiber and implementing mobile coverage, increasing the time it takes to install, the amount of materials needed, and — consequently — the total cost, which impacts service prices.

Though the state is well on its way to providing 100 Mbps symmetrical speeds to every on-grid location, the topology and rurality have meant that major public investment has been required to be successful. As this Plan makes clear in various

⁵⁰ Department of Forests, Parks, and Recreation (2023) "Overview of Vermont's Forests." Available at <https://fpr.vermont.gov/forest/vermonts-forests#:~:text=Vermont%27s%20forests%20cover%204%2C591%2C281%20acres,has%20relatively%20little%20public%20land>. Accessed November 14, 2023.

⁵¹ Agency of Transportation (2023) "Statewide Totals of Paved and 'Dirt' Highways." Available at <https://vtrans.vermont.gov/planning/maps/stats>. Accessed November 14, 2023.

sections, meeting the state's mobile broadband goals with the same dedication will require significant capital expenditures as well.

4.2 Climate Challenges

Vermont's climate is projected to warm faster than the global average.⁵² Consequently, the increase in extreme weather events that the state is already experiencing is predicted to become even more frequent and more intense. According to the Agency of Natural Resources, "Annual average precipitation has increased nearly six inches since the 1960s, with the largest increases occurring in mountainous regions of the state."⁵³ Over the next decade and beyond, precipitation during winter and spring will likely increase,^{54,55} impacting various aspects of life in Vermont and causing extensive damage to infrastructure.

Many parts of the state endured catastrophic flooding in July 2023, leading to millions of dollars in damage to buildings, property, farmland, roads, bridges, and telecommunications infrastructure.⁵⁶ According to state officials, the state's telecommunications systems held up well in general, but there were isolated incidents that led to service disruptions. For example, the Director of Telecommunications and Connectivity explained that the flooding damaged 1.5 miles of fiber optic cables, and because the roads were washed out, crews had to wait for the roads to be repaired before they were able to restore connectivity, resulting in a three-day internet outage.

Because of the increased frequency of disaster events, many state officials are reevaluating risks to systems, and telecommunications play a role in safety and resilience across public and private institutions. For example, the Ottauquechee

⁵² Mahalia Clark, Caitlin Crossett (2021) "Climate Change in Vermont." *The Vermont Climate Assessment 2021*. Available at <https://site.uvm.edu/vtclimateassessment/files/2021/11/VCA-Chapter-1-11-4-21-1.pdf>. Accessed December 1, 2023.

⁵³ Agency of Natural Resources (2023) "Climate Change in Vermont." Available at <http://climatechange.vermont.gov/vermont-today#>. Accessed December 1, 2023.

⁵⁴ Mahalia Clark, Caitlin Crossett (2021) "Climate Change in Vermont." *The Vermont Climate Assessment 2021*. Available at <https://site.uvm.edu/vtclimateassessment/files/2021/11/VCA-Chapter-1-11-4-21-1.pdf>. Accessed December 1, 2023.

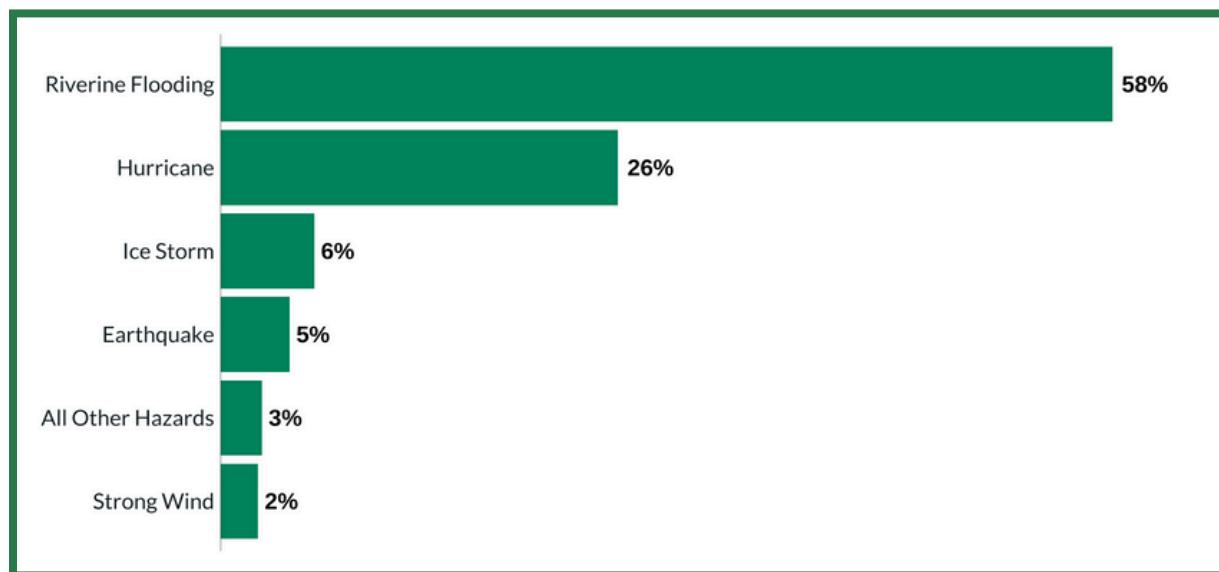
⁵⁵ Agency of Natural Resources (2023) "Climate Change in Vermont." Available at <http://climatechange.vermont.gov/vermont-today#>. Accessed December 1, 2023.

⁵⁶ Peter Banacos (2023) "The Great Vermont Flood of 10-11 July 2023: Preliminary Meteorological Summary," *National Weather Service*. Available at <https://www.weather.gov/btv/The-Great-Vermont-Flood-of-10-11-July-2023-Preliminary-Meteorological-Summary>. Accessed December 1, 2023.

Health Clinic was closed for a significant amount of time after the floods, and the Vermont Department of Health has raised concerns that small hospitals located throughout Vermont may lose internet service in the event of a climate emergency, hindering healthcare personnel from providing medical treatment.

To mitigate future infrastructure damage and associated connectivity lapses, deployment plans must take climate change and how it impacts different regions of the state into account. The BEAD Program rules also require grantees to consider climate risks. In Vermont, riverine flooding poses the greatest hazard risk to infrastructure, followed by hurricanes and ice storms, as seen in the graph below.

**Figure 43: Greatest hazard risk to Vermont's infrastructure
By hazard expected annual building loss shares**

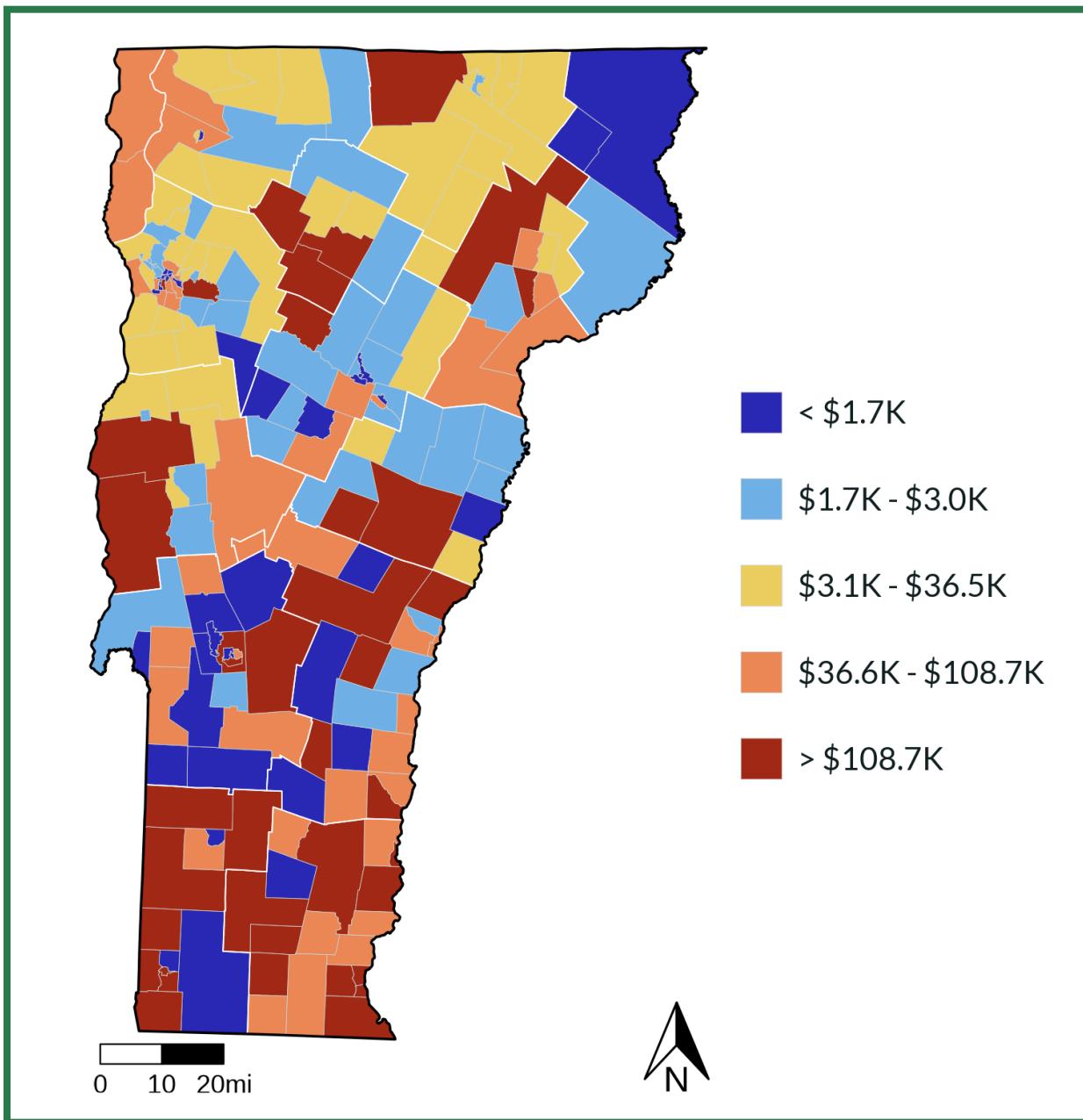


Source: Federal Emergency Management Agency National Risk Index

Except for major storms like hurricanes, exact disaster risk can also be hyper-local. As Vermont experienced during the July 2023 floods, areas along rivers – especially smaller creeks – are more susceptible to flooding, so broadband deployments need to include a mitigation plan around the hazard risks specific to each location.

The map below shows Vermont census tracts color-coded by expected annual building losses from climate impacts. Note that higher numbers in the map often reflect a greater density of structures, in addition to more climate risks.

Figure 44: Climate risk in Vermont census tracts by total expected annual building losses



Source: Federal Emergency Management Agency's National Risk Index (2023)

This map demonstrates that towns with the highest risk are scattered throughout the state, rather than clustered together. Though the data is available by town, the indicated hazard risk is also rarely townwide; for instance, hazard ratings may be

explained by the presence of a stream or another body of water with the potential to breach its banks during heavy rainfall.

Therefore, hazard risk mitigation plans for broadband deployments need to be as granular as possible, and should not assume that all parts of a town experience the same level or type of hazard risk. To this end, public safety officials in Essex have begun a granular analysis of where internet service could fail during a climate emergency.

The state is already taking preventative climate-related action. For instance, the Public Utility Commission authorized Green Mountain Power to preemptively remove ash trees in areas along roadways where the presence of the invasive emerald ash borer beetle is confirmed. Preemptive ash tree removal along power line rights-of-way avoids more expensive removal, damage to infrastructure, and power outages in the future.⁵⁷ In addition, Green Mountain Power has stated a goal of burying a substantial amount of their utility lines to achieve zero outages by 2030,⁵⁸ in large part to make infrastructure more resilient to disaster.

The state needs to take into account growing climate risk, and because telecommunications touch almost every institution and system, the state should coordinate with institutions and agencies that are also taking climate mitigation steps to ensure that resilience is built efficiently and collaboratively.

Strategies and best practices to increase network resiliency are explored in Section 10.5.

4.3 Demographic Challenges

Vermont's demographic conditions are unlike any other state in the country, with low population density and a higher median age than the national average (43.2 in Vermont versus 39.0 nationally, as of the 2022 American Community Survey⁵⁹).

⁵⁷ Vermont Agency of Transportation (2021) "Emerald Ash Borer Ash Tree Management Plan." Available at <https://vtrans.vermont.gov/sites/aot/files/highway/documents/environmental/EAB%20Management%20Plan%20Oct2021.pdf>. Accessed December 6, 2023.

⁵⁸ Green Mountain Power (2023) "Green Mountain Power Launches First in Nation 2030 Zero Outages Initiative." Available at <https://greenmountainpower.com/news/green-mountain-power-launches-first-in-nation-2030-zero-outages-initiative/>. Accessed February 29, 2024.

⁵⁹ United States Census Bureau, "Populations and People." Available at <https://data.census.gov/profile/Vermont?g=040XX00US50>. Accessed November 14, 2023.

Low population density creates deployment and market challenges. Greater distances between premises mean more fiber is required to reach fewer potential customers per mile, resulting in higher costs per drop – especially for premises with long driveways – and lower return on investment, making deployment to these rural areas economically unfeasible without subsidy for ISPs. Though the ARPA money Vermont allocated to broadband and wireless connectivity (over \$350 million⁶⁰) along with the federal BEAD Program funding (about \$229 million⁶¹) should alleviate this problem for wireline service, the same density challenges play a role in making mobile broadband expansion challenging in the state as well.

However, density is not the only demographic challenge related to effective telecommunications deployment. The ongoing work to deploy broadband cannot be completed without an adequate workforce, and since Vermont has a higher median age than the national average, the proportion of working-age residents is smaller. According to *The New York Times*, “Vermont’s population is rapidly aging. More than a fifth of Vermonters are 65 or older, and more than 35 percent are over 54 ... No state has a smaller share of its residents in their prime working years.”⁶²

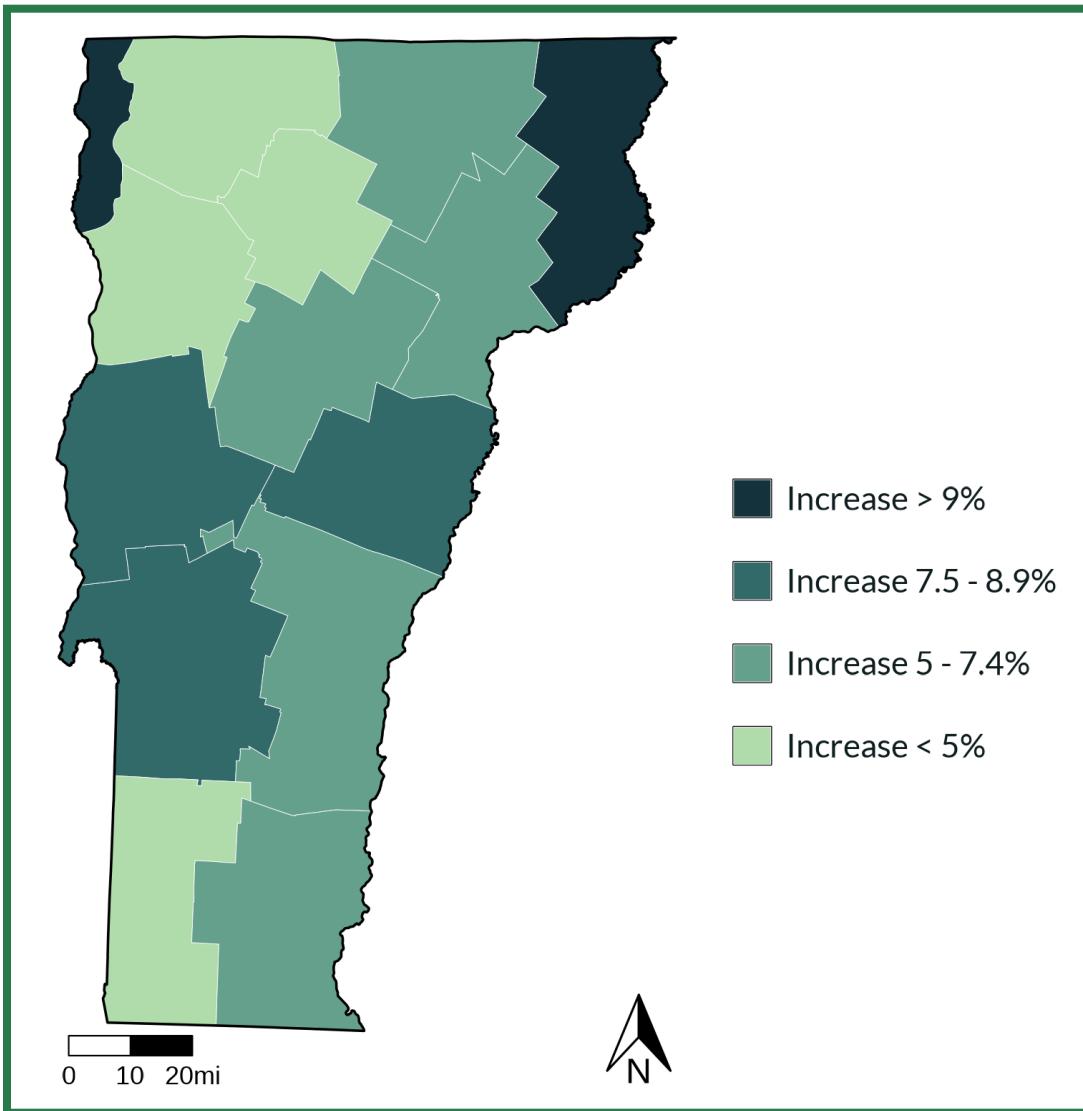
Although trends indicate that older adults are remaining in the workforce longer, the impact of an aging workforce on labor pool availability is reflected in labor market data; according to a senior Economic and Labor Market Information official, Vermont’s labor force has been in decline since 2011, when the “baby boomer” generation started reaching retirement age. Between 2010 and 2020, the median age of Vermonters increased by 4.4 percent, but some counties experienced a more dramatic increase – higher than 8.5 percent – as shown in the map below.

⁶⁰ Office of Governor Phil Scott, “Governor Scott’s Transformational Investments for American Rescue Plan Funds.” Available at <https://governor.vermont.gov/arpa>. Accessed December 6, 2023.

⁶¹ NTIA (2023) “Biden-Harris Administration Announces State Allocations for \$42.45 Billion High-Speed Internet Grant Program as Part of Investing in America Agenda.” Available at <https://www.ntia.gov/press-release/2023/biden-harris-administration-announces-state-allocations-4245-billion-high-speed>. Accessed November 21, 2023.

⁶² Ben Casselman, Jenna Smialek (2023) “Vermont May Be the Face of a Long-Term U.S. Labor Shortage.” *The New York Times*. Available at https://www.nytimes.com/2023/11/12/business/economy/vermont-labor-shortage.html?unlocked_article_code=1-Ew.perJ.tuxh-R_uWL5r&smid=url-share. Accessed November 14, 2023.

Figure 45: Median age change in Vermont counties from 2010 to 2020
Change in Vermont's median age was approximately 4.4 percent



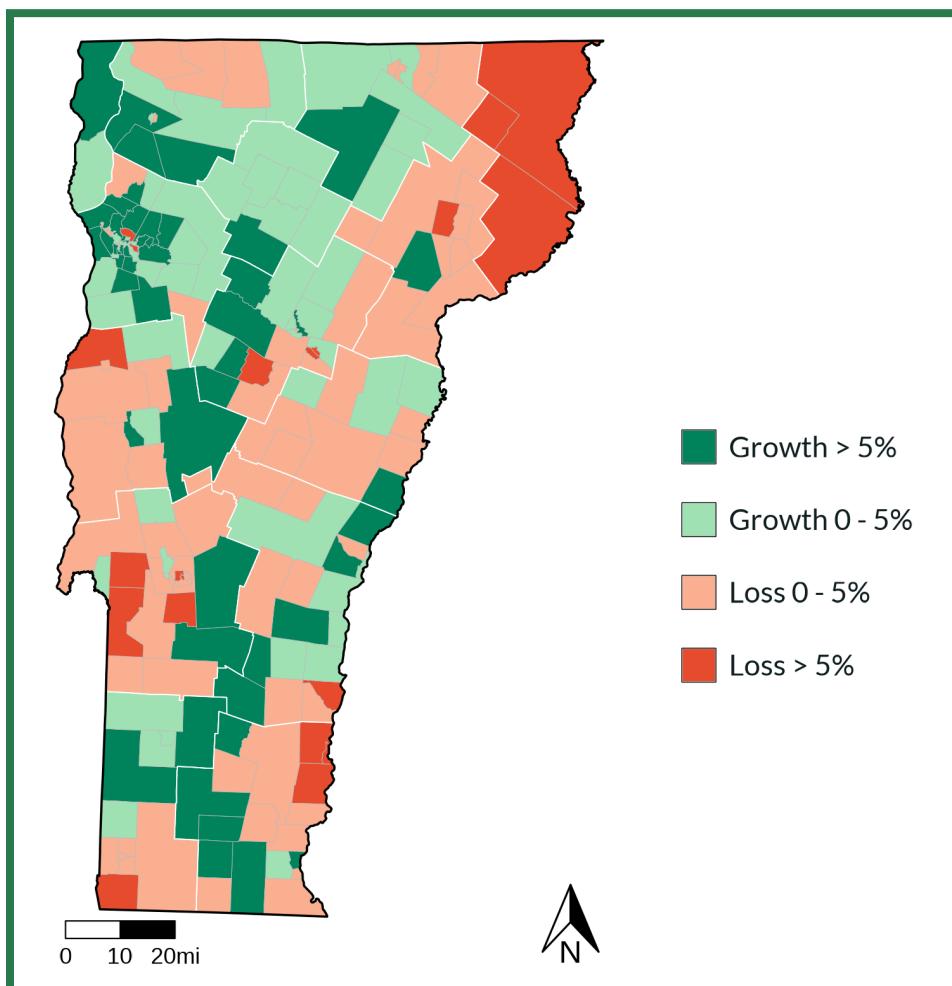
Source: American Community Survey 5-year estimates (2010, 2020)

The comparatively smaller increase in median age in Chittenden, Lamoille, and Franklin counties is likely attributable to their proximity to area colleges. Grand Isle, Essex, Orange, and Rutland counties had the greatest jump in median age during this timeframe.

As discussed in more detail in Section 8, Vermont's workforce shortage stems in part from its aging population, as well as from outward migration and low immigration

rates.⁶³ Vermont's population only grew by 2.8 percent between 2010 and 2020. The map below illustrates where the state's population increased and decreased.

Figure 46: Population change in Vermont from 2010 to 2020
Vermont's population growth was approximately 2.8 percent



Source: Decennial Census (2010, 2020)

Much of the Northeast Kingdom experienced a population decline, especially Essex County. Conversely, areas near higher-education institutions like the University of Vermont, Saint Michael's College, Johnson State College, Lyndon State College, and Middlebury College experienced population growth. The regional growth patterns displayed in the data above are expected to continue; however, the slow pace of new

⁶³ Erin Petenko (2019) "People Are Leaving VT in Droves. Where Are They Going?" *VTDigger*. Available at <https://vtdigger.org/2019/09/13/people-are-leaving-vt-in-droves-where-are-they-going/>. Accessed November 14, 2023.

housing construction and modest in-migration and birth rates make it unlikely for the rural nature of the state to change significantly, even in higher-growth areas.

According to a report from the Office of the State Treasurer, Vermont's population grew by 14,548 in 2021, but the rate of growth slowed dramatically in 2022, when the population only increased by 2,981.⁶⁴ Dropping birth rates⁶⁵ demonstrate that this trend of slow population growth will likely not only continue but may worsen in the future – unless residents of other states can be enticed to relocate to Vermont in greater numbers and/or current residents' reasons for leaving can be alleviated.

This being said, the Vermont Futures Project – a nonprofit think tank – estimates that the state's total population needs to increase to 802,000 by 2035 to fill its workforce needs in all sectors, not just broadband-related industries.⁶⁶ Ensuring healthy population growth in rural areas of the state would also increase the customer base for telecommunications services, making the financial challenges to deploying rural broadband slightly easier.

Regardless of the current indicators forecasting very modest population growth, it would benefit the state to ensure broadband infrastructure throughout the state is designed to scale to accommodate potential growth to at least 800,000 full-time residents, which could be realized in the coming decades from increased climate migration coupled with other actions the state may take to increase the workforce.

4.4 Regulatory Challenges

How the internet is used and regulated is continually evolving. This section details two areas of federal regulation that could affect Vermonters and state-level policy decisions: net neutrality and Carrier of Last Resort. Changes to either of these areas

⁶⁴ Office of the State Treasurer (2023) "US Census Bureau: State-to-State Migration Flows 2022: Analysis of Population Movement In and Out of Vermont." Available at <https://www.vermonttreasurer.gov/sites/treasurer/files/documents/US%20Census%20Bureau%20State-to-State%20Migration%20Flows.pdf>. Accessed December 7, 2023.

⁶⁵ Art Woolf (2019) "When It Comes to Birth Rate, Everyone Has Vermont Beat," *VTDigger*. Available at <https://vtdigger.org/2019/05/19/woolf-comes-birth-rate-everyone-vermont-beat/>. Accessed November 14, 2023.

⁶⁶ Mikaela Lefrak, Tedra Meyer, Andrea Laurion (2023) "A Think Tank Says Vermont Should Grow to 802,000 People by 2035. Here's Why – and How," *Vermont Public*. Available at <https://www.vermontpublic.org/show/vermont-edition/2023-08-17/a-think-tank-says-vermont-should-grow-to-802-000-people-by-2035-heres-why-and-how>. Accessed December 6, 2023.

of regulation could impact the path to reaching the state's telecommunications goals.

4.4.1 Net Neutrality Regulations

One of the challenges the state faces in implementing the goal of ensuring net neutrality is the fact that the nature of federal jurisdiction over broadband has changed several times over the past few decades.

Broadband is predominantly regulated at the federal level under the jurisdiction of the FCC. The FCC is directed by five commissioners appointed by the president of the United States and confirmed by the United States Senate for five-year terms, except when filling an unexpired term. The U.S. president designates one of the commissioners to serve as chair, and no more than three commissioners may be members of the same political party. This means that the FCC's regulation of industry is heavily influenced by the current political environment and – with a simple majority – regulations can be modified relatively quickly. As a result, rules established under one administration are often reversed under the next.

In 2002, the FCC determined that cable ISPs are an “interstate information service” and not a “common carrier.”⁶⁷ This differentiation meant that cable ISPs were no longer considered to be providing a general public good, they faced looser regulation, and they were not required to provide services in a specific coverage area.

That definition held until 2015 when the FCC passed the Open Internet Order,⁶⁸ which classified ISPs as common carriers and expressly banned activities like throttling, blocking, and paid prioritization. The Order also gave the FCC authority to pass net neutrality rules, which were prohibited for information services industries, but not for industries considered a common carrier. In 2017, the FCC reversed that

⁶⁷ Federal Communications Commission (2002) “FCC Classifies Cable Modem Service As ‘Information Service.’” Available at https://transition.fcc.gov/Bureaus/Cable/News_Releases/2002/nrcb0201.html. Accessed December 11, 2023.

⁶⁸ Federal Communications Commission (2015) “Protecting and Promoting the Open Internet.” Available at <https://docs.fcc.gov/public/attachments/FCC-15-24A1.pdf>. Accessed December 11, 2023.

Order and again classified internet service providers as an information service industry,⁶⁹ closing the door on net neutrality regulations at that time.⁷⁰

In September 2023, the FCC announced that it was considering categorizing internet service providers as a common carrier again and therefore subjecting ISPs to stricter regulations including prohibiting throttling, blocking, and other anticompetitive behavior.⁷¹ At the time of publication of this Plan, the FCC has not released the hearing dates for this item, but industry experts anticipate that it will be discussed in the spring or summer of 2024.⁷²

Considering the political environment that the FCC operates within, this rule revision may not be implemented or could be rescinded in the next three to five years. As a result of this uncertainty, states such as California have implemented their own state-level net neutrality regulations.

Vermont policymakers should remain aware of the ongoing proceedings of the FCC and the state's federal delegates, but given the rapidly changing political environment at the federal level, establishing state-level requirements is the most reliable way to maintain a consistent policy regarding net neutrality if the state wishes to do so.

Of course, any state-level action on this topic should be taken with robust legal guidance due to the significant jurisdictional and regulatory complexities of the issue.

4.4.2 ILEC Carrier of Last Resort Obligations

This Plan considers the impact of a regulatory issue concerning ILECs that will become increasingly relevant as wireline fiber service is deployed to all Vermont premises: carrier of last resort (COLR) obligations.

⁶⁹ Federal Communications Commission (2017) "Restoring Internet Freedom." Available at <https://docs.fcc.gov/public/attachments/FCC-17-60A1.pdf>. Accessed December 11, 2023.

⁷⁰ Clare Hopping, Dale Walker (2018) "Net Neutrality Laws Are Now Officially Dead," *ITPro*. Available at <https://www.itpro.com/network-internet/31103/net-neutrality-laws-are-now-officially-dead>. Accessed December 11, 2023.

⁷¹ Federal Communications Commission (2023) "Safeguarding and Securing the Open Internet." Available at <https://docs.fcc.gov/public/attachments/FCC-23-83A1.pdf>. Accessed December 11, 2023.

⁷² Amy Maclean (2023) "FCC Sets its Calendar as Title II, Billing Items Loom," *Cablefax*. Available at <https://www.cablefax.com/regulation/locked-and-loaded-fcc-sets-its-calendar-as-title-ii-billing-items-loom>. Accessed December 11, 2023.

Historically, incumbent carriers that operated as a monopoly – including the former Bell System operating companies – were designated as the COLRs within their service territories.⁷³ As carriers of last resort, these companies were required to offer phone service to all potential customers within their service territories, maintain service, and promptly restore service if there were any outages. COLRs were also expected to offer fair and reasonable pricing. As such, COLR obligations serve the critical function of ensuring very rural Vermont households gain or retain telecommunications infrastructure when there is no economic case for an ISP to build in a region.

These COLR obligations in telecommunications are rooted in centuries-old concepts that applied to common carriers and enterprises such as inns, coaches, ferries, and railroads.⁷⁴ Common carriers were required to provide services to all customers as long as there was enough space, the fee was paid, and there were no reasonable grounds to refuse to do so.⁷⁵

The concept of the COLR obligation for telecommunications services was established through the Communications Act of 1934 and amended by the Telecommunications Act of 1996, which required that nationwide, regulated telecommunications services be made available to everyone:

A nationwide, regulated telecommunications network available to ... all the people of the United States, without discrimination on the basis of race, color, religion, national origin, or sex, a rapid, efficient, Nationwide, and world-wide wire and radio communication service with adequate facilities at reasonable charges, ... for the purpose of the national defense, for the purpose of promoting safety of life and property through the use of wire and radio communication....⁷⁶

The Telecommunications Act of 1996 further mandated that:

⁷³ Sherry Lichtenberg (2016) “Carrier of Last Resort: Anachronism or Necessity?” *National Regulatory Research Institute*. Available at <https://pubs.naruc.org/pub/FA85B978-00A3-862C-5E8D-9E10816FA7DB>. Accessed December 8, 2023.

⁷⁴ Sherry Lichtenberg (2016) “Carrier of Last Resort: Anachronism or Necessity?” *National Regulatory Research Institute*. Available at <https://pubs.naruc.org/pub/FA85B978-00A3-862C-5E8D-9E10816FA7DB>. Accessed December 8, 2023.

⁷⁵ Sherry Lichtenberg (2016) “Carrier of Last Resort: Anachronism or Necessity?” *National Regulatory Research Institute*. Available at <https://pubs.naruc.org/pub/FA85B978-00A3-862C-5E8D-9E10816FA7DB>. Accessed December 8, 2023.

⁷⁶ Communications Act of 1934, 47 U.S.C. § 151.

Customers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications and information services, including interexchange service and advanced telecommunications and information services, that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas.⁷⁷

However, there is increasing discussion among policymakers in various states about how COLR regulations may change as fiber is deployed to the last mile and as technology evolves. Carriers increasingly argue that in situations where a fiber product is available to all homes, which enables Voice over Internet Protocol (VoIP) and Wi-Fi calling, COLR obligations should be transferred to the entity using the updated technology (i.e., fiber).

As telephone and data services continue to converge and as fiber is built to every on-grid premise in Vermont, regulators can expect ILECs in Vermont to request a reevaluation of COLR responsibilities, especially in jurisdictions where other ISPs also have a mandate to serve every on-grid premise.

However, this Plan advises that shifting the responsibility from ILECs to other entities may present challenges for the state. For one, ILECs transferring COLR obligations to fiber networks run by different operators could allow the ILECs to deprioritize the maintenance of copper networks – potentially leading to a greater incidence of disrupted service – and allow them to decline to connect new landline phone service in certain circumstances. These copper networks are still used by many people in the state and are essential to various components of connectivity. Further, some of the entities that are currently building fiber (such as smaller ISPs and CUDs in the state) do not currently have the organizational capacity or infrastructure to match the service levels, maintenance and repair capacity, and experience of the current COLR providers. Because of this, policymakers and regulators should carefully consider the potential implications of changing the COLR responsibilities of ILECs in Vermont.

⁷⁷ Telecommunications Act of 1996, 47 U.S.C. § 254.

Section 5: Broadband Affordability in Vermont

Vermonters cannot take advantage of the many benefits of broadband if they cannot afford the cost of connectivity.

While difficulty paying for an internet connection is a national problem — nearly two in five subscribers compromise other expenses to pay for broadband⁷⁸ — the specifics of what is considered affordable are also localized. For example, residents of cold-climate states like Vermont spend more on heating costs and therefore may not be able to allocate the same percentage of their income to a broadband subscription as someone living in a warm-weather region. Other local variables such as the average cost of housing, food, transportation, and medical expenses all impact what a household considers affordable.

In a 2023 survey of Vermont residents, 16 percent of survey respondents under the age of 45 reported that the cost of their cell phone bill often or always affected what essential items they could afford. While this rate drops to 9 percent and 8 percent for those 45 to 59 years old and those older than 59, it is still well above the ideal rate of zero percent.

The affordability of the internet is a concern for everyone — and stakeholders who work with vulnerable or disadvantaged populations expressed particular concern about broadband costs. For example, the Deaf Independence Coordinator at the Vermont Center for Independent Living noted that when vital connectivity services are out of reach for those who are deaf or hard of hearing, they lose a tool that is critical to making basic services accessible (e.g., video calling, emergency alert systems with bed shakers, etc.). AARP Vermont also noted that some residents who do not technically qualify as low-income often struggle to pay their bills and therefore struggle to afford connectivity.

In addition, housing advocates and healthcare workers noted that for unhoused Vermonters, mobile connectivity is often their most critical connection to support

⁷⁸ Emma Gautier (2023) “U.S. News & World Report Finds Nearly 2 in 5 Internet Subscribers Compromise Personal Expenses to Afford Internet,” *Community Networks*. Available at <https://communitynets.org/content/us-news-world-report-finds-nearly-2-5-internet-subscribers-compromise-personal-expenses>. Accessed November 15, 2023.

services and social networks. Survey results strongly indicate that if healthcare workers cannot contact someone via phone, they have almost no other options besides mail, which is a challenge with many vulnerable populations. According to an interview with the Director of Shelter and Clinical Services at the Upper Valley Haven, the monthly cost of cell phone service is “a big lift for clients who do not have a steady income, so they often gain and lose any plan they have.” For these reasons, ensuring mobile connectivity and affordability is critical for supporting unhoused Vermonters.

5.1 Current Broadband Pricing

Prices for service in Vermont range by provider, and it is difficult to ascertain the true cost of broadband because ISPs often use introductory pricing and bundling. For example, Xfinity offers fixed service for a promotional rate of \$25 per month for 200 Mbps service for the first year, but the regular rate is \$87 per month – a significant price difference. Customers often bundle home internet with telephone, television, streaming, home security, and increasingly, mobile broadband services, all of which obscure broadband pricing and prevent consumers from easily comparing plans. Some providers – typically smaller ISPs and CUDs – do offer clear pricing models on their websites.

This Plan attempts to document prices for broadband delivered by ISPs in the state.

Of Vermont’s ten communication union districts, six offer service as of February 2024. Entry-level CUD pricing is summarized here:

Table 4: Entry-level pricing in six Vermont CUDs

Provider	Price for Entry-Level Tier
CVFiber	\$79.00
DVFiber	\$75.00
ECFiber	\$72.00
Maple Broadband	\$69.95
NEK Broadband	\$80.00

Provider	Price for Entry-Level Tier
SoVT CUD/Fidium Fiber	Introductory rate: \$35.00 Rate after first year: \$55.00

A full chart of ISP prices at the time of publication of this Plan can be found in Appendix I.

Mobile broadband pricing is also difficult to capture. Mobile providers run promotions and offer incentives like new cell phones to attract customers, and charges vary greatly based on the number of phone lines on the plan. Therefore, rather than documenting exact per-plan pricing, the following chart demonstrates the approximate range of rates Vermonters may be paying for an individual plan from a major carrier, according to current advertised prices as of this writing.

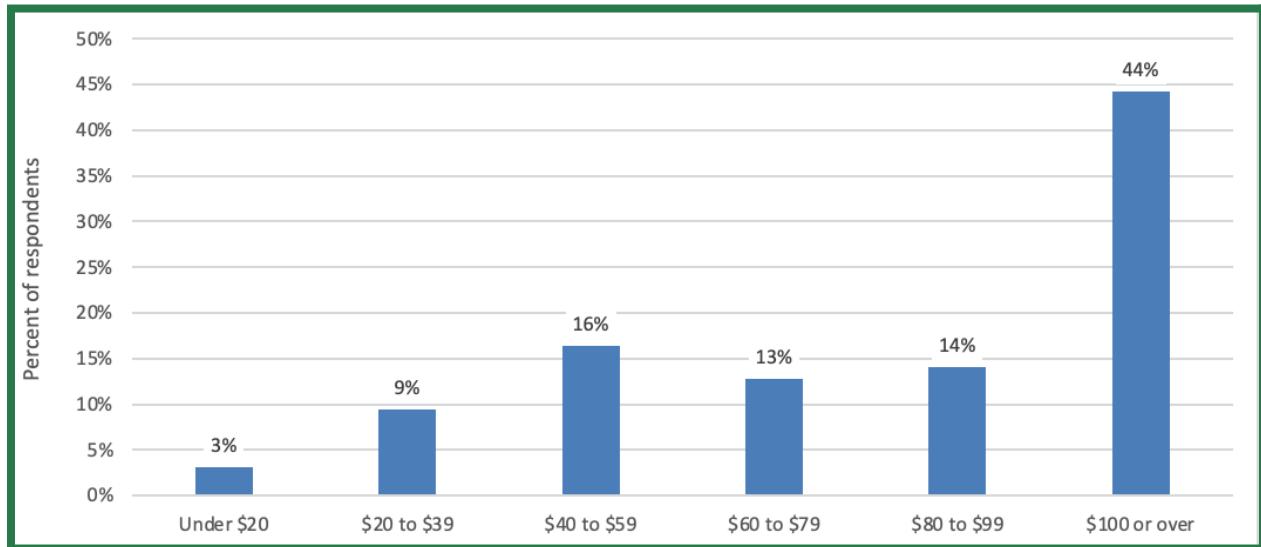
Table 5: Range of rates for plans from major carriers

Carrier	Low End	High End
AT&T	\$50.00	\$85.00
T-Mobile	\$60.00	\$90.00
US Cellular	\$40.00	\$60.00
Verizon	\$50.00	\$100.00

Notes: Pricing captured December 12, 2023. Rates are for one line and do not include taxes, fees, or promotions for bundling services or purchasing a cellular device. Pricing is subject to change at any time.

Despite the comparatively lower advertised prices, a plurality of 2023 survey respondents reported paying *more* than \$100 per month for service (which in some instances may include taxes, monthly device payments, or insurance):

Figure 47: Monthly cost for a single phone line of mobile cellular service



More transparency – regardless of whether broadband service is fixed or mobile – is needed to enable shoppers to make direct comparisons and informed decisions. The FCC is addressing this issue at the federal level, and legislation has been proposed in Vermont to establish stronger consumer protections around pricing transparency and service quality.

Via the National Broadband Consumer Label initiative, the FCC is requiring ISPs to provide transparent pricing and speeds by April 10, 2024, unless they have 100,000 subscribers or fewer, in which case they have until October 10, 2024.⁷⁹ In Vermont, proposed Bill H.419 goes further than the FCC rules with additional requirements, testing, enforcement, and repercussions for ISPs that do not deliver promised speeds.⁸⁰

5.2 Federal Programs to Support Affordability

During the creation of this Plan, there were two federal programs in place to help Vermonters afford broadband: Lifeline and the ACP. However, both programs had

⁷⁹ Dani Blaise (2023) “Everything You Need to Know About Broadband Consumer Labels,” *National Broadband Resource Hub*. Available at <https://medium.com/national-broadband-resource-hub/everything-you-need-to-know-about-broadband-consumer-labels-4d2da627fd95>. Accessed November 15, 2023.

⁸⁰ Vermont Broadband Consumer Protection and Competition Act, H.419 (2023). Available at <https://legislature.vermont.gov/Documents/2024/Docs/BILLS/H-0419/H-0419%20As%20Introduced.pdf>. Accessed December 8, 2023.

funding and eligibility constraints, and the most generous program, the ACP, could only be used for either mobile or fixed service but not both simultaneously.

The federal Lifeline program offers a monthly subsidy of \$9.25 for qualifying telephone service, broadband internet service, or bundled voice and broadband packages purchased from participating wireline or wireless providers. To be eligible, household income cannot exceed 135 percent of the Federal Poverty Guidelines (i.e., \$19,683 for an individual, \$26,622 for two people, and \$40,500 for a family of four in 2023⁸¹). Households enrolled in Medicaid, Supplemental Security Income (SSI), the Supplemental Nutrition Assistance Program (SNAP), and other federal assistance programs qualify to receive Lifeline discounts. Only 10 percent of eligible households in Vermont have signed up for Lifeline.⁸²

Due to the small amount of subsidy provided, this program has modest utility on its own but can sometimes be coupled with other programs to further reduce a household's broadband bill.

Administered by the USAC with oversight from the FCC, the ACP offered a \$30 monthly internet service discount to eligible households.⁸³ Each household could also receive a one-time \$100 discount for the purchase of a computer or tablet from participating providers if the household contributed a copayment of \$10–\$50 toward the purchase price.

Eligibility for the ACP was determined based on household income or enrollment in federal assistance programs. Household income could not exceed 200 percent of the 2022 Federal Poverty Guidelines.⁸⁴ For schools that had universal free breakfast or

⁸¹ Universal Service Administrative Co., “Do I Qualify?” Available at <https://www.lifelinesupport.org/do-i-qualify/#programs>. Accessed February 28, 2024.

⁸² Universal Service Administrative Co., “Lifeline Participation Rate.” Available at <https://www.usac.org/lifeline/resources/program-data/>. Accessed November 7, 2023.

⁸³ Under the eligibility requirements, a household is considered to be a group of people who live together and share money. If a group of people lives together but does not share money, they are considered separate households that can apply for separate discounts. Only one person per household may participate in the ACP. A household qualifies for the ACP if any member of the group meets the eligibility criteria for a participating provider’s existing low-income program (<https://www.fcc.gov/acp>).

⁸⁴ Universal Service Administrative Company, “Do I Qualify?” Available at <https://www.affordableconnectivity.gov/do-i-qualify/>. Accessed December 7, 2023.

lunch through the Community Eligibility Provision, every student's household qualified for ACP subsidies.

Though many Vermonters enrolled in the program, they were not utilizing the ACP as much as they could have. According to data retrieved from the Institute for Local Self-Reliance's ACP Dashboard⁸⁵ on December 7, 2023, only 21.2 percent of eligible Vermont households were enrolled in the ACP (out of 115,003 eligible households, only 24,337 households are enrolled), meaning that \$2,719,980 of potentially available *monthly* subsidies are not being utilized in the state.

Importantly, as of the writing of this Plan, federal ACP funding has expired.⁸⁶ Unless Congress passes yet-to-be-filed federal legislation that includes provisions for refunding the ACP, subsidies will end for all enrolled Vermonters in May.⁸⁷ On January 11, the FCC provided guidance to ISPs about notifying participating households on January 25 (with additional notices to follow) and freezing new enrollments on February 8.⁸⁸

5.3 ISP-Based Affordability Programs

Some ISPs offer low-income broadband services that significantly reduce the monthly cost for qualifying households.

Burlington Telecom's self-funded Internet Assistance Program offers qualifying customers a 50 Mbps symmetrical service tier for \$9.95 per month or 150 Mbps for \$24.95 per month, along with free installation and a smart Wi-Fi router.⁸⁹ VTel offered an "all in" package for enrolled ACP customers that included 100 Mbps for \$30 per month – making it free after the ACP discount.⁹⁰

⁸⁵ Institute for Local Self-Reliance, "Affordable Connectivity Program Dashboard." Available at <https://acpdashboard.com/>. Accessed December 7, 2023.

⁸⁶ Federal Communications Commission (2024) "Affordable Connectivity Program (ACP) Wind-Down Fact Sheet." Available at https://www.fcc.gov/sites/default/files/ACP_Wind-down_Fact_Sheet_Final.pdf. Accessed April 29, 2024.

⁸⁷ Jake Neenan (2024) "Cantwell Ups ACP Money in Updated Draft Spectrum Auction Bill." Available at <https://broadbandbreakfast.com/cantwell-updates-draft-spectrum-auction-bill/>. Accessed April 30, 2024.

⁸⁸ Federal Communications Commission (2024) "WC Docket No. 21-450." Available at <https://docs.fcc.gov/public/attachments/DA-24-23A1.pdf>. Accessed January 26, 2024.

⁸⁹ Burlington Telecom, "BT Internet Assistance Program." Available at <https://www.burlingtontelecom.com/bt-internet-assistance-program/>. Accessed December 8, 2023.

⁹⁰ VTel, "Affordable Connectivity Program (ACP)." Available at <https://www.vermontel.com/acp/>. Accessed December 8, 2023.

ECFiber offered an additional \$20 per month subsidy to internet subscribers who were enrolled in the ACP. Though the ACP stopped accepting new enrollments, ECFiber continues to provide the \$20 per month subsidy to people who were enrolled in the ACP prior to its sunset. Other CUDs – namely CVFiber and Maple Broadband – are currently offering a limited affordability subsidy to some qualified customers and are working toward more comprehensive solutions.

Other providers, such as Comcast and Spectrum, have low-income programs that currently offer service at \$10 and \$30 per month, respectively. However, previous surveys in Vermont have found that a significant number of eligible people in the state don't know about these programs or tried to enroll and were unsuccessful, indicating that the enrollment process may be difficult.

5.4 How Should Vermont Define “Affordable” Connectivity?

Many state and federal policymakers consider affordable connectivity as pertaining to only one type of service (e.g., either fixed or mobile) – as evidenced in part by the fact that the ACP could be used for either a fixed or mobile subscription but not both. However, this Plan asserts that given the criticality of a mobile subscription, as indicated by statutory goals as well as the results from the surveys conducted for this Plan, mobile subscriptions should be considered essential – and separate from fixed subscriptions.

The Vermont Community Broadband Board’s “Broadband Equity, Access, and Deployment Initial Proposal Volume 2” states that “low-income households can generally afford to spend up to 1 percent of their monthly income on fixed broadband connectivity.”⁹¹

Building on this recommendation from the BEAD Proposals, and incorporating the critical additional element of mobile service, 2 percent of income should be established as a benchmark for combined fixed and mobile broadband affordability

⁹¹ Vermont Community Broadband Board (2023) *Vermont's Broadband Equity, Access, and Deployment Initial Proposal Volume 2*, page 79. Available at https://publicservice.vermont.gov/sites/dps/files/documents/VT%20Initial%20Proposal%20Volume%202_Draft%20for%20Public%20Comment_15Sept2023.pdf. Accessed October 31, 2023.

spending, which is in line with research from leading digital equity advocates such as the Alliance for Affordable Internet.⁹²

The tables below detail what 1 and 2 percent of income would mean for an individual and for a household at 100 percent of the federal poverty guidelines,⁹³ and for reference, the same measures for an individual and a household at the median income levels in Vermont.

Table 6: 1% and 2% of income at 100% of federal poverty guidelines

100% of Poverty in Vermont	1% of Monthly Income	2% of Monthly Income
\$14,580 for an individual	\$12.15	\$24.30
\$30,000 for a household of 4 people	\$25.00	\$50.00

Table 7: 1% and 2% of income at Vermont's median annual income levels

Median Annual Income in Vermont	1% of Monthly Income	2% of Monthly Income
\$34,800 for an individual	\$29.00	\$58.00
\$74,014 for a household of 4 people	\$61.68	\$123.36

This Plan's recommendation is to set an affordability goal that low-income Vermonters pay no more than 2 percent of income for *all* of their connectivity needs, established at 100 percent of the federal poverty guideline for a family of four. In other words, this Plan recommends an affordability goal that low-income Vermonters pay no more than \$50 per month for all of their connectivity subscriptions.

⁹² Alliance for Affordable Internet, "Redefining Affordability to Achieve Universal Internet Access." Available at <https://a4ai.org/affordable-internet-is-1-for-2/>. Accessed October 31, 2023.

⁹³ Office of the Assistant Secretary for Planning and Evaluation (2023) "HHS Poverty Guidelines for 2023." Available at <https://aspe.hhs.gov/topics/poverty-economic-mobility/poverty-guidelines>. Accessed December 12, 2023.

5.5 State Actions to Encourage Affordability

First, this Plan affirms some of the additional strategies the state is already taking to encourage long-term affordability and downward pressure on prices.

By allowing the establishment of CUDs, the state is vastly increasing the amount of broadband competition in the state, which has been shown to exert downward pressure on prices. Furthermore, by supporting entities that will reinvest profits into expanding services and lowering prices, the state is exerting additional downward pressure on prices. These are important steps to ensuring the long-term affordability of broadband services in Vermont.

However, there is not likely to be a market-based solution for providing connectivity services at levels considered affordable in Vermont. Relying on individual fixed or mobile ISPs to provide affordable service is not viable, especially in a very rural state where many ISPs will have limits as to the prices they can offer and still be financially healthy.

If the legislature chooses to ensure affordable service for Vermonters, this Plan recommends they fund a program to replace or augment the ACP, which will run out of funding in May 2024.

This Plan recommends using the same eligibility criteria as Lifeline (135 percent of federal poverty guidelines), or if the budget allows, the same criteria as LI-HEAP and SNAP (185 percent of federal poverty guidelines). Using the 135 percent threshold would set eligibility for connectivity assistance at \$19,683 for an individual and \$40,500 for a family of four, while using the 185 percent threshold would set eligibility at \$26,973 for an individual and \$55,500 for a family of four.

The Vermont Joint Fiscal Office used a monthly \$117 expense for “telecommunications” when determining the 2022 basic needs budget for either an individual or a single parent.⁹⁴ Using this metric and the recommended target for affordability of \$50 per month per household, a state-level subsidy program should provide a total of \$67 per month.

⁹⁴ Joint Fiscal Office (2023) 2022 *Vermont Basic Needs Budgets and Livable Wage Report*. Available at <https://ljfo.vermont.gov/assets/Subjects/Basic-Needs-Budgets/8924c89cea/2022-Basic-Needs-Budget-and-Livable-Wage-report-FINAL-1-17-2023.pdf>. Accessed December 12, 2023.

At the ACP enrollment rate in Vermont of 24,337 households (prior to the ACP's sunset), a \$67 subsidy would result in an annual cost to the state of approximately \$19.5 million, without administrative expenses. Of course, setting the eligibility threshold at 185 percent or 135 percent would decrease the total number of people eligible, but not likely by a proportional amount, because a program that is more generous than the ACP – and associated with the state rather than the federal government – would likely see increased interest and participation. Therefore, the cost of such a program would likely rise in subsequent years as participation rates increase.

Mobile broadband connectivity is critically important to Vermonters who are unhoused or unsheltered. They are often required to regularly recertify eligibility for programs and services, which involves significant time either completing forms or remaining on hold on the phone, and those who do not have consistent income must recertify more frequently. Without access to a cell phone and service plan, they are at a significant disadvantage.

While low-cost phone and service providers such as Cricket Wireless regularly visit organizations like the Upper Valley Haven, maintaining a service plan – no matter how low-cost – can be onerous. In addition, when individuals work in the cash economy, they may not have a bank account from which to make service plan payments. These concerns were echoed during an interview with the Commissioner of the Department of Housing and Community Development, who said that a lack of connectivity makes it harder for vulnerable populations to get and maintain housing.

The state should consider providing fully subsidized mobile phones and phone plans to unhoused and housing-insecure Vermonters. This could take the form of bundling a free mobile broadband device and service plan with other social service programs – likely with centralized procurement at the state level coupled with distribution via local social services organizations. Based on feedback from stakeholders, this Plan also recommends that the eligibility and recertification processes for recipients of this program are created so as not to place an undue burden on the user. For example, recertification should happen no sooner than every six months and use a simple process that can result in immediate, in-person access and set-up to the device.

Lastly, leadership from agencies such as the Upper Valley Haven and Groundworks Collaborative in Brattleboro stated that most of their clients often use free public Wi-Fi along with a gifted or low-cost phone to access mobile broadband.

Unfortunately, in many communities, public Wi-Fi spots are not advertised or require a purchase before use, such as at a café. Though there was a substantial push to activate more public Wi-Fi locations during the pandemic, stakeholders reported that not every community has accessible Wi-Fi. As such, the state should consider enabling more municipalities and community anchor institutions to provide public Wi-Fi with sufficient range for use in their parking lots, as part of the Digital Equity work being done at the VCBB.

Section 6: Emerging Telecommunications Technologies

Telecommunications technology is always evolving and improving, and differentiating the theoretical capabilities and marketing claims of new and emerging technologies from the realities can be challenging.

Rather than provide a comprehensive history of telecommunications technology or review the specifics of every type of broadband technology, this section summarizes the most important current and emerging data transmission and adjacent technologies related to construction and deployment that are critical to understanding as policymakers and state administrators.

6.1 Emerging Applications of Existing Technology

6.1.1 Wi-Fi Calling

Perhaps the most impactful novel use of technology happening in Vermont and elsewhere is the increasing adoption of Wi-Fi-based calling. In effect, cell phone users connected to home Wi-Fi can use that signal to place a call, rather than relying on a mobile broadband signal. The increasing adoption of Wi-Fi calling is impacting telecommunications in the state in a few ways:

- Accelerating the decline of landline telephone services purchased from traditional phone providers
- Reducing the demand for revenue-generating VoIP products offered by ISPs
- Partially alleviating the challenge of a lack of mobile broadband service in households, for residents of those households who own cell phones

Wi-Fi calling still requires the cell phone user to log in to the Wi-Fi network with the applicable password, so users must have access to that information; someone looking to place a call cannot simply use any Wi-Fi network in range.

6.1.2 Expansion of Wireline Providers Into Mobile Broadband

Due to the ability to provide calling over Wi-Fi, some wireline broadband providers have entered the mobile broadband and cell phone carrier markets. In Vermont, the most notable entity expanding services in this way is Comcast, the dominant cable provider in the state. Comcast is encouraging subscribers to add cell phone plans to their cable television and internet bundles, use home Wi-Fi to provide cell service, and purchase roaming data from existing mobile broadband providers as a Mobile Virtual Network Operator (MVNO) outside the home. (Comcast is also operating its own mobile network at 600 megahertz [MHz] Citizens Broadband Radio Service [CBRS] spectrum in select areas.⁹⁵) This allows Comcast to create new bundle options for customers, which provides new revenue opportunities and improves customer retention.

6.1.3 Mobile Broadband via Low Earth Orbit Satellite

A discussion of LEO satellite technology can be found in Section 3.4.3. An emerging application of satellite technology is leveraging LEO satellites to support mobile broadband.

Currently, LEO satellite service is primarily used when the receiver is stationary; however, proprietary vehicle-mounted antennas can provide service to moving vehicles.

In 2022, T-Mobile announced a partnership with SpaceX to use the company's LEO satellites to provide limited mobile broadband services for T-Mobile subscribers using standard T-Mobile devices, starting with the ability to send text messages or use messaging applications. However, as of early 2024, this service has not been implemented, nor has T-Mobile released a date for adding voice and data services. In addition, other major carriers, including AT&T, have filed formal objections with the FCC, which may further delay the implementation of this technology.

⁹⁵ Comcast (2023) "Nokia's 5G Core Selected to Support Comcast's Mobile Connectivity Efforts." Available at <https://corporate.comcast.com/press/releases/nokias-5g-core-selected-support-comcast-mobile-connectivity-efforts>. Accessed January 4, 2023.

6.2 Fiber Construction Advancements

Green Mountain Power (GMP) has a goal of burying a substantial amount of its infrastructure to achieve zero outages by 2030.⁹⁶ To do so, GMP invested in a major new trenching machine that can install multiple conduits simultaneously with minimal disruption to the surface. However, for ISPs and infrastructure builders who cannot procure a device of that capability but who are considering burying infrastructure, this section presents an analysis of standard and novel trenching technologies and their relative effectiveness.

There are three primary trenching methods for fiber optic installation:

1. Directional boring — a boring rig pushes conduit through the ground, entering and leaving the ground only via widely spaced bore pits
2. Plowing — conduit is placed up to three feet underground, but only a relatively narrow surface cut is needed
3. Excavating a trench — conduit is installed in a trench that is a foot wide or more and up to three feet deep before the trench is repaired; this method is not preferable compared with the first two, but it is sometimes required due to needing to work around existing utilities or other constraints

Trenching using these common methods is typically more expensive than building aerially, especially in Vermont, prompting the exploration of new, more cost-effective trenching techniques.

Though there may be instances where using the following techniques is appropriate, this Plan cautions against indiscriminate promotion of these trenching techniques because — in many situations — they may not provide the same level of resiliency as traditional boring, plowing, or trenching.

6.2.1 Microtrenching

Microtrenching entails burying conduit in a shallower and narrower furrow than traditional trenching — as shallow as six to twelve inches below the surface. The advantage of this method is that it allows for smaller machinery and therefore a

⁹⁶ Green Mountain Power (2023) “Green Mountain Power Launches First in Nation 2030 Zero Outages Initiative.” Available at <https://greenmountainpower.com/news/green-mountain-power-launches-first-in-nation-2030-zero-outages-initiative/>. Accessed February 29, 2024.

smaller footprint and reduced disruption of streets, parking lots, sidewalks, and yards. Microtrenching is now strongly encouraged in New York City⁹⁷ in part because it is faster to deploy and less disruptive to roads, sidewalks, and traffic.

However, the shallower trenching depth means that there may be a significant increase in incidences of accidental fiber cuts and disrupted service during road or sewer repairs, frost heaving, and farming activities alongside roadways. Networks built using microtrenching should have increased redundancy to account for the prevalence of fiber cuts – which may offset much of the cost savings of microtrenching – or should limit microtrenching to relatively short distances, construction on private property, or locations where an outage will not have a significant impact.

6.2.2 Surface-Level Deployments

In mid-2023, Corning released a product⁹⁸ that allows fiber to be laid directly on paved surfaces and covered with a special tape. Other similar products allow fiber to be laid on a roadway and covered with a hard plastic casing. Though they have been attempted in longer-term contexts, these types of deployments are best for temporary outdoor connections, for areas where construction can be expensive, and for areas where access is limited, such as crossing parking lots. It is unlikely that such surface deployments will ever become tough enough to be deployed as permanent parts of a robust and resilient fiber network.

6.3 Vehicle Connectivity and Safety Advancements

Although the state spends more money per capita on public transportation than almost all other similarly rural states,⁹⁹ Vermonters drive 20 percent more than the national average,¹⁰⁰ with the majority of commuters using personal vehicles as their

⁹⁷ New York City Office of Technology and Innovation, “Microtrenching.” Available at <https://www.nyc.gov/content/oti/pages/franchises/microtrenching>. Accessed December 11, 2023.

⁹⁸ Corning, “Outdoor Pathway Tape.” Available at <https://www.corning.com/fiber-to-the-premise/emea/en/home/solutions/outdoor-pathway-tape.html>. Accessed December 7, 2023.

⁹⁹ Vermont Agency of Transportation (2019) *Vermont Public Transit Policy Plan 2019*, page 17. Available at https://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/PTPP%20Draft%20Report_Existing%20Conditions_8-14.pdf. Accessed December 13, 2023.

¹⁰⁰ Vermont Business Magazine (2016) “Vermonters Drive 20 Percent More Than US Average, but Are Seeking Out Alternatives,” *VermontBiz*. Available at <https://vermontbiz.com/news/2016/january/28/vermonters-drive-20-percent-more-us-average-are-seeking-out-alternatives>. Accessed December 13, 2023.

primary mode of transportation.¹⁰¹ This section asserts that strong mobile coverage is essential for the safety of drivers in Vermont, but at this stage, it is primarily used for navigation and communication with emergency services – not for car safety features or autonomous driving; the majority of autonomous capabilities and other car safety features are self-contained within the vehicle and do not require ubiquitous or persistent communications.

In the late 2010s, when self-driving vehicles were in the beginning stages of development and testing on public roadways, there were different perspectives on the connectivity that would be required to operate autonomous vehicles' safety features, and some predicted the need for ubiquitous 5G mobile broadband coverage.¹⁰² However, safety capabilities in automobiles today – including lane-departure warning, smart breaking, collision warning, and blind-spot detection – work via onboard cameras and sensors that do not require constant connectivity.

Though automated safety features will proliferate and attempts at making fully self-driving features will likely continue to be developed and tested by automakers, the industry is many years away from pursuing technology that requires ubiquitous, continuous 5G connectivity to function, and deployment of ubiquitous 5G will not be required for Vermonters to take advantage of new automotive safety features in the coming decade.

That said, drivers will still need widespread mobile connectivity on Vermont's roads to enable emergency communication and keep drivers safe on the road. Drivers and passengers increasingly rely on terrestrial mobile communications as more applications that were once considered bonus features are now seen as fundamental, such as navigation applications (e.g., Google Maps and Waze), tracking applications (used by parents of teen drivers, for example), fleet management and theft prevention, and increasingly advanced and data-intensive communications between drivers and 911 systems.

¹⁰¹ Vermont Agency of Transportation (2018) *Vermont Long-Range Transportation Plan*, page 12. Available at https://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/2040_LRTP_%20Final.pdf. Accessed December 13, 2023.

¹⁰² Mary-Ann Russen (2018) "Will 5G Be Necessary for Self-Driving Cars?" BBC. Available at <https://www.bbc.com/news/business-45048264>. Accessed December 11, 2023.

Satellite communications can manage the less data-intensive parts of these applications, but they require the vehicle to have satellite communications systems, which are commonplace but not universal. Mobile providers are testing conventional cell phones that can connect to satellites outside coverage areas (see Section 3.4.3), but in the next few years, they will only be able to send and receive text messages or other short, asynchronous messages. Therefore, having terrestrial communications over as many Vermont roads as possible and minimizing areas without cell phone service can be considered a public good worth pursuing to increase safety and essential services.

Section 7: Opportunities for Neutral Host Arrangements, Shared Infrastructure, and Open Access

This section describes neutral host and shared infrastructure arrangements that could be pursued in Vermont, and importantly, the benefits and risks associated with these models. This section also explores what CUD involvement in expanding mobile broadband could look like, again with the benefits and risks associated with that course of action. This section ends with an update to the previous Plan's assessment of open access opportunities for wireline networks.

This section is meant to be educational and informative and to provide policymakers with an independent description and assessment of various potential courses of action, in compliance with statute.

7.1 Neutral Host Arrangements

Neutral host infrastructure deployments occur when the owner of a single piece of telecommunications equipment allows multiple providers to use the equipment simultaneously on a nondiscriminatory basis. For example, a single macro or micro wireless radio could be deployed by one entity so that multiple mobile network operators (MNOs) could use it to serve commercial customers.

These arrangements can appear logical from a public policy standpoint because, in theory, they allow for expanded coverage in fully unserved areas for multiple providers with a single deployment — if multiple providers are willing to participate. The biggest hurdle, therefore, is ensuring provider participation. If only one provider participates — especially if that provider is not the dominant market player in the area — the expense of the deployment only benefits a small percentage of the population.

However, the challenges to full participation with these deployments in Vermont range from a frequent lack of market incentive to the fact that private companies do not always operate under the same logic as policymakers. Though these

deployments are not impossible to facilitate, policymakers need to have a deep understanding of the risks inherent to pursuing this strategy.

From the point of view of the traditional MNOs, even if an area could conceivably support a profitable neutral host deployment, neutral host arrangements are often avoided for several reasons:

1. **Sharing equipment owned by a third party introduces maintenance and service-quality risks.** Being able to monitor and maintain their own equipment increases their control over quality, service, and important metrics like uptime. Especially with a new or less experienced owner of the equipment, providers may be hesitant to sign on to an arrangement where they do not control the infrastructure. Small cell deployments in particular may need more regular maintenance and calibration due to being lower to the ground and more susceptible to environmental damage (e.g., from tree branches). Small cells also require more radios to cover an area, thereby increasing maintenance requirements.
2. **Public safety and resiliency features are often diminished or harder to provide effectively.** Small cells operated by third-party providers typically do not have the same battery backup capabilities, ability to prioritize FirstNet calls for public safety uses, and – depending on location – the same level of redundant pathways. The owners of the equipment and fiber would also need to have robust service-level agreements (SLAs) with Recovery Time Objectives (RTOs) that meet the carriers' expectations, which is challenging for small, dispersed deployments.
3. **Participation in neutral host arrangements can enable unwanted competition.** MNOs know that neutral host deployments work best with full participation from major carriers to generate enough revenue to maintain the equipment. Therefore, some carriers avoid agreeing to a framework that upon implementation also bolsters the networks of competitors – especially carriers that are known to have an existing edge in coverage in an area and want to maintain that advantage.
4. **Revenue is diminished when third parties are involved.** Given the need for the neutral host equipment owner to also make a profit, the carriers' overall revenue must be diminished. In theory, this may be balanced out by the reduced costs of using shared infrastructure, but whether this will happen in

practice with all the other complexities is not always clear for companies when they are asked to participate.

Fortunately, Vermont does not need to simply speculate as to the viability of a neutral host arrangement for mobile broadband and the likelihood of participation by multiple providers; past and ongoing attempts to make these arrangements work can be illustrative.

In 2017 and 2018, a private company called CoverageCo (now Vanu, Inc.) under contract with the state¹⁰³ placed many neutral host radios around spots without cell phone service along roadways. Each radio could serve approximately 0.5 miles of road in either direction and for that deployment, Verizon and T-Mobile both agreed to offer service to their customers via these radios.

Though several individual deployment sites were profitable (the revenue from calls exceeded operating expenses for that particular site), the enterprise lost money on the deployments as a whole, and ultimately the service was canceled. The following five reasons contributed to the lack of success of CoverageCo:

1. **Many radios were placed assuming that Vermonters would use their phones while driving at the same rate as national averages.** The architecture for the proposal was focused on segments of highways where no cell service existed with the hope of providing drivers continuous access to connections while driving. During CoverageCo's operation, Vermonters were using cell phones while driving well below the national average, according to CoverageCo employees at the time, and the Vermont Legislature passed a law discouraging people from using cell phones while driving.
2. **Radios were placed where DSL was the only backhaul option.** While there were some exceptions, the use of DSL backhaul frequently led to poor service and therefore poor revenue. In the limited locations where it was possible to switch the radios to cable or fiber connections, the improvement in service and revenue was minimal.
3. **Electric metering significantly increased opex costs.** Regulations required that a device attached to a utility pole had to be equipped with a unique

¹⁰³ Department of Public Service (2018) "Status of Coverage Co." Available at <https://publicservice.vermont.gov/telecommunications-and-connectivity/status-coverage-co>. Accessed November 22, 2023.

electric meter. Though CoverageCo's technology was energy efficient and used a predictable amount of power, the cost of the meter — in terms of installation and ongoing service fees — exceeded the cost of electricity used.

4. **911 service created a high fixed cost.** The contract for providing 911 service to CoverageCo locations was around \$50 per month per site at the time, regardless of the volume of calls at the site, representing nearly half of the total operating cost of each location.
5. **AT&T declined to participate.**¹⁰⁴ Using a revenue model based only on when consumers received service paired with having the largest carrier in the state opt out of the network reduced profitability.

Some of these issues can and would be resolved in future attempts at deploying neutral host small cells. For one, the ability to use fiber backhaul after the state achieves its universal 100 Mbps symmetrical service goal would greatly improve the service provided. Some of the operational costs could be altered via legislative action or more structured partnerships with electric utilities. However, some of the fundamental business challenges — such as the fact that maintenance for neutral host small cells presents complications, and revenue often relies on mobile device usage while driving — have not changed.

That said, there are new efforts to deploy neutral host mobile wireless in Vermont — primarily by a company called Mac Mountain — that state officials could monitor to gather more data on the viability of neutral host deployments as a statewide solution.

Mac Mountain is a private business that recently invested in Great Works Internet (GWI) in Maine, which is a fiber-based ISP providing internet service in partnership with three of Vermont's CUDs: ECFiber, DVFiber, and Northwest Fiberworx. In addition to its participation in fiber construction, Mac Mountain will be launching a pilot program in Windsor County with small cell, neutral host wireless radios placed on utility poles, creating contiguous mobile broadband service from Woodstock to Pomfret. Stakeholders from Mac Mountain report that they have the committed participation of three carrier partners, allowing the delivery of mobile connectivity to mobile customers of the project.

¹⁰⁴ Dave Gram (2018) "CoverageCo Financial Woes Could Cost Some Vermonters Cell, 911 Service," VTdigger. Available at <https://vtdigger.org/2018/03/16/firms-financial-woes-cost-vermonters-cell-911-service/>. Accessed November 22, 2023.

Representatives of the company also noted that they have an ongoing pilot program in Maine using an MVNO structure with a local ISP that involves deploying CBRS radios — which typically use about 150 MHz of spectrum around the 3.5 GHz band, and can be accessed via newer mobile devices. Through a partnership with a white-label MVNO service, Mac Mountain reports that users of the MVNO service will be able to utilize AT&T, Verizon, and T-Mobile networks on mobile devices in areas outside of the ISP's local Wi-Fi or CBRS range.

The Vermont attempt — as well as the Maine pilot, which is happening in a very similar geography and context — will provide valuable data for the state as neutral host solutions continue to be tested and considered.

7.2 Shared Infrastructure

Beyond neutral host arrangements, other frameworks allow telecommunications providers to share infrastructure — sometimes in partnership with third parties or even the public sector — which may provide financial efficiencies in deployment.

The greatest opportunities to leverage existing built vertical assets include partnerships with:

- Convenient, existing vertical assets
- Local electric distribution utilities
- Vermont Electric Power Company (VELCO)

Convenient, existing vertical assets could be used to make neutral host deployments more efficient. For example, if an area has been identified as a deployment target, an in-person inspection may reveal a silo, water tower, or other structure in a location beneficial to deployment. However, large mobile broadband providers themselves typically do not seek out deployments on existing structures in rural areas due to the difficulty of getting permission and reliable access from structure owners, and concerns about the long-term structural integrity of older vertical assets built for other purposes. Therefore, a public sector deployment would need to be mindful of these challenges, as well as ensure that any resulting infrastructure would be robust.

Local electric distribution utilities with aerial infrastructure such as utility poles or communications towers may be able to make space available. Because electric distribution poles are typically under 50 feet tall, they can be suitable for small cell deployments (please see Section 7.3.1). Utility-owned communications towers — such as those operated for land mobile radio communications with utility vehicles and monitoring infrastructure — are taller and potentially able to accommodate larger antennas, thereby serving larger areas. (This being said, in conversations, Green Mountain Power also noted that it is often easier to install a new, stand-alone utility pole for a communications purpose, which enables telecommunications workers to climb it without the required training to operate in the electric space.)

Lastly, while many towers are built and owned by the mobile network operators themselves, some towers in Vermont have been constructed without a committed carrier involved at the start, which could be considered an attempt at “shared infrastructure” as a third-party builder would then try to entice multiple providers onto a tower. However, a tower without a committed carrier may in fact have a harder time advancing through the siting and certificate of public good (CPG) processes, and therefore surviving resident-led legal challenges; without a committed carrier, building a tower is essentially real estate speculation and does not provide an immediate public benefit until a carrier installs infrastructure.

Should the state act on this Plan’s recommendation to use a grant program to expand broadband service (described in Section 10.2.3), independent tower builders may apply and score competitively on a cost basis. However, independent tower builders should be encouraged to bid with mobile operators in place to ensure that service will be provided at a particular location. Funding and building a tower without a mobile operator in place risks ending the process with an unused tower.

7.3 Opportunities for the Public Sector or CUDs to Participate in Neutral Host and Shared Infrastructure Broadband Deployments

Given that CUDs are established public-sector vehicles for facilitating wireline deployments, this section frames benefits and risks around possible CUD participation in mobile deployments as well; however, Vermont could take a public-sector approach at the state level or via jurisdictions other than CUDs.

The CUDs benefit from being the anticipated owners of significant fiber throughout the state. As that fiber is deployed over the next five years, CUDs could possibly play a role in providing backhaul for mobile broadband expansion to traditional mobile or small cell deployments in a neutral host arrangement, or they could go further and build their own network of towers and/or small cells alongside their fiber infrastructure.

The information and analysis in this section underpins the recommendations for a mobile broadband grant program in Section 10.2.3.

7.3.1 Small Cell Deployments

Small cells are wireless facilities that are typically at or under 50 feet tall. They are usually located on utility poles, streetlights, or on standalone structures of similar height. They are most common in urban and suburban areas where the capacity needs of many people and vehicles in a small area require frequent reuse of spectrum.

Due to high capital and operational costs per user,¹⁰⁵ small coverage area, maintenance complexities, and service quality concerns (resulting from maintaining power and from physical barriers, like buildings and foliage), small cell deployments in rural unserved areas are typically deployed to provide infill for smaller areas without cell phone service in valleys. However, in a state where macro sites are often delayed and costs can be greatly increased due to litigation, the actual cost to deploy over a similar coverage area may end up being lower with a small cell strategy on a case-by-case basis.

Should the CUDs own small cells – whether small cells are deployed using their own capital or via a state grant program – they would need to engage in processes or develop capabilities to overcome the following challenges common to any new entrant in wireless infrastructure:

- **Acquiring access to or deploying new vertical structures such as utility poles for placing antennas and equipment.** The permitting and technical

¹⁰⁵ Because small cell coverage areas are limited – usually under half a mile in radius – they individually serve relatively few addresses and mobile users, so even though the capital and operational cost is lower than for a large site, small cells are usually more costly per user.

requirements for small cells on poles are different and more complex than the requirements for attaching fiber.

- **Working with the electric utility to power the infrastructure.** Even though infrastructure would be on or near utility poles, installing suitable service in a rural area may be costly and time consuming.
- **Building a skilled workforce and sophisticated operational systems to maintain small cell infrastructure.** Small cell operations require specialized competencies such as pole climbing, working in the electric space if radios are placed at the top of poles, and calibrating equipment multiple times a year, often with the changing of seasons. Current CUD staff and operational partners may not have these skills or capacity.
- **Establishing a sustainable business plan that covers operational costs and provides for routine replacement of equipment to ensure service longevity.** Small cell operations require more equipment maintenance and more frequent replacement schedules than fiber-based operations. Newer or smaller CUDs with small operating margins may not be able to incorporate these expenditures until their economics mature.
- **Enticing mobile operators to use the small cells in an economically viable arrangement.** Limited customer traffic and resultantly small potential revenues may not entice traditional MNOs to use small cell infrastructure, even when available.
- **Ensuring operational resilience.** Carriers expect backhaul providers to have operational resilience and operational continuity plans to ensure that mobile service outages are minimal, even during disaster events. This resiliency can be more challenging with smaller pole-based installations (which, for example, are typically not provided with a back-up generator).

Though some of the logistical skills and challenges CUDs would need to overcome — such as accessing power and poles — are achievable with existing staff capabilities, some of the bigger challenges around business plans are context specific to deployment locations and MNO partners, and would require careful planning and likely outside expertise to investigate on a case-by-case basis.

7.3.2 Operating Traditional Wireless Infrastructure

Traditional macro wireless infrastructure — on towers greater than 50 feet tall — presents efficiency gains from a capital and operational expense perspective.

However, CUD or public sector involvement in macro sites presents its own complexities.

In a scenario where CUDs own and operate traditional wireless infrastructure such as towers, they would need to oversee site selection, permitting, public engagement processes, construction, maintenance, and the provision of access to lessees. In addition, CUDs would likely want to provide backhaul to the towers with their own infrastructure rather than procuring backhaul from one of the existing enterprise service providers in the state.

Again, for CUDs or other public sector entities to play a role as tower owners, they would need to be able to overcome the following challenges:

- **Procuring a range of services – including site selection, construction, and construction management – to ensure tower construction is effective.** Tower preconstruction and construction are specialized technical fields requiring diverse professional services, many of which would be novel contractual relationships for the CUDs.
- **Achieving the scale necessary to effectively negotiate leases with mobile network operators.** MNOs like to negotiate bulk deals with tower owners for efficiency, and may not be interested in a discussion about a small number of towers. CUDs would need to obtain scale to be of interest, and coordinate a negotiating strategy as they solicit lessees for towers. Importantly, achieving scale in a new business endeavor without revenue increases the financial risk CUDs would need to accommodate.
- **Providing quality enterprise services to support tower backhaul.** Due to uptime and security requirements, enterprise broadband services for mobile broadband towers are strict. CUDs and their ISP partners would need to ensure these services can be provided to the satisfaction of mobile operators and would be bound by contracts promising a minimum quality of service.
- **Ensuring a viable long-term business model.** As with any new product offering, CUDs would need the expertise necessary to develop a model with long-term viability to honor obligations to lessees and ensure service sustainability. This business model would also need to accommodate the uncertain and widely variable legal costs commonly incurred by entities seeking to build new towers in the state.

In theory, CUDs could benefit from their close relationships with member communities when it comes time for public engagement processes. However, this benefit cannot be guaranteed, as tower construction can be delayed, or costs greatly increased, by a single person who decides to mount legal challenges and appeals. Broad favorability in a community cannot prevent a single actor from opposing a tower and using their resources to push back.

7.3.3 Mobile Broadband Backhaul and Enterprise Services

In either the tower ownership or neutral host framework, CUDs would likely need to provide carrier-grade broadband service via fiber to the MNOs. Additionally, it is potentially beneficial for CUDs to build the capacity to provide this level of service in general so that they can compete for business customers or participate in mobile expansion by providing connectivity to towers or antennas.

However, stakeholder interviews indicate that (as of the writing of this Plan) CUDs are not uniformly aware of the capabilities they would need in order to provide carrier-grade service. Many CUDs are in the early stages of deployment and focused on serving their most rural residential areas first, and as such are understandably still working to establish increased organizational capacity. It may be that the ISPs who are working in partnership with CUDs have the experience and knowledge to support the CUDs in providing carrier-grade service.

This section outlines some of the critical components of carrier-grade service, which are typically documented in an SLA. This section does not advocate that CUDs develop carrier-grade service immediately, and certainly not before their original mission of deploying universal residential service is complete. It simply documents the capabilities that CUDs may work to develop over the next 10 years to most effectively position themselves to participate in the provision of mobile broadband backhaul (as well as supply enterprise-grade service to other business customers).

To support enterprise-level clients, including macrosite mobile broadband towers, CUDs would need to be able to do the following:

Provide symmetrical multi-gigabit connections. The capacity needs of enterprise customers greatly exceed those of homes and small businesses. Enterprise customers have many more individuals at a location. They also use applications such as computer-aided design, high-resolution imaging (e.g., medical charts, graphic

design, and 3D rendering), and agricultural capabilities, all of which require more bandwidth.

Wireless sites may serve hundreds of simultaneous users. Enterprise customers and wireless carriers also require symmetrical bandwidth. Uses include two-way video, hosting of content, cloud communications, and virtual reality applications and simulations, all of which require multi-gigabit connections.

Create sufficient resiliency and redundancy to guarantee a minimum uptime, speed, and latency. Losing a single backhaul connection could cut off wireless service for hundreds of users of mobile or fixed services over dozens of square miles, with potentially devastating impacts:

- If a business has many employees at a location, work disruptions and the losses resulting from an outage may damage or even destroy a business.
- For medical facilities relying on remote examination and diagnosis, losing a connection may be a matter of life and death.
- If a government location loses connectivity, public safety and basic services can be negatively affected.
- If a utility loses service, critical control and monitoring functions could be compromised.

For these reasons, enterprise and institutional customers with critical needs typically do not rely on a single source of broadband. Unfortunately, the options for a second connection may be poor, such as relying on satellite service with asymmetrical and slow bandwidth, on a less-capable wireline provider with lower speeds and reliability, or on a second provider with routing that overlaps the first provider and therefore does not provide true redundancy.

Enterprise-level providers also need plans to meet appropriate Recovery Time Objectives (RTOs), or benchmarks for restoring service after an outage or disaster. These plans include staff or contractors arriving on site, diagnosing the problem, and performing the repair — often a temporary repair followed by a permanent solution. Providers need to have agreements in place with multiple contractors who can do this work, with clear, rigorous terms to minimize the duration of service downtime. RTOs often include provisions for refunds or payments if the provider

cannot restore service within the agreed-upon timeframe. For example, Comcast offers a pro rata credit (excluding taxes and fees) for a service interruption exceeding 24 consecutive hours after the outage is reported, as long as the credit is requested within 120 days of the interruption.¹⁰⁶

A CUD that provides enterprise customers with real path diversity of fiber and facilities and that responds quickly and effectively to repair outages can make it possible for enterprise customers to build a level of reliable and resilient service that does not exist outside metropolitan areas. An enterprise with critical communications needs would require this diversity to see the CUD service as a viable business option.

Ensure robust cybersecurity protection and monitoring. A successful cybersecurity attack can have the same or greater impact than cutting a major fiber route or disabling a key data center. CUDs need to be educated in cybersecurity best practices and adopt cybersecurity frameworks, practices, and procedures that keep their networks operational and protect personal information. Best practices include:

- Regular software updates
- Recurring third-party audits
- Network interface monitoring and management
- Selecting secure network equipment from companies with strong cybersecurity records
- Training and background checks of key employees
- Collaboration among providers in a consortium
- Working with experts in higher education institutions and government

If a CUD does not have sufficient scale to hire specialized staff for robust cybersecurity, they may need to contract out security roles.

Create, execute, and abide by significant contracts that typically include structured penalties if contract guarantees are not met (e.g., target uptime is not achieved). Contracts structure the relationship between the CUD and the customer and help to alleviate problems if they arise. A strong contract will convey to the enterprise customer that the CUD is serious and professional. Robust enterprise

¹⁰⁶ Xfinity, “Xfinity Residential Services Agreement.” Available at <https://www.xfinity.com/corporate/customers/policies/subscriberagreement>. Accessed January 17, 2024.

contracts typically include required service levels for availability and technical performance as well as penalties.

It is rare that the dollar amount of a penalty – usually some portion of a monthly service fee – will make the enterprise whole in the event of a significant failure. But having a benchmark in place and giving the enterprise customer the ability to measure performance against the benchmark helps to create an environment where the provider will select staff, staffing levels, equipment, network architecture, and support contracts to meet the benchmark. Having a benchmark also enables the CUD – if it chooses – to publicly advertise its adherence to the standard.

7.4 Opportunities for Open Access

In 30 V.S.A. § 202c, the state establishes a goal to “support competitive choice for consumers among telecommunications service providers and promote open access among competitive service providers on nondiscriminatory terms.”

The previous sections addressing neutral host and shared infrastructure models analyze, in part, considerations around facilitating competitive mobile wireless services via shared radio infrastructure; however, the term “open access” is often used in reference to wireline deployments where multiple ISPs serve customers via a single network, owned by a third party, on a nondiscriminatory basis.

The analysis of open access opportunities in Vermont – particularly for the CUDs – presented in the Department of Public Service’s 2021 10-Year Telecommunications Plan, is just as valid today. The 2021 Plan stated:

The challenge with open access is that it complicates the economics of network ownership through the very competition that it is intended to create – by reducing the likely revenues for any given provider and thus potentially reducing interest in the opportunity. For CUDs that value open access, this model can and should be considered, with full analysis of the financial and partnership implications.

There are two primary technical approaches to open access that CUDs may wish to consider. First, in a dark fiber¹⁰⁷ infrastructure approach, the CUD would focus

¹⁰⁷ “Dark fiber” refers to fiber optic cables that are installed but not currently in use.

its efforts on building out the fiber and leasing strands of fiber to one or more lessees. Second, in an alternative model, open access would be provided over lit communications circuits¹⁰⁸ rather than physical assets.

That said, there is no universal understanding of what is meant by “open access.” Generally, the term refers to an arrangement in which multiple entities can access the same physical infrastructure, thus enabling broadband competition over one physical network – a far more efficient means of delivering competition than requiring all entities to build their own networks as a path to competing in a given market.

In a more focused sense, what advocates of open access mean by this term are rules to require an asset owner to sell or lease an asset at reasonable and often predetermined rates, terms, and conditions. After all, it could reasonably be expected that every asset owner would have a price at which it would voluntarily be willing to sell access – the key is that the rates and terms are standardized and reasonable, thus facilitating the competitive environment that is one of the goals of open access.

But it is critical to understand that the economics of open access are more complex than that, particularly for a CUD that is seeking partnership with a private entity that has to build a business case for taking on the risk and cost of network operations and other elements of its arrangement with the CUD. The prospect, even if remote, of having to share a finite market with competitors changes the business case for the CUD’s partner, potentially increases the risk, and likely changes the terms under which that partner will enter into the arrangement with the CUD. Stated otherwise, a requirement of open access may come with costs to a CUD – costs that the CUD may or may not wish to undertake, based on its goals.

And it is also important to note that the willingness of a network owner to lease access over its network does not mean that there will be willing lessees for that access. Even if the CUD’s partner agrees to open the network to its competitors under certain terms, those competitors may not be interested in the opportunity, given the costs of entering the market and need to share the limited revenues associated with a low-density, competitive market.

¹⁰⁸ “Lit communications circuits” refer to circuits that are installed and in use.

In the past few years, various CUDs have explored and established – and in some cases abandoned – frameworks that are versions of open access models, from models that establish an anchor tenant but leave open the possibility of bringing on multiple providers in the future, to frameworks for nondiscriminatory data wholesale services over CUD networks. The diversity of paths evaluated, embraced, and in some cases abandoned by the CUDs reflect the logistical and economic complexities of open access models described in the 2021 Plan and reproduced above. These considerations are just as valid today as they were in 2021 for any entity considering the establishment of an open-access network.

To further the conversation about open access and competitive choice in 2024, this Plan presents an analysis of the ongoing strength and applicability of the statutory goals presented in 30 V.S.A. § 202c in comparison with the goals and initiatives established in other parts of state statute. With open access and the goals of competition in particular, this Plan recommends reorienting state statutory telecommunications goals to address the underlying *benefits* that open access and competition can often enable (such as more affordable service, better customer service, and clear recourse in the event of poor ISP performance). Please see Section 11 for this analysis of Vermont statutory goals related to telecommunications.

Section 8: Workforce Readiness, Analysis, and Best Practices

Vermont's success in executing broadband deployments to connect all unserved and underserved households will require unprecedented collaboration across the public, private, and nonprofit sector, especially when it comes to fostering a well-trained and diverse Vermont workforce.

This section reviews workforce changes in Vermont's broadband deployment sector from 2018 to 2022, outlines the workforce needs that will be created by the estimated total spending on broadband construction to bring connectivity to all Vermonters over the next five years, explores the broadband deployment occupations with the highest anticipated need for additional workers, and describes best practices for workforce development.

8.1 Establishing a Baseline for the Broadband Construction Sector in Vermont

According to a 2021 Brookings report, "How Federal Infrastructure Investment Can Put America to Work," the workforce clusters involved in broadband deployment are represented by the following North American Industry Classification System (NAICS) categories:

- *Power and Communication Line and Related Structures Construction*
- *Fiber Optic Cable Manufacturing*
- *All Other Electrical Equipment and Component Manufacturing*
- *Cable and Other Subscription Programming*
- *Wired Telecommunications Carriers*
- *Wireless Telecommunications Carriers¹⁰⁹*

¹⁰⁹ The Broadband Deployment Sector is defined by the March 2021 Brookings Report, "How Federal Infrastructure Investment Can Put America to Work" (<https://www.brookings.edu/research/how-federal-infrastructure-investment-can-put-america-to-work/>). These industries were originally identified by Pollin et al. in the October 2020 report, "Impacts of the Reimagine Appalachia & Clean Energy Transition Programs for Ohio" from the Political Economy Research Institute at the University of Massachusetts, Amherst (<https://reimagineappalachia.org/wp-content/uploads/2020/10/Pollin-et-al-OHIO-Reimagine-Appalachia-and-Clean-Energy-Programs-10-19-20.pdf>).

The following table, generated using data from the economic and labor market modeling tool Lightcast,¹¹⁰ outlines the performance of these subsectors that were directly employed in telecommunications in Vermont from 2018 to 2022. (Note: The data nomenclature used by the NAICS changed between the publication of the 2021 Brookings report and now; the category formerly called *Cable and Other Subscription Programming* is now called *Media Streaming Distribution Services, Social Networks, and Other Media Networks and Content Providers*.)

Table 8: Performance of Vermont's broadband deployment sector (2018 – 2022)

NAICS	Industry	2018 Jobs	2022 Jobs	2018 - 2022 Change	2018 - 2022 % Change	2022 Avg Earnings per Job - Vermont	2022 Avg Earnings per Job - National
237130	Power and Communication Line and Related Structures Construction	360	322	-38	-11%	\$115,169	\$107,881
335921	Fiber Optic Cable Manufacturing ¹¹¹	<10	0	Insf. Data	Insf. Data	\$0	\$109,186
335999	All Other Electrical Equipment and Component Manufacturing	273	163	-110	-40%	\$137,007	\$121,247
516210	Media Streaming Distribution Services, Social Networks, and Other Media Networks and Content Providers	222	230	8	4%	\$95,205	\$232,083
517111	Wired Telecommunications Carriers	762	697	-65	-9%	\$118,485	\$125,927
517112	Wireless Telecommunications Carriers (except Satellite)	52	55	3	6%	\$81,682	\$121,884
	Total	1,675	1,467	-208	-12%	\$114,790	\$145,503

Average earnings are based on weighted averages. Source: Lightcast Datarun 2023.3

There has been significant dynamism within Vermont's broadband deployment sector in the past five years, and the data suggest a few notable trends:

- The decrease in *Power and Communication Line and Related Structures Construction* roles suggests declining construction or utility repair in the state, and the need for improved mechanisms for training and hiring new workers in the field.

¹¹⁰ Lightcast. Available at <https://analyst.lightcast.io>. Accessed November 16, 2023.

¹¹¹ Fiber Optic Cable Manufacturing data is intentionally imprecise due to rules that prevent the Bureau of Labor Statistics from revealing exact data in situations where business secrets could be inadvertently exposed, such as when there is only one type of firm in a state.

- The sharp decline in *Electric Equipment and Component Manufacturing* obviously represents a contraction of that sector in the state; however, manufactured goods will be bought from out of state regardless, and while contractions in this workforce do signify job declines, it is not necessarily as much of a barrier to future construction deployment as a lack of construction laborers, for example.
- The decline in *Wired Telecommunications Carriers* aligns with a general contraction in the industry over the past few years. Contributing factors may include an increased use of technology in ISP operations resulting in less reliance on people, or an increase in retirements in the industry.
- The slight growth in *Wireless Telecommunications Carriers* may indicate increased deployment of mobile broadband infrastructure (e.g., 5G) and a push by certain carriers like T-Mobile, Verizon, and AT&T to deploy and market FWA technology for home internet service.

Overall, the state saw a reduction of over 200 jobs in industries related to broadband deployment during this timeframe, which was greater than national trends. Vermont saw a 12 percent reduction in the broadband deployment workforce, while the same sector shrank by 4 percent nationally over the same timeframe.

One reason, according to high-level officials at the Department of Labor, is Vermont's higher concentration of older workers who are closer to retirement. Vermont does not have enough younger workers to replace those retiring, and youth labor force participation has been trending downward for decades.

To combat this trend, Governor Phil Scott worked to secure funding to encourage students to enroll in post-secondary technical training programs, such as those offered through the Green Mountain Technology and Career Center, which provides training in areas like computer networking, construction, and electrical technology. The Vermont Student Assistance Corporation offered forgivable student loans to support education in high-demand trades.¹¹²

If workers can be enticed back into the sector with compensation and incentives, the challenge of a recently contracting workforce can also be seen as an opportunity.

¹¹² Katharine Huntley (2022) "State Tries to Encourage More Vt. Students to Consider Careers in the Trades," WCAX. Available at <https://www.wcax.com/2022/08/23/state-tries-encourage-more-vt-students-consider-careers-trades/>. Accessed January 26, 2024.

Wages for Vermonters in broadband construction roles are varied in their relationship to national averages. Overall, the state lags behind the nation with earnings. Wages for both *Wired* and *Wireless Telecommunications Carriers* are significantly lower than the national averages for those categories, suggesting there is a risk that some workers may be enticed out of state. Workers in *Power and Communication Line and Related Structures Construction* and *All Other Electrical Equipment and Component Manufacturing* make more than national averages for the same categories, which may have impacts on worker attraction and retention.¹¹³

That being said, data available on wages in these occupations may not reflect very recent changes. A Department of Labor official noted that Vermont wages have risen approximately 6 percent over the past year as businesses try to keep pace with inflation and compete for workers.

8.2 Estimating the Impact of Total Construction Spending on Broadband Construction Jobs

This analysis uses the \$500 to \$700 million estimated spending to connect all 50,000 unserved and underserved households with fiber presented in Vermont's Five-Year Action Plan.¹¹⁴ The estimated total construction cost will be covered by BEAD, ARPA, subgrantee matches, and other funding sources. According to the Five-Year Action Plan, "The upper end of this range accounts for the risk of project cost overruns (i.e., to account for inflation, supply chain challenges, labor shortages, etc.)" (page 80).

Based on the Brookings research cited above, broadband construction activities are expected to be allocated in the following proportions across the following relevant industry sectors.^{115,116}

¹¹³ Lightcast Datarun 2023.3.

¹¹⁴ Vermont Community Broadband Board (2023) *The State of Vermont's Broadband Equity, Access, and Deployment Five-Year Action Plan*. Available at https://publicservice.vermont.gov/sites/dps/files/documents/Vermont%20BEAD%20Five-Year%20Action%20Plan%20Final%2008242023pm_0.pdf. Accessed November 8, 2023.

¹¹⁵ The distribution of how this investment across broadband industries was based on the work of the Brookings Report [How Federal Infrastructure Investment Can Put America to Work](#), by Escobari, Gandhi, and Strauss, from June 2021, which is based on the work of Pollin, et al. (2020).

¹¹⁶ Robert Pollin, Jeannette Wicks-Lim, Shouvik Chakraborty, Gregor Semieniuk (2020) "Impacts of the Reimagine Appalachia & Clean Energy Transition Programs for Ohio: Job Creation, Economic Recovery, and Long-Term Sustainability," PERI at University of Massachusetts Amherst, page 107.

Table 9: Anticipated distribution of broadband investment across sectors

NAICS	Industry	Weight
237130	Power and Communication Line and Related Structures Construction	25%
335921	Fiber Optic Cable Manufacturing	10%
335999	All Other Electrical Equipment and Component Manufacturing	15%
516210	Media Streaming Distribution Services, Social Networks, and Other Media Networks and Content Providers	10%
517111	Wired Telecommunications Carriers	20%
517112	Wireless Telecommunications Carriers (Except Satellite)	20%

Using the anticipated impact across sectors, an input-output methodology with the modeling tool Lightcast was used to understand and analyze the workforce needs based on anticipated broadband spending.

8.2.1 Broadband Construction Spending Will Require Vermont To Grow Its Broadband Construction Workforce by Over 750 Jobs

Though over a hundred occupation categories may be involved in broadband deployment in some form or another, this analysis focuses on 12 occupational categories required to deploy broadband, identified by the Brookings article cited above. The following table estimates the numbers of workers needed in those categories to execute on a \$500 million or a \$700 million investment in broadband construction, and the proportional increase in workforce needed for each occupation.

Table 10: Estimated workforce requirements for broadband deployment occupations

Occupation	Currently Employed in Vermont	\$500 Million Investment		\$700 Million Investment	
		New Workers Needed	% Increase	New Workers Needed	% Increase
Project Management Specialists	896	20	2.23%	27	3.01%
Business Operations Specialists, All Other	2,075	19	0.92%	26	1.25%
Software Developers	1,741	17	0.98%	24	1.38%
Software Quality Assurance Analysts and Testers	155	1	0.65%	4	2.58%

Occupation	Currently Employed in Vermont	\$500 Million Investment		\$700 Million Investment	
		New Workers Needed	% Increase	New Workers Needed	% Increase
Electronics Engineers, Except Computer	174	7	4.02%	9	5.17%
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	1,345	37	2.75%	52	3.87%
Customer Service Representatives	3,896	40	1.03%	56	1.44%
Construction Laborers	3,441	158	4.59%	221	6.42%
First-Line Supervisors of Mechanics, Installers, and Repairers	1,016	36	3.54%	52	5.12%
Telecommunications Equipment Installers and Repairers, Except Line Installers	260	53	20.38%	76	29.23%
Electrical Power-Line Installers and Repairers	344	78	22.67%	109	31.69%
Telecommunications Line Installers and Repairers	186	77	41.40%	107	57.53%

Source: Lightcast Datarun 2023.3

Because this chart is based on job classifications regardless of industry (i.e., inclusive of more industries than just those in the broadband deployment sector), there are significantly more employees noted for each job category than in the previous chart, which only included workers employed at broadband deployment-related businesses. For example, a significant number of lineworkers may be working for electric utilities rather than telecommunications companies. However, this chart gives perspective as to the pool of people who could be drawn upon to work — and which categories may be hardest to supply as a percentage of the existing workforce.

For example, in the \$700 million construction scenario, *Electrical Power-Line Installers and Repairers* and *Telecommunications Line Installers and Repairers* will need approximately the same amount of new people (109 and 107, respectively), but as a percentage, *Telecommunications Line Installers and Repairers* will need to grow by much more, suggesting that it may be significantly harder to fill those roles.

Another factor that impacts how difficult it will be to grow the net workforce in a particular category is how concentrated that workforce is relative to a national baseline in a particular area. When there are notable existing higher-density clusters, not only is filling roles easier with the existing workforce, but there is more possibility for specialization, mentorship, and even recruitment due to an increased visibility in the community.

To demonstrate this, a Location Quotient (LQ) analysis is used to show the relative concentration of an occupation compared to national averages, and as such, which roles may be especially hard to fill. An LQ of 1.00 means an occupation is exactly as concentrated in a region as it is in the whole country. An LQ higher than 1.00 means there is a higher concentration of that occupation in the region (and thus more opportunity for specialization, more resilience when an influx of these occupations are needed, and more of an existing network in the community), while an LQ less than 1.00 represents a lower concentration (and therefore could be considered a greater scarcity issue in times of occupational need).

Table 11: Occupations needed for broadband deployment (by percentage increase required)

Occupation	% Occupational Increase Required	Location Quotient
Telecommunications Line Installers and Repairers	57.53%	0.80
Electrical Power-Line Installers and Repairers	31.69%	1.35
Telecommunications Equipment Installers and Repairers, Except Line Installers	29.23%	0.72
Construction Laborers	6.42%	1.18
Electronics Engineers, Except Computer	5.17%	0.75
First-Line Supervisors of Mechanics, Installers, and Repairers	5.12%	0.88
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	3.87%	0.58
Project Management Specialists	3.01%	0.50
Software Quality Assurance Analysts and Testers	2.58%	0.37
Customer Service Representatives	1.44%	0.65
Software Developers	1.38%	0.53
Business Operations Specialists, All Other	1.25%	0.88

Source: Lightcast Datarun 2023.3

While a couple of these impacted occupations are above national levels of concentration, most are well below, indicating those roles may be especially difficult to fill as more broadband deployment demand is generated across the country. Of particular concern are *Telecommunications Line Installers and Repairers* (LQ of 0.80) and *Telecommunications Equipment Installers and Repairers, Except Line Installers*

(LQ of 0.72). Both the Executive Director of Maple Broadband and the Commissioner of Labor cited a major workforce shortage of installers.

A number of office jobs such as *Sales Representatives of Services* (LQ of 0.58), *Software Quality Assurance Analysts and Testers* (LQ of 0.37), and *Software Developers* (LQ of 0.53) also have very low Location Quotients; however, these roles can more easily be performed remotely.

8.2.2 Characteristics of Key Workforce Categories

Understanding how to create a robust workforce across key categories requires understanding characteristics of those job categories, such as the average earnings, change in number of employees over the past few years, and importantly, the turnover rate. High turnover rates, which could represent people switching jobs or retiring – both of which are trends in parts of the broadband deployment sector – impact the efficiency of organizations by requiring more frequent hiring and training and losing employees with context and experience. The chart below outlines characteristics of the occupations identified as in need of critical workforce attention.

Table 12: Characteristics of key occupations impacted by broadband investment

Occupation	Currently Employed in Vermont	2018 - 2022 % Change	Median Annual Earnings	Annual Turnover Rate
Project Management Specialists	896	23%	\$72,951	40%
Business Operations Specialists, All Other	2,075	111%	\$66,077	51%
Software Developers	1,741	9%	\$99,376	26%
Software Quality Assurance Analysts and Testers	155	-14%	\$68,375	31%
Electronics Engineers, Except Computer	174	-10%	\$104,084	24%
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	1,345	11%	\$65,201	59%
Customer Service Representatives	3,896	-10%	\$39,380	78%
Construction Laborers	3,441	2%	\$41,189	44%
First-Line Supervisors of Mechanics, Installers, and Repairers	1,016	0%	\$70,160	49%
Telecommunications Equipment Installers and Repairers, Except Line Installers	260	-23%	\$78,556	42%

Occupation	Currently Employed in Vermont	2018 - 2022 % Change	Median Annual Earnings	Annual Turnover Rate
Electrical Power-Line Installers and Repairers	344	-1%	\$99,322	32%
Telecommunications Line Installers and Repairers	186	-40%	\$62,785	41%

Source: Lightcast Datarun 2023.3

While several of these occupations have seen growth from 2018 to 2022, many occupations have contracted in numbers, particularly *Telecommunications Line Installers and Repairers*, *Telecommunications Equipment Installers and Repairers*, *Except Line Installers*, and *Software Quality Assurance Analysts and Testers*. This could be due to retirements, technology changes rendering some jobs obsolete, reclassification of occupations, contractions in the industry, or wages that are lower than national averages, causing outward migration. While some workers may be enticed back out of retirement, or brought back into the industry despite a previous contraction, a large number are likely out of the sector for good.

Turnover rates also give context for how often employees in each occupation are moving to different employers. For example, while the overall number of *Customer Service Representatives* declined by 10 percent between 2018 and 2022, the turnover rate was 78 percent, indicating significant movement of most of these workers to other occupations. To some extent, turnover also illustrates there are opportunities for employment elsewhere with a similar skill set and is a sign of a strong job market.

These findings were reiterated during interviews with the General Manager of Vermont Public Power Supply Authority and the CEO of ValleyNet, who have found recruiting and retention in broadband workforce sectors to be difficult.

8.2.3 Current Unemployment Metrics

According to the U.S. Bureau of Labor Statistics, the seasonally adjusted unemployment rate in Vermont was 1.9 percent in September 2023,¹¹⁷ which was much lower than the national unemployment rate of 3.8 percent.¹¹⁸

¹¹⁷ U.S. Bureau of Labor Statistics (2023) “State Unemployment Rates, Seasonally Adjusted.” Available at <https://www.bls.gov/charts/state-employment-and-unemployment/state-unemployment-rates-map.htm>. Accessed November 16, 2023.

¹¹⁸ U.S. Bureau of Labor Statistics (2023) “Civilian Unemployment Rate, Seasonally Adjusted.” Available at <https://www.bls.gov/charts/employment-situation/civilian-unemployment-rate.htm>. Accessed November 16, 2023.

Though unemployment numbers are only aggregated at more general occupation classification levels, some inferences can be made as to how current unemployment numbers may impact ability to fill open positions in broadband construction.

The chart below outlines the total number of unemployed workers in Vermont by major occupation category (i.e., a portion of the overall unemployment rate in the state), the share of all unemployed people in Vermont represented by that category, and the comparable percentage of all unemployed people in that category for the nation. In other words, while 7 percent of unemployed people in Vermont are from the *Construction and Extraction* occupations, 10 percent of people nationally who are unemployed are from that category, showing a proportionally smaller availability of those workers in Vermont compared to the nation.

Table 13: Unemployment for occupations impacted by broadband investment

Occupation	Unemployed in Vermont (May 2023)	% of State Unemployment	% of National Unemployment
<u>Business and Financial Operations Occupations</u> Project Management Specialists Business Operations Specialists, All Other	114	2%	6%
<u>Computer and Mathematical Occupations</u> Software Developers Software Quality Assurance Analysts and Testers	85	1%	3%
<u>Architecture and Engineering Occupations</u> Electronics Engineers, Except Computer	461	8%	1%
<u>Sales and Related Occupations</u> Sales Representatives of Services	142	2%	8%
<u>Office and Administrative Support Occupations</u> Customer Service Representatives	158	3%	14%
<u>Construction and Extraction Occupations</u> Construction Laborers	373	7%	10%
<u>Installation, Maintenance, and Repair Occupations</u> First-Line Supervisors of Mechanics, Installers, and Repairers Telecommunications Equipment Installers and Repairers Electrical Power-Line Installers and Repairers Telecommunications Line Installers and Repairers	52	1%	4%

Source: Lightcast Datarun 2023.3

This analysis suggests that in Vermont, almost all of the roles associated with broadband construction have lower rates of proportional unemployment than the nation, indicating that filling these roles with the pool of currently unemployed

individuals will be more difficult than it will be on average across the nation. According to the VCBB, this trend is reflected in workforce development programs focused on highlighting the long-term career path from entry-level fiber technician roles to systems management positions.

Staffing shortages can also be examined via job postings. The chart below outlines average monthly postings versus average monthly hires. Hiring data are calculated using a combination of Lightcast jobs data, information on separation rates from the Bureau of Labor Statistics (BLS), and industry-based hiring data from the Census Bureau.

Table 14: Occupations impacted by broadband investment, job postings vs. hires (2022)

Occupation	Avg. Monthly Postings (Jan – Dec 2022)	Avg. Monthly Hires (Jan – Dec 2022)
Project Management Specialists	76	41
Business Operations Specialists, All Other	16	103
Software Developers	354	60
Software Quality Assurance Analysts and Testers	33	6
Electronics Engineers, Except Computer	10	4
Sales Representatives of Services, Except Advertising, Insurance, Financial Services, and Travel	23	80
Customer Service Representatives	127	260
Construction Laborers	28	140
First-Line Supervisors of Mechanics, Installers, and Repairers	29	48
Telecommunications Equipment Installers and Repairers, Except Line Installers	8	10
Electrical Power-Line Installers and Repairers	8	10
Telecommunications Line Installers and Repairers	1	7

Source: Lightcast Datarun 2023.3

One challenge of using job postings alone to quantify the hiring gaps is that hiring does not happen on a 1:1 ratio with postings. Within many occupations, more hiring is happening than job postings are listed, suggesting that hiring occurs via direct recruitment, re-hires, contractors, unions, career fairs, or directly from training or educational programs. In addition, it is common for large firms to use one posting to hire multiple roles at the same position and at the same time. That said, postings

and hiring are a useful way to understand almost in real time what specific roles are the most sought after and needed across the state.

8.3 Continuing to Support Workforce Development in Vermont

The state of Vermont is already taking significant steps to grow the telecommunications workforce. The Vermont Community Broadband Board recently took on a program started by Vermont Technical College (VTC), in partnership with the Department of Labor, to train broadband installers with an associated apprenticeship program¹¹⁹ to provide a smooth transition to the workforce and paid on-the-job training.

This Plan commends the state for setting up this collaborative structure, and for the close communication public sector stakeholders have maintained with construction firms and ISPs in the state. To form a data-driven assessment of the programs, the VCBB – in collaboration with the state college system, the Department of Labor, and employers – should consider using the gap analysis in this section to scale and calibrate existing workforce training programs. Metrics to quantify success could include the number of qualified workers trained, hired, and still in the industry after three months. However, time is of the essence, as the majority of the workforce training must happen in 2024 and early 2025 to be maximally impactful for the BEAD Program's construction timeline.

The best practices listed here are largely in place in Vermont, but are provided so the full ecosystem of telecommunications stakeholders can understand how a statewide effort to train a workforce is best achieved.

- **Apprenticeships and on-the-job training programs:** Apprenticeship models for industries where apprenticeships exist (e.g., for electricians and lineworkers, such as those offered by the Communications Workers of America or International Brotherhood of Electrical Workers), as well as on-the-job training programs for all industries, provide benefits to both employees and employers. Employers can train people in their systems

¹¹⁹ Vermont Community Broadband Board (2023) "Vermont Community Broadband Board Announces New Apprenticeship Program." Available at <https://publicservice.vermont.gov/sites/dps/files/documents/Workforce%20Dev.%20Apprenticeship%20Program.pdf>. Accessed December 15, 2023.

correctly from the beginning of their career and evaluate employees during introductory periods for the qualities that will set them up for long-term success. Furthermore, employees do not have to pay for separate training before getting a paycheck and can experience the rigors and learning curve of the work in a measured way as they come up to speed in the sector.

- **Marketing to diverse prospective workers:** The ability to build great networks will be improved with the inclusion of people from all parts of society, including those without significant past representation in the telecommunications sector. Trade schools, VTC, and entities like Vermont Works for Women have deep experience with outreach into the community, including to people underrepresented in the telecommunications field; collaboration across these types of organizations to grow the workforce with diverse Vermonters is essential. The Executive Director of the Vermont State Colleges suggested that groups like Warriors4Wireless – which connects veterans with telecommunications careers – could help raise awareness of these careers in populations that may not know they exist.
- **Local training and hiring:** Training Vermonters to fill local roles helps residents access education and well-paying job opportunities without needing to relocate. Hiring local workers benefits telecommunications construction in several ways. It saves money by reducing the travel time and travel expenses (e.g., accommodations) required of laborers; it allows for better recruitment as employees often prefer to stay near their home; it ensures the benefits of hiring in Labor Surplus Areas stay in that community; and it means that the state is reaping the benefits of local training efforts instead of losing those potential workers to another state. It even positively impacts Vermonters who are not directly participating in the training and hiring programs because well-paid, local employees spend money at local businesses, thereby supporting the state economy.
 - State and local economies and tax bases benefit the most when firms from Labor Surplus Areas are engaged, particularly when they fill staff openings locally. In Vermont, those areas are designated by the U.S. Department of Labor as Barton, Buel's Gore, Dover, Granby, Killington, Newport, Stratton, and Sutton.
- **Explicit pathways to advancement:** Once a new hire takes the first step into a telecommunications career, their ability to stick with that career and grow in the sector requires well-established pathways to advancement. Establishing

great growth pathways can both incentivize people to start in the sector and ensure they stay to build on their skills and knowledge.

- **Coordination between training providers and employers:** Ongoing close coordination between training providers and employers is essential to ensure that training providers understand what credentials are meaningful, adapt programs to stay current with the sector's needs, and collectively evaluate programs' success and iterate as needed.
- **Recruitment strategies tailored to the realities and challenges of the industry:** Enticing people into a new sector and new career — especially one as unique as being a telecommunications worker — is difficult, especially when unemployment rates are low. Successful recruitment strategies involve screening for aptitude and ability to learn, marketing opportunities based on the tangible and intangible benefits of the career, and making sure there are diverse demographics represented in marketing materials. However, due to the challenges of the job that can only be understood fully through experience, there will always be significant numbers of people who resign within a few months of employment as a lineworker or installer.

Though the immediate workforce concern is having enough trained workers to handle the massive fiber deployments underway, this Plan encourages the VCBB and other training providers and stakeholders to define career pathways beyond the immediate fiber deployment push, outlining the ways in which fiber installers in the state will have the opportunity to grow in the industry over a longer time horizon. As the state leverages the growing fiber infrastructure to increase mobile broadband, workers should know that additional training and support will be available, if they desire, to continue working to connect Vermont while gaining new skills in an evolving sector.

Lastly, this Plan recommends the state consider adapting or expanding an existing workforce incentive program to include the telecommunications sector. Vermont's Worker Relocation Grant Program targeted 50 occupations that the Department of Labor identified as "Short-Term Occupational Projections with the Most Openings."¹²⁰ A similar program could incentivize growth in communications lineworkers and fiber installers. Like the Worker Relocation Grant Program, such a program should have qualification criteria to ensure that workers receiving the

¹²⁰ Agency of Commerce and Community Development (2021) "Worker Relocation Grant Program Frequently Asked Questions" Available at <https://thinkvermont.com/wp-content/uploads/2021/10/Worker-Relocation-Grant-Program-FAQs.pdf>. Accessed April 30, 2024.

grant are employed in the industry and based in Vermont. Construction crews are often hired for out-of-state jobs, and while Vermont cannot prevent Vermonters from working in neighboring states, an incentive could be awarded in proportion to the number of weeks the worker spends on Vermont-based projects.

Section 9: Review of Additional State Telecommunications Systems and Practices

This section presents stakeholder feedback and analysis related to various state agencies, systems, and practices pertaining to telecommunications.

9.1 Agency of Digital Services

Established in 2017, the Agency of Digital Services (ADS) is charged with maintaining and modernizing information technology systems for the state with the goal of improving the coordination and effectiveness of providing services to the public.

ADS is in a multiyear process of transitioning state networks from servers in state data centers to cloud-based platforms. The value of this transition was evident after the July 2023 floods, which displaced vital state operations for months while state buildings were cleaned and dried. Because of cloud-based capabilities, state agency data and applications continued to operate during the floods, and staff were able to maintain most operations and customer service functions while working remotely, which continues to this day. As of December 2023, for example, nine state locations were still closed due to flood damage.¹²¹ Without the cloud migration, operations might have been impacted long after the flood.

Though ADS has made much progress on their cloud-migration efforts, the process is ongoing and there are still some operational on-premises systems to be upgraded. However, telecommunications network systems are reported not to be an impediment to this process; ADS stated that system capacity and bandwidth constraints have not been a roadblock to completing the migration. According to ADS, the main challenges were caused by the sheer complexity of the interconnected IT systems that the state used.

ADS is also beginning to update their in-building network architecture. Though this effort is in its nascent stages, ADS's ultimate plan is to move wired LANs to Wi-Fi-based solutions. Again, the prudence of this planning was reinforced by the

¹²¹ Department of Human Resources (2023) "Alerts/Closings/Delays." Available at <https://humanresources.vermont.gov/about-us/alerts-closings-delays>. Accessed December 12, 2023.

historic summer floods of 2023, which destroyed significant amounts of wired infrastructure in state buildings. Furthermore, an in-building solution based on Wi-Fi is a better fit to a work environment where staff use laptops and mobile devices and the occupancy of the building is unpredictable because staff sometimes work remotely.

The implementation of non-wired solutions will increase physical resiliency, and this Plan recommends that ADS also implement backup circuits. Depending on the size and criticality of the building, backup circuits can be wired or on fixed or mobile broadband. More frequent disaster events, along with the state's increasing use of digital platforms, demonstrate that the hardening and resilience work of ADS is timely and will continue to be important; therefore, increasing resiliency by leveraging backup circuits – which can use wired or, in smaller buildings, wireless infrastructure – is an expedient undertaking.

Looking further ahead, ADS has stated the department will focus telecommunications efforts on continuously evolving cybersecurity considerations and steadily increasing bandwidth requirements for their networks. This Plan concurs with those two ongoing priorities, which will remain relevant through and beyond the current network upgrade efforts.

9.2 Vermont Community Broadband Board

Led by a five-member Board and supported by eight staff, the Vermont Community Broadband Board (VCBB) has facilitated significant gains in the Vermont wireline broadband landscape since 2021, when the Vermont Legislature established the VCBB through Act 71.¹²² Act 71 lists eight goals for the VCBB, including ensuring broadband availability for all Vermonters, public accountability for maintaining and upgrading critical broadband infrastructure, and providing leadership for coordinating the development of Vermont's CUDs and their partners.

The achievements enabled and supported by the VCBB and their staff are numerous, and credit for those achievements also extends to significant efforts across the public and private sectors, as well as from hundreds of Vermonters, including many volunteers. The deployment of wireline fiber broadband in Vermont is an ongoing,

¹²² Act 71 (2021). Available at <https://legislature.vermont.gov/Documents/2022/Docs/ACTS/ACT071/ACT071%20As%20Enacted.pdf>. Accessed November 21, 2023.

collaborative state effort, and the programming led by VCBB has fit the culture, needs, and capacity of the state.

A sample of notable achievements and milestones include:

- Distribution and oversight of approximately \$441.8 million in ARPA¹²³ and Capital Projects Funds¹²⁴ awarded to Vermont for broadband
- Publication of the BEAD Five-Year Action Plan, Initial Proposal Volumes 1 and 2, and Digital Equity Plan, which demonstrate national leadership on connectivity strategies and an aspirational vision for meeting Vermont's wireline telecommunications goals
- Support of business and feasibility planning efforts across the state to ensure no town is left without a path toward to universal service
- Establishment of construction guidelines to ensure resilient networks that will last for decades and meet state needs
- Leadership on workforce training and planning, including leading the nation in partnerships to foster apprenticeship opportunities

That said, the VCBB's work is far from over. While there are a wide range of entities listed below, the VCBB is — by design of the legislature and in practice — the logical convener of policymakers and stakeholders, and the driver of practices related to broadband deployment. As such, the following recommendations are provided for the VCBB to pursue alongside the entities they have ably convened and collaborated with throughout their work.

- **Develop a comprehensive analysis of the costs to bury telecommunications infrastructure in Vermont and opportunities for harmonizing GMP's work with fiber infrastructure builders.** Fiber builders and telecommunications infrastructure owners have expressed concern about the cost of undergrounding their fiber as Green Mountain Power works toward their goal of zero outages by 2030 in part by moving a substantial amount of their utility

¹²³ Office of Governor Phil Scott, "Governor Scott's Transformational Investments for American Rescue Plan Funds." Available at <https://governorvermont.gov/arpa>. Accessed December 6, 2023.

¹²⁴ U.S. Department of the Treasury (2023) *Capital Projects Fund Award Fact Sheet: Vermont*. Available at <https://home.treasury.gov/system/files/136/VT-CPF-Award-FactSheet.pdf>. Accessed February 26, 2024.

lines underground.¹²⁵ The VCBB should develop a comprehensive analysis and understanding of GMP's intended plans, timelines, and capabilities, and the associated costs for fiber builders and owners. The result of this analysis should **detail strategies to align deployment and undergrounding processes to the greatest degree possible**, and establish mechanisms to avoid unnecessary re-deployment costs. This analysis should be completed soon to provide maximum benefit. As the VCBB makes BEAD awards and analyzes the sustainability of funded deployments, they should take into account whether the potential future costs of burying fiber are a significant business risk to fiber builders.

- **Facilitate broader agency alignment around processes related to broadband deployment.** There are instances when the VCBB's goal of universal service is impacted by the policies or practices of other Vermont agencies and jurisdictions, and the VCBB is in a position to contribute positively to the streamlining of procedures. For example, infrastructure builders noted that there is no standard review and approval time frame for Agency of Natural Resources permits, which can cause unpredictability and delays. Additionally, towns have widely different standards for what information to request in permits, and what information they retain in their records (and in what format). The VCBB has the most exposure to issues related to broadband building, and is well positioned to encourage and coordinate an effort to standardize processes across relevant partners.
- **Consider the potential role of the VCBB in mobile deployment.** The capacity that the VCBB has developed in facilitating wireline deployments could be leveraged for future wireless grant programs or other connectivity programs. If the VCBB's internal analysis, in conjunction with the analysis in this Plan and by policymakers in the state, determines that the VCBB would be effective at playing a role in facilitating wireless deployments, those duties need to be codified and the scope of the VCBB's work expanded.
- **Extend the end date of the VCBB to ensure proper BEAD compliance.** By statute, the VCBB will cease to exist on July 1, 2029. This timing coincides with the performance period of the BEAD funding, which will require construction to occur within four years of receipt of funding (anticipated Q4 of 2024). However, if the VCBB ceases operations at approximately the same time that

¹²⁵ Green Mountain Power (2023) "Green Mountain Power Launches First in Nation 2030 Zero Outages Initiative." Available at <https://greenmountainpower.com/news/green-mountain-power-launches-first-in-nation-2030-zero-outages-initiative/>. Accessed February 29, 2024.

construction is completed, there is a risk that the subsequent post-construction monitoring and compliance work to ensure proper execution by subgrantees will be shortchanged. Given that the CPF funding was authorized by the Treasury, BEAD was authorized by the NTIA, and that there may be substantial personnel changes in the administration by 2029, the state may be the only entity rigorously monitoring and overseeing BEAD compliance at that time. Therefore, continuity at the VCBB until at least 2030 would be the best methodology for post-construction compliance and monitoring.

9.3 Communication Union Districts

Vermont's Communications Union Districts have played a significant role in improving the state's connectivity landscape over the past few years. At the time of publication, six of ten CUDs have deployed fiber and connected customers, using partnerships with ISPs that vary greatly in form, and one CUD has completed building to every on-grid premises. These more mature CUDs have demonstrated the viability of the CUD model and serve as examples for the CUDs in earlier planning phases.

This Plan's review of CUD operations, informed by stakeholder interviews with CUD leadership and by third parties, surfaced a few themes and recommendations that apply to most or all CUDs. Those recommendations are as follows:

- **Focus on financial sustainability until deployments are complete and penetration improves.** The most precarious time for new ISPs or new public-private partnerships is during the initial years of expansion and growth, as it takes at least four years after construction to reach target penetration levels. All of the CUDs want to immediately push costs down, provide discounted service, and reinvest in digital adoption programs – all of which will benefit Vermonters and aligns well with the CUD mission – but this Plan cautions against taking too much early action on those fronts until deployments are complete and mature penetration rates create a stable and predictable revenue base. The affordability challenge – as well as the challenges of expanding mobile broadband service – cannot be prioritized today at the expense of building sustainable businesses that meet residential broadband goals.

- **Continue to create more efficiencies across deployments by leveraging the scale and position of the Vermont CUD Association (VCUDA).** The VCUDA structure is a useful tool to create scale across Vermont; stakeholders noted that if VCUDA had more resources, it could create savings across CUDs by leading procurement on equipment and services that are required of all CUDs, including legal, regulatory, compliance/audit services, software, and more. Stakeholders reported that some of these efforts are already in progress or beginning to be operationalized, and there will be new opportunities for leveraging the scale of VCUDA in the future.
- **Consider a long-term plan to develop enterprise-grade and carrier-grade service to ensure fiber built today has maximum benefits for future wireless expansion.** Conversations with CUDs revealed that not all CUDs are prepared — or planning — to offer carrier-grade service. Though this service may not have been part of CUDs' primary mission of residential service, this Plan recommends that all CUDs plan for and develop these capabilities, ideally within the next 10 years, as their rate of development allows. Offering carrier-grade service will be required to participate meaningfully in mobile expansion should CUDs find opportunities to do so, and although it will increase opex costs, it may allow for increased revenues as well.
- **Consider whether mobile broadband expansion is a viable and beneficial role for CUDs after wireline deployments are complete.** Using the analysis of this point in Section 7.3 and taking into consideration staff capacity, partner abilities, financial implications, and other factors that vary across CUDs, each CUD should consider whether supporting mobile broadband expansion is a viable future endeavor. The answer to this question may vary depending on the CUD.

9.4 Agency of Transportation

Stakeholder interviews with Agency of Transportation leadership identified notable elements of AOT policy related to telecommunications.

Driver and staff safety is at the forefront of the AOT's need for connectivity along Vermont's roads. For example, repair and maintenance crews often perform work in areas that have weak or no cellular service, which is problematic because the number of workers and the need for photo and video documentation capabilities necessitates using cell phones instead of land mobile radio (LMR) for

communication during major projects. This creates safety concerns as staff would have to use other communications equipment in the event of an accident or emergency.

Lack of mobile broadband coverage and capacity also hinders staff efficiency, according to insights shared by AOT's Policy and Planning Manager during an interview. Project managers and inspectors often cannot complete their required reports while at the work site; instead, they draft reports and drive until they receive a strong enough signal to submit the required documentation, and then they return to the work site.

Safety is also the foundation for AOT's need for mobile-connected electronic roadway signs. For example, these signs can warn drivers of areas of inclement weather conditions or a significant accident ahead so drivers can begin to reduce their speed. New electronic signs require access to mobile broadband, which is not universally available along all of Vermont's interstates and major roadways.

Lastly, multiple stakeholders involved with new broadband deployments said that AOT was easy to work with generally, but cited challenges with understanding where AOT jurisdiction stops and local jurisdiction starts, which adds complexity and delays to permitting.

9.5 Public Safety Communications Systems

This section provides an overview of the networks and systems comprising emergency communications in Vermont — land mobile radio systems for first responders, supplemented by the national FirstNet wireless broadband network with 50 sites in the state, and six Public Safety Answering Points where emergency calls are received and addressed — as well as the Statewide Communication Interoperability Plan, which is a federal requirement that offers guidance regarding the ability of emergency responders to communicate and coordinate with each other across systems.

Importantly, there is significant Public Safety Communications planning work occurring in parallel to this Plan. The Public Safety Communications Task Force (PSCTF) was signed into law in June 2023 via Act 78 to oversee and manage the transition to a statewide public safety communications system.

The PSCTF retained Mission Critical Partners to provide professional services and subject matter expertise to the Task Force as it oversees and manages the transition to a statewide, reliable, secure, and interoperable public safety communications system.

According to the PSCTF's project plan, they began work on the project with Mission Critical Partners contractors in March 2024. Currently, they are performing a Public Safety Communications Systems Inventory and Assessment. The project will then move to design planning and final design with an anticipated report release in January 2025. The Department of Public Service hopes that this 10-Year Plan supports and adds context to the PSCTF's critical work.

9.5.1 Emergency Communications Radio Technology / Land Mobile Radios

The former Police Chief of South Burlington – who is the current Vermont League of Cities and Towns Law Enforcement Consultant – noted that Vermont's first responder communications systems are a patchwork between LMR, FirstNet (described in Section 9.5.2), and a number of mobile broadband solutions.

Much of this system is overseen by the Department of Public Safety's Radio Technology Services, which supports:

- Telephone systems used by several Department of Public Safety units
- The Vermont Communications System (VCOMM), which uses shared frequencies enabling interoperability among state, county, and municipal agencies
- LMR¹²⁶ and related backhaul systems used by the Vermont State Police, the Division of Emergency Management, and the Division of Fire Safety

While Vermont has a useful and functional LMR system, a recent upgrade to the Project 25 (P25) system,¹²⁷ which was intended to offer more robust transmission encryption and a digital interface, had to be retracted when it did not function adequately in Vermont's topography. The Department of Public Safety is now

¹²⁶ Land mobile radios are used to communicate person-to-person with handheld units, vehicle units, or stationary base units.

¹²⁷ Project 25 Technology Interest Group, "What Is P25 Technology?" Available at <https://www.project25.org/index.php/technology/what-is-p25-technology>. Accessed January 11, 2024.

reassessing how to upgrade to P25 within the constraints of Vermont's landscape and has proposed using Department of Justice grant funding to migrate the Vermont State Police from its current ten-zone multicast analog topology to a ten-zone digital (P25) simulcast topology.

Because of the state's reliance on Land Mobile Radio to coordinate emergency services, the most important step for the state to take to improve first responder communications beyond supporting the deployment of mobile wireless is to provide the resources necessary for the Public Safety Department to deploy LMR systems in areas without LMR coverage. The Vermont Legislature should consider ensuring sufficient funding is allocated to this vital resource.

Expanding commercial mobile wireless broadband, according to the Commissioner for Public Safety, will provide redundancy in emergencies while also allowing agencies to use more modern products and services that require mobile wireless broadband (e.g., faster dispatch or redirection of staff via automatic vehicle locators).

Mobile Broadband and Land Mobile Radio are two systems that complement each other and provide backup and redundancy in the case of emergencies that affect one system or another.

9.5.2 First Responder Network Authority (*FirstNet*)

The Middle Class Tax Relief and Job Creation Act of 2012¹²⁸ ("the Act") created the First Responder Network Authority (FirstNet) to implement a nationwide, interoperable wireless broadband network for public safety users. The Act established FirstNet as an independent authority within the U.S. Department of Commerce's NTIA and allocated over \$7 billion to establish the network and address other public safety needs.

The Act requires the network's minimum technology standards to be aligned with 4G commercial LTE — offering higher capacity and faster transmission speeds than previous technology and enhancing communications for emergency response and recovery.

¹²⁸ Middle Class Tax Relief and Job Creation Act of 2012, H.R. 3630. Available at <https://www.congress.gov/112/plaws/publ96/PLAW-112publ96.pdf>. Accessed January 11, 2024.

By law, FirstNet must oversee the planning, building, operation, and maintenance of the network — including its nationwide core and Radio Access Networks (RANs) in each state. The network itself offers mobile broadband communications and is meant to supplement — not replace — mission-critical public safety voice radios (land mobile radios). As the network matures, however, it may ultimately support mission-critical voice applications.

Through a competitive bidding process, the FirstNet Authority selected AT&T to deploy and maintain a nationwide public safety broadband network (NPSBN). AT&T made its commercial spectrum available and dedicated 10 MHz of spectrum leased from the federal government to public safety. The network includes prioritization (next in line) and preemption (users removed from line) features.

AT&T also maintains a fleet of portable network assets for public safety agencies' emergency response needs, at no additional cost. These in-demand deployables come in various forms (e.g., cellular sites on vehicles, compact rapid deployables, and drones) and are located strategically throughout the country, facilitating more rapid deployment.

The FirstNet contract with AT&T includes a provision for migration to 5G as the carrier migrates its commercial network to 5G. Previous upgrades to the FirstNet core enabled access to 5G services for FirstNet subscribers. In general, added capacity for the network buttresses AT&T's commercial network as well because first responders use dedicated spectrum, freeing up network space for commercial users.

AT&T originally anticipated deploying 36 FirstNet sites throughout Vermont, but during an interview supporting this Plan, a representative of AT&T reported the company had deployed over 50 sites as of late 2023. Despite exceeding initial deployment expectations, AT&T was quick to note that access to viable tower locations remains a challenge due to Vermont's terrain and, more significantly, due to individual Vermonters' opposition to tower siting options. AT&T and the public will need to balance the interests of public safety broadband, enhanced commercial wireless service, and strongly held concerns about the aesthetic and environmental impacts of vertical infrastructure deployments.

Lastly, based on stakeholder feedback, this Plan also seeks to educate stakeholders about the additional preemption and priority protocols available to first responders. Three major carriers offer first responder preemption services: in addition to FirstNet from AT&T, Verizon offers Frontline and T-Mobile offers Wireless Priority. These services give first responders priority access to mobile networks; in the event that AT&T FirstNet goes down, first responders can move over to other networks.

In the event of a major natural disaster resulting in first responders coming to Vermont from out of state, those first responders would be able to use their systems (whether they are AT&T-based or not) in Vermont via priority networks.

9.5.3 Statewide Communication Interoperability Plan

Vermont's Statewide Communication Interoperability Plan (SCIP) — required by the federal Department of Homeland Security (DHS) in applications to federal grant programs from DHS, Federal Emergency Management Agency (FEMA), and other federal agencies — is a strategic plan to enhance interoperable and emergency communications between Vermont first responders. Vermont's SCIP was last updated in 2020.¹²⁹

While the Department of Public Safety is the primary responsible agency for coordinating the SCIP, the Emergency Communications Advisory Council provides advice and feedback on the creation and implementation of interoperable communications within all areas of the emergency communications ecosystem.

The SCIP currently has eight goals and 25 associated objectives to enhance interoperable communications operations. For example, objectives include conducting VCOMM field exercise training with first responders and ensuring first responder communications personnel are included in planning, exercises, and major events. Notably, implementing the P25 radio system is another goal in the SCIP that was attempted but has yet to prove successful (as discussed in Section 9.5.1).

In the SCIP, the Department of Public Safety and the Emergency Communications Advisory Council state that obtaining and maintaining funding to address these

¹²⁹ Department of Public Safety (2020) *Vermont Statewide Communication Interoperability Plan*. Available at <https://rts.vermont.gov/sites/rts/files/documents/SCIP%202020%20Vermont%20FINAL.pdf>. Accessed January 11, 2024.

goals is difficult because funding the SCIP requires legislative action. Generally, the Department of Public Safety receives federal grants to fund the initial upgrade of major public safety communications systems, but it is the responsibility of the state to fund those systems' ongoing maintenance, upkeep, and usage.

Stakeholders were aligned on the need for the state legislature to allocate funding to the Department of Public Safety for the SWIC to execute on the goals and objectives in the SCIP, as funding is the primary barrier. The Vermont Legislature should consider ensuring sufficient funding is allocated to this vital resource.

9.5.4 Public Safety Answering Point Consolidation and Integration

A Public Safety Answering Point (PSAP) is where emergency calls are received via an advanced next-generation 911 system that manages calls on a statewide basis. Once the call is received, a professionally trained call-taker speaks with the caller, determines the emergency, and offers pre-arrival instructions to the caller, when appropriate.¹³⁰

Changes in technology have added many facets to the call-taker role, including managing communications from mobile callers. In May 2014, Vermont led the nation in text-to-911 capabilities, providing a backup option if a phone call is not possible – for example, due to a lack of adequate cell phone service, for those who are deaf or hard of hearing, or due to safety concerns during a domestic violence situation.¹³¹

Vermont PSAPs communicate with over 30 dispatching locations, some of which are collocated with a PSAP. This communication is facilitated by a statewide fiber optic network called an Emergency Services IP Network (ESINet). An ESINet is a standard part of next-generation 911, creating high-availability IP network connections between incoming calls and PSAPs. In Vermont, the ESINet leverages commercial provider infrastructure.

Vermont has six PSAPs statewide:

- Hartford Police Department

¹³⁰ State of Vermont Enhanced 911 Board, "General 911 Questions (FAQs)." Available at <https://e911.vermont.gov/frequently-asked-questions-faq#:~:text=The%20Vermont%20911%20call%2Dtaker,questions%20and%20provide%20continued%20assistance>. Accessed January 17, 2024.

¹³¹ State of Vermont Enhanced 911 Board, "Text-to-911." Available at <https://e911.vermont.gov/text-911>. Accessed January 24, 2024.

- Lamoille County Sheriff's Office
- Shelburne Police Department
- St. Albans Police Department
- Westminster Vermont State Police Barracks
- Williston Vermont State Police Barracks

Calls are routed based on PSAP catchment areas that are defined by PSAPs and towns, and if a call-taker is not available, calls are directed to the first available call-taker at another PSAP.¹³² During Tropical Storm Irene, one of the PSAPs shut down because of a power failure, and calls were handled by the other facilities.¹³³

During the creation of this Plan, stakeholders indicated that there are ongoing discussions about whether or not to consolidate and integrate PSAPs in Vermont. Advances in network technology and increased data processing have enabled the possibility of consolidation, as what was once necessarily a local role often performed by one or two employees can now be done regionally or statewide.

Costs and functionality need to be optimized for each state; the National Emergency Number Association (NENA), the professional organization focused on 911 policy and operations, recommends targeted consolidation done to suit the specific environment of the state.¹³⁴

The costs and benefits of potential PSAP consolidation and integration in Vermont are complex and variable, and a comprehensive recommendation requires *extensive* study of this specific issue focused on local facts, discussions with stakeholders, and measurement and evaluation of key metrics and costs.

It is not the Department of Public Service's role to provide a single roadmap to a single predetermined outcome in this arena; however, this Plan provides an analysis of this situation based on considerations in choosing whether and where to increase consolidation, steps and components involved in PSAP consolidation, and how Vermont fits with other states. Decision-makers should consider using the values-based costs and benefits of PSAP consolidation in this section to determine

¹³² State of Vermont Enhanced 911 Board, "System Information." Available at <https://e911.vermont.gov/forms-and-publications/system-information>. Accessed January 12, 2024.

¹³³ Bruce Kling (2023) *Dispatch Centers for the Cities and Towns in New England for Police, Fire, and EMS*. Available at <https://klingreport.com/wp-content/uploads/2023/04/NewEnglandDispatchSummary.pdf>. Accessed November 20, 2023.

¹³⁴ Virginia Department of Emergency Management (2023) *PSAP Consolidation Use Cases*. Available at <https://gismaps.vdem.virginia.gov/Websites/PSC/911ServicesBoard/Documents/20230518VDEMConsolidationUseCasesKPMG.pdf>. Accessed November 20, 2023.

whether to move forward with a rigorous, deep, and specific study about the cost of consolidation.

There are many advantages of PSAP consolidation, including:

1. **Increased flexibility in staffing.** Consolidated PSAPS are more likely to be staffed 24 hours a day, 7 days a week, and can more easily accommodate illnesses and vacation time. In many cases, staffing on a statewide or regional basis makes it easier to hire more highly trained individuals and to hire and retain specialized staff for more advanced functions, such as medical dispatching, and share their abilities across a wider area. Small dispatching centers with one to two dispatchers are more likely to need to fill dispatching roles temporarily with first responders who are not necessarily trained in dispatching and who are needed in their response role.
2. **More resources available for major emergencies.** Regional or statewide PSAPs are better able to handle large-scale emergencies without being overwhelmed and can manage mutual aid in a centralized, unified way. Conversely, a small, local facility may not be able to handle more than a typical load of calls and day-to-day emergencies, and may only be able to manage a small part of a large-scale emergency.
3. **Potential for improved response times and reduction in errors.** Taken together, improved technologies that are consistent across a large region reduce response times and errors. More advanced technologies and the use of common databases, software (such as automated location identification databases), and maps can enhance public safety responses. For example, mutual aid responders would have up-to-date information about neighboring areas if common databases were used.
4. **Improved collaboration among state, local, and county agencies.** Planning and implementing consolidation increases the number of touch points between communities and potentially fosters collaboration in a wider range of activities.
5. **Potential for consolidation – and therefore efficiencies – of other public safety functions.** If consolidation extends beyond PSAPs to other functions such as dispatching, a single robust facility can host call-takers, dispatchers, land mobile radio operations, emergency operations centers, and command of first responders in the same location and reduce fragmentation of operations and response.

6. **More efficient communications links to remote centers and responders.**
Having fewer, larger statewide or regional PSAPs makes it easier to interconnect the public and centers. Having fewer centers and placing them in more centralized locations reduces the number of circuits or connections that need to be built and funded, especially to more remote areas where costs may be higher and infrastructure quality may be lower. Having fewer locations makes it more affordable to build higher-quality connections to the PSAPs over physically diverse paths.
7. **Economies of scale.** Fewer, larger PSAPs result in lower costs per resident for facilities, training, advanced technologies, electronics, and software licensing.
8. **Simplified budget process.** Statewide or regionally, fewer resources are necessary to project budgetary needs, and there are fewer total line items and funding mechanisms. Localities can also hand off the funding of PSAPs to the state.¹³⁵

However, there are also significant challenges in planning, building, and operating a consolidated PSAP environment, and states need to balance the advantages and challenges to optimize for their environment. Challenges include:

1. **Loss of local control.** PSAP consolidation may mean abandoning a system where individual call-takers personally know many people, roads, and locations in the community, as well as where the community knows the individual taking the calls. Consolidation may diminish direct connections between local government leaders, police and fire chiefs and officers, and the call-takers and dispatchers, and replace it with a system that relies more on technology, new relationships, and structure. Localities may also have less latitude in determining the funding level or prioritizing changes in a PSAP.
2. **Need to develop new governance and processes.** PSAP consolidation may require a new relationship among localities, a new command structure, a different role for state or regional government, and a new mechanism for both capital and operational funding. There also needs to be a plan for migrating from the previous structure to the new structure.
3. **Cost of migration.** Planning and building a new PSAP is costly, as is planning and executing migration of systems and processes. As a result, savings may

¹³⁵ Virginia Department of Emergency Management (2023) *PSAP Consolidation Use Cases*. Available at <https://gismaps.vdem.virginia.gov/Websites/PSC/911ServicesBoard/Documents/20230518VDEMConsolidationUseCasesKPMG.pdf>. Accessed November 20, 2023.

take time to emerge; in some cases, high startup and capital costs may delay any cost savings for several years.¹³⁶

4. **Ensuring redundancy and resiliency.** With a consolidated PSAP configuration — as with all PSAP configurations — ensuring there are no single points of failure is critical. The state will need to establish new redundancy and failover processes.

A study of recent literature and the practices of other states in New England and in the nation finds that consolidation is an active area of discussion, planning, and implementation, but is different in degree and type in each state. States use a wide range of approaches in PSAP consolidation, including in determining the number of PSAPs, the size of the PSAP service area, integration with other functions such as dispatching, and means of funding and governance.

9.5.4.1 PSAPs in Other New England States

The greatest degree of PSAP consolidation is in New Hampshire and Rhode Island, which have one primary PSAP each. However, the PSAPs connect to many dispatching centers, which are in the localities; New Hampshire has 86 dispatching centers, and Rhode Island has 13 dispatch centers.¹³⁷

Maine has seen some consolidation of PSAPs, but not of dispatching. There are 24 PSAPs and 55 fire/Emergency Medical Services (EMS) dispatching centers, with about half also operating as police dispatching centers.¹³⁸

Connecticut has 96 PSAPs, mostly housed in localities, many of which are also local dispatching centers.¹³⁹

¹³⁶ Office of Statewide Emergency Telecommunications, State of Connecticut (2012) *Consolidation Guide*. Available at https://portal.ct.gov/-/media/DESPP/DSET/PSAP_Consolidation/Consolidation_Guide.pdf.pdf. Accessed November 20, 2023.

¹³⁷ Bruce Kling (2023) *Dispatch Centers for the Cities and Towns in New England for Police, Fire, and EMS*. Available at <https://klingreport.com/wp-content/uploads/2023/04/NewEnglandDispatchSummary.pdf>. Accessed November 20, 2023.

¹³⁸ Bruce Kling (2023) *Dispatch Centers for the Cities and Towns in New England for Police, Fire, and EMS*. Available at <https://klingreport.com/wp-content/uploads/2023/04/NewEnglandDispatchSummary.pdf>. Accessed November 20, 2023.

¹³⁹ Bruce Kling (2023) *Dispatch Centers for the Cities and Towns in New England for Police, Fire, and EMS*. Available at <https://klingreport.com/wp-content/uploads/2023/04/NewEnglandDispatchSummary.pdf>. Accessed November 20, 2023.

Massachusetts has 232 PSAPs, mostly in localities. The Massachusetts 911 Department is seeking consolidation and is providing financial incentives to communities to join regional emergency communications centers that integrate call-taking and dispatching for multiple communities. The incentive grants range from 0.75 to 10 percent of locality surcharge revenues from the previous fiscal year for two municipalities. There are also other funds available, including general support grants and regional development grants.¹⁴⁰

9.5.4.2 PSAPs Elsewhere in the U.S.

In 2010, Michigan state policy called for regional consolidation.¹⁴¹ An emergency communications center needed to serve 911 call-taking and dispatching to 150,000 residents or lose state funding. In 2013, the threshold was raised to 300,000 residents. The policy was driven by a desire to improve outcomes from local one-seat PSAPs staffed by individuals without specific telecommunicator training (such as first responders), sometimes only for 12 hours a day.

In Virginia, the state is studying consolidation in specific use cases to make recommendations for the rest of the state. In the eastern part of the state, the James City County Emergency Communications Center (ECC) and the York-Poquoson-Williamsburg ECC are planning to merge to address low staffing levels, and the Pulaski County and Radford City PSAPs in the central part of the state are taking advantage of a new facility opportunity.

The communities selected a process that analyzes working environments, convenes leaders and stakeholders, and performs a risk-benefit analysis. If they decide to proceed with consolidation, the participating localities will formalize functional and technical requirements, determine how to organize staff, plan procurement, and create a charter. In the implementation stage, they will build, train, monitor, and adjust as needed. Afterward, they will consider consolidation of larger regions.¹⁴²

¹⁴⁰ City of Taunton, Massachusetts (2021) *Evaluation of the Taunton Emergency Communications Center & Regionalization Options*, pages 14-17. Available at <https://www.taunton-ma.gov/DocumentCenter/View/990/Edward-J-Collins-Jr-Center-Feasibility-Study-for-City-of-Taunton-to-Join-SEMRECC-PDF>. Accessed November 20, 2023.

¹⁴¹ Kent County Dispatch Authority (2015) *Operations Overview and Recommendations*. Available at <https://www.kent911.org/wp-content/uploads/2014/11/KCDA-Final-Report012216.pdf>. Accessed January 17, 2024.

¹⁴² Virginia Department of Emergency Management (2023) *PSAP Consolidation Use Cases*. Available at <https://gismaps.vdem.virginia.gov/Websites/PSC/911ServicesBoard/Documents/20230518VDEMConsolidationUseCasesKPMG.pdf>. Accessed November 20, 2023.

Kentucky is seeking to interconnect – but not necessarily consolidate – small, generally single-seat PSAPs to address the challenge of staffing and operating centers full time and to increase resiliency. The state initiated a pilot program in the Appalachian region of eastern Kentucky to interconnect 12 PSAPs located across five telephone service areas using the state’s fiber optic KentuckyWired network. The goal is to incrementally bring more advanced functionality to the PSAPs, including text-to-911, hosted customer premise equipment, a centralized automatic location identification database, and geographic information systems (GIS)-enabled location-based routing. Interconnection will also enable the PSAPs to manage calls outside of their areas if a PSAP is unstaffed, overloaded, or otherwise unable to function.¹⁴³

In Arkansas, the state seeks to consolidate PSAPs so that there is no more than one per county. In early 2022, the state released a 30-month migration plan to reduce the number of stations from 135 to 79. Accompanying the consolidation is the creation of a new state board that incorporates state appointees and leadership as well as local government representatives appointed by associations and by the state. The vision is that the consolidation will enable the call duties to be blended and not eliminated. Each individual county will have its own operational review and plan to guide the consolidation.¹⁴⁴

¹⁴³ Kentucky Commercial Mobile Radio Service Emergency Telecommunications Board (2015) *Requirements Document for NG911 Pilot Project Version 2*.

¹⁴⁴ Arkansas 911 Board (2022) *Public Safety Answering Point Consolidation Plan*. Available at <https://911board.arkansas.gov/wp-content/uploads/2021/12/Arkansas-PSAP-Consolidation-Plan-FINAL.pdf>. Accessed November 20, 2023.

Section 10: Additional and Alternative Strategies to Expand Broadband and Increase Network Resiliency

This section describes possible strategies to expand broadband coverage in Vermont – including strategies that state statute requires this Plan to analyze (e.g., leveraging rights-of-way) as well as strategies based on stakeholder input, author expertise, and examples from other states – and potential methods to improve network resiliency.

As discussed, these strategies are intended to augment and bolster the significant ongoing work being performed by public and private institutions, led in large part by the VCBB. In addition, these strategies focus primarily on increasing wireless coverage because the wireline gaps are in the process of being fully addressed.

10.1 Mobile Broadband Expansion via Electric Utility Partnerships

Given this Plan’s analysis shows that smaller wireless facilities – optimally placed – can be as effective as industry-standard towers, there may be an opportunity to partner with infrastructure owners who have existing vertical assets of a comparable size.

A representative from GMP expressed openness to exploring the use of existing GMP poles to host radio equipment, but noted that a few complicating factors need to be addressed:

- Use of existing poles would require installers and maintainers to be certified to work in the electric space, which has much stricter requirements.
- GMP is in the process of moving some poles from easements to the rights-of-way, meaning that wireless deployments would need to be coordinated with that work (and new rights-of-way pole locations may or may not be as optimal).

- GMP has set a goal of zero outages by 2030 by undergrounding a substantial amount of their infrastructure,¹⁴⁵ so the viability of using existing GMP infrastructure over the long term is not clear.

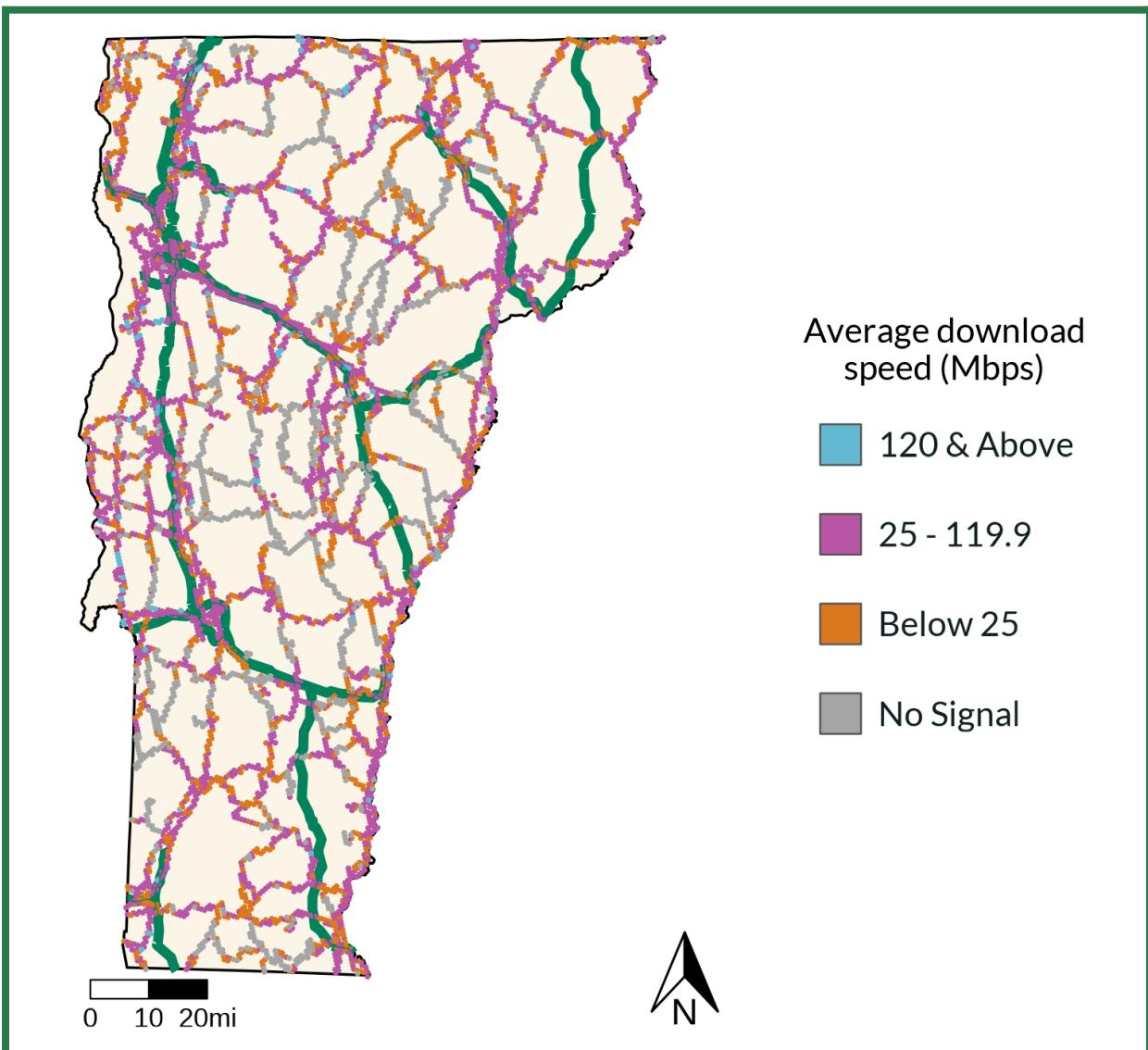
To avoid these challenges, the GMP representative suggested that they could be engaged to deploy new, single-use <50-foot poles for mobile radios upon demand.

A partnership with Vermont Electric Power Company (VELCO) could also be beneficial on a statewide scale as, in addition to owning transmission utility poles that can support small cells and larger antennas, VELCO currently maintains a robust land mobile radio network with communications towers across much of the state. VELCO is planning extensive upgrades to their wireless communications system. VELCO and the Department of Public Safety are in initial stages of conversations about possibilities to leverage these upgrades to enhance mobile broadband. The state should also consider VELCO's fiber and conduit assets along their transmission lines, which may, in certain instances, have spare capacity to provide backhaul for new wireless sites.

The following maps, derived from data available via the Vermont Open Geodata Portal, show VELCO transmission lines overlaid with mobile broadband gaps identified during a 2022 drive test. The first map below indicates average mobile download speeds, while the second map below specifically highlights points along the drive test where the average download speed was below 25 Mbps and where there was no signal at all. The maps show clear overlap between locations without cell phone service and VELCO assets.

¹⁴⁵ Green Mountain Power (2023) "Green Mountain Power Launches First in Nation 2030 Zero Outages Initiative." Available at <https://greenmountainpower.com/news/green-mountain-power-launches-first-in-nation-2030-zero-outages-initiative/>. Accessed February 29, 2024.

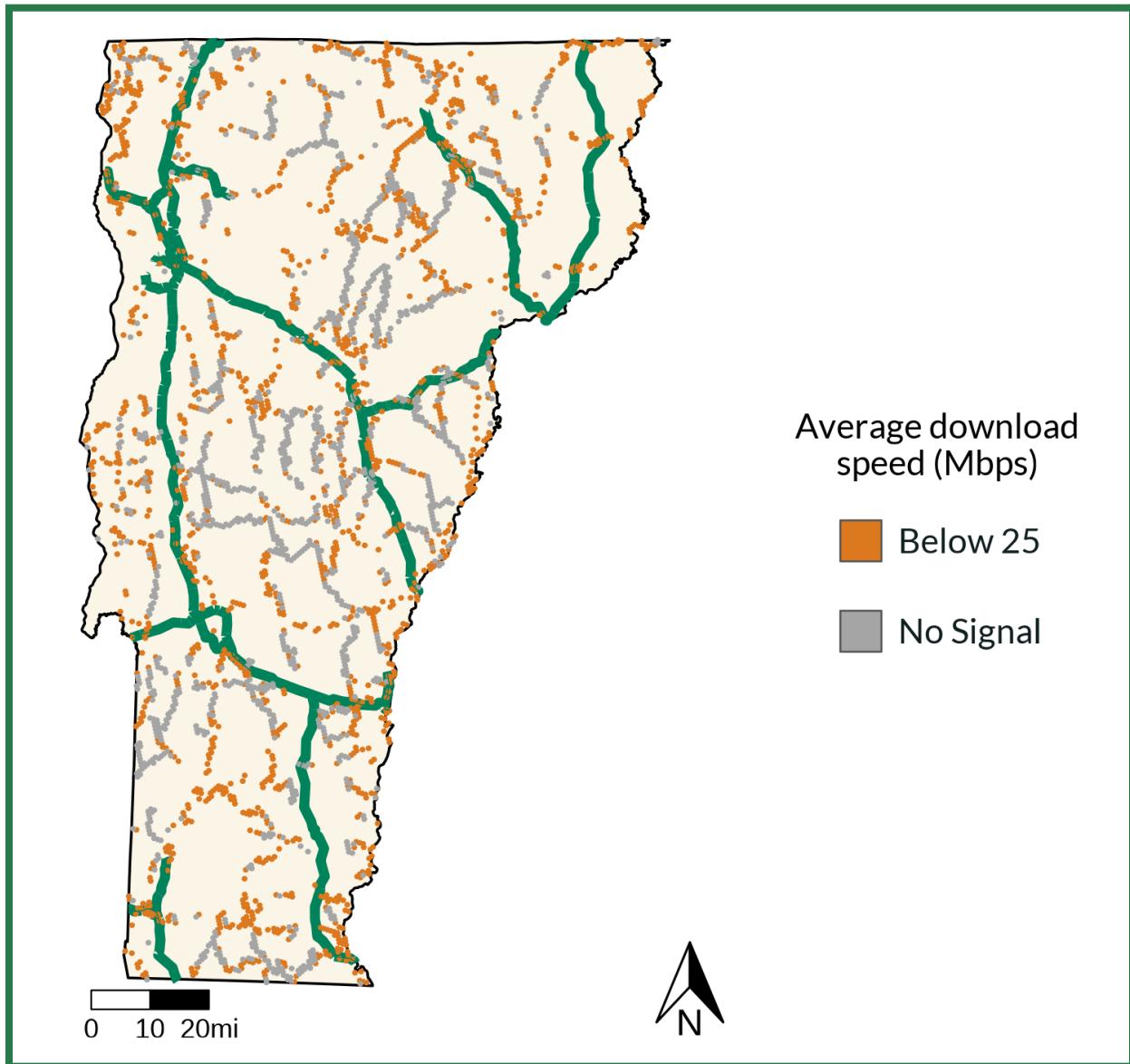
Figure 48: VELCO routes with average mobile speeds from all providers tested in 2022



Source: Vermont Department of Public Service (2022)

Notes: Green lines represent VELCO routes. Roads that were not tested in 2018 were removed. 2022 data includes drive test results for AT&T, FirstNet, T-Mobile, US Cellular, Verizon, and VTel.

Figure 49: VELCO routes and roadways with low or no mobile speeds from all providers tested in 2022

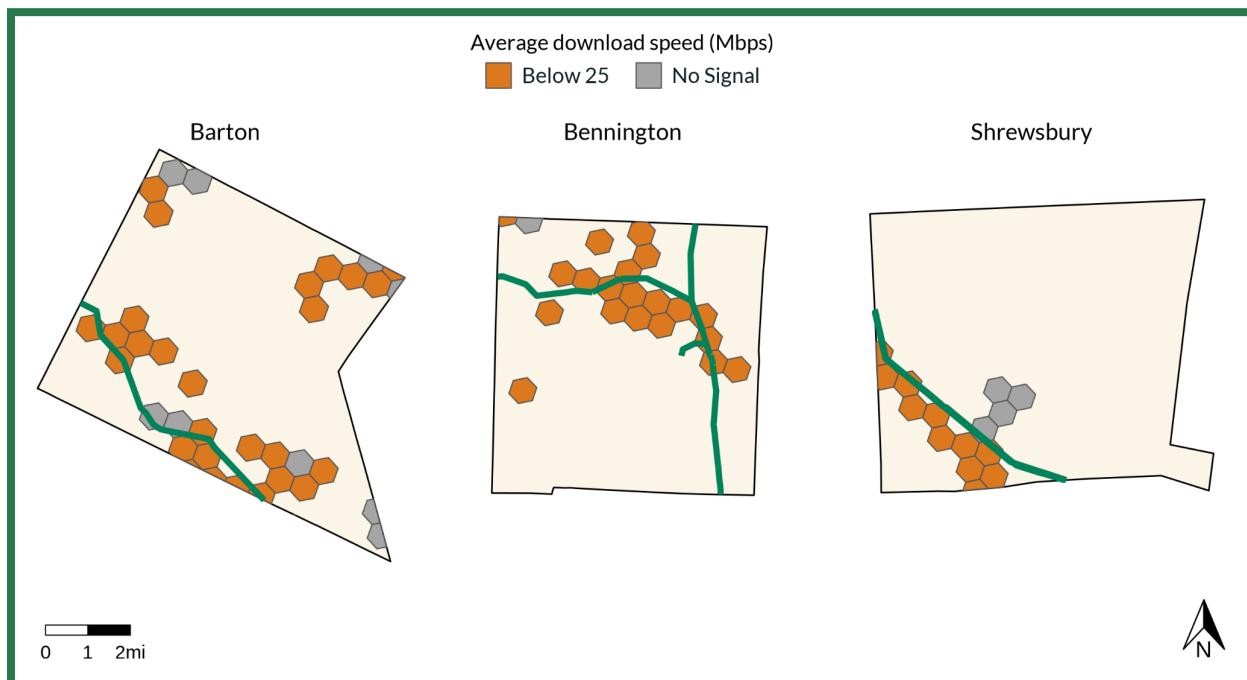


Source: Vermont Department of Public Service (2022)

Notes: Green lines represent VELCO routes. Roads that were not tested in 2018 were removed. 2022 data includes drive test results for AT&T, FirstNet, T-Mobile, US Cellular, Verizon, and VTel.

The next map provides three examples where VELCO infrastructure crosses directly through areas with low or no recorded speeds.

Figure 50: Example VELCO routes for selected towns, and roadways with no or low mobile speeds from all providers tested in 2022



Source: Vermont Department of Public Service (2022)

Notes: Green lines represent VELCO routes. Roads that were not tested in 2018 were removed. 2022 data includes drive test results for AT&T, FirstNet, T-Mobile, US Cellular, Verizon, and VTel.

This is not a recommendation to focus on these three locations first and foremost, but an indication of the type of opportunities across the state that may be possible by partnering with VELCO.

A site selection process that is collaborative with VELCO — with the terms and goals of a partnership in place from the outset — would be required to identify exact location targets.

10.2 Mobile Broadband Expansion via State Mobile Grant Program

The market gap for mobile broadband is multifaceted — there are many factors that impact the cost of deployment in a state like Vermont, including density, cost of

bringing fiber and power to the installment, maintenance, opportunities for secondary revenue (e.g., home broadband or institutional contracts), and the cost of permitting and potential litigation that occurs during the permit process. There is no single policy solution that can single-handedly change the underlying challenges and facilitate deployments. Similar to fixed wireline deployment, meeting the state's mobile broadband goals will not be possible without public investment.

This section discusses the data needed to properly benchmark and support mobile deployment progress, quantifies the funding required to close mobile broadband gaps in the state, and proposes a grant program that can be used to distribute funding strategically in support of the state's mobile broadband goals.

10.2.1 Mobile Broadband Data Collection and Practices

This section recommends ways Vermont can improve data collection practices to support its mobile broadband deployment strategy and progress evaluation.

As described in Section 3.4.1, drive tests are the most reliable way to understand the user experience of mobile broadband coverage in the state and track year-over-year progress. To draw conclusions about mobile broadband improvements in Vermont, the Department of Public Service should consider collecting and analyzing drive test data every two years — or more frequently if significant deployments are occurring (e.g., in conjunction with a grant program).

When conducting future drive tests, the Department of Public Service should continue to use Ookla Wind and follow the same routes to mitigate variables and allow for direct data comparisons. In addition, the following best practices can help data collection so that the resulting data are as complete and accurate as possible:

- Perform tests in the summer to account for foliage
- Perform tests in the evening, when network traffic is consistently lower
- Use the same make and model of vehicle to account for factors like vehicle roof material and density
- Use the same device (industry experts' opinions differ, but many prefer Google Pixel)

- Root the device (i.e., unlock)¹⁴⁶ and keep it on a particular band in areas where coverage is weak
- Use the Reference Signal Received Power (RSRP) value (i.e., the measured power of the signal, spread across spectrum) as the primary data point for service comparison, measured in decibel milliwatts (dBm):
 - RSRP of less than -100 dBm (negative 100 dBm) should be considered poor
 - RSRP of between -110 and -100 dBm should be considered okay
 - RSRP of greater than -100 dBm should be considered good

Vermont has nearly 3,000 miles of state interstates, Class 1 roads, and scenic highways.¹⁴⁷ Undertaking drive tests solely on these roads would take significant staff time and funding if performed by PSD employees.

To capture coverage data along the remaining Class 2 and Class 3 roads (approximately an additional 11,000 miles¹⁴⁸), the PSD could establish a crowdsourcing process leveraging a platform like Ookla Wind. State and local government employees – such as local public works departments, the Agency of Transportation, and first responders – could capture drive test data while traveling in Vermont.

While crowdsourcing data along roads in this manner will not allow the PSD to ensure *all* of the best practices listed above are followed, the PSD could limit testing to certain months to account for foliage, or convey a preference for certain categories of vehicles (e.g., passenger vehicles).

In addition, Vermont would benefit from better tracking of when permitted mobile broadband towers have completed construction and are operational. Currently, telecommunication providers that have obtained a 248a permit are not required to submit a notification of completion indicating that the tower is operational (i.e., providing some level of service from one or more carriers). Collecting this data will be vital for pursuing the programs and recommendations in the below sections and

¹⁴⁶ Okta (2023) “Rooted Devices: Definition, Benefits & Security Risks.” Available at <https://www.okta.com/identity-101/rooted-device/>. Accessed January 26, 2024.

¹⁴⁷ Agency of Transportation, “General Statistics.” Available at <https://vtrans.vermont.gov/planning/maps/stats>. Accessed January 29, 2024.

¹⁴⁸ Agency of Transportation, “General Statistics.” Available at <https://vtrans.vermont.gov/planning/maps/stats>. Accessed January 29, 2024.

will ultimately help the state make informed decisions about where additional infrastructure is needed to expand mobile broadband coverage. To close this data collection gap, the state could consider requiring 248a permit holders to notify the PSD when a permitted tower is built and operational.

10.2.2 Quantifying the Gaps in Mobile Broadband Along Vermont Roads

A set of propagation analyses were performed to model the theoretical levels of deployment required to infill existing holes in 25/3 Mbps mobile wireless coverage along Vermont roads. A Longley-Rice propagation model¹⁴⁹ (typical for modeling coverage in irregular terrain) with 10-meter resolution was used to predict coverage. This analysis is meant to give the state a proportionally and directionally accurate understanding of the deployments necessary to meet the state's wireless coverage goals.

10.2.2.1 Existing Coverage

This Plan estimates that there are a total of 412 miles of road in Vermont without mobile wireless coverage from *any* provider.

To reach that conclusion, coverage predictions were first modeled from existing 248a and E-911 Geographic Information System site data. Coverage originating from tower sites outside of Vermont was estimated using tower data from New Hampshire, New York, and Canada, and the resulting propagation predictions were then augmented by an overlay of state-supplied mobile drive test data.

Areas along roadways with and without existing coverage were determined by overlaying propagation models, drive test data, and road centerlines. The state was divided into a grid of 250-meter by 250-meter squares, which was used to estimate the net area with and without coverage. Only grid squares that intersect Vermont roadways — covering a total of 3,112 square miles — were considered in the analyses.

This provides a coverage prediction for all mobile broadband providers in the state combined. This will not reflect the coverage experience of an individual Vermonter,

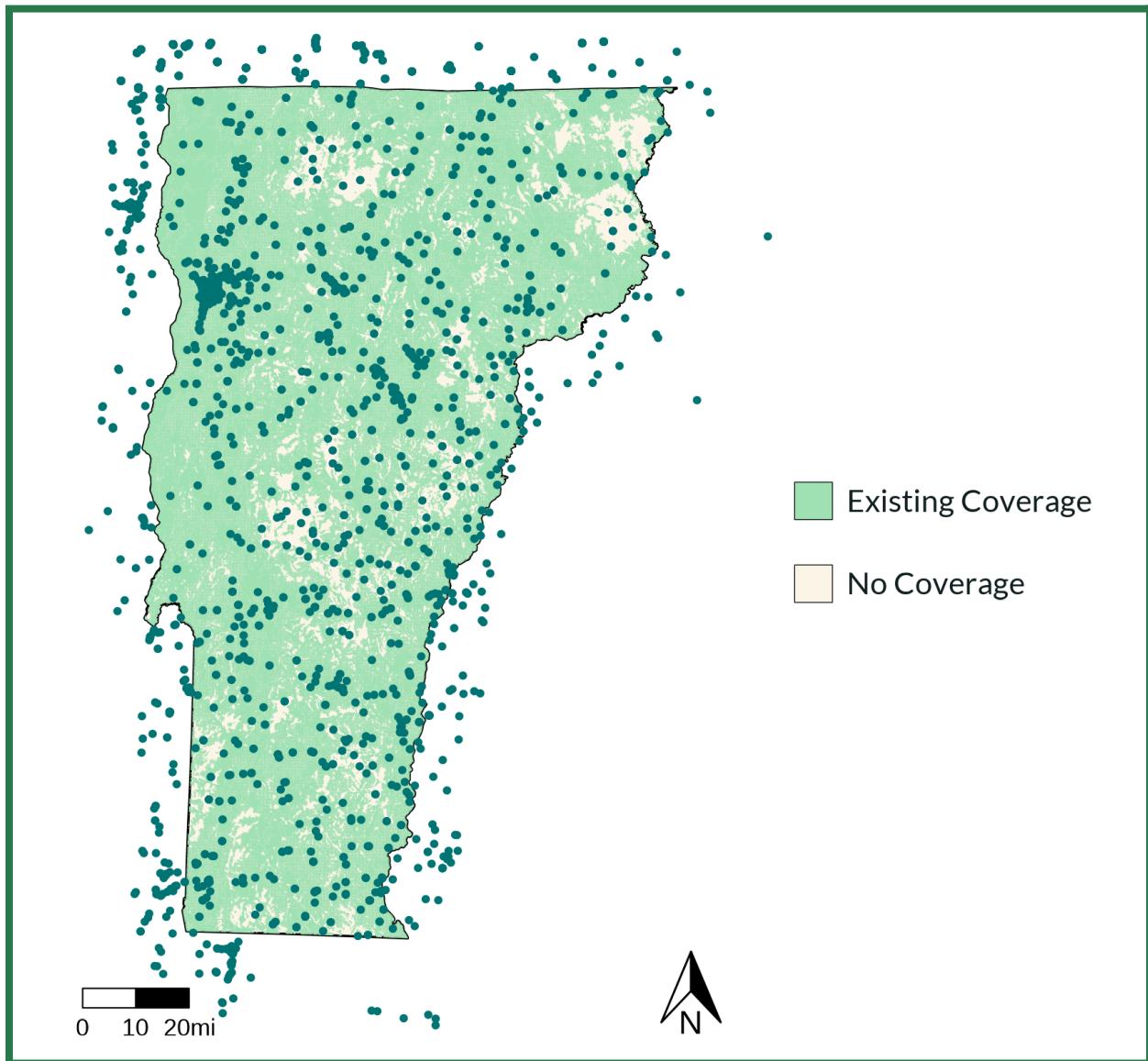
¹⁴⁹ Institute for Telecommunication Science, “Irregular Terrain Model (ITM) (Longley-Rice) (20 MHz – 20 GHz).” Available at <https://its.ntia.gov/research-topics/radio-propagation-software/itm/itm>. Accessed January 26, 2024.

as each person is presumably subscribed to only one mobile wireless carrier. The following chart and maps summarize this analysis:

Table 15: Existing mobile broadband coverage prediction

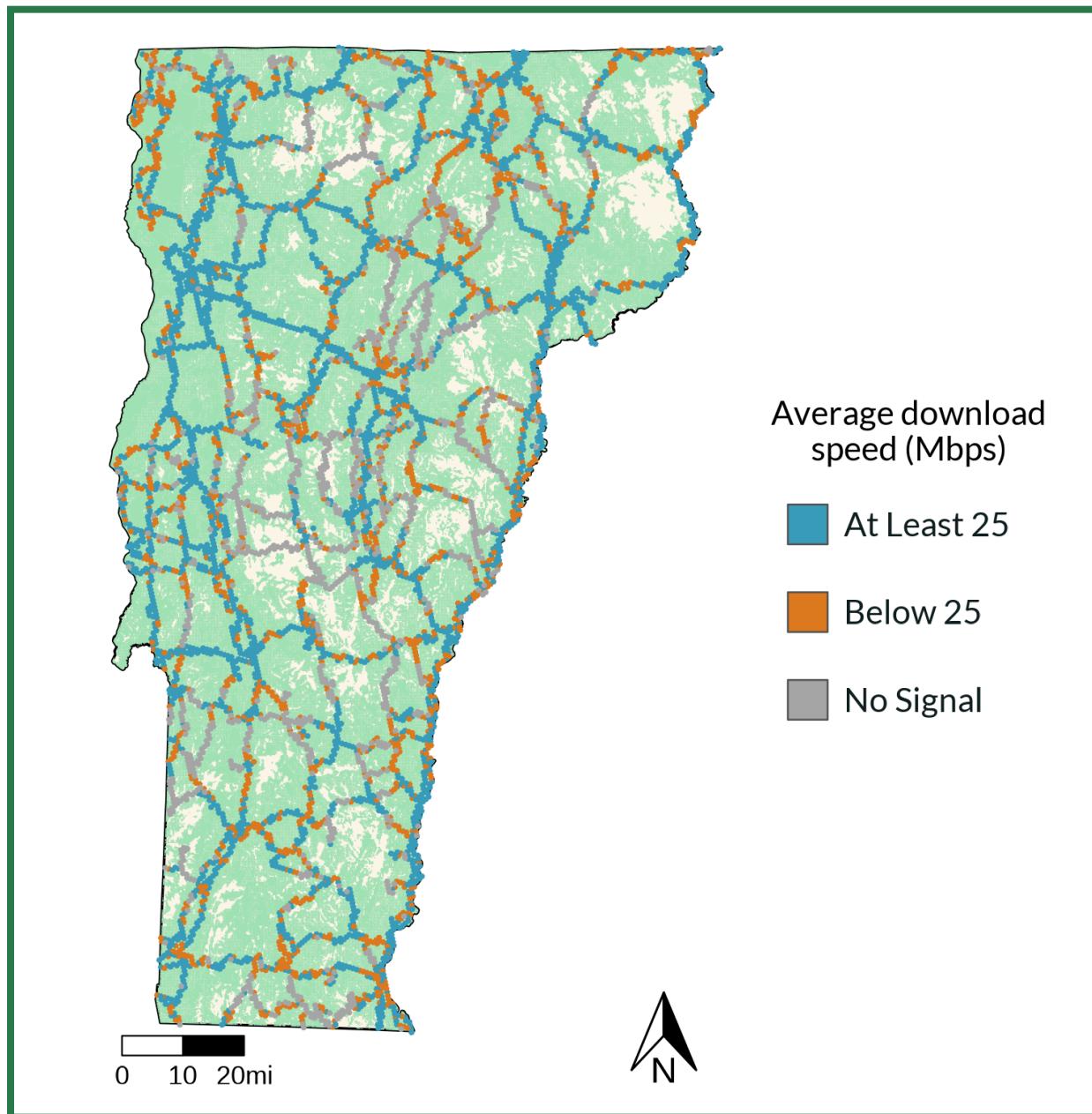
Calculation	Square Miles
Sum area representing all Vermont roads	3,112
Area covered by vertical assets in state databases (propagation model)	2,678
Additional area covered by state drive test data	23
Total theoretical coverage based on available data sources (all carriers)	2,700
Remaining road area to be covered by additional deployments	412

Figure 51: Estimated mobile broadband coverage based on tower locations



Source: CTC data and analysis, Government of Canada Spectrum Management System Data, New Hampshire Geodata Portal, Vermont Department of Public Service (2022)

Figure 52: Estimated existing mobile broadband coverage and average mobile wireless download speeds on Vermont roadways in 2022



Source: Vermont Department of Public Service (2022), CTC analysis

Notes: Roads that were not tested in 2018 were removed.

10.2.2.2 Model of Coverage Required to Address Gaps

An infill analysis was performed to estimate the new deployments needed to provide coverage to the 412 square miles of unserved roads.

Two types of deployment designs were created. The first used traditional macro tower deployments 140 feet above ground level (AGL), which is considered by industry experts to be an optimal size for self-supporting macro towers based on their cost to deploy and the coverage they deliver. Based on engineering analysis performed by a certified Professional Engineer on the project team, estimated costs for this type of deployment are as follows:

Table 16: Example cost estimate for 140-foot AGL deployment

Component	Cost Estimate
140' Tower	\$100,000
RAN Hardware Electronics	\$50,000
Site Installation	\$50,000
Core Electronics	\$1,000
Switches and Cabling	\$4,000
Backhaul (Wireless or Fiber)	\$15,000
Design	\$20,000
Total	\$240,000

These towers require more significant changes to the landscape, especially when situated in prominent locations to maximize signal reach.

Therefore, a second type of small facility design was explored: 50-foot pole-based AGL deployments. These 50-foot AGL radios are well suited to the terrain and foliage of Vermont, and are often considered less aesthetically obtrusive than taller, stand-alone towers. Importantly, these deployments also typically represent a savings of over 50 percent in capital expenditures compared to their 140-foot counterparts.

Table 17: Example cost estimate for 50-foot AGL deployment

Component	Cost Estimate
50' Pole	\$5,000
RAN Hardware Electronics	\$50,000
Site Installation	\$15,000
Core Electronics	\$1,000

Component	Cost Estimate
Switches and Cabling	\$4,000
Backhaul (Wireless or Fiber)	\$15,000
Design	\$7,000
Total	\$97,000

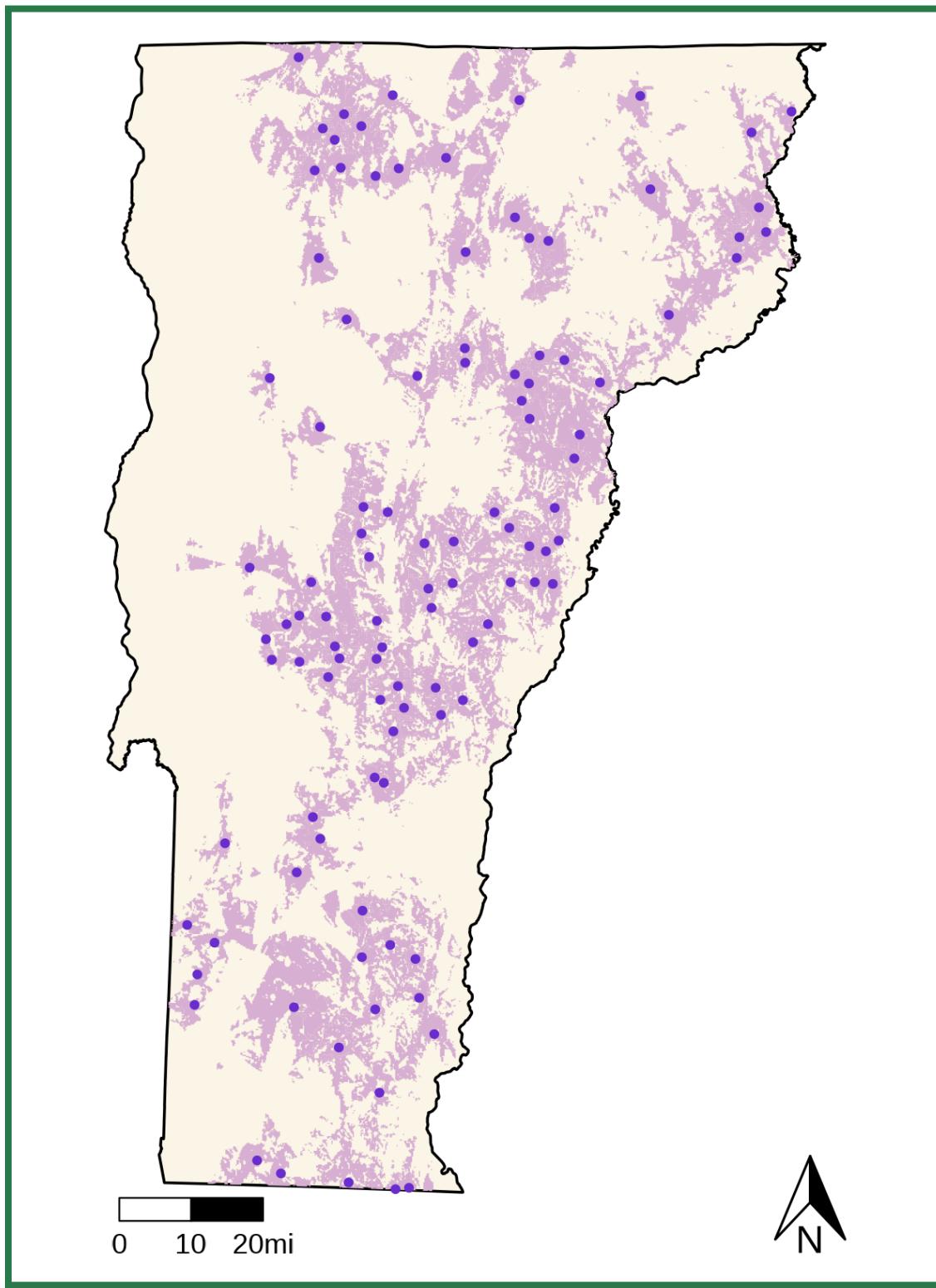
Two scenarios for infilling service gaps with each type of tower design were modeled. The first scenario showed deployments needed to infill the easiest 50 percent of areas without coverage along roadways, while the second looked at the additional deployments needed to infill 90+ percent. Both of these scenarios assume that fiber has been deployed to every on-grid premises and is available to support mobile deployments.

Table 18: Scenarios for infilling service gaps in the remaining 412 square miles of road area to be covered by additional deployments

	Site Type	Total Deployment Sites	Road Area (Square Miles)	Remaining Road Area (Square Miles)	Percentage of Remaining Area Lacking Coverage Along Roads	Estimated Total Cost of Deployments
<i>Deployment needed to infill ~50% of remaining area lacking coverage along roads</i>	50' Sites	107	216	196	47.6%	\$10,379,000
	140' Sites	98	214	198	48.1%	\$23,520,000
<i>Deployment needed to infill ~90+% of remaining area lacking coverage along roads</i>	50' Sites	511	378	33	8.1%	\$49,567,000
	140' Sites	438	379	33	8.0%	\$105,120,000

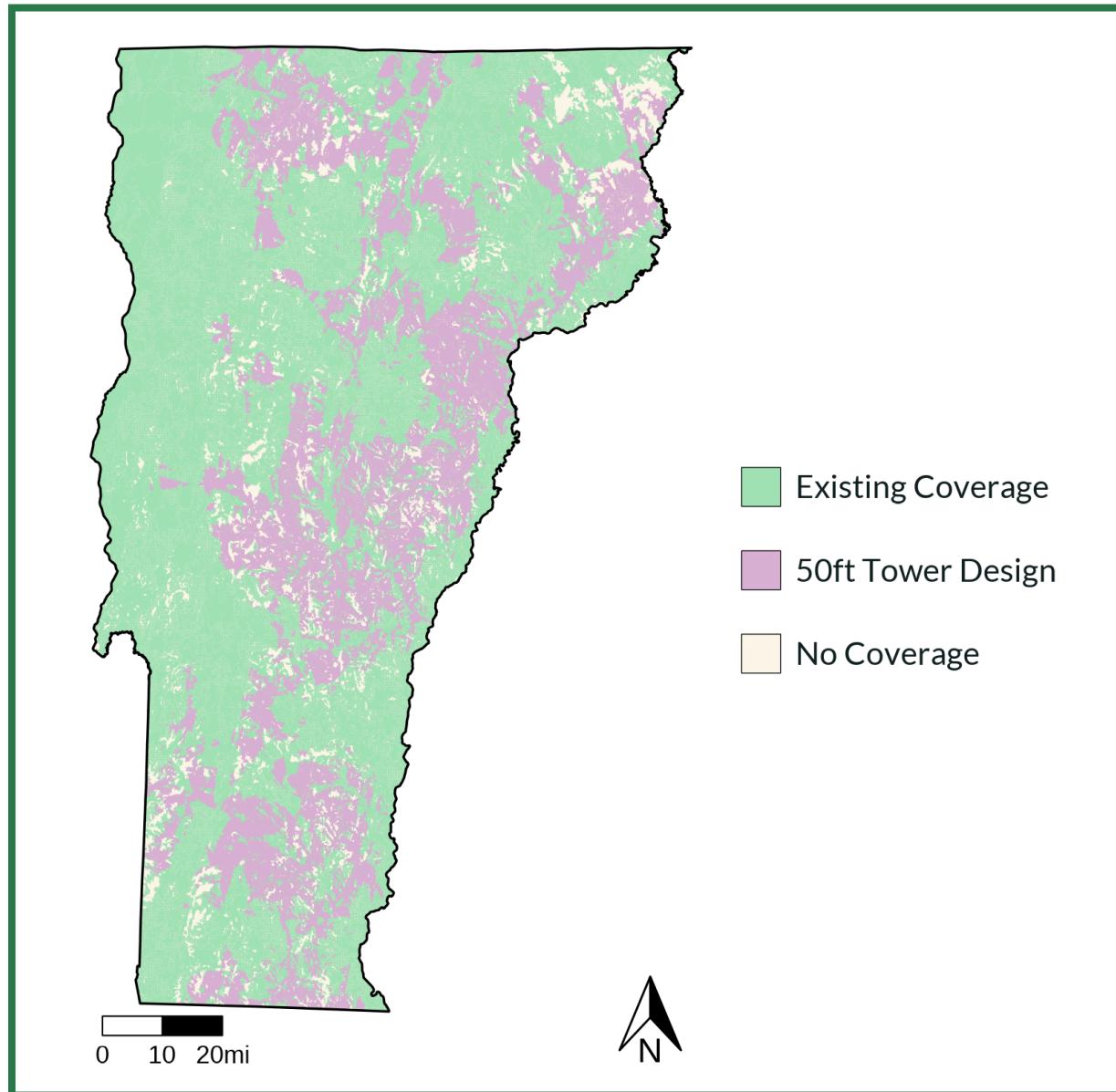
To illustrate these scenarios, the following two maps show coverage resulting from 107 new 50-foot towers as well as the hypothetical new coverage overlaid with estimated existing coverage.

Figure 53: 107 new 50-foot towers and coverage



Source: CTC analysis

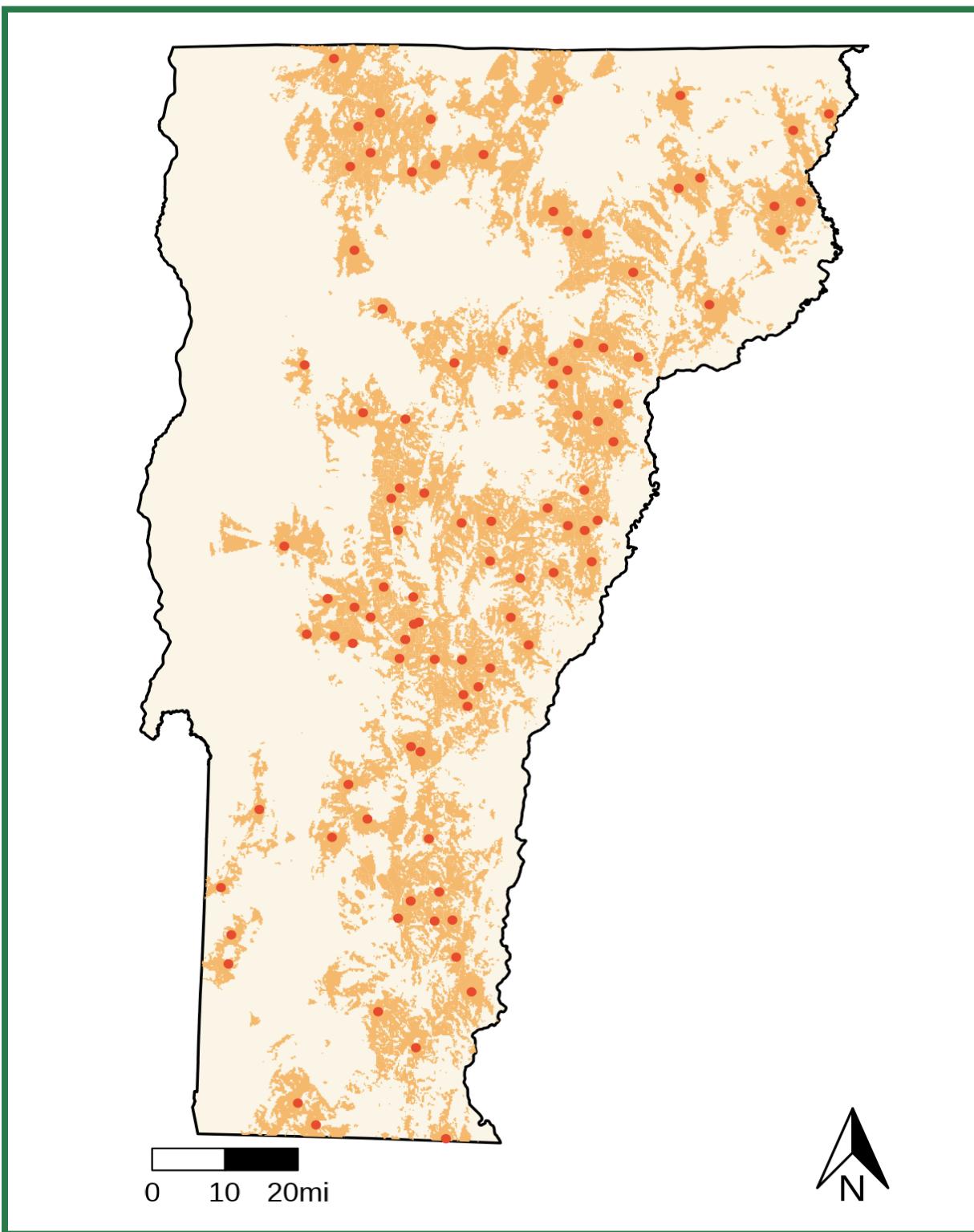
Figure 54: Estimated existing coverage and coverage from 107 new 50-foot towers



Source: CTC analysis

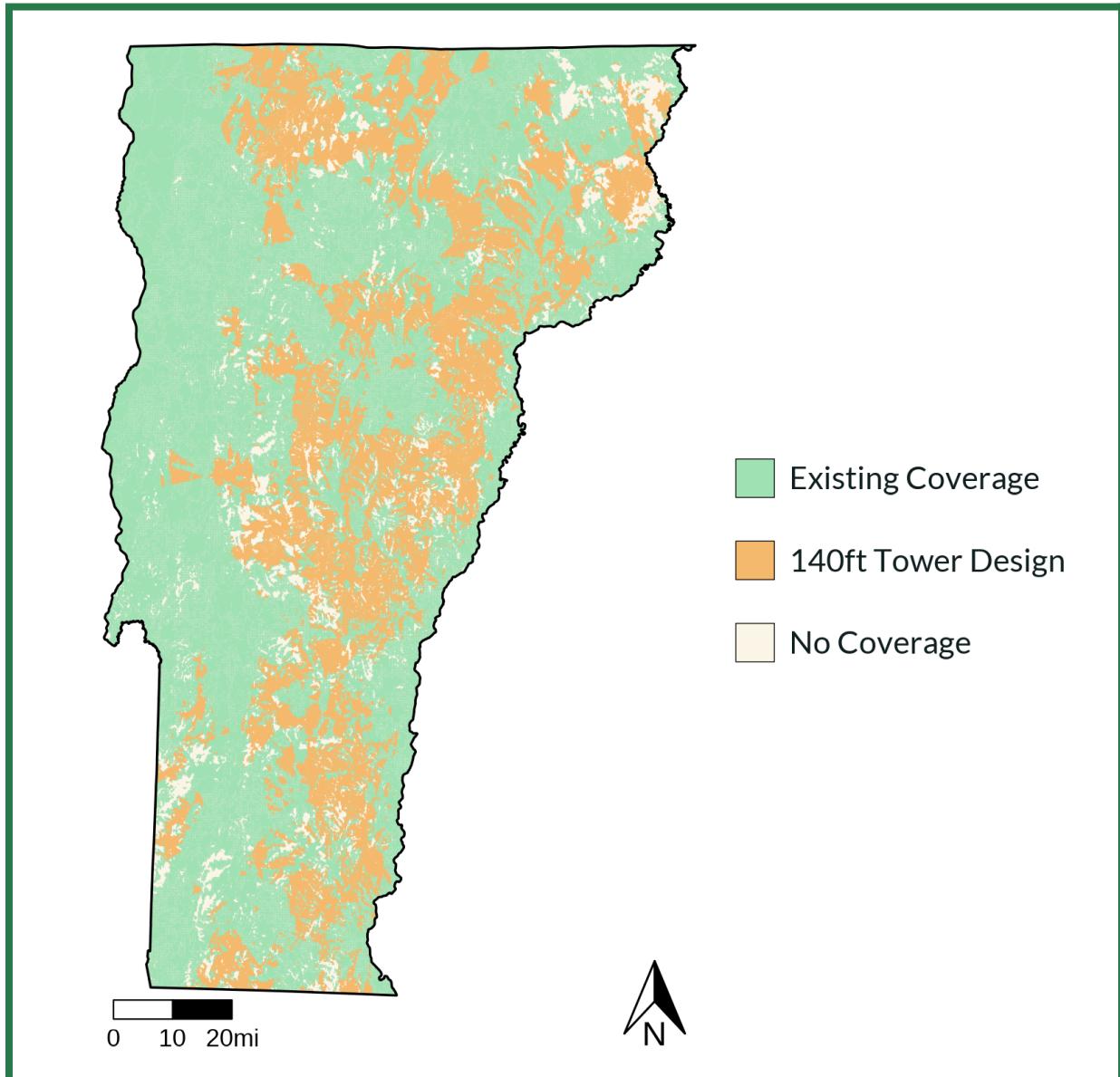
The following two maps illustrate coverage resulting from 98 new 140-foot towers as well as the hypothetical new coverage overlaid with estimated existing coverage.

Figure 55: 98 new 140-foot towers and coverage



Source: CTC analysis

Figure 56: Estimated existing coverage and coverage from 98 new 140-foot towers



Source: CTC analysis

The intent of this analysis is to characterize the scale of deployments necessary to address the persistent problem of coverage gaps along roadways. It is not meant to identify specific, buildable tower or pole locations. For analytical purposes, conceptual placement of towers and poles were algorithmically optimized to require a minimum number of sites based upon each site's propagation characteristics. Real-world siting processes must consider a host of additional factors, including

environmental impact, aesthetic and visual impact, land use and zoning regulations, electromagnetic interference (EMI), and site security.

10.2.2.3 Conclusions

The engineering analysis performed for this Plan demonstrates that strategically placed 50-foot wireless facilities achieve almost the same per-tower efficiency as 140-foot towers when addressing the easiest 50 percent of unserved areas.

Though the efficiency of 50-foot deployments may be surprising, their effectiveness is due to the topology of Vermont and the curvature of the Earth diminishing the theoretical benefits of higher towers as the signal propagates farther out. To be clear, the use of 50-foot deployments is not an efficient solution for everywhere in the state, as the effectiveness of small wireless deployments tapers off after covering the easiest 50 percent of unserved areas. (Please see Appendix H for additional methodological details.)

In addition, 50-foot AGL deployments present opportunities for considerable savings without sacrificing significant coverage. The savings of 50 percent on standard deployment costs may be augmented further by faster construction timelines and the potential for less opposition from individuals trying to block improvements in coverage.

That being said, these towers can have some physical and technical limitations that can impact resiliency. For example, 50-foot towers often:

- Have 8 to 12 hours of battery backup for power, rather than a generator that can be used for multiple days of power outages
- Are not tall enough to have backup microwave links that can be used in the event of a fiber cut
- Do not have a wide concrete pad, which can minimize impacts from potential encroaching branches or falling trees

The PSD will need to take these limitations into account – and incentivize resiliency where possible – when enabling or facilitating deployments of this nature. However, given the historical lack of progress in improving coverage due to the cost and challenge of macro tower siting in Vermont, this analysis supports the idea that the state can make meaningful progress on achieving its mobile broadband goals,

reduce aesthetic impact, and maximize cost effectiveness by deploying small wireless facilities – especially in the easiest 50 percent of areas without coverage along roadways.

10.2.3 Recommendation for a Mobile Broadband Pilot Grant Program Designed to Test and Refine Small Facilities Deployment Strategies

This Plan has previously provided analyses of different mobile broadband deployment frameworks – including small cell, neutral host, and shared infrastructure deployment – as well as the potential for different degrees of public sector or CUD involvement. The intent of the analyses is to educate decision-makers on the challenges and trade-offs inherent to different deployment methodologies, and how those trade-offs relate to the telecommunications goals of the state. This section recommends that the state launches a pilot grant program inclusive of the aforementioned strategies and moreover tests and refines a process that works for expanding mobile coverage in Vermont.

This pilot program would build on the successes of the current fiber deployments supported by ARPA, CPF, and BEAD funds, leveraging both physical infrastructure enabled by this process and the increased institutional capacity at the state level that has been built to administer grant and connectivity programs. Importantly, this program would focus on deployments that are “minimally visible” or “low impact” from an environmental and viewshed perspective.

This Plan recommends the initial scale of the pilot to be \$2 to \$3 million of grant funding. This would be large enough to collect meaningful data on deployment strategies, justify the operational infrastructure needed to conduct the program properly, and have real impact on coverage; however, it would not be so large that it ties up funds in an initial effort that has not benefited from the learnings that would be gained through the process.

Recently, prior staff of the Department of Public Service proposed a “reverse auction” framework to distribute funding for mobile broadband. While a reverse auction could be a viable framework, this Plan proposes a grant process specifically because it should allow for more customization of solutions to fit different towns and contexts, as no single deployment method is right for everywhere in the state, and factors like cost, infrastructure type, partnership structures, and execution path will

vary by location. The ability to accommodate different solutions in different areas is a guiding principle behind the pilot grant strategy proposed.

The pilot grant program design should also test whether and how the state can act to reduce deployment delays that can arise from frivolous lawsuits. Unfortunately, in select cases around the country, property owners have used laws designed to protect the environment as a means to stop deployment of needed communications infrastructure, particularly wireless facilities. While such cases are not the norm, they do create the risk of costly delays to deployment. Carriers frequently mitigate that risk by changing deployment patterns or declining to invest in areas where the risks outweigh the potential business opportunity – to the detriment of state policies designed to facilitate and incentivize deployment. Therefore, a state grant program designed to attract competitive applications from mobile companies should take these risks, costs, and disincentives into account.

The following section presents recommended parameters for the pilot mobile broadband grant program.

10.2.3.1 Recommended Strategies for Deployment Siting and a Geographic Focus Area(s)

The quality and efficiency of mobile wireless bids will depend on factors that are hard to evaluate, except on a location-by-location basis. Distance from fiber (and specifically a provider capable of carrier-grade service), distance from power, anticipated usage at premises or in transit, difficulty of obtaining permits, leases, or easements, and other factors all impact cost and are all context specific.

Therefore, this Plan recommends that the state ask bidders to *propose* the areas they would build efficiently and impactfully, and then measure those proposals against a rubric that prioritizes impact; in other words, a rubric based on filling coverage gaps, serving new road miles and premises, public safety needs, and other factors should inform awards. Though it may be tempting to pick more specific target deployment areas – such as gaps along particular roads – mandating bids in these areas may reduce the quality of the data the state can collect because it may inadvertently force bidders to work in a particularly challenging location. This in turn will impact how bidders respond and will skew the state's understanding of costs and requirements necessary to elicit competitive bids. Allowing bidders to suggest deployment areas will maximize the efficiency of the deployments.

That said, the state may express geographic preferences or provide more concrete guidance on target areas to ensure collection of better data from the pilot program. For example, the state could designate broad target areas with CUDs or ISPs that have completed their FTTP construction. This could allow the state to test – or even incentivize – collaboration among mobile providers and CUDs and then apply those learnings statewide as all CUDs deploy fiber and mature organizationally.

10.2.3.2 Recommended Strategic Components of the Pilot Grant Program

Given the goal of testing the potential for small facilities to expand mobile broadband in Vermont, the grant program should restrict new deployments to towers under 50 feet tall, but allow bidders the flexibility to propose the radio types (small cell, macro cell) and arrangements (e.g., shared infrastructure, neutral host) they seek to deploy.

In addition, the following strategic elements should be included in grant applications with transparent and consistent scoring criteria attached to submission materials:

- Propagation maps in GIS format to demonstrate coverage area with documentation of assumptions to allow third-party engineering verification
- Visual context analysis to demonstrate that deployments will minimally impact sightlines and viewsheds
- Itemized application costs, including (at a minimum) cost of site installation, engineering, fiber capex, power capex, electronics, tower infrastructure, and labor and resources devoted to the permitting process
- Proof of committed tenancy, with points awarded for each major carrier that is committed in writing
- Impact and benefits to public safety and first responders, with points awarded for greater benefits provided
- Siting due diligence, including coordination with local officials and the public
- Sustainability of the deployment to ensure it can be maintained, extended, and upgraded beyond the useful life of the first radios deployed

Lastly, applicants should be required to describe whether they have concerns about legal challenges to their deployments, and how those concerns have impacted their

proposed locations and costs. This will allow the state to better understand if and how anti-wireless facilities litigation impacts mobile expansion.

The Department of Public Service may also coordinate with local and state institutions, such as those in the public safety sector, to understand where public sector entities may want to be a paying subscriber. By aligning these locations with institutional customers, PSD may be able to further incentivize deployments in challenging areas.

10.2.3.3 Recommended Qualitative and Quantitative Data to Collect During a Pilot Grant Process

Structuring the grant program as a pilot will allow the Department of Public Service to collect information to further refine and optimize the program. In particular, this Plan recommends that the PSD analyze the following with qualitative and quantitative data collected during the process:

- How carriers are or are not able to provide carrier-grade services
- The average subsidy requested per deployment, per road mile served, and per premise served
- The most significant itemized costs
- What the state can do to establish more efficient processes around the highest-cost items
- If applicants able to leverage newly deployed fiber to achieve more efficient deployments
- Whether applicants are improving efficiency by using the 248a exemption for towers under 50 feet tall to decrease permitting costs and legal risks

Data and analyses that address these questions should inform future versions of mobile broadband expansion grants and programs.

10.3 Leveraging the Rights-of-Way

Currently, the Agency of Transportation requires a permit and application fee for accessing Agency-managed rights-of-way. The permit is required for all public and private entities, and application fees for nonresidential or agricultural purposes

range from \$100 to \$2,500.¹⁵⁰ Large-scale infrastructure projects may require dozens of permits depending on the specific deployment and construction plans. In addition, any remaining infrastructure in the right-of-way is subject to fair market value rent unless it is an allowed use under federal guidelines or the Agency determines that the infrastructure serves a public purpose.

These costs are incurred by infrastructure builders in the state and increase project costs. Because of this, until the state's universal 100/100 Mbps wireline goal is achieved, rights-of-way application fees and rent impede deployments.

In recognition of this dynamic, the state created a system to provide rights-of-way rent waivers for broadband builders under 19 V.S.A. § 26a(b),¹⁵¹ as long as the entity requesting the permit "offers to provide comparable value to the State so as to meet the public good as determined by the Agency and the Department of Public Service." The statute explains that "comparable value" should be "construed broadly to further the state's interest in ubiquitous broadband and wireless service availability at reasonable cost."

Stakeholders interviewed for this Plan reported that through the end of 2023, the waivers were working as intended and enabling better broadband deployment in unserved areas. However, during the writing of this Plan, the Vermont Legislature discussed revisions to the waiver system via H.657.¹⁵²

As indicated by their testimony on February 7, 2024,¹⁵³ PSD supports the continuation of the rent waivers until the state achieves universal 100/100 Mbps broadband because right-of-way rent increases the costs of deploying in the most difficult-to-reach areas. Therefore, this Plan recommends leveraging state control of rights-of-way by providing rent waivers to infrastructure builders deploying in unserved and underserved areas until Vermont meets its broadband goals.

¹⁵⁰ Vermont Agency of Transportation (2016) *State Highway Access and Work Permit*. Available at <https://vtrans.vermont.gov/sites/aot/files/planning/documents/permittingservices/FeeScheduleAndPermitApp%200223.pdf>. Accessed January 15, 2024.

¹⁵¹ 19 V.S.A. § 26a. Available at <https://legislature.vermont.gov/statutes/section/19/001/00026a>. Accessed January 15, 2024.

¹⁵² Modernization of Vermont's Communications Taxes and Fees, H.657 (2024). Available at <https://legislature.vermont.gov/Documents/2024/Docs/BILLS/H-0657/H-0657%20As%20Introduced.pdf>. Accessed February 20, 2024.

¹⁵³ House Committee on Ways and Means (2024) "Meeting Record." Available at <https://legislature.vermont.gov/committee/meeting-detail/2024/21/6083>. Accessed February 20, 2024.

10.4 Electric Utility Tariff Rider Program

The Temporary Unserved Location Broadband Deployment Rider program¹⁵⁴ established by Green Mountain Power and Vermont Electric Coop provides credits to infrastructure builders for make-ready work in un- and underserved areas, and has proven to be a successful strategy to reduce the cost of deploying wireline broadband.

During conversations in late 2023, utility representatives reported that the program would expire in March 2024 and would need to be reauthorized to continue supporting wireline deployment. Fortunately, utility representatives noted that reauthorization was likely.

Given that this alternative strategy successfully supports rural deployment, and because those deployments have not yet been completed in the state, this Plan recommends the reauthorization of the program.

10.5 Increasing Network Resiliency

As discussed in Section 4.2, Vermont is projected to continue to experience more frequent and intense weather-related disasters over the coming decade — especially riverine flooding, hurricanes, and ice storms, which result in infrastructure damage and service disruptions.

When the public sector enables infrastructure construction in the state (e.g., through grant programs), the public sector has leverage to encourage resilience practices. Plans to mitigate the negative impacts of extreme weather should be as granular and hyper-local as possible, considering the hazard risks specific to each location (e.g., a small creek that is likely to breach its banks during heavy or prolonged precipitation).

As required by the BEAD planning process, the VCBB is already taking climate risks into account when planning infrastructure deployments, but best practices are reiterated here for the benefit of readers of this Plan.

¹⁵⁴ Public Utility Commission (2021) Case No. 21-0544-TF. Available at <https://greenmountainpower.com/wp-content/uploads/2021/03/2021-03-12-PUC-Order-Approving-Tariff.pdf>. Accessed January 30, 2024.

Telecommunications resilience depends heavily on the design of infrastructure, the quality and quantity of teams repairing the infrastructure, and power. Best practices include:

- Burying cables when possible rather than installing aerially, particularly in areas prone to hurricanes, flooding, and ice storms
- Performing regular vegetation management in rights-of-way along aerial power lines
- Building geographically diverse redundancy into routes that serve a large number of premises and critical locations (such as hospitals and PSAPs)
- Providing alternative internet traffic routes during emergencies via peering arrangements between ISPs
- Establishing network connections with neighboring states and Canada
- Encouraging CUDs and ISPs to have two fiber feeds for every hub
- Ensuring facilities have robust backup power options
- Storing electronics and equipment out of harm's way (e.g., on upper floors of buildings, placing cabinets on stilts, etc.)
- Maintaining supplies of spare materials needed to repair damaged equipment and infrastructure
- Conducting recurring assessments of the network to identify vulnerabilities
- Collaborating with neighboring municipalities and local ISPs for resource-sharing opportunities (e.g., repair crews)
- Coordinating with institutions and agencies that are also taking climate mitigation steps to ensure that resilience is built efficiently and collaboratively

The single most effective approach to proactively build resilience *into network designs* is to have redundancy of key routes and equipment. Redundancy can be provided with multiple geographically diverse fiber routes, multiple service providers, multiple internet connections, and where multiple fiber routes are not available, satellite or wireless backup.

These best practices have successfully kept emergency services operational in Vermont during fiber cuts. Recently, fiber used by ADS was severed during highway construction, resulting in temporary outages to some state websites. However, because of redundant networking, vital services such as VoIP and emergency

communications were not disrupted. All systems were completely restored within hours.

In addition to redundancy, network resilience is also significantly impacted by power resilience. Large facilities such as central offices should have redundant generators and batteries that are regularly tested. Smaller cabinets with powered equipment might not be suitable for generators, so options may include the ability to attach a temporary generator and the use of sufficient battery backup.

The need for power and the impact of outages should be primary considerations in design. As noted earlier, an advantage of PON fiber technology is that small cabinets that contain splitters and passive equipment do not need power. Hybrid fiber-coaxial networks, on the other hand, require distributed power supplies on poles or in pedestals, which limits the available backup power that can be provided in batteries and presents a challenge for operating during a power outage that outlasts the batteries (backup batteries typically last two to twelve hours).

The final challenge for maintaining network operations during a power outage is the power required at the home or business. While modems and routers may have backup batteries, they tend to last for eight to twelve hours. The recent initiative by Green Mountain Power¹⁵⁵ to facilitate in-home battery backups is receiving national attention and will support in-home connections during outages, but network resilience requires a coalition of actors all prioritizing resiliency. Having long-term backup power at the premises and a broadband operator paying attention to resiliency is an excellent combination and the best way for Vermonters to achieve broadband resiliency.

Given the challenges inherent in predicting the future of extreme weather events in Vermont, network resilience will depend on preparing for emergency events that occur with no forewarning. The state has leverage to encourage and mandate resilient construction via its grantmaking work. As such, this Plan recommends that the VCBB use the BEAD grantmaking process to continue to ensure that new networks are resilient and redundant, in line with the best practices described in this Plan.

¹⁵⁵ Green Mountain Power (2023) “GMP’s Request to Expand Customer Access to Cost-Effective Home Energy Storage Through Popular Powerwall and BYOD Battery Programs is Approved.” Available at <https://greenmountainpower.com/news/gmps-request-to-expand-customer-access-to-cost-effective-home-energy-storage-is-approved/>. Accessed December 14, 2023.

Section 11: Assessment of Vermont Telecommunications Statute

Vermont telecommunications policy is governed by two primary statutes: 30 V.S.A. § 202c-f and Act 71.

The Telecommunications Plan was first mandated by law through the creation of 30 V.S.A. § 202c-f in 1987.¹⁵⁶ The goals of the statute were last updated in 2014, and the process of crafting the Plan was revised in 2020. The Plan aims to create a technologically advanced telecommunications network covering all service areas in the state and offering stable and predictable rates for all Vermonters. Other sections of 30 V.S.A. § 202 outline the powers and duties of the Department of Public Service and the Telecommunications and Connectivity Advisory Board.

The legislature again demonstrated a commitment to connecting Vermonters with the passage of Act 71 in 2021. Act 71 established the Vermont Community Broadband Fund to “support policies and programs designed to accelerate community efforts that advance the State’s goal of achieving universal access to reliable, high-quality, affordable, fixed broadband” and established the Vermont Community Broadband Board to “coordinate, facilitate, support, and accelerate the development and implementation of universal community broadband solutions.” Act 71 also acknowledges that connectivity in Vermont must take a grassroots approach because favorable market conditions are lacking in the state. A more detailed discussion of the Vermont Community Broadband Board is available in Section 9.2.

Given that these vital statutes have been written and revised by the legislature over nearly 40 years, it is inevitable that there are now inconsistencies within 30 V.S.A. § 202c and with Act 71. At this time of unprecedented funding and scrutiny on Vermont’s telecommunications landscape, stakeholders and decision-makers will rely on these governing statutes to provide information and accountability for themselves and their communities.

¹⁵⁶ 30 V.S.A. § 202d. Available at <https://legislature.vermont.gov/statutes/section/30/005/00202d>. Accessed January 15, 2024.

This section provides recommendations for updating both 30 V.S.A. § 202c-f and Act 71 to be more specific, strategic, aligned with each other, and current.

11.1 Statute Should Establish Specific, Distinct, Measurable, and Achievable Goals

11.1.1 Updating the Goals of 30 V.S.A. § 202c

The ten goals that guide state telecommunications planning in 30 V.S.A. § 202c¹⁵⁷ (listed in Appendix A) contain significant overlap, and are not written in a specific and quantifiable manner that would enable policymakers and decision-makers to set benchmarks and measure progress.

For example, the following five goals contain wholly or partially overlapping ideas:

(Goal 2) Support the universal availability of appropriate infrastructure and affordable services

(Goal 4) Provide for high-quality, reliable telecommunications services for Vermont businesses and residents

(Goal 8) Support the deployment of broadband infrastructure that uses the best commercially available technology

(Goal 7) Support the application of telecommunications technology to maintain and improve governmental and public services, public safety, and the economic development of the State

(Goal 10) Support measures designed to ensure that by the end of the year 2024 every E-911 business and residential location in Vermont has infrastructure capable of delivering Internet access with service that has a minimum download speed of 100 Mbps and is symmetrical

The goals in this statute very clearly describe Vermont values and aspirations; however, considerable overlap among many of the goals prevents maximum effectiveness. If the intention is to require PSD and other stakeholders to concretely measure progress toward the goals, the legislature should consider structuring the

¹⁵⁷ 30 V.S.A. § 202c. Available at <https://legislature.vermont.gov/statutes/section/30/005/00202c>. Accessed January 15, 2024.

goals in a way that is separate, specific, and measurable. Concrete objectives can be established by the agency or department responsible for the work, but given the priority placed on broadband by the legislature, and the legislature's specificity in some parts of statute (i.e., goal 10), goals may best be established in statutory language as statute is revised.

11.1.2 Updating the Specific Goal of 2024 for Wireline Deployments

In one case, the statute establishes a very specific goal that simply needs to be updated. The tenth goal in 30 V.S.A. § 202d sets a deadline of 2024 for every E-911 location in Vermont to have infrastructure capable of delivering 100 Mbps symmetrical internet access.

To accurately reflect the deployment timeline of the BEAD Program, this goal should be revised to match with a deadline of 2029.

11.2 Alignment Across Statutes and Statutory Sections

11.2.1 Ensuring Broadband Speed Definitions Are Cohesive and Modernized

The legislature has explicitly stated broadband speed goals in three places in slightly different ways:

- Act 71 defines a served location as having access to minimum speeds of 25/3 Mbps¹⁵⁸
- 30 V.S.A. § 202e(e)1-3 require the Commissioner of Public Service to report areas served by broadband capable of delivering speeds of at least 4/1 Mbps, 25/3 Mbps, or 100/100 Mbps
- 30 V.S.A. § 202c(b)10 sets a goal of each E-911 address having service with a “minimum download speed of 100 Mbps and is symmetrical”

Furthermore, as explained in Section 3.2, the 25/3 Mbps threshold is now obsolete as the FCC raised the threshold for a premise being considered served from 25/3 Mbps to 100/20 Mbps on March 14, 2024.¹⁵⁹

¹⁵⁸ Act 71 (2021). Available at <https://legislature.vermont.gov/Documents/2022/Docs/ACTS/ACT071/ACT071%20As%20Enacted.pdf>. Accessed November 21, 2023.

¹⁵⁹ Federal Communications Commission (2024) “FCC Increases Broadband Speed Benchmark.” Available at <https://docs.fcc.gov/public/attachments/DOC-401205A1.pdf>. Accessed April 26, 2024.

Many states are considering more robust definitions, and some have already made updates. Alabama, for example, has established 100/100 Mbps as its definition of broadband.¹⁶⁰ The legislature should consider modernizing statute to clearly document the speeds at which Vermonters should be considered served, underserved, and unserved, and ensure data collection practices are standardized to this definition. Adding a provision to reevaluate and update the definitions at a regular cadence will ensure they do not become obsolete in the future.

11.2.2 Harmonizing State Telecommunications Goals, PSD Goals, and 10-Year Plan Objectives

30 V.S.A. § 202e provides guidance to the Department of Public Service through five broad goals and ten requirements to promote to achieve those goals. Adopted in 2015, it has never been updated. 30 V.S.A. § 202c lists ten goals to guide state telecommunications planning, and 30 V.S.A. § 202d provides a range of directives relating to the execution of the Plan.

The goals for the Department in 30 V.S.A. § 202e at times match the goals established in 30 V.S.A. § 202c, but sometimes diverge or offer additional responsibilities. For example, 30 V.S.A. § 202c(b)3 sets a goal to “support the availability of modern mobile wireless telecommunications services along the State’s travel corridors and in the State’s communities,” while 30 V.S.A. § 202e establishes that the PSD should promote “universal availability of mobile telecommunication services, including voice and high-speed data along roadways, and near universal availability statewide.”

In addition, as discussed in Section 11.3, 30 V.S.A. § 202e directs the Department to prepare an Action Plan with the advice and assistance of the Telecommunications and Connectivity Board. That language is not reflected in 30 V.S.A. § 202d, nor in 30 V.S.A. § 202f, which focuses on the charge of the Telecommunications and Connectivity Board.

In order to provide clarity on their priorities for the Department, the legislature should consider revising 30 V.S.A. § 202e to coordinate with 30 V.S.A. § 202c, and

¹⁶⁰ Alabama Department of Economic and Community Affairs, Alabama Broadband Accessibility Act (Act 2018-395, § 1). Available at <https://adeca.alabama.gov/wp-content/uploads/Alabama-Broadband-Accessibility-Act.pdf>. Accessed January 30, 2024.

ensure that the responsibilities of the Department (30 V.S.A. § 202c) are fully cohesive with the creation of the 10-Year Telecommunications Plan (30 V.S.A. § 202d).

11.3 Statute Should Be Modernized to Align with Present-Day Strategies

11.3.1 Establishing Clear Requirements for Collaboration Among Agencies

30 V.S.A. § 202d(b) states that the Department of Public Service must complete the Plan with the assistance of the Agency of Digital Services, the Agency of Commerce and Community Development, and the Agency of Transportation. While all three agencies were happy to provide stakeholder interviews and review the draft Plan, various stakeholders expressed that there was not a clear role and responsibility for their agency to contribute to the Plan beyond providing a stakeholder interview.

The original intent for including these agencies may have been their previous ownership or management of telecommunications systems; however, the responsibilities of these agencies are far different now than when the statute was established. If the legislature wants agencies other than the PSD to participate directly in PSD processes, the legislature should consider codifying that direction in the official descriptions of those agencies' functions.

In addition, the legislature may increase the efficiency of the planning effort and collaboration among agencies by encouraging the use of existing state agency reports. 30 V.S.A. § 202d(b) requires a ten-year forecast of statewide growth and development and lists a variety of factors, including items such as patterns of urban expansion and shifts in transportation modes. However, other state agencies perform the same, or similar, work:

- The Legislative Joint Fiscal Offices produce forecasting documentation for metrics like population growth, taxpayer migration, the annual basic needs budget (which includes telecommunications), and other demographic trends.

- The Agency of Commerce and Community Development maintains the state's Comprehensive Economic Development Strategy, which provides guidance for future public investment to build regional economic development.¹⁶¹
- The Department of Labor produces reports on workforce development and labor market trends.
- The Agency of Transportation produces long-range transportation plans and traffic data.

The forecasting requirements should be revised so that the Plan focuses on the factors that both affect telecommunications in Vermont and are not part of other reports provided by departmental leadership to the legislature and the administration. This would allow the PSD to target the most timely factors to provide context for the Action Plan portion of the requirements.

Lastly, there are additional state agencies and partners that might be suitable for a bigger role in the connectivity planning landscape moving forward. Though it has an end date, the VCBB is one of the most critical entities currently working in telecommunications in the state. Other entities, such as libraries and social services organizations, play a crucial role in local connectivity – especially for vulnerable populations by addressing adoption-related challenges.

The legislature should consider reviewing the coalition of stakeholders named explicitly in statute and specifying how they should participate for the benefit of the Plan and connectivity landscape.

11.3.2 Aligning Statutory Goals With Current State Infrastructure Strategies

The state has established CUDs as an essential vehicle for connectivity and policies to make sure CUDs are financially sustainable. The CUDs are also empowered with a mission of public good. This strategy ensures adequate service is built even to the most economically challenging locations and exerts long-term downward pressure on prices.

However, this strategy is in partial conflict with the sixth goal of 30 V.S.A. § 202c(b):

¹⁶¹ Agency of Commerce and Community Development, "2020 Comprehensive Economic Development Strategy (CEDS)." Available at <https://accd.vermont.gov/economic-development/major-initiatives/ceds>. Accessed February 15, 2024.

Support competitive choice for consumers among telecommunications service providers and promote open access among competitive service providers on nondiscriminatory terms to networks over which broadband and telecommunications services are delivered.

Competition and open access are both contexts that *can* create better outcomes for customers in the form of improved connectivity, higher speeds, lower costs, and better customer service. However, the state has undertaken a very capital-intensive effort to allow even one provider to serve the most rural areas, and open-access models typically make the economics of rural broadband more difficult. If not done thoughtfully, promoting open-access risks compromising the goals of universal deployment by making the economics of deployments more challenging.

This is not intended to imply that the theoretical benefits open-access and increased competition can bring are not strong goals of current telecommunications practices; in fact, they are central values that underpin current strategy. The CUD model uses public ownership to work toward the same benefits that competition and open access may bring. This is a viable and successful path toward providing customers with great service, faster speeds, and long-term downward pressure on prices. With this in mind, this Plan recommends that the legislature consider whether a better strategy might be to establish the positive *outcomes* competition brings to the open market, rather than setting competition as the goal.

Lastly, the goals presented in 30 V.S.A. § 202c are predominantly focused on supply-side telecommunications issues – in other words, facilitating deployment of critical technologies. However, a significant portion of the connectivity challenge falls on the demand side, concerning affordability, digital skill building, cybersecurity practices, device ownership, accessibility, and more. The legislature should consider including goals that address the demand-side challenges that the ecosystem of telecommunications stakeholders should be focused on after deployment goals are met.

11.3.3 Ensuring the VCBB End Date Does Not Adversely Impact Grant Recipient Accountability

Currently, Act 71 sets an end date of July 1, 2029, for the Vermont Community Broadband Board. As discussed in Section 9.2, this end date is within six months of

the anticipated completion of BEAD-funded wireline deployments, which will prevent the VCBB from performing the appropriate post-deployment monitoring of grantees.

Furthermore, the VCBB has built significant institutional knowledge and capacity that would be useful in efforts to meet additional telecommunications goals, such as facilitating mobile broadband expansion. In collaboration with VCBB and PSD leadership, the legislature should consider whether additional responsibilities should be assigned to the VCBB while extending its end date.

11.3.4 Revising the Role of the Telecommunications and Connectivity Advisory Board

30 V.S.A. § 202f created the Telecommunications and Connectivity Advisory Board to function in an advisory capacity to the Commissioner of Public Service on the development of state telecommunications policy and planning. However, despite the best efforts of the Department of Public Service, the Board is not functioning as the legislature intended. According to meeting minutes and agendas, the meetings are primarily attended by the Commissioner and her staff with sporadic attendance by others. It is also unclear, using publicly available documents, whether the Governor is regularly filling vacancies on the Board, creating potential problems with meeting any decision-making quorums.

To better focus the attention of agency leadership across the state and prioritize the coalitions and interagency collaborations that are currently functioning well, the legislature should consider revising 30 V.S.A. § 202f to either wind down the group or be more explicit with the overarching structure, goals, and objectives of the group to ensure it is operating as intended. For example, the statute does not require the Board to meet in a specific frequency, stating only that it may meet up to six times a year. Meetings are also called at the discretion of either the chair or a majority of the Board, rather than on a regular cycle throughout the year. Although the Board met in March 2024 to discuss the draft of the 2024 10-Year Telecommunications Plan, they had not met for over two years prior. In creating clearer expectations for the Board's role in Vermont telecommunications, the knowledge and expertise of Board members can be better leveraged to address telecommunications policy and planning issues.

Section 12: Recommendations and Action Plan

This section synthesizes the recommendations from prior sections into an Action Plan to allow readers to concisely see the range of steps stakeholders across the state may take to make progress toward the state telecommunications goals, as well as the outcomes that should be considered successful.

The section is structured around the goals from 30 V.S.A. § 202c that govern state telecommunications planning, in accordance with the following language from state statute:

"In developing the Plan, the Department shall address each of the State telecommunications policies and goals of section 202c of this title, and shall assess initiatives designed to advance and make measurable progress with respect to each of those policies and goals."

The goals in 30 V.S.A. § 202c provide a visionary and expansive direction for state telecommunications. However, as discussed in Section 11, many of these goals have overlapping sentiments. Consequently, **the actions and recommendations in this section often apply to multiple state goals, though they are each only listed once in this Action Plan.**

12.1 Strengthening the State's Role in Planning

30 V.S.A. § 202c(b)1: *Strengthen the State's role in telecommunications planning*

Section 11 notes how the various pieces of statute that govern telecommunications are almost 40 years old, conflict or overlap, and warrant modernization for strategic reasons. These challenges can lead to inefficiencies in planning processes and a lack of clarity for stakeholders.

To strengthen the state's role in telecommunications planning, the Vermont Legislature should consider the following actions:

1. Establish specific, distinct, measurable, and actionable goals in 30 V.S.A. § 202c, including but not limited to:
 - Increasing the specificity and measurability of goals related to the deployment of infrastructure

- Updating the specific goal of 2024 for wireline deployments
- 2. Align goals and directives across statutes, including:
 - Setting universal 100/100 Mbps as the goal for wireline broadband across all elements of telecommunications statute
 - Ensuring the stated PSD goals are fully aligned with the goals for the state and directives for creating the 10-Year Telecommunications Plan
 - Establishing clear goals for mobile broadband access and speeds
- 3. Ensure statute is fully aligned with modern state practices and strategy, including:
 - Establishing clear requirements for collaboration among agencies
 - Aligning statutory goals with current state infrastructure strategies
 - Ensuring the VCBB end date does not adversely impact grant recipient accountability
 - Revising the role of the Telecommunications and Connectivity Advisory Board

Suggested lead: Vermont Legislature

Suggested timeline: 2025 biennial

12.2 Supporting Universal Availability of Appropriate Infrastructure and Affordable Services

30 V.S.A. § 202c(b)2: Support the universal availability of appropriate infrastructure and affordable services for transmitting voice and high-speed data

Universal availability of infrastructure cannot be achieved without a robust workforce to take on the significant increase in broadband construction. This Plan seeks to augment the BEAD planning work done by the VCBB by providing a gap analysis of the workforce needed to meet the state's wireline infrastructure goals in Section 8.3.

This Plan recommends that the VCBB – in collaboration with the state college system, Department of Labor, and employers – use the gap analysis in Section 8.3 to scale and calibrate existing workforce training programs. Metrics to quantify success should include the following:

- Program trainees
- Trained workers hired
- Hired workers who remain employed in the industry after three and six months

Time is of the essence, as much of the workforce training must happen in 2024 and early 2025 to be maximally impactful for the BEAD Program's construction timeline.

Suggested lead: Vermont Community Broadband Board

Suggested timeline: 2024 and early 2025

In addition to the gap analysis, the Plan recommends the state consider adapting or expanding an existing workforce incentive program to include the telecommunications sector, modeled in part on the Worker Relocation Grant Program, to incentivize increased training in critical broadband construction jobs and potentially attract relevant workers to the state or back into the industry.

Suggested lead: Agency of Commerce and Community Development

Suggested timeline: 2024 and early 2025

To address the “affordable services” portion of this goal, Section 5.4 offers an assessment of wireline and mobile broadband affordability in Vermont. To provide Vermont residents with affordable and accessible internet service, this Plan recommends that the Vermont Legislature consider funding the following actions during the 2025 biennial to be administered by the Agency of Human Services:

- Establish a state-level connectivity subsidy program of \$67 per month per household to support both fixed and mobile broadband service so that no low-income Vermonter pays more than \$50 per month for all of the connectivity subscriptions
- Set the eligibility criteria for such a program at either 185 percent of poverty guidelines to match LI-HEAP and SNAP, or at 135 percent of poverty guidelines to match Lifeline if budgetary constraints prevent using a 185 percent threshold

- Allocate funding of at least \$19.5 million per year under the 185 percent threshold scenario, not including administrative fees, to support affordable internet
 - This estimate for likely usage is based on the current enrollment levels of the ACP; however, enrollment in a state-run program may rise above these levels over time because state-run programs tend to be trusted more than federal programs

In addition, reliable mobile connectivity is essential for unhoused and housing-insecure Vermonters to access services. Therefore, Section 5.4 also recommends that the Vermont Legislature and/or the VCBB leverage digital equity resources and consider the following actions in 2025:

- Establish and fund a program that provides a free mobile device and service to unhoused Vermonters
 - Structure the program to leverage the purchasing power of the state, but implement it in collaboration with local social service providers
- Encourage municipalities to deploy and promote additional public Wi-Fi installations

Suggested lead: Funded by the Vermont Legislature and implemented by the Vermont Agency of Human Services in collaboration with the Vermont Community Broadband Board

Suggested timeline: Funding during the 2025 biennial and program implementation in 2026

12.3 Supporting Universal Mobile Wireless

30 V.S.A. § 202c(b)3: Support the availability of modern mobile wireless telecommunications services along the State's travel corridors and in the State's communities

In support of providing universal mobile wireless, Section 3.4 provides an analysis of existing mobile wireless coverage in Vermont, and Section 10.2.1 recommends improvements to the data collection practices to allow the state to better track

progress against this goal, and inform future programming to encourage more wireless deployments.

Those recommendations, to be addressed by the Department of Public Service, are as follows:

- Replicate the Ookla Wind drive test performed in 2022 every two years, using the same technology and methodology, to allow for direct comparison of RSRP data, which is the best indicator of mobile wireless quality
- Implement the best practices detailed in Section 10.2.1 to ensure tests are maximally accurate
- Establish a crowdsourcing process for appropriate state and local officials to use to capture coverage on Class 2 and Class 3 roads, again using the best practices described
- Require 248a permit holders to notify the PSD when a permitted tower is built and operational

Furthermore, this Plan demonstrates that to close mobile wireless gaps, using 50-foot wireless facilities would be significantly more efficient from a cost perspective than 140-foot towers, and nearly as efficient in terms of the number of deployments needed. As such, Section 10.2.3 details a framework for a pilot small-facilities mobile wireless grant program. The pilot program, likely under the direction of the VCBB or PSD, should do the following:

- Prioritize small facilities under 50 feet tall
- Take place after the ongoing fiber deployments to reduce costs
- Receive \$2 to \$3 million in initial funding (in its pilot stage) from the Vermont Legislature
- Collect data on carrier interest, reliability of new fiber deployments, and permitting process to calibrate future wireless grant programs

To begin the pilot program will require funding allocated by the Vermont Legislature in the 2025 biennial.

Significant additional detail on this recommendation is included in Section 10.2.3.

Suggested lead: Department of Public Service with funding allocated by the Vermont Legislature

Suggested timeline: Data collection starting in 2024; pilot program in 2026 after allocated funding is made available in the 2025 biennial

12.4 Providing for High-Quality, Reliable Telecommunications Services

30 VSA 202c(b)4: *Provide for high-quality, reliable telecommunications services for Vermont businesses and residents*

This telecommunications goal applies to many of the recommendations listed in other subsections. However, of particular importance from a quality and reliability perspective is this Plan's analysis of what enterprise-grade and carrier-grade service entails, detailed in Sections 7.3.3 and 9.3. In short, for the ongoing fiber deployments to be maximally beneficial for increasing wireless coverage, entities building and operating networks today should consider developing enterprise-grade and carrier-grade service options to support mobile carriers and wireless networks.

As such, this Plan recommends that CUDs consider developing enterprise-grade and carrier-grade service offerings that meet industry standards as part of their long-range planning efforts over the next ten years.

Success should be measured by the number of CUDs and ISPs that offer enterprise-grade service, and the strength of the terms of that service. Then, to assess the amount of trust that carriers have in Vermont ISPs, data should be collected via the pilot small-facilities mobile wireless grant program relating to use of ISP infrastructure for mobile wireless deployments.

Suggested lead: Communications Union Districts

Suggested timeline: Over the next ten years

12.5 Providing the Benefits of Future Advances in Telecommunications Technologies

30 VSA 202c(b)5: Provide the benefits of future advances in telecommunications technologies to Vermont residents and businesses

The Plan, including Sections 3.3.2, 3.3.3, and 10.5, establishes that 100 Mbps symmetrical fiber deployments offer Vermont the most scalable, forward-thinking, and climate-resilient infrastructure. In other words, providing the benefits of future advances in telecommunications technologies requires successfully bringing fiber to every on-grid premises in the state, and all recommendations in this report in support of that goal should be considered in support of this goal as well.

This Plan discusses network resiliency extensively in Section 10.5 and concludes that the state has leverage via its grantmaking role to ensure that new networks are built that are resilient and redundant in the face of increasing natural disasters. This Plan recommends that the VCBB use the BEAD grantmaking process – which will take place in 2024 and 2025 – to ensure that new networks are resilient and redundant, in line with the best practices described in this Plan.

Suggested lead: Vermont Community Broadband Board

Suggested timeline: During the BEAD grantmaking period, anticipated in 2024 and 2025

12.6 Supporting Competitive Choice for Consumers and Promoting Open Access

30 VSA 202c(b)6: Support competitive choice for consumers among telecommunications service providers and promote open access among competitive service providers on nondiscriminatory terms to networks over which broadband and telecommunications services are delivered

This Plan provides a number of analyses and recommendations relating to competitive choice in Sections 3.5.1 and 11.3.2 and open access in Section 7.4.

First, this Plan recommends that the state use access to multiple satisfactory (cable or fiber) wireline providers as its measure of competition, and recommends that the PSD adjust its data collection and dissemination practices to allow this analysis at the premises level rather than the census block level.

Using that metric, Section 3.5.1 establishes that although competition is increasing in the state with the deployment of new infrastructure led by the CUDs, the state is substantially far from every house having access to more than one good wireline provider.

That said, the Plan also notes that the economics of deploying rural broadband are challenging for a single provider in sparse unserved areas, and these economics would be even harder with multiple providers or in an open-access framework. As a result, the goals of universal competitive choice and open access can run counter to the goal of ensuring universal service in a resource-constrained environment.

However, the strategy the state is pursuing by empowering public ownership of infrastructure in unserved areas should provide the benefits to rural consumers that competitive choice could also create. As such, Section 11.3.2 recommends updating this goal to focus on the desired outcomes for consumers, rather than focusing on competition for competition's sake (though competition need not be dropped from the list of goals for this to occur). Specifically, the state should measure the quality of service across the state by the following attributes:

- **Customer Service Quality:** By measuring online customer reviews, and consumer complaints and resolutions at the ISP level, the PSD can evaluate the quality of service ISPs are providing.
- **Speeds:** By using speed tests, and comparing consumer-reported speeds to advertised speeds, Vermont can assess whether ISPs are providing consumers with speeds that meet their needs and are aligned with ISP marketing claims.
- **Costs:** Vermont can track the cost of connectivity from different service providers. Importantly, as the BEAD Proposals suggest, the state should prioritize tracking and evaluating against long-term affordability goals to understand if ISPs are exerting downward pressure on prices.

Stakeholders acting on this recommendation may consider drawing from the related process established in Docket 5903,¹⁶² which tracks service quality among telecommunications (telephone) service providers.

This action can be considered complete when the statutory goal is updated to include benchmarks that refer to the goals that can be created by a competitive landscape or by other strategies, such as promoting public ownership of infrastructure. Furthermore, completion of this action will require the PSD to establish a practice of tracking and measuring the above factors in addition to measuring competition at the household level.

Suggested lead: Vermont Legislature, then the Department of Public Service

Suggested timeline: The update to the statutory goal can be addressed during the 2025 biennial; the Department of Public Service will address these recommendations once the update has been finalized

12.7 Improving Governmental and Public Services

30 VSA 202c(b)7: Support the application of telecommunications technology to maintain and improve governmental and public services, public safety, and the economic development of the State

Given the discussion among some lawmakers about the possibility of consolidating Public Safety Answering Points in Vermont, as well as the creation of the Public Safety Communications Task Force (PSCTF), this Plan provides substantial analysis of the benefits and challenges related to potential consolidation (see Section 9.5.4). The analysis presents the ways in which consolidation could improve government services and public safety, how user experience might change, and the potential challenges that may result. Ultimately, this Plan recommends that lawmakers and/or the PSCTF use the analysis to inform their next steps in this effort.

In addition, as discussed in Section 9.1, technology applications can aid the Agency of Digital Services in its charge to modernize information technology systems to

¹⁶² Department of Public Service (2021) Docket No. 5903. Available at <https://publicservice.vermont.gov/sites/dps/files/documents/5903%20-%2020199.07.02%20-%20Att.%201%20Service%20Quality%20Stipulation.pdf>. Accessed February 15, 2024.

improve the coordination and effectiveness of providing services to the public. This Plan recommends the Agency continue focusing on these priorities in 2024 and 2025:

- Mitigating cybersecurity risks
- Accommodating bandwidth requirements increases
- Completing systems migration to cloud-based services
- Establishing backup circuits over wired and wireless broadband networks

Lastly, this Plan notes that the Statewide Communication Interoperability Plan (SCIP), enacted in 2020 and discussed in Section 9.5.3, is becoming out of date, and additional funding is needed to meet some of the goals stated in the SCIP. The legislature should consider allocating funding in the 2025 biennial to support the ongoing goals of the SCIP in instances where there are no federal grants available to drive progress.

Suggested leads: Agency of Digital Services and Vermont Legislature

Suggested timeline: For the recommendation led by ADS, 2024 and 2025; for the allocation of funding for the implementation of the SCIP, the 2025 biennial

12.8 Supporting the Deployment of Broadband Infrastructure

30 VSA 202c(b)8: *Support deployment of broadband infrastructure that:*

- (A) *uses the best commercially available technology;*
- (B) *does not negatively affect the ability of Vermont to take advantage of future improvements in broadband technology or result in widespread installation of technology that becomes outmoded within a short period after installation*

As described in Section 9.2, the VCBB is successfully supporting the deployment of fiber broadband infrastructure – and will have distributed over \$500 million in wireline grants by the end of 2025. Fiber technology is the best commercially available technology and will enable Vermonters to take advantage of future improvements to connectivity services and technology. This Plan provides several recommendations to continue to improve upon deployment processes and facilitate better outcomes:

- The VCBB should consider developing a comprehensive study of the anticipated costs to bury telecommunications infrastructure that infrastructure owners may incur in conjunction with Green Mountain Power's efforts to bury a substantial amount of their utilities to achieve zero outages by 2030, including:
 - Analysis of how those costs may impact service costs and availability
 - Strategies to minimize potential adverse impacts to customers and/or the ability of the state to meet its telecommunications goals
 - Opportunities for efficiency in deployment, including alignment of construction timelines and other resources
- The VCBB should consider developing a standardized and predictable permitting process with the Agency of Natural Resources (ANR) to increase predictability for infrastructure builders passing through ANR jurisdictions
- The Agency of Transportation should consider leveraging state control of rights-of-way by providing rent waivers to infrastructure builders that meet the requirements described in the applicable legislation, as discussed in Section 10.3
- Green Mountain Power and the Vermont Electric Coop should consider renewing the successful Tariff Rider program to ease deployment costs in unserved areas, as discussed in Section 10.4

Suggested leads: Vermont Community Broadband Board and Agency of Transportation

Suggested timeline: These actions should take place prior to the beginning of construction funded by BEAD grants, likely in 2026

Other critical public-sector stakeholders driving broadband deployment in the state are the CUDs. Section 9.3 provides recommendations for CUDs based on stakeholder conversations and analysis. A summary of recommendations for CUDs is as follows:

- Continue to increase efficiency and leverage the scale of VCUDA to procure services and pursue additional revenue opportunities
- Focus on financial sustainability until deployments are complete and penetration improves

- Consider whether mobile broadband expansion is a viable and beneficial role for CUDs after wireline deployments are complete

This Plan encourages VCUDA to incorporate these recommendations into its long-term strategy over the next 10 years.

Suggested lead: Vermont Communications Union District Association

Suggested timeline: During long-term strategy development over the next 10 years

12.9 Encouraging the Use of Existing Facilities in the Deployment of Broadband Infrastructure

30 VSA 202c(b)9: *In the deployment of broadband infrastructure, encourage the use of existing facilities, such as existing utility poles and corridors and other structures, in preference to the construction of new facilities or the replacement of existing structures with taller structures*

One major contribution to the goal of using existing facilities is this Plan's analysis of shared infrastructure and neutral host arrangements in Sections 7, 10.1, and 10.2. This Plan concludes that there may be efficiencies for shared infrastructure and neutral host arrangements, though the viability is significantly dependent on the interests of major carriers, which are evolving.

Furthermore, Section 10.1 analyzes the opportunity to leverage existing electric utility and/or VELCO assets for mobile broadband deployments in unserved areas.

Based on these analyses, the Department of Public Service should consider the following actions in late 2024 and 2025 to support this goal:

- Ensure that the small facilities mobile broadband grant program is structured flexibly enough for shared infrastructure and neutral host proposals to be considered and competitive
- Establish a working group with VELCO to study the viability of leveraging VELCO's infrastructure for mobile deployments in the following ways:
 - Whether VELCO's planned LMR upgrades could be altered to deploy LTE that could serve commercial customers

- Whether LTE radios could be hosted on existing VELCO assets and if locations could be targeted with VELCO assets as part of a small-facilities wireless deployment program

Suggested lead: Department of Public Service

Suggested timeline: Late 2024 and 2025

12.10 Supporting Measures Designed to Ensure That Every E-911 Business and Residential Location in Vermont Has Infrastructure Capable of Delivering Internet Access

30 VSA 202c(b)10: Support measures designed to ensure that by the end of the year 2024 every E-911 business and residential location in Vermont has infrastructure capable of delivering Internet access with service that has a minimum download speed of 100 Mbps and is symmetrical

Section 11.2 notes that this goal is not aligned with the timeline for wireline deployments enabled by the BEAD process, which are anticipated to be completed by Q1 of 2029. To align this goal with BEAD deployments, the Vermont Legislature should consider revising the target deployment date to the end of 2029.

Suggested lead: Vermont Legislature

Suggested timeline: 2025 biennial

Section 13: Acknowledgments

The Department of Public Service would like to thank members of the Vermont Legislature, JITOC leadership, staff of Vermont agencies and departments, nonprofit frontline service providers, utility owners, and everyone who participated in stakeholder interviews and the public comment process for their valuable contributions and insights. The PSD is grateful for the healthcare professionals, emergency communications staff, first responders, business owners, and Vermont residents who took the time to participate in the online and phone surveys and share thoughtful feedback. This Plan would not have been possible without your collaboration, perspectives, and dedication to improving telecommunications in Vermont.

The PSD also extends appreciation to Rural Innovation Strategies, Inc., and CTC Technology and Energy for their work preparing this Plan.



Appendix A: 30 V.S.A. § 202c and 202d

The full text of 30 V.S.A. § 202c and 202d is reprinted below for reference. The statutes are also available on the Legislature of the State of Vermont website.^{163,164}

§ 202c. State telecommunications; policy and planning

(a) The General Assembly finds that advances in telecommunications technology and changes in federal regulatory policy are rapidly reshaping telecommunications services, thereby promising the people and businesses of the State communication and access to information, while creating new challenges for maintaining a robust, modern telecommunications network in Vermont.

(b) Therefore, to direct the benefits of improved telecommunications technology to all Vermonters, it is the purpose of this section and section 202d of this title to:

- (1) strengthen the State's role in telecommunications planning;*
- (2) support the universal availability of appropriate infrastructure and affordable services for transmitting voice and high-speed data;*
- (3) support the availability of modern mobile wireless telecommunications services along the State's travel corridors and in the State's communities;*
- (4) provide for high-quality, reliable telecommunications services for Vermont businesses and residents;*
- (5) provide the benefits of future advances in telecommunications technologies to Vermont residents and businesses;*
- (6) support competitive choice for consumers among telecommunications service providers and promote open access among competitive service providers on nondiscriminatory terms to networks over which broadband and telecommunications services are delivered;*

¹⁶³ 30 V.S.A. § 202c. Available at <https://legislature.vermont.gov/statutes/section/30/005/00202c>. Accessed January 15, 2024.

¹⁶⁴ 30 V.S.A. § 202d. Available at <https://legislature.vermont.gov/statutes/section/30/005/00202d>. Accessed January 15, 2024.

- (7) support the application of telecommunications technology to maintain and improve governmental and public services, public safety, and the economic development of the State;
- (8) support deployment of broadband infrastructure that:
 - (A) uses the best commercially available technology;
 - (B) does not negatively affect the ability of Vermont to take advantage of future improvements in broadband technology or result in widespread installation of technology that becomes outmoded within a short period after installation;
- (9) in the deployment of broadband infrastructure, encourage the use of existing facilities, such as existing utility poles and corridors and other structures, in preference to the construction of new facilities or the replacement of existing structures with taller structures; and
- (10) support measures designed to ensure that by the end of the year 2024 every E-911 business and residential location in Vermont has infrastructure capable of delivering Internet access with service that has a minimum download speed of 100 Mbps and is symmetrical.

§ 202d. Telecommunications Plan

- (a) The Department of Public Service shall constitute the responsible planning agency of the State for the purpose of obtaining for all consumers in the State stable and predictable rates and a technologically advanced telecommunications network serving all service areas in the State. The Department shall be responsible for the provision of plans for meeting emerging trends related to telecommunications technology, markets, financing, and competition.
- (b) The Department shall prepare the Telecommunications Plan for the State. The Agency of Digital Services, the Agency of Commerce and Community Development, and the Agency of Transportation shall assist the Department in preparing the Plan. The Plan shall be for a 10-year period and shall serve as a basis for State telecommunications policy. Prior to preparing the Plan, the Department shall prepare:

- (1) An overview, looking 10 years ahead, of statewide growth and development as they relate to future requirements for telecommunications services, including patterns of urban expansion, statewide and service area economic growth, shifts in transportation modes, economic development, technological advances, and other trends and factors that will significantly affect State telecommunications policy and programs. The overview shall include an economic and demographic forecast sufficient to determine infrastructure investment goals and objectives.
- (2) One or more surveys of Vermont residents and businesses, conducted in cooperation with the Agency of Commerce and Community Development to determine what telecommunications services are needed now and in the succeeding 10 years, generally, and with respect to the following specific sectors in Vermont:
 - (A) the educational sector, with input from the Secretary of Education;
 - (B) the health care and human services sectors, with input from the Commissioner of Health and the Secretary of Human Services;
 - (C) the public safety sector, with input from the Commissioner of Public Safety and the Executive Director of the Enhanced 911 Board; and
 - (D) the workforce training and development sectors, with input from the Commissioner of Labor.
- (3) An assessment of the current state of telecommunications infrastructure.
- (4) An assessment, conducted in cooperation with the Agency of Digital Services and the Agency of Transportation, of State-owned and managed telecommunications systems and related infrastructure and an evaluation, with specific goals and objectives, of alternative proposals for upgrading the systems to provide the best available and affordable technology for use by State and local government, public safety, educational institutions, community media, nonprofit organizations

performing governmental functions, and other community anchor institutions.

(5) A geographically specific assessment of the status, coverage, and capacity of telecommunications networks and services available throughout Vermont, a comparison of available services relative to other states, including price and broadband speed comparisons for key services and comparisons of the status of technology deployment.

(6) An assessment of opportunities for shared infrastructure, open access, and neutral host wireless facilities that is sufficiently specific to guide the Public Utility Commission, the Department, State and local governments, and telecommunications service companies in the deployment of new technology.

(7) [Repealed.]

(8) With respect to emergency communications, an analysis of all federal initiatives and requirements, including the Department of Commerce FirstNet initiative and the Department of Homeland Security Statewide Communication Interoperability Plan, and how these activities can best be integrated with strategies to advance the State's interest in achieving ubiquitous deployment of mobile telecommunications and broadband services within Vermont.

(9) An analysis of alternative strategies to leverage the State's ownership and management of the public rights-of-way to create opportunities for accelerating the buildout of fiber-optic broadband and for increasing network resiliency capacity.

(c) In developing the Plan, the Department shall address each of the State telecommunications policies and goals of section 202c of this title, and shall assess initiatives designed to advance and make measurable progress with respect to each of those policies and goals. The assessment shall include identification of the resources required and potential sources of funding for Plan implementation.

(d) The Department shall establish a participatory planning process that includes effective provisions for increased public participation. In establishing plans, public hearings shall be held and the Department shall consult with

members of the public, representatives of telecommunications utilities with a certificate of public good, other providers, including the Vermont Electric Power Co., Inc. (VELCO) and communications union districts, and other interested State agencies, particularly the Agency of Commerce and Community Development, the Agency of Transportation, and the Agency of Digital Services, whose views shall be considered in preparation of the Plan. To the extent necessary, the Department shall include in the Plan surveys to determine existing, needed, and desirable plant improvements and extensions, access and coordination between telecommunications providers, methods of operations, and any change that will produce better service or reduce costs. To this end, the Department may require the submission of data by each company subject to supervision by the Public Utility Commission.

(e) Before adopting the Plan, the Department shall first prepare and publish a preliminary draft and solicit public comment. The Department's procedures for soliciting public comment shall include a method for submitting comments electronically. After review and consideration of the comments received, the Department shall prepare a final draft. This final draft shall either incorporate public comments received with respect to the preliminary draft or shall include a detailed explanation as to why specific individual comments were not incorporated. The Department shall conduct at least four public hearings across the State on the final draft and shall consider the testimony presented at such hearings when preparing the Plan. The Department shall coordinate with Vermont's access media organizations when planning the public hearings required by this subsection. At least one public hearing shall be held jointly with committees of the General Assembly designated by the General Assembly for this purpose.

(f) The Department shall adopt a new Plan every three years pursuant to the procedures established in subsection (e) of this section. The Plan shall outline significant deviations from the prior Plan. For good cause or upon request by a joint resolution passed by the General Assembly, an interim review and revision of any section of the Plan may be made after conducting public hearings on the interim revision. At least one hearing shall be held jointly with committees of the General Assembly designated by the General Assembly for this purpose.

Appendix B: Alignment of Plan to Statutes

Table 19: Alignment of Plan to 30 V.S.A. § 202d

30 V.S.A. § 202d Telecommunications Plan	Plan Sections
(1) An overview, looking 10 years ahead, of statewide growth and development as they relate to future requirements for telecommunications services, including patterns of urban expansion, statewide and service area economic growth, shifts in transportation modes, economic development, technological advances, and other trends and factors that will significantly affect State telecommunications policy and programs. The overview shall include an economic and demographic forecast sufficient to determine infrastructure investment goals and objectives.	<ul style="list-style-type: none">● Section 2.4: Business Connectivity Needs● Section 2.5: Remote Work● Section 3.1: ISP and Infrastructure Owners in Vermont● Section 4: Challenges with Expanding Telecommunications in Vermont● Section 6: Emerging Telecommunications Technologies● Section 8: Workforce Readiness
(2) One or more surveys of Vermont residents and businesses, conducted in cooperation with the Agency of Commerce and Community Development to determine what telecommunications services are needed now and in the succeeding 10 years, generally, and with respect to the following specific sectors in Vermont: (A) the educational sector, with input from the Secretary of Education; (B) the health care and human services sectors, with input from the Commissioner of Health and the Secretary of Human Services; (C) the public safety sector, with input from the Commissioner of Public Safety	<ul style="list-style-type: none">● Section 2.1: Residential Survey Results and Analysis● Stakeholder interviews listed in Appendix C● Appendices D-G

30 V.S.A. § 202d Telecommunications Plan	Plan Sections
<p>and the Executive Director of the Enhanced 911 Board; and</p> <p>(D) the workforce training and development sectors, with input from the Commissioner of Labor.</p>	
(3) An assessment of the current state of telecommunications infrastructure.	<ul style="list-style-type: none"> • Section 3: Current State of Telecommunications Infrastructure and Coverage in Vermont
<p>(4) An assessment, conducted in cooperation with the Agency of Digital Services and the Agency of Transportation, of State-owned and managed telecommunications systems and related infrastructure and an evaluation, with specific goals and objectives, of alternative proposals for upgrading the systems to provide the best available and affordable technology for use by State and local government, public safety, educational institutions, community media, nonprofit organizations performing governmental functions, and other community anchor institutions.</p>	<ul style="list-style-type: none"> • Section 9: Review of Additional State Telecommunications Systems and Practices • Section 10: Alternative Strategies to Expand Broadband and Increase Network Resiliency
<p>(5) A geographically specific assessment of the status, coverage, and capacity of telecommunications networks and services available throughout Vermont, a comparison of available services relative to other states, including price and broadband speed comparisons for key services and comparisons of the status of technology deployment.</p>	<ul style="list-style-type: none"> • Section 3: Current State of Telecommunications Infrastructure and Coverage in Vermont

30 V.S.A. § 202d Telecommunications Plan	Plan Sections
(6) An assessment of opportunities for shared infrastructure, open access, and neutral host wireless facilities that is sufficiently specific to guide the Public Utility Commission, the Department, State and local governments, and telecommunications service companies in the deployment of new technology.	<ul style="list-style-type: none"> ● Section 7: Opportunities for Neutral Host Arrangements for Mobile Broadband and Shared Infrastructure ● Section 10: Additional and Alternative Strategies to Expand Broadband and Increase Network Resiliency
(8) With respect to emergency communications, an analysis of all federal initiatives and requirements, including the Department of Commerce FirstNet initiative and the Department of Homeland Security Statewide Communication Interoperability Plan, and how these activities can best be integrated with strategies to advance the State's interest in achieving ubiquitous deployment of mobile telecommunications and broadband services within Vermont.	<ul style="list-style-type: none"> ● Section 9: Review of Additional State Telecommunications Systems and Practices ● Section 10: Additional and Alternative Strategies to Expand Broadband and Increase Network Resiliency
(9) An analysis of alternative strategies to leverage the State's ownership and management of the public rights-of-way to create opportunities for accelerating the buildup of fiber-optic broadband and for increasing network resiliency capacity.	<ul style="list-style-type: none"> ● Section 10: Additional and Alternative Strategies to Expand Broadband and Increase Network Resiliency
(9c) In developing the Plan, the Department shall address each of the State telecommunications policies and goals of section 202c of this title, and shall assess initiatives designed to advance and make measurable progress with respect to each of	<ul style="list-style-type: none"> ● Section 11: Assessment of Vermont Telecommunications Statute

30 V.S.A. § 202d Telecommunications Plan	Plan Sections
those policies and goals. The assessment shall include identification of the resources required and potential sources of funding for Plan implementation	<ul style="list-style-type: none"> ● Section 12: Recommendations and Action Plan
(9d) The Department shall establish a participatory planning process that includes effective provisions for increased public participation. In establishing plans, public hearings shall be held and the Department shall consult with members of the public, representatives of telecommunications utilities with a certificate of public good, other providers, including the Vermont Electric Power Co., Inc. (VELCO) and communications union districts, and other interested State agencies, particularly the Agency of Commerce and Community Development, the Agency of Transportation, and the Agency of Digital Services, whose views shall be considered in preparation of the Plan. To the extent necessary, the Department shall include in the Plan surveys to determine existing, needed, and desirable plant improvements and extensions, access and coordination between telecommunications providers, methods of operations, and any change that will produce better service or reduce costs. To this end, the Department may require the submission of data by each company subject to supervision by the Public Utility Commission.	<ul style="list-style-type: none"> ● Stakeholder interviews listed in Appendix C ● Appendix L
(9e) Before adopting the Plan, the Department shall first prepare and publish a preliminary	<ul style="list-style-type: none"> ● Appendix L

30 V.S.A. § 202d Telecommunications Plan	Plan Sections
<p>draft and solicit public comment. The Department's procedures for soliciting public comment shall include a method for submitting comments electronically. After review and consideration of the comments received, the Department shall prepare a final draft. This final draft shall either incorporate public comments received with respect to the preliminary draft or shall include a detailed explanation as to why specific individual comments were not incorporated. The Department shall conduct at least four public hearings across the State on the final draft and shall consider the testimony presented at such hearings when preparing the Plan. The Department shall coordinate with Vermont's access media organizations when planning the public hearings required by this subsection. At least one public hearing shall be held jointly with committees of the General Assembly designated by the General Assembly for this purpose.</p>	
<p>(9f) The Department shall adopt a new Plan every three years pursuant to the procedures established in subsection (e) of this section. The Plan shall outline significant deviations from the prior Plan. For good cause or upon request by a joint resolution passed by the General Assembly, an interim review and revision of any section of the Plan may be made after conducting public hearings on the interim revision. At least one hearing shall be held jointly with committees of the General</p>	<ul style="list-style-type: none"> • Appendix J

30 V.S.A. § 202d Telecommunications Plan	Plan Sections
Assembly designated by the General Assembly for this purpose	

Table 20: Alignment of Plan to 30 V.S.A. § 202c

30 V.S.A. § 202c	Plan Sections
(1) strengthen the State's role in telecommunications planning;	<ul style="list-style-type: none"> ● Section 11: Assessment of Vermont Telecommunications Statute ● Section 12.1: Strengthening the State's Role in Planning
(2) support the universal availability of appropriate infrastructure and affordable services for transmitting voice and high-speed data;	<ul style="list-style-type: none"> ● Section 5.4: How Should Vermont Define "Affordable" Connectivity? ● Section 8.3: Continuing to Support Workforce Development in Vermont ● Section 12.2: Supporting Universal Availability of Appropriate Infrastructure and Affordable Services
(3) support the availability of modern mobile wireless telecommunications services along the State's travel corridors and in the State's communities;	<ul style="list-style-type: none"> ● Section 3.4: Wireless Broadband Coverage ● Section 10.2.1: Mobile Broadband Data Collection and Practices ● Section 10.2.3: Recommendation for a Mobile Broadband Pilot Grant Program Designed to Test and Refine Small Facilities Deployment Strategies ● Section 12.3: Supporting Universal Mobile Wireless

30 V.S.A. § 202c	Plan Sections
(4) provide for high-quality, reliable telecommunications services for Vermont businesses and residents;	<ul style="list-style-type: none"> ● Section 7.3.3: Mobile Broadband Backhaul and Enterprise Services ● Section 9.3: Communication Union Districts ● Section 12.4: Providing for High-Quality, Reliable Telecommunications Services
(5) provide the benefits of future advances in telecommunications technologies to Vermont residents and businesses;	<ul style="list-style-type: none"> ● Section 3.3.2: Fiber Coverage ● Section 3.3.3: Fiber Expansion Plans ● Section 10.5: Increasing Network Resiliency ● Section 12.5: Providing the Benefits of Future Advances in Telecommunications Technologies
(6) support competitive choice for consumers among telecommunications service providers and promote open access among competitive service providers on nondiscriminatory terms to networks over which broadband and telecommunications services are delivered;	<ul style="list-style-type: none"> ● Section 3.5.1: Competition ● Section 7.4: Opportunities for Open Access ● Section 11.3.2: Aligning Statutory Goals With Current State Infrastructure Strategies ● Section 12.6: Supporting Competitive Choice for Consumers and Promoting Open Access
(7) support the application of telecommunications technology to maintain and improve governmental and public services, public safety, and the economic	<ul style="list-style-type: none"> ● Section 9.1: Agency of Digital Services

30 V.S.A. § 202c	Plan Sections
development of the State;	<ul style="list-style-type: none"> ● Section 9.5.3: Statewide Communication Interoperability Plan ● Section 9.5.4: Public Safety Answering Point Consolidation and Integration ● Section 12.7: Improving Governmental and Public Services
<p>(8) support deployment of broadband infrastructure that:</p> <p style="margin-left: 20px;">(A) uses the best commercially available technology;</p> <p style="margin-left: 20px;">(B) does not negatively affect the ability of Vermont to take advantage of future improvements in broadband technology or result in widespread installation of technology that becomes outmoded within a short period after installation;</p>	<ul style="list-style-type: none"> ● Section 9.2: Vermont Community Broadband Board ● Section 9.3: Communication Union Districts ● Section 10.3: Leveraging the Rights-of-Way ● Section 10.4: Electric Utility Tariff Rider Program ● Section 12.8: Supporting the Deployment of Broadband Infrastructure
<p>(9) in the deployment of broadband infrastructure, encourage the use of existing facilities, such as existing utility poles and corridors and other structures, in preference to the construction of new facilities or the replacement of existing structures with taller structures;</p>	<ul style="list-style-type: none"> ● Section 7: Opportunities for Neutral Host Arrangements, Shared Infrastructure, and Open Access ● Section 10.1: Mobile Broadband Expansion via VELCO Partnership ● Section 10.2: Mobile Broadband Expansion via State Mobile Grant Program ● Section 12.9: Encouraging the Use of Existing

30 V.S.A. § 202c	Plan Sections
	Facilities in the Deployment of Broadband Infrastructure
(10) support measures designed to ensure that by the end of the year 2024 every E-911 business and residential location in Vermont has infrastructure capable of delivering Internet access with service that has a minimum download speed of 100 Mbps and is symmetrical.	<ul style="list-style-type: none"> ● Section 11.2: Alignment Across Statutes and Statutory Sections ● Section 12.10: Supporting Measures Designed to Ensure That Every E-911 Business and Residential Location in Vermont Has Infrastructure Capable of Delivering Internet Access

Appendix C: List of Stakeholders

Table 21: Completed interviews

Organization	Name	Title
AARP	Kelly Poor	Director of Outreach
ACCD – Housing, Community Development	Alex Farrell	Commissioner
Agency of Administration Buildings and General Services	Eric Pembroke	Director of Planning and Property Management
Agency of Digital Services	Frank Costantino	Director of ERP Systems
Agency of Human Services	Jenney Samuelson	Secretary of Human Services
Agency of Human Services	Todd Daloz	Deputy Secretary of Human Services
Agency of Transportation	Costa Pappis	Policy and Planning Manager
AT&T	Ryan Clark	External Affairs Manager
Chittenden County Communications Union District	Mike Reed	Consultant
Consolidated Communications	Scott Woods	President of Consumer and Small Business
CVFiber	Jerry Diamantides	Chair
CVFiber	Jennille Smith	Executive Director
Deerfield Valley CUD	Steven John	Chair
Department of Disabilities, Aging and Independent Living	Laura Siegel	Director of Deaf, Hard of Hearing, and DeafBlind Services
Department of Health	John Olson	State Office Director

Organization	Name	Title
Department of Public Safety	Jennifer Morrison	Deputy Commissioner of Public Safety
Department of Public Safety	Corey Chase	Director of Radio Technology Services
Enhanced 911 Board	Barbara Neal	Executive Director
Green Mountain Power	Liz Miller	VP, Sustainable Supply and Resilient Systems; Chief Legal Officer
Groundworks	Peter Elwell	Interim Executive Director
Mac Mountain	Alex Rozek	Founder
Mac Mountain	Sydney Atkins	Mobile Broadband Projects Lead
Maple Broadband	Ellie de Villiers	Executive Director
Regional Development Leadership	Multiple	—
SpaceX	Erica Myers	Senior Manager, Global Government Affairs
Upper Valley Haven	Cherry Sullivan	Director of Shelter and Clinical Services
ValleyNet	Tom Cecere	CEO
VELCO	Dan Nelson	Vice President of Technology
Vermont Agency of Education	Heather Bouchey	Interim Secretary of Education
Vermont Center for Independent Living	Valerie Hughes	Deaf Independence Coordinator
Vermont Community Broadband Board	Christine Hallquist	Executive Director
Vermont Community Broadband Board	Rob Fish	Deputy Director

Organization	Name	Title
Vermont Department of Labor	Michael Harrington	Commissioner
Vermont Department of Labor	Mathew Barewicz	Director of Economic and Labor Market Information
Vermont Department of Libraries	Catherine Delneo	State Librarian of Vermont
Vermont Electric Cooperative	Peter Rossi	COO
Vermont Electric Cooperative	Andrea Cohen	Manager Gov't Affairs and Member Relations
Vermont House of Representatives	Representative Jill Krowinski	Speaker of the House
Vermont House of Representatives	Representative Laura Sibilia	Vice Chair of House Committee On Environment and Energy
Vermont House of Representatives	Representative Seth Chase	Chair of Joint Information Technology Oversight Committee
Vermont House of Representatives	Representative Mike McCarthy	Chair of House Committee on Government Operations & Military Affairs
Vermont League of Cities and Towns	Ted Brady	Executive Director
Vermont League of Cities and Towns	Trevor Whipple	Law Enforcement Consultant
Vermont Principals' Association	Jay Nichols	Executive Director
Vermont Program for Quality in Health Care, Inc.	Hillary Wolfly	Associate Director
Vermont Program for Quality in Health Care, Inc.	Ali Johnson	Quality Improvement Specialist

Organization	Name	Title
Vermont Public Power Supply Authority	Ken Nolan	General Manager
Vermont Senate	Senator Philip Baruth	President Pro Tempore
Vermont Senate	Senator Randy Brock	Vice Chair of Joint Information Technology Oversight Committee
Vermont Senate	Senator Ann Cummings	Chair of Senate Finance Committee
Vermont State Colleges System	Patricia Moulton	Executive Director
Vermonters for a Clean Environment	Annette Smith	Executive Director
VTel	Gordon Mathews	Vice President Legal and Regulatory Affairs
Windsor County	Ryan Palmer	Windsor County Sheriff

Appendix D: Survey Methodology

Four surveys were conducted in 2023 to understand the current and future needs of Vermonters and to provide a foundation for this Plan: a residential survey, a business survey, a healthcare sector survey, and a public safety survey.

A scientific survey of Vermont residents was performed by telephone to obtain a statistically valid sample and ensure that the survey included those who may not participate in online surveys and those who still rely on traditional landline telephone service. A database of 20,000 landline and cellular phone numbers was purchased from Data Axle, an industry leader in data collection. Of those, 15,907 were dialed and 478 respondents participated in the survey, which translates to a 4 percent margin of error at a confidence level of 95 percent. The calls were made between November 15, 2023, and December 1, 2023, between the hours of 9 a.m. and 5 p.m. Eastern Standard Time.

Vermont businesses were invited to participate in an online survey. The Agency of Commerce and Community Development provided feedback on the survey prior to release. The survey was promoted by the Public Safety Department, included in a paid email campaign through Vermont Business Magazine, and provided to all regional Vermont chambers of commerce, the Vermont Professionals of Color Network, and the Vermont Small Business Development Center. While the survey was not intended to reach a statistically significant portion of Vermont businesses, it provided insight into the current and future telecommunications needs of businesses.

In addition to the statutorily required surveys described above, this Plan also included a survey of healthcare employees to gain further understanding of their needs and perspectives. The survey was reviewed by industry experts and distributed by the Vermont Department of Health, Vermont Nurse Practitioners Association, and the Green Mountain Care Board, as well as other community-based organizations via targeted emails to individuals working in the healthcare sector in Vermont. While the survey was not intended to be statistically significant, it provided insight into current and future telecommunications needs in the healthcare sector.

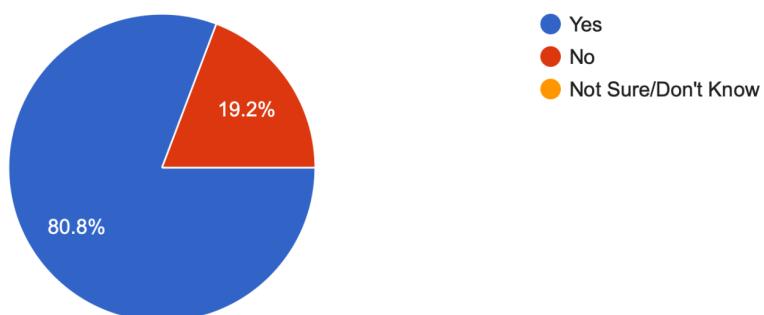
Vermont law enforcement and first responders were also invited to participate in an online survey. The survey questions were informed by stakeholder interviews. The survey was distributed via targeted emails through the aid of the Commissioner of Public Safety, Windsor County Sheriff, Hartland Fire Chief, Vermont League of Cities and Towns Law Enforcement Consultant, and the Vermont Fire Chiefs email list. While the survey was not intended to be statistically significant, it provided insight into the current and future telecommunications needs and experiences of first responders.

Appendix E: Business Survey Results

The following images show the 22 questions included in the Business Survey above a breakdown of the received responses.

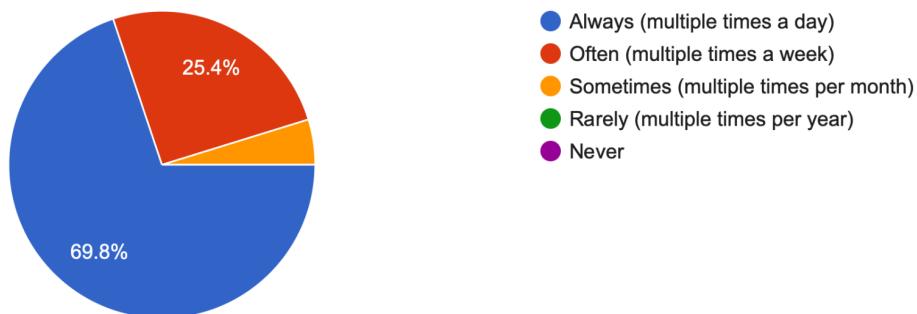
Do your employees use mobile cell service to perform their core job functions?

78 responses



If yes, how often do they use mobile cell service to perform core job functions?

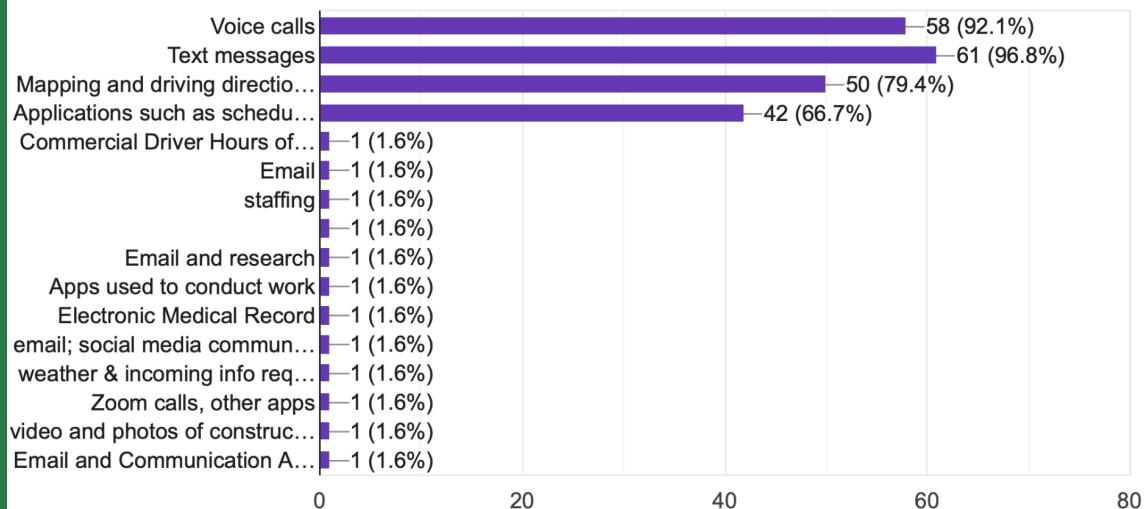
63 responses



Notes: The percentage for "sometimes (multiple times per month)" is 4.8 percent.

If yes, what cell service functions do your employees use during their work? Select all that apply.

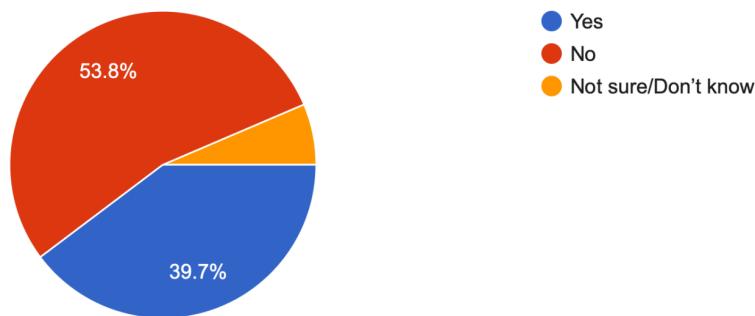
63 responses



Notes: The full text of responses with ellipses above include "mapping and driving direction applications," "applications such as scheduling or invoicing platforms," "commercial driver hours of service software," "email; social media communications," "weather & incoming info requests," "video and photos of construction job sites in rural and urban areas," and "email and communication apps on the go."

Do your employees need mobile cell service to access ongoing job skills development or training?

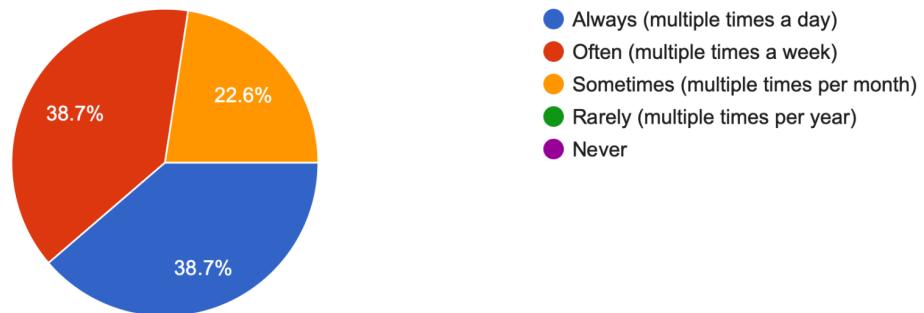
78 responses



Notes: The percentage for "not sure/don't know" is 6.4 percent.

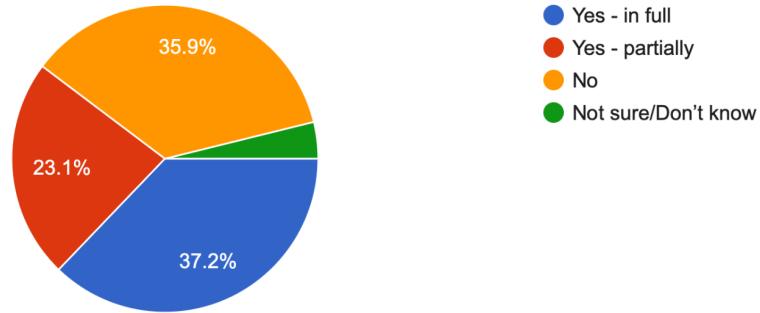
If yes, how often does mobile connectivity negatively impact that access?

31 responses



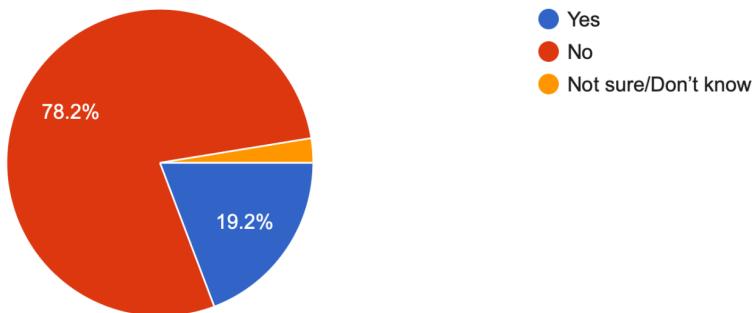
Do you pay in full or in part for your employee's cell phones?

78 responses



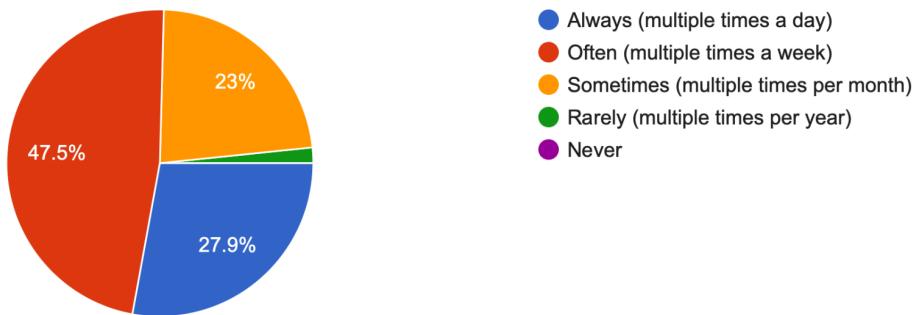
Do you consider Vermont's mobile cell service adequate for your business needs?

78 responses



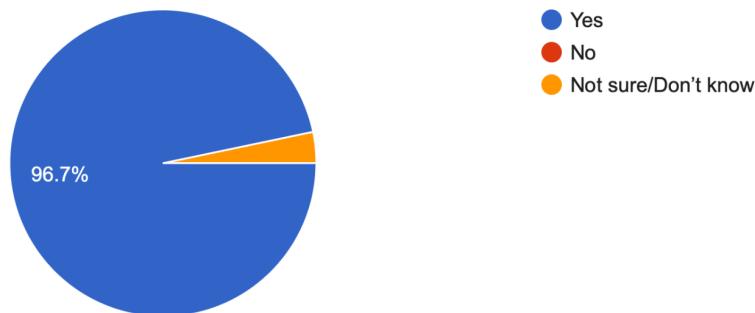
If not, how often do you or your employees experience issues with mobile cell service while working? Please select the most typical frequency you experience.

61 responses



Would improving the mobile broadband coverage in Vermont help your business grow, be more efficient, or be more effective?

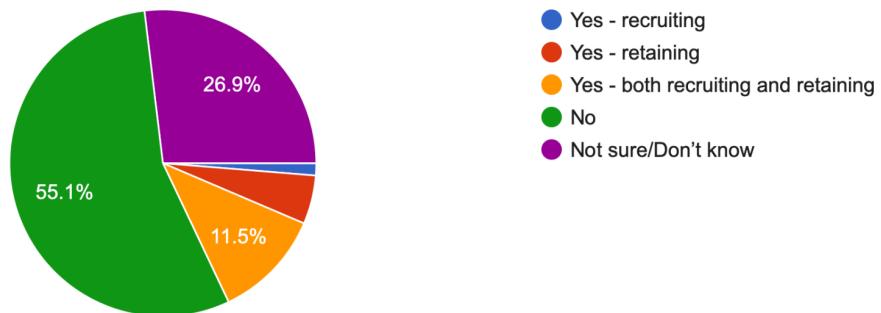
61 responses



Notes: The percentage for "not sure/don't know" is 3.3 percent.

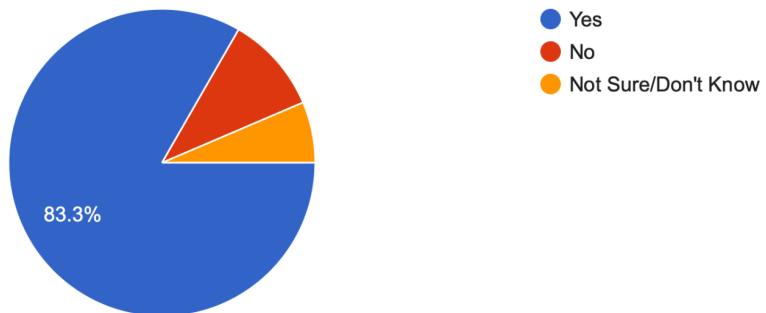
Has your business found a lack of cell service in Vermont a challenge to recruiting or retaining employees?

78 responses



Do your customers use mobile cell service to access or utilize your services?

78 responses

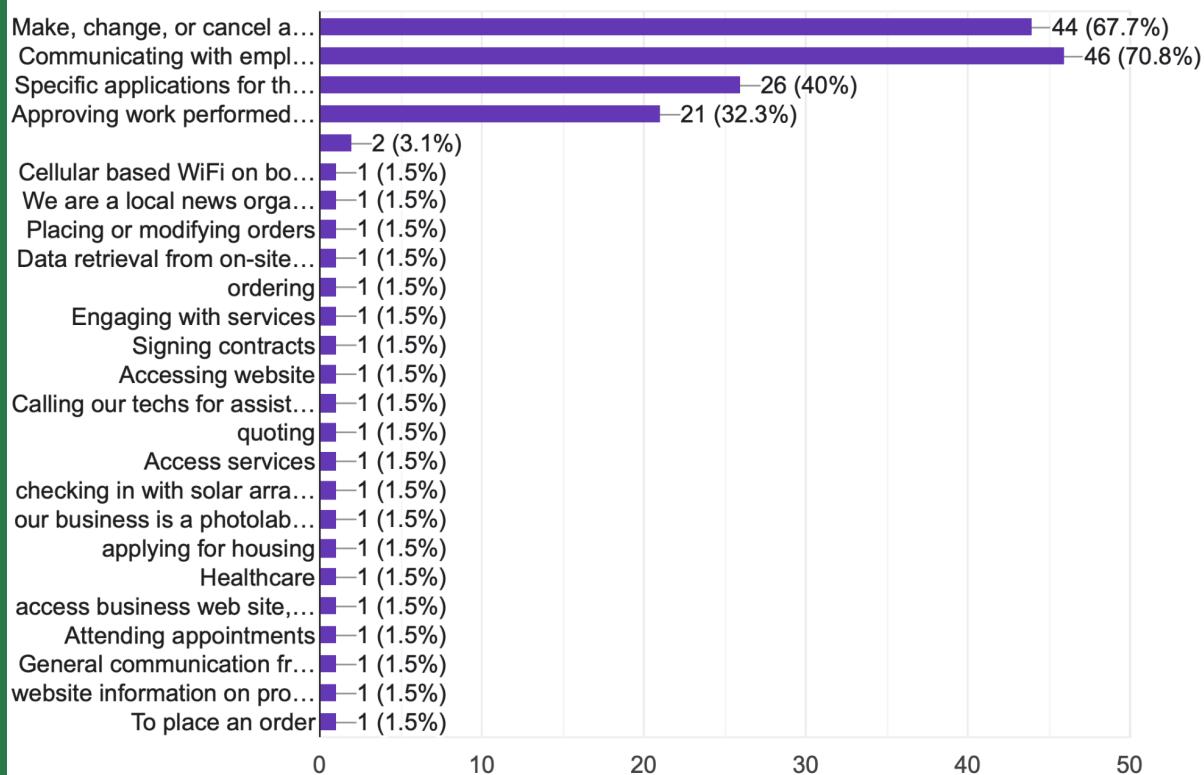


Notes: The percentage for “no” is 10.3 percent, and the percentage for “not sure/don’t know” is 6.4 percent.

If yes, what cell service functions do your customers likely use to access or utilize your services?

Select all that apply.

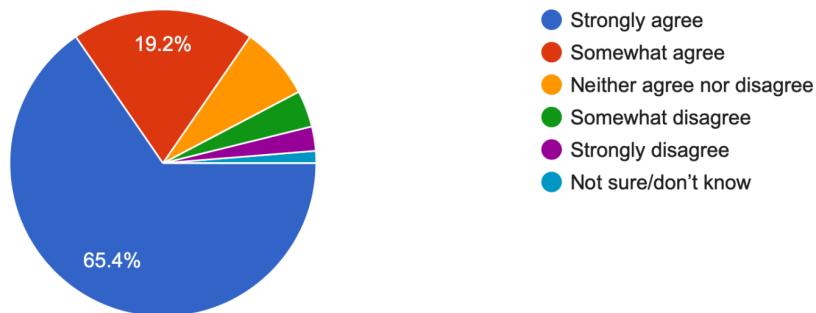
65 responses



Notes: The full text of responses with ellipses above include "make, change, or cancel appointments," "communicating with employees prior to, during, or after services," "specific applications for things such as paying invoices," "approving work performed by the business," "cellular based Wi-Fi on board our vehicles," "we are a local news organization and 60% of visits to our website are done via mobile phones," "data retrieval from on-site monitoring," "calling our techs for assistance," "checking in with solar array functioning," "our business is a photolab over 60% of online orders are received by our online service. Orders can be placed directly from the phone. Many customers complain they do not have sell [sic] service," "access business web site, info calls," "general communication from customers, but no [sic] frequent; communication mostly done via email, and not on a cell phone," and "website information on programs and services; meeting materials."

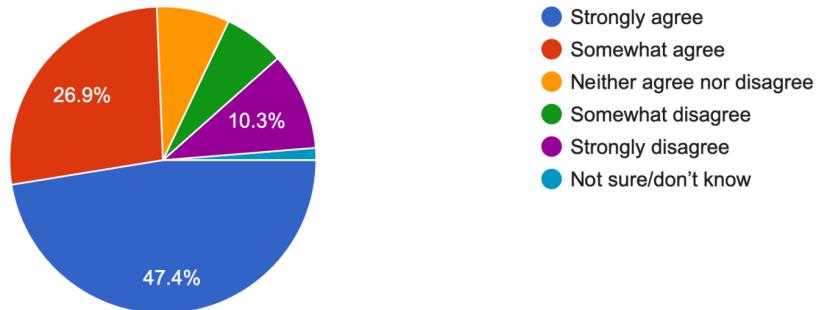
The State of Vermont should do more to increase mobile cellular broadband coverage, even if it means spending public money to do so.

78 responses



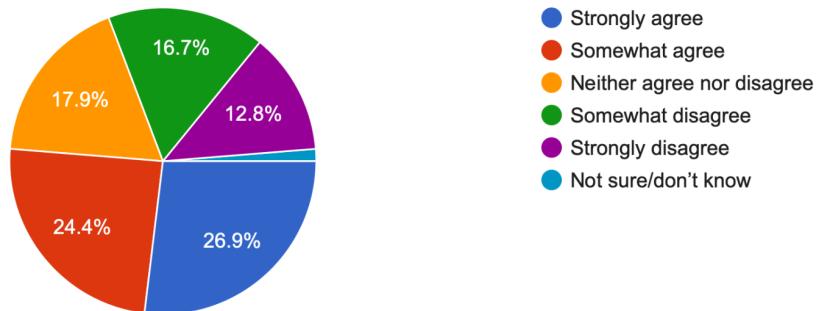
The state should take the most economically efficient route to spending public money to increase mobile broadband coverage, which typically means supporting new cell towers on hills and mountains.

78 responses



The state should fund ways to increase mobile cellular coverage that avoid deployments on hills and mountains in favor of placing small equipment...f these types of deployments are more expensive.

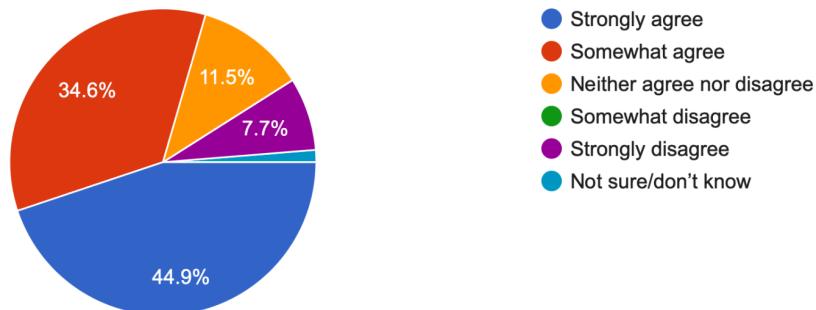
78 responses



Notes: The full text of the question is, "The state should fund ways to increase mobile cellular coverage that avoid deployments on hills and mountains in favor of placing small equipment on utility poles and existing structures, even if these types of deployments are more expensive."

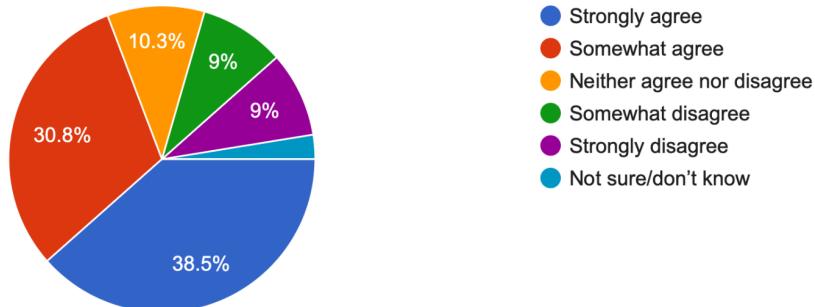
The state should support a combination of tower deployments on hills and mountains, and smaller equipment on existing utility poles and structures to balance cost and aesthetics.

78 responses



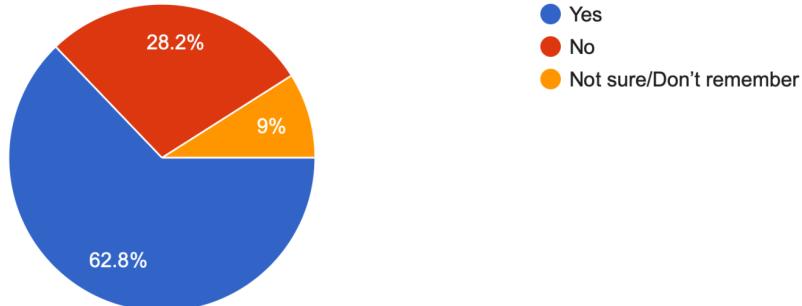
It does not matter to me how the state helps increase mobile cellular coverage — it just needs to happen.

78 responses



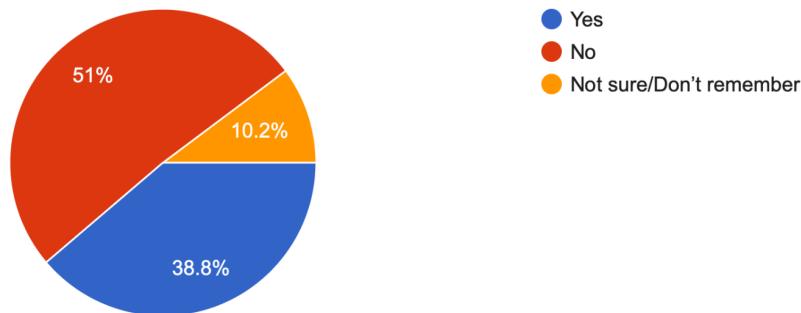
Have you needed to use cell service to communicate with employees about emergencies?

78 responses



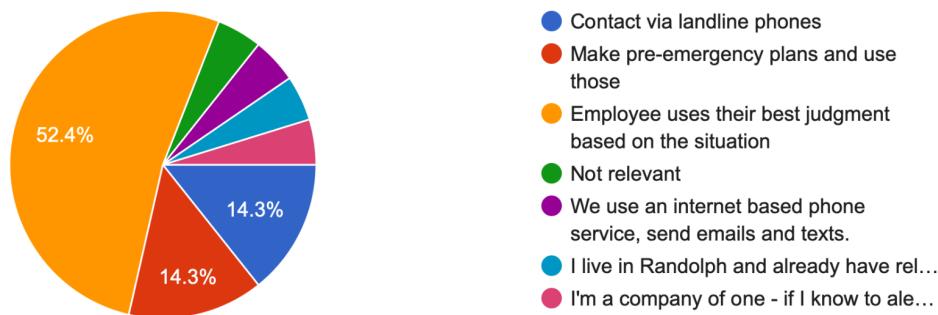
If so, did you feel confident your employees received your messages?

49 responses



If not, how do you communicate with your employees and customers in the event of an emergency?

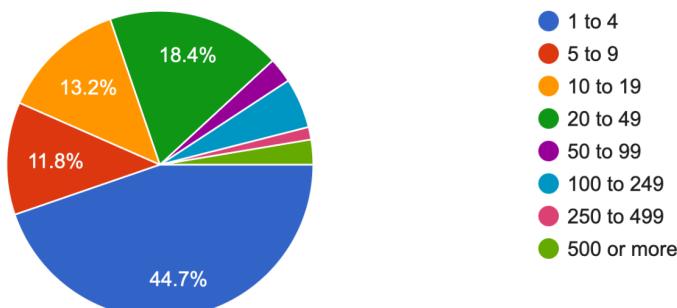
21 responses



Notes: The full text of responses with ellipses above include "I live in Randolph and already have reliable cell service from the 2 towers outside of town, plus I also have a landline. More towers are not needed here, and I strongly opposed adding cell transmitters to building and right outside homes on utility poles" and "I'm a company of one - if I know to alert my employee to an emergency they already know."

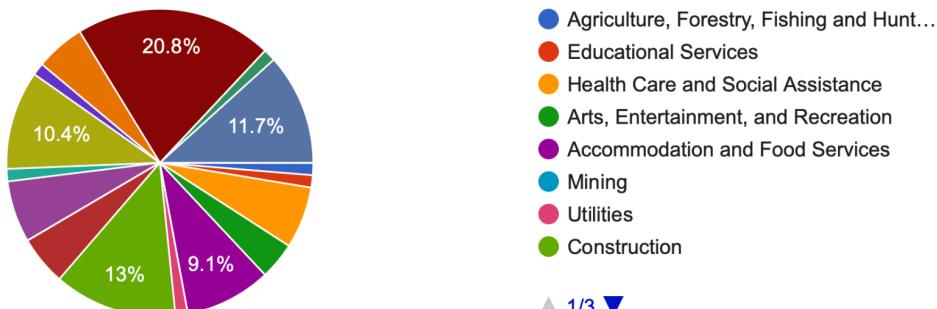
How many employees does your business employ in Vermont?

76 responses



What sector best describes your business?

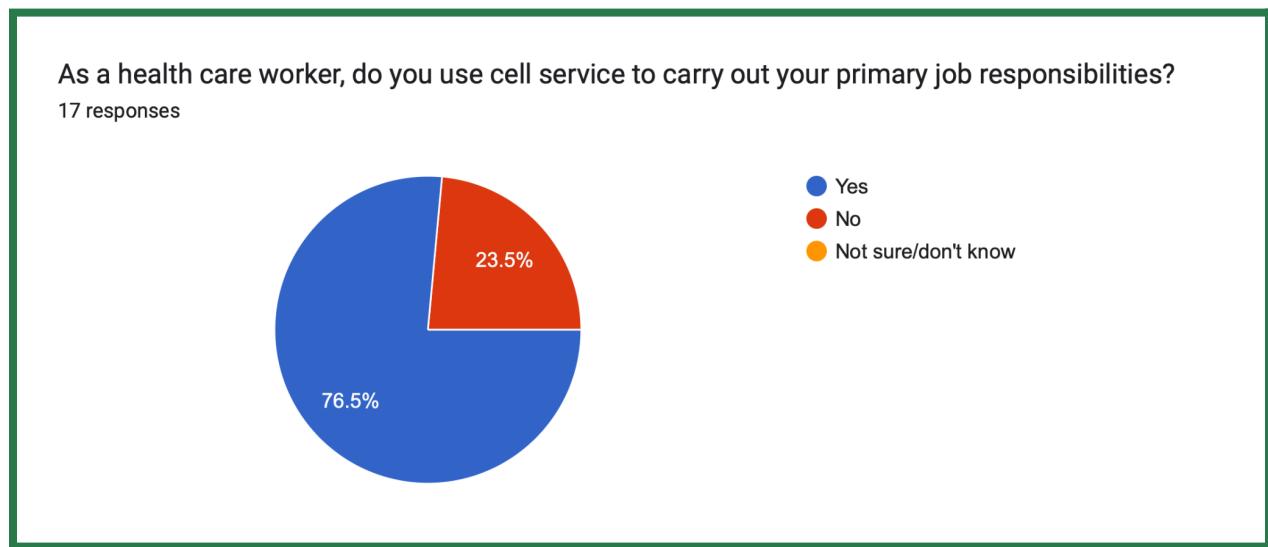
77 responses



Notes: The top responses were 20.8 percent Professional, Scientific, and Technical Services; 13 percent Construction; 11.7 percent Other Services (except public administration); 10.4 percent Information; and 9.1 percent Accommodation and Food Services. Other responses not listed above include: Manufacturing; Wholesale Trade; Retail Trade; Transportation and Warehousing; Information; Finance and Insurance; Real Estate Rental and Leasing; Professional, Scientific, and Technical Services; Management of Companies and Enterprises; Administrative and Support and Waste Management and Remediation Services; Other Services (except public administration); and Public Administration.

Appendix F: Healthcare Sector Survey Results

The following images show the 11 questions included in the Healthcare Sector Survey above a breakdown of the received responses.



If yes, what primary job responsibilities are conducted via cell service?

13 responses

Being on call

Answer on call pages. Attend meetings

Phone triage, accessing apps for guidelines

Followup calls with patients. Patients use cell for internet portal use and call office

Checking/responding to emails; sharing resources; talking with colleagues

Returning pages, telemedicine visits

Communication with co-workers

emails, calls, meetings

Everything

all matters like calling sick working from home, communication to peers because building is large

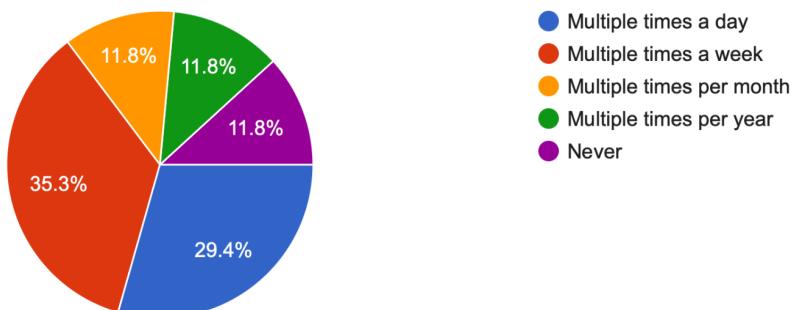
Calling doctor's offices, calling insurance companies, calling patients if I need to work remote, etc

Email, phone calls, and video meetings

patient calls for messages when remote.

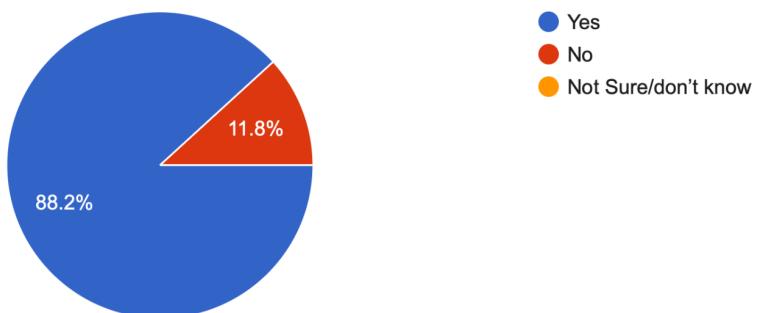
How often are you hindered by lack of cell service for your job?

17 responses



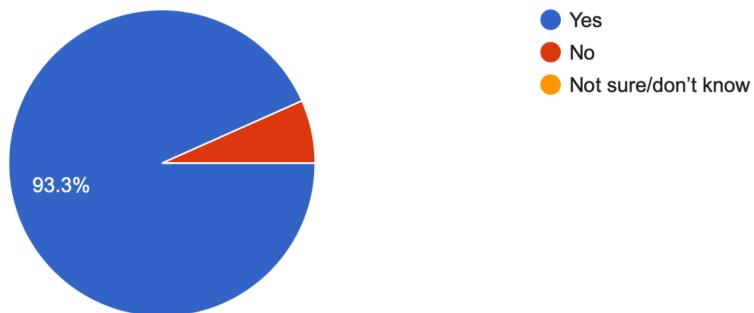
Do you work with vulnerable populations (i.e. racial or ethnic minorities, children, elderly, socioeconomically disadvantaged, underinsured or those with certain medical conditions) ?

17 responses



If yes, would better cell service for you and/or your patients result in more efficient or effective care?

15 responses



Notes: The percentage for "no" is 6.7 percent.

What strategies do you utilize to connect with vulnerable populations that are not connected via a phone or tablet?

14 responses

In person

USPS mailings. In person visits

Letters, mychart

Mailed letter. Neighbor or community member or community organization

Mailing letters is really the only remaining option

I do not use any

schedule in person and look for transportation assistance

We can't connect

go to the people

If they don't have cell service but have access to wifi then we try platforms like Zoom, Microsoft Teams, etc. If there is no phone or internet available then many times we have to work through family members which is incredibly unreliable.

Mail, and public advertising

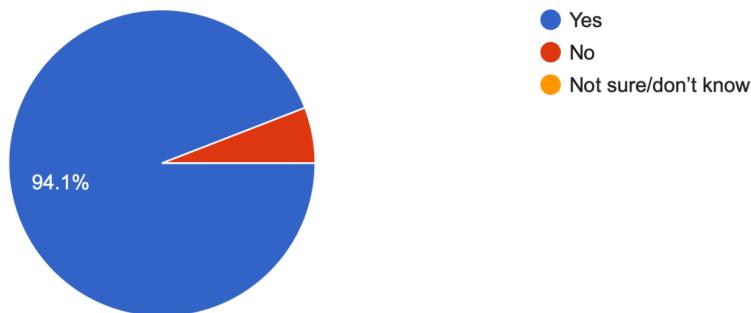
Telehealth

Store and forward solutions that are not real-time

friends and relatives that can be reached to help communicate with the patients/caregiver.

Do you or your employer/clinic provide voice call and/or video based direct care/telehealth services?

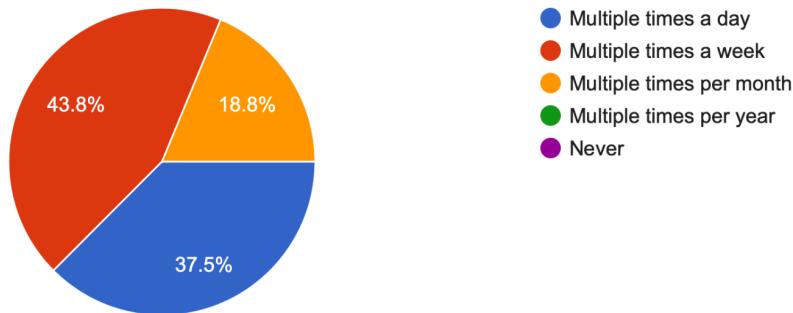
17 responses



Notes: The percentage for "not sure/don't know" is 5.9 percent.

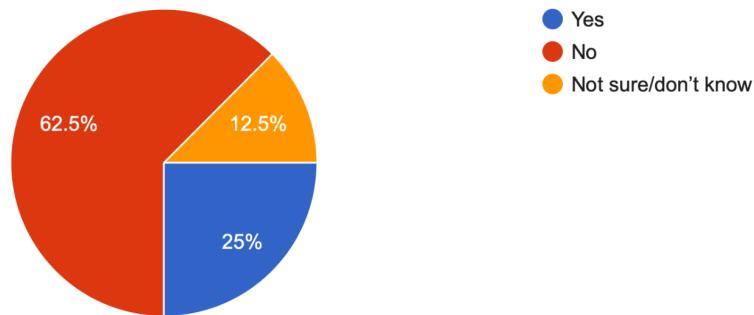
If yes, how often do you or your employer use these options with your patients?

16 responses



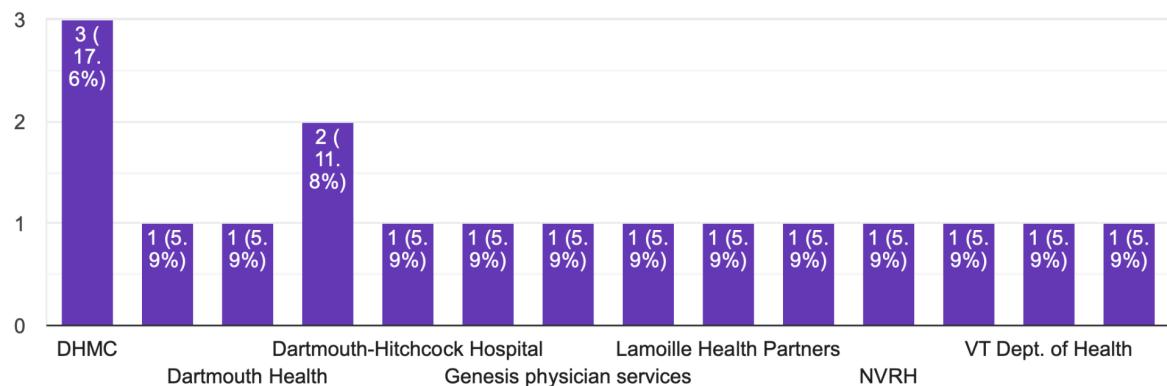
Do you think voice call services are just as effective as video based services?

16 responses



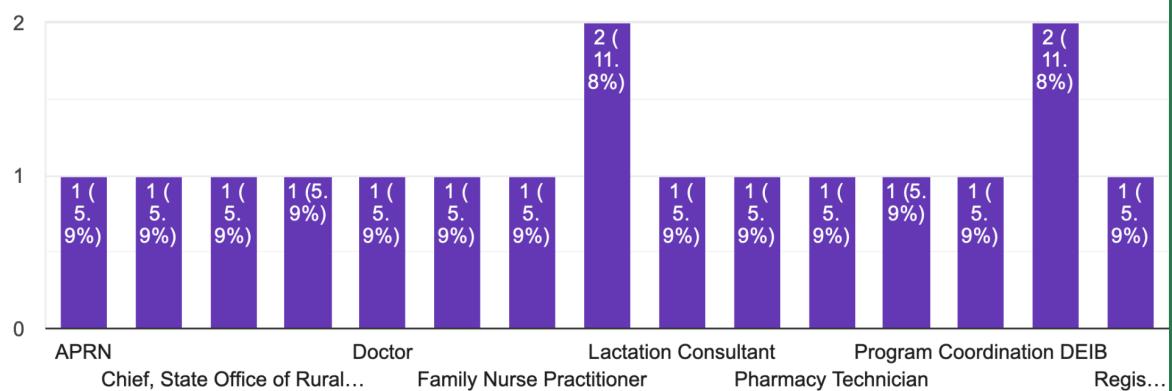
Who is your employer?

17 responses



What is your job title?

17 responses



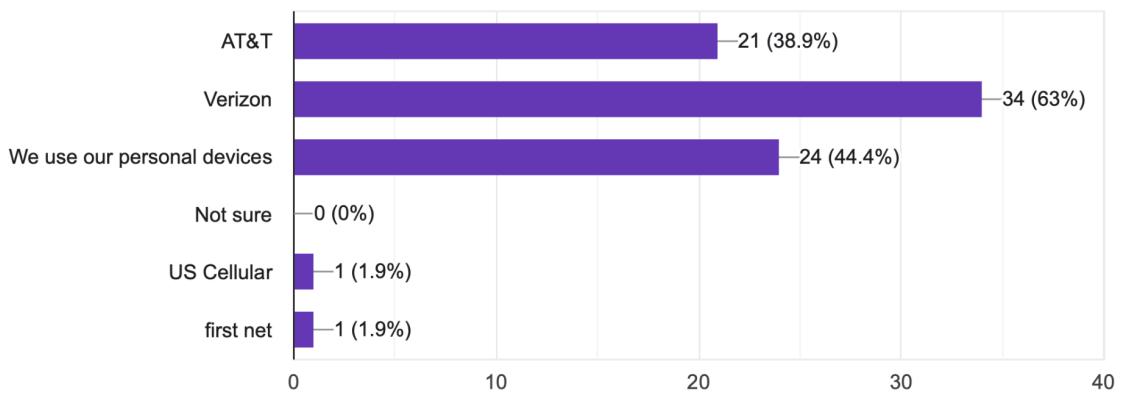
Notes: The full text of responses with ellipses above include “Chief, State Office of Rural Health” and “Registered Nurse.”

Appendix G: Public Safety Survey Results

The following images show the 17 questions included in the Public Safety Survey above a breakdown of the received responses.

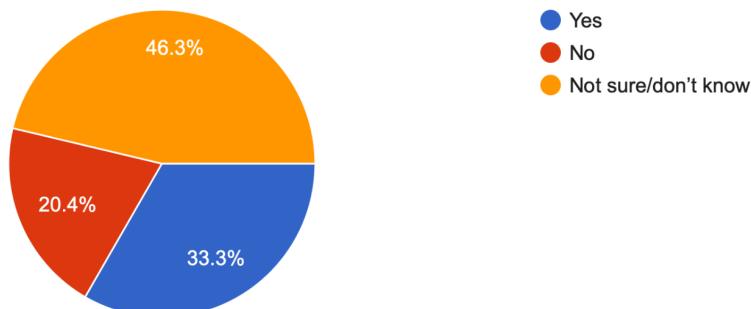
What brand of mobile broadband devices does your division use for first responder purposes?
Select all that apply.

54 responses



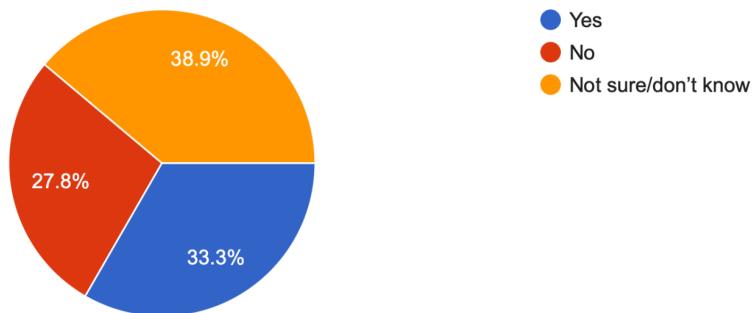
Have there been AT&T FirstNet deployments in your service area over the past 5 years?

54 responses



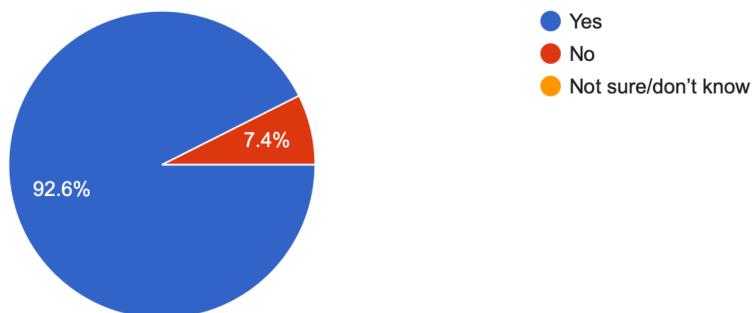
If yes, have the AT&T FirstNet deployments improved mobile broadband coverage in your area for public safety purposes?

18 responses



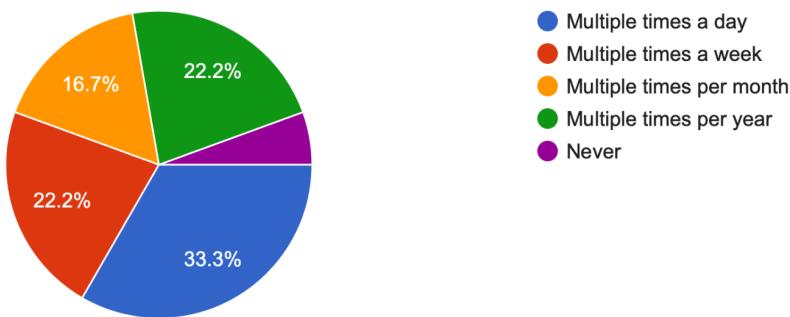
Does your department respond to calls for service to locations that have no mobile cell service?

54 responses



How often do responders lose mobile cell service on the way to or from a call?

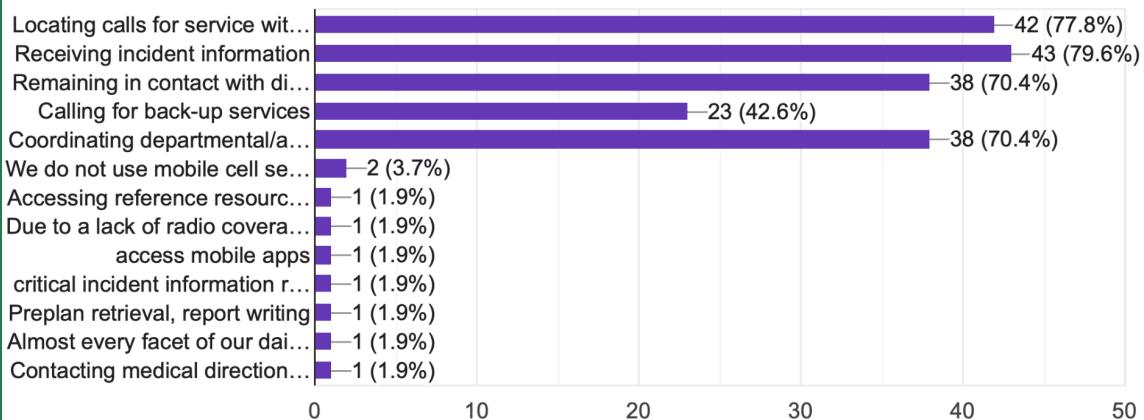
54 responses



Notes: The percentage for "never" is 5.6 percent.

What job functions do you and your staff need mobile cell service for? Select all that apply.

54 responses

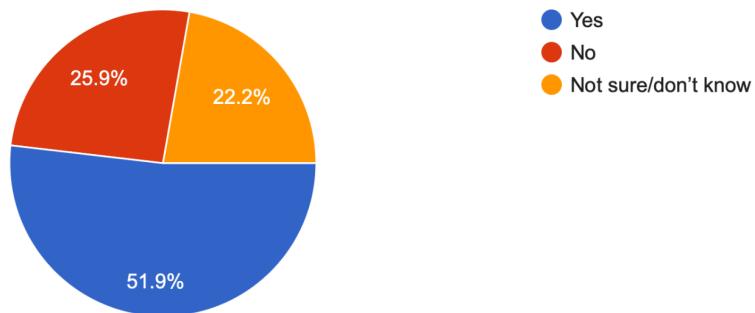


Notes: The full text of responses with ellipses above include "locating calls for service with GPS," "remaining in contact with dispatch," "Coordinating departmental/agency cross-functionality," "we do not use mobile cell service," "accessing reference resources such as guidebooks, pre-plans, and hazardous material data," "due to a lack of radio coverage as well as cell service, many times officers need/try to use cell phones to gain additional information for the calls they are responding to as well as call for assistance. Portable radios do not work in the majority of the areas and thus cell phones are used, where there is service," "critical incident information release for public safety," "almost every facet of our daily functions require mobile service at some point. When you have no Radio Coverage or Cell

Coverage it prohibits Law Enforcement capabilities and puts public at risk," and "contacting medical direction during EMS calls."

Is your department's ability to provide public safety services to vulnerable populations impeded by lack of mobile cell coverage?

54 responses



If yes, please provide some examples on how a lack of mobile cell coverage impacts your team's work with vulnerable populations.

23 responses

Cannot verify information without service

Loss of connectivity to CAD/RMS on-line systems, Loss of cellphone communications to provide services

we often disclose sensitive information only via cell and often cannot due to poor coverage. This also includes safety concerns.

Some in our vulnerable populations get free phones, but may not have service when needed depending on where they are at.

Approximately 35% of our population live in a rural area which in area is approximately 90%. A portion of this area as well as the downtown area have limited coverage. 18.6% live below the poverty line, 22% are over 65, 12.4% are under 65 with a disability

Vulnerable populations tend to live in the more rural areas of the state. Those areas, generally speaking, are the ones with no cell service.

Some areas of the New North End of Burlington have limited coverage.

Homebound populations in our district are uniquely vulnerable due to the lack of cell coverage. These populations rely exclusively on POTS landlines for communication due to the lack of cell coverage. The POTS landlines have all been converted to fiber optic, so they must self-supply power, and most of the backup batteries are 10+ years old and no longer function. Therefore, shortly after a loss of power, these populations have no means to call for emergency services, and town emergency management has no means to call them with shelter information, evacuation orders, etc. If there was a hazard that coincided with the power outage, such as flooding or freezing temperatures, going door-to-door would be the only option to effect an evacuation or welfare check. It is unlikely that this could be performed by my agency for all vulnerable households in a timely fashion.

Unable to communicate and receive incident updates for vulnerable populations incidents in areas we are contracted to provide fire protection services

Our response units have iPads which we utilize as Mobile Data Terminals, to host our response software, (First Due, ActiveAlert). When we have no cell signal, we cannot access pre-plans, dispatch information, hazardous materials (Tier II), or other critical information stored on our cloud based platforms.

unable to contact the emergency department to speak with medical control

Unless there is a landline in place contacting their listed point of contacts is impossible

If dispatch cannot be called via radio, cell phone is backup. If we cannot call dispatch there can be a delay in response (standing by waiting for scene to be safe, delay in locating incident address with active 911 app is difficult with no service)

In certain areas we cannot contact dispatch or hospital to receive orders or to coordinate additional resource needs

Not able to coordinate on scene resources with dispatch or direct calls to local agencies with the correct resources.

Inability to respond to 911 calls due to poor and or no cell phone service.

The inability to communicate and reference data

It's impacted because radio usage with portable radio's is sporadic and the use of cell phones would help to provide dispatch with valuable updated information to relay to EMS or other services

The Elderly often live in remote areas of where no cell service exists

We have very spotty coverage. We use cell for finding the call locations.

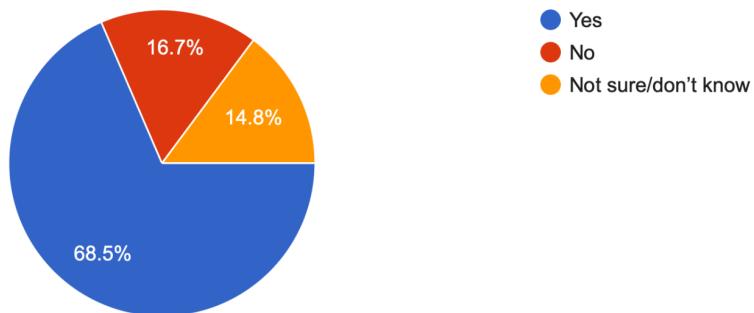
We have no coverage in the communities we serve so all communication must over the open radio.

If we do not have cell service we cannot connect victims to victim services; court orders, etc

During severe weather events, unable to provide or receive critical information

Would improving mobile cell coverage reduce your department's/team's operational costs or improve your efficiency?

54 responses



If yes, in what areas would your department see reductions in operational costs or improved efficiency?

32 responses

Reduction in time, no need to purchase boosters

Having continuous cell service is critical for first responders

Having to maintain other ways of communication to insure connectivity. i.e. multiple cellular carriers, backup communications (radios), etc.

Efficeincy. WE need to be able to communicate via cell/text at all times. this is the way people communicate now. Cells allow for voice, text and e-mail service that keeps oficers up to date in calls for service. By doing so time is not lost and efficiency increases.

We would be able to update/add our own case, run our own information, and just be more self sufficient when dispatch is busy. more

coordination of responders, locations, and assignments during an incident

Greater ability to communicate effectively, there will be no cost savings

The ability to call dispatch or VSP when you don't want it on the air.

Better communication will almost always lower costs of operation and will most definitely improve efficiency.

Less dead spots within our town.

Ability to use mobile CAD resources consistently is much more efficient than going back and forth between mobile devices and radio communications.

Our agency spends a great deal on VHF radio equipment, some of which could be replaced by PTT phones. Cell phones would enable voice communication with alarm companies, HAZMAT duty officers, fire investigators, and other partner agencies who are beyond the range of our VHF radios (present practice is to either play telephone via VHF using our dispatchers as a relay, or knock on a door and borrow a phone, which is highly problematic). We could use cell phones to communicate with our dispatchers in the areas of the district where the VHF network does not reach, or in situations where we don't want to give personal information like door access codes over open air. GPS navigation devices in fire apparatus could be replaced by Google Maps if we had mobile data. Our IAmResponding dispatch system is entirely non-functional once we leave the station, due to the lack of mobile data coverage. The entire task of maintaining a library of offline-accessible emergency response guides for electric vehicles, HAZMAT, etc would be eliminated if we had consistent mobile data coverage. I could go on and on.

Not having broken or dropped calls. We may not have to buy a truck repeaters to we can get up and make contact with other units. make sure

Having reliable cell service would enable command staff to perform tasks in the field that currently requires them to wait until they are in a service area. In addition, two-way radio communications are not always reliable in our response area and cell coverage would provide redundancy in communication systems.

It would improve our abilities to get assistance to victims of an emergency quicker and more efficiently mostly information updates and locating rural incident scenes incident scenes

Efficiency - accessing our critical information, pre-plans, haz mat info, critical dispatch information, AVL for vehicle location, etc.

No need for landline

It would improve efficiency in that mapping an address and being able to see the satellite view while enroute is very helpful, and allows us to locate an address much more quickly.

Improved efficiency because communications are essential to our operations. Typically in areas with no radio coverage there is ALSO no cell coverage, which can put vulnerable patients because of the delay in obtaining resources. It also creates a safety issue for responders if we have no communications.

Use of mobile data systems throughout our areas of coverage would increase efficiency.

The ability to coordinate resources improves efficiency.

Overtime costs for report writing.

It would greatly improve efficiency to be able to go direct with whatever agency is needed. Or direct call to supervisor or Chief that is not on scene.

Fuel, improved response time, improved public safety, potential life saving situations

Efficiency improvements via the ability to communicate and maintain data access; Operational costs would decrease by not having to deploy personnel to establish direct contact with citizens

Improved efficiency

Better assets tracking via mobile CAD type systems. Increase communications reliability.

It would improve efficiency by allowing command or other personnel to make the needed calls to dispatch or other agencies without having to drive to locations with adequate cell coverage.

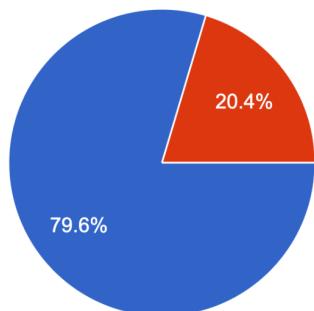
Our efficiency would be improved by not having to contact various support agencies by first contacting dispatch via radio to then make a call for us.

Not having members searching for call locations

Improved efficiency - more efficient in responding to calls, connecting individuals with services, communicating with each other and other departments; other first responders, etc

Improving mobile cell coverage in Vermont will improve public safety services.

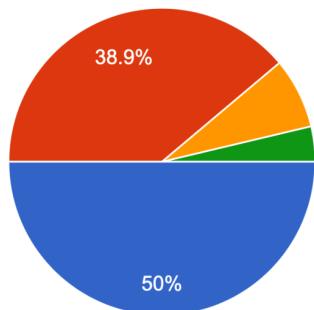
54 responses



- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree
- Not sure/don't know

Lack of mobile cell coverage negatively impacts first responders' safety on a daily basis.

54 responses

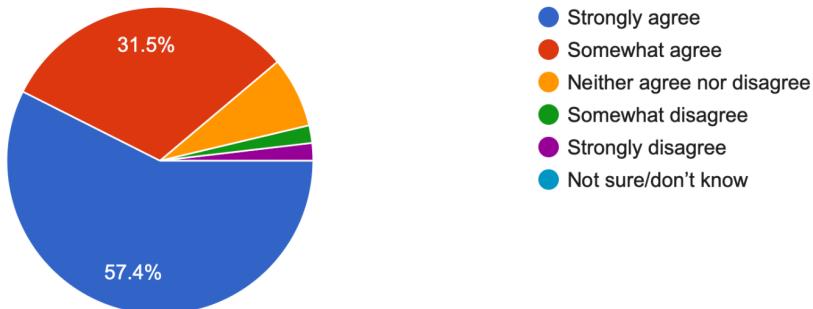


- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree
- Not sure/don't know

Notes: The percentage for “neither agree nor disagree” is 7.4 percent, and the percentage for “somewhat disagree” is 3.7 percent.

Lack of mobile cell coverage regularly impacts residents' safety.

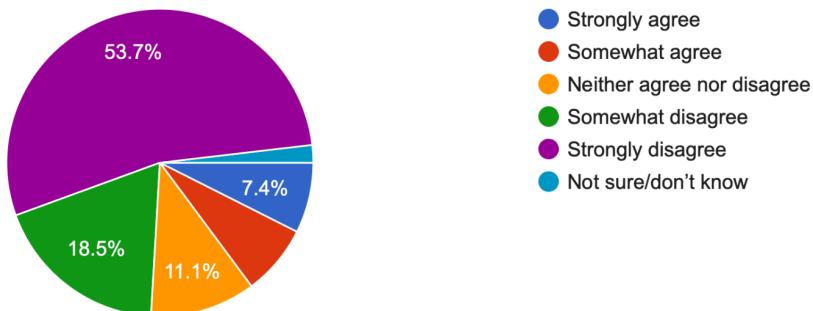
54 responses



Notes: The percentage for "neither agree nor disagree" is 7.4 percent, the percentage for "somewhat disagree" is 1.9 percent, and the percentage for "strongly disagree" is 1.9 percent.

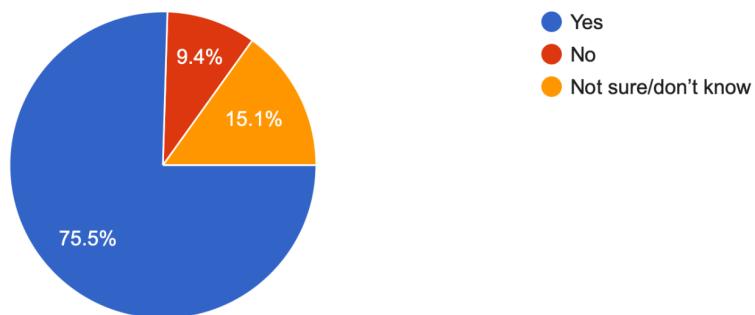
Mobile cell coverage does not hinder public safety operations significantly.

54 responses



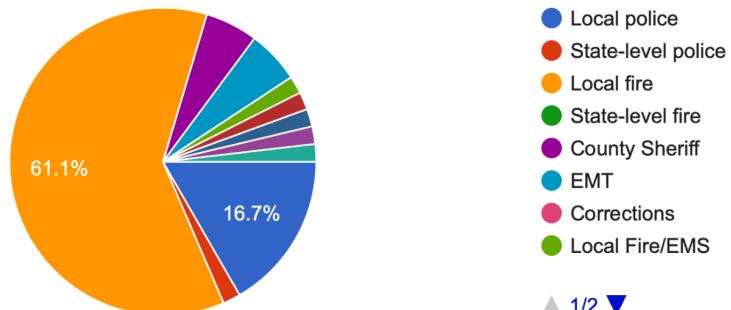
Notes: The percentage for "somewhat agree" is 7.4 percent, and the percentage for "not sure/don't know" is 1.9 percent.

Would you be willing to participate in a program where your department reports known mobile dead spots to Vermont's Public Service Department to help prioritize areas for mobile broadband expansion?
53 responses



Notes: The full text of the question is, "Would you be willing to participate in a program where your department reports known mobile dead spots to Vermont's Public Service Department to help prioritize areas for mobile broadband expansion?"

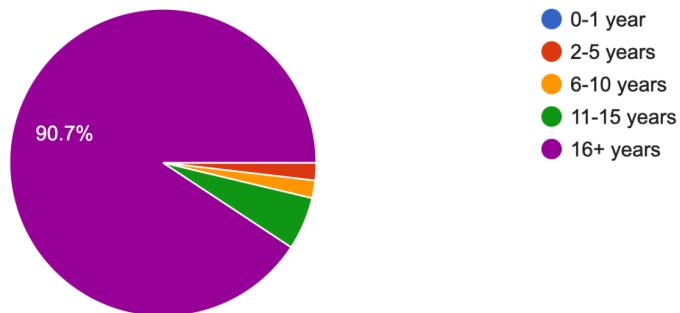
What sector of public safety do you work in?
54 responses



Notes: Other responses not listed above include: EMS, local fire and EMS, capitol only, and PSAP.

How long have you worked in public safety?

54 responses



Appendix H: Additional Propagation Analysis Methodological Details

Link Budget used in analyses: 5G NR.

Table 22: System parameters

Link	Unit	Downlink	Uplink
Frequency	MHz	2100	1700
Aggregated Channels		1	1
Cyclic Prefix		normal	normal
FR-Numerology-Bandwidth	FR1-0-20		
Table Lookup		11	
Frame Configuration		-FDD-	
TDD Maximum Cell Coverage (mi)			
TDD Time of Flight (mi)			
TDD Ratio		1	1
Required End User Throughput	Mbps	25	3
% of Resource Blocks Allocated to User		100%	100%
Required Physical Layer Throughput	Mbps	25	3
Selected Data Rate	Mbps	26.7	3.6
CQI Index		5	0
Required SINR	dB	4.5	-5.5
% of Uplink Occupied Bandwidth			83.57%

Table 23: Transmitter and receiver parameters

	Unit	Downlink	Uplink
Total Bandwidth	MHz	19.08	15.95
Required Cell Edge Coverage	Mbps	25	3
Transmitter			

	Unit	Downlink	Uplink
Tx Power Per Port	dBm	43	23
Number of Transmitters		4	1
Total Power Out (PA Power)	dBm	49.02	23
Total Power Out (PA Power)	Watts	79.81	0.2
Antenna Gain	dBi	19	0
Feeder Loss	dB	1	0
Max Transmit EIRP	dBm	67.02	23
Max Transmit EIRP/MHz	dBm/MHz	54.21	10.97
Receiver			
Feeder loss	dB	0	1
Antenna Gain	dBi	0	19
Noise Figure	dB	5	4
Number of Receivers		2	4
Diversity Gain	dB	3.01	6.02
Thermal noise kT	dBm/Hz	-174	-174
Noise Bandwidth	kHz	19,080.00	15,945.14
Noise Power	dBm	-96.19	-97.97
CQI Index		5	0
Required SINR	dB	1.5	-11.56
SCS	kHz	15	15
Required RSRP (Downlink MCS)	dBm	-125.74	-139.79
Rx Sensitivity	dBm	-94.69	-109.53
Link Imbalance	dB	11.18	
Hardware System Gain	dB	161.71	150.53

	Unit	Downlink	Uplink
Required RSRP (Inc. Margin/Link Imbalance)	dBm	-114.55	
Rx Sensitivity (Inc. Margin/Link Imbalance)	dBm	-83.51	
In Car Penetration Losses	dB	10	
Rx Sensitivity (Including In Building Losses)	dBm	-73.5	

Assumptions used in baseline coverage and infill analyses:

- Coverage definition: 25/3 Mbps
- Frequency Bands 1700-2100
 - PCS and AWS
 - 3GPP Bands n2 and n66
 - 40 MHz of aggregated spectrum
 - 10 dB penetration losses for vehicle
- 248a data: Site data used to derive coverage provided by the state initially came from a database with 1,035 sites. Erroneous and duplicate data were removed and 524 sites were used for coverage. Where height data was missing, 100 feet or the structure height for antenna height above ground was used, whichever was shorter.
- Vermont E-911 data: Data with the field “SITETYPE” set to “communication tower” used. Tower height data was not available; 40 feet was assumed.
- Drive data tests binned into 0.3 square mile hexes.
- RF coverage is binned into pixels sized with an area of 0.0241 square miles (250 meters by 250 meters).
- Site RF parameters typical for macro n2 and n66 sites.

Appendix I: ISP Pricing

Table 24: Broadband service pricing in Vermont

Provider	Starting Price Per Month*	Download Speed Range	Technology
Xfinity	\$65.00	Up to 1200 Mbps	Cable
Spectrum	\$49.99	Up to 1,000 Mbps	Cable, fiber
Burlington Telecom	\$40.00	Up to 1,000 Mbps	Fiber
Vermont Telephone Company	\$34.95	Up to 1,000 Mbps	Fiber
Waitsfield and Champlain Valley Telecom	\$72.00	Up to 1,000 Mbps	Fiber
Consolidated Communications	\$57.00	Up to 100 Mbps	DSL, cable, fiber, fixed wireless
Viasat	\$50.00	Up to 50 Mbps	Satellite
HughesNet	\$50.00	Up to 200 Mbps	Satellite
CVFiber	\$79.00	Up to 2,000Mbps	Fiber
Starlink	\$120.00	Up to 200 Mbps	Satellite
DVFiber	\$75.00	Up to 1,000 Mbps	Fiber
ECFiber	\$72.00	Up to 1,000 Mbps	Fiber
Maple Broadband	\$69.95	Up to 1,000 Mbps	Fiber
NEK Broadband	\$80.00	Up to 1,000 Mbps	Fiber
SoVT CUD/Fidium Fiber	\$35.00	Up to 2,000 Mbps	Fiber

*Pricing per month plus taxes for length of contract. Additional fees and terms may apply. Pricing varies by location and availability. All prices are subject to change. Speeds may vary. May not be available at every address. Pricing may include short-term introductory rate.

As of August 10, 2023.

Appendix J: Significant Changes From the 2021 Telecommunications Plan

As required by 30 V.S.A. § 202d(f), this appendix provides an outline of significant deviations from the prior Plan.

The 2021 Vermont 10-Year Telecommunications Plan was adopted by the Department of Public Service and accepted by the legislature on June 30, 2021. Both the 2021 Plan and the 2024 Plan fulfill the statutory requirements of 30 V.S.A. § 202 (c and d).

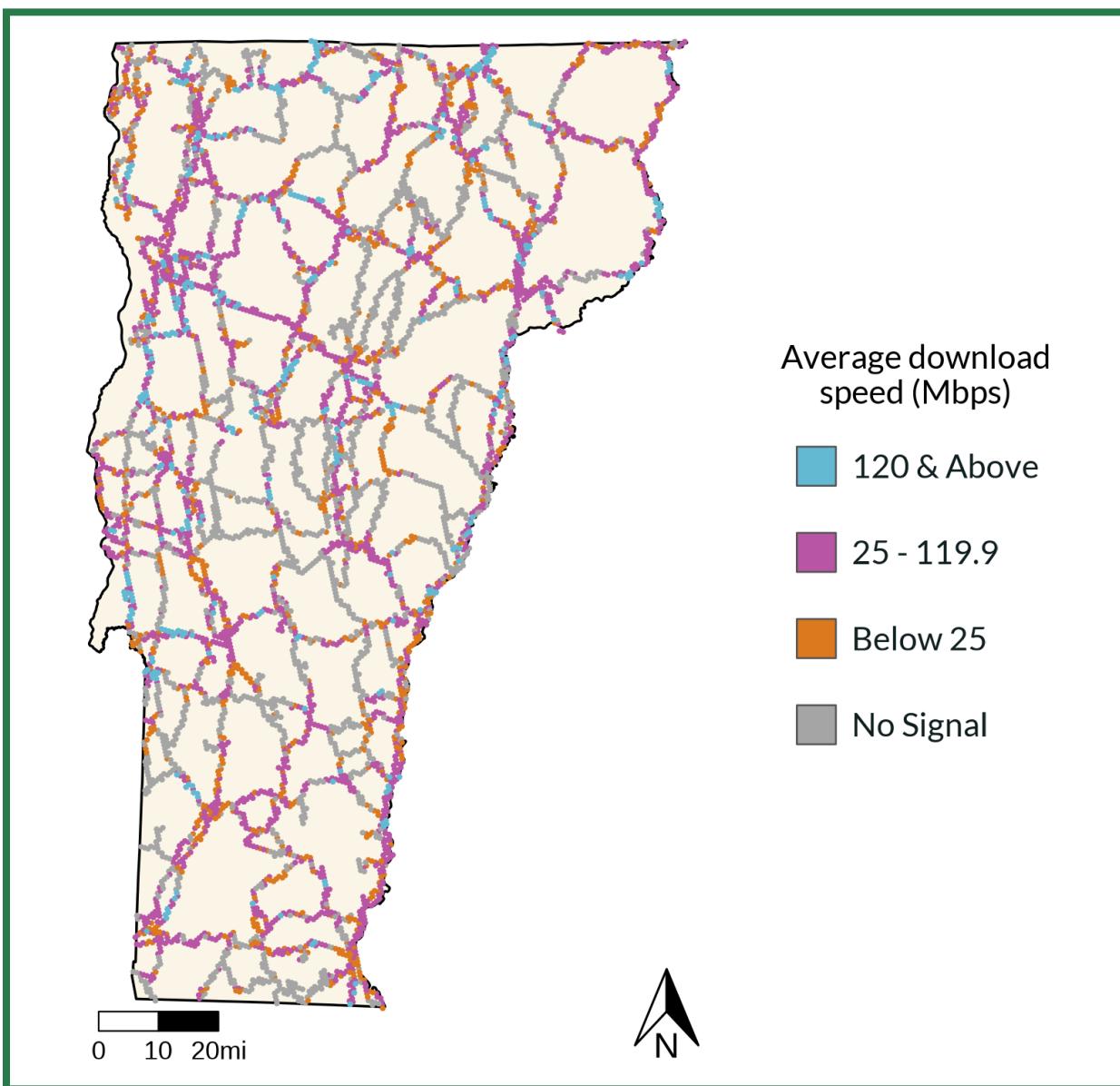
However, this Plan has three significant changes from the 2021 Plan. Two changes were included in the request for proposals and contract language for the Plan, and the other was included due to the changing telecommunications landscape driven by the BEAD funding.

The contracted scope of work for the 2021 Plan required the contractor to give particular focus to Communication Union Districts and provide an assessment of the resources needed for the CUDs to succeed. The contract also required that the 2021 Plan include an analysis of available options to support the state's public, educational, and government access television media organizations. Finally, the 2021 Plan included a required legal analysis of relevant federal and state laws and regulations affecting state action in the telecommunications and information market, including relevant preemption issues raised by any proposed policy initiatives.

The contracted scope of work for the 2024 Plan does not include the additional analysis of public, educational, and government access television or relevant federal and state laws and regulations. During the course of the engagement, as Vermont's proposals for BEAD funding were created, finalized, and approved, the Department of Public Service requested that the contractor emphasize mobile broadband expansion. In addition, during the course of the engagement, the Department requested that the contractor provide an analysis of the Public Safety Answering Point communication systems and Vermont's broadband construction workforce readiness.

Appendix K: Enlarged Maps

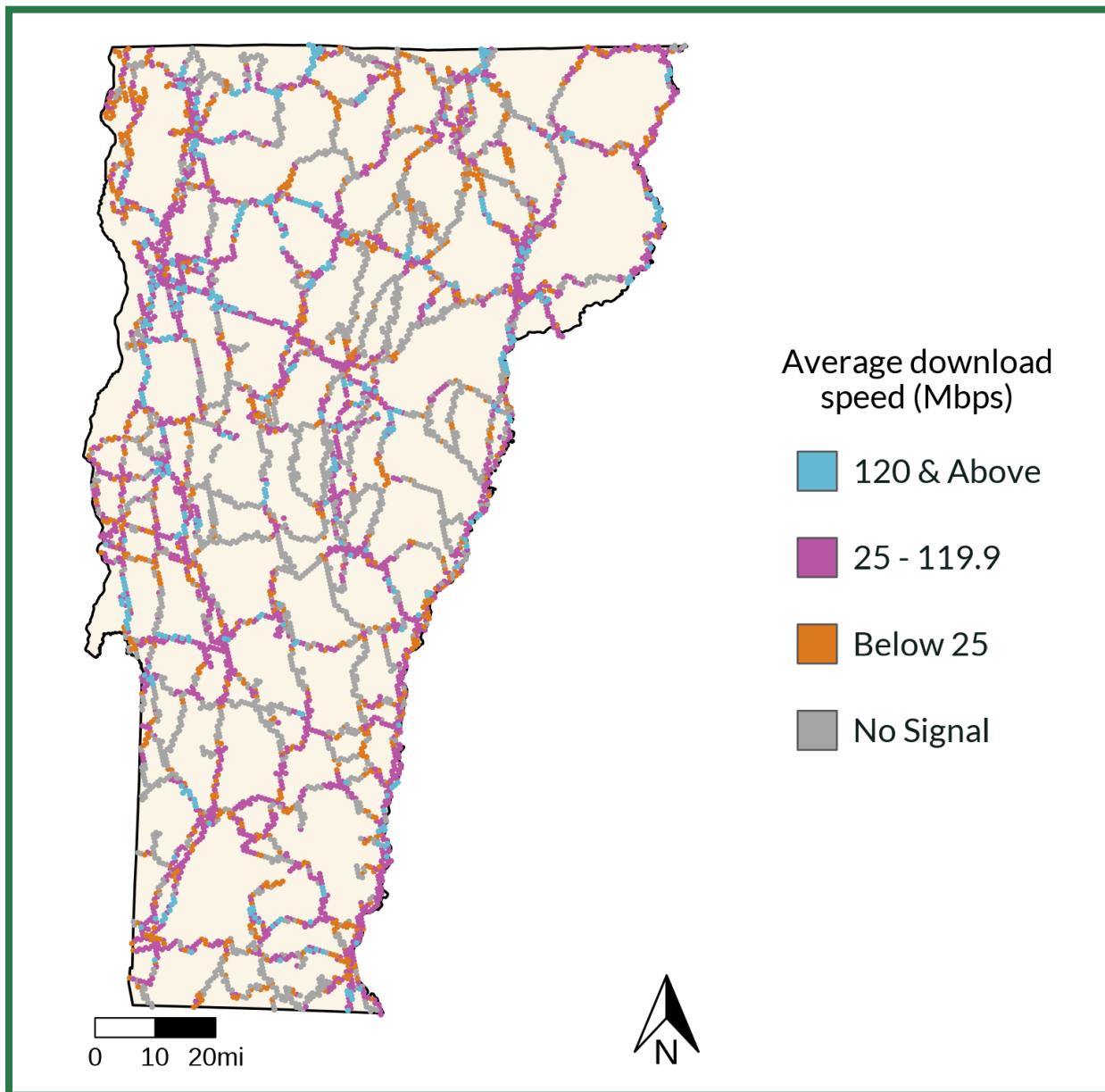
Figure 57: Average mobile wireless download speeds for AT&T on Vermont roadways in 2022



Source: Vermont Department of Public Service (2022)

Notes: Roads that were not tested in 2018 were removed.

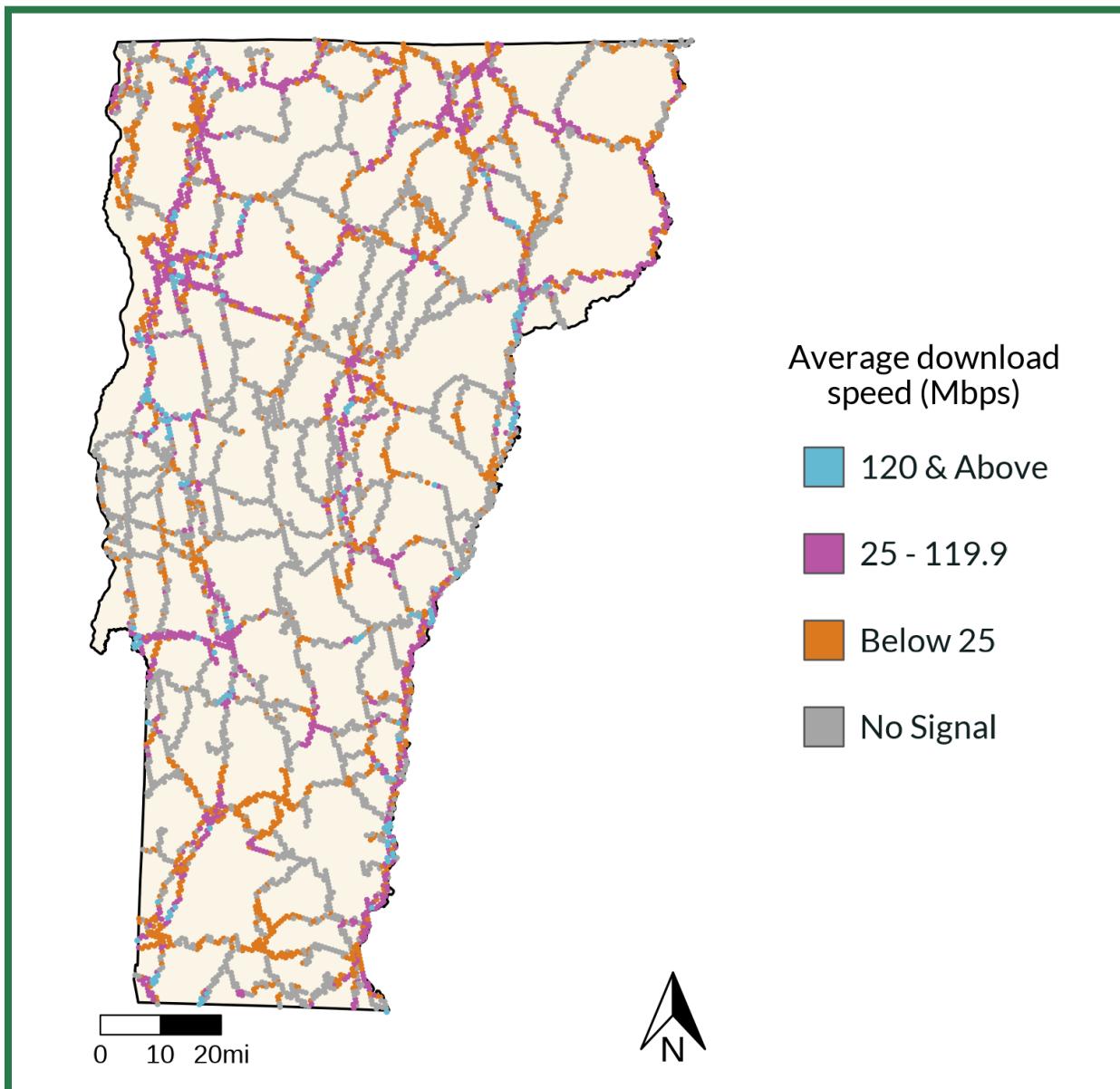
Figure 58: Average mobile wireless download speeds for FirstNet on Vermont roadways in 2022



Source: Vermont Department of Public Service (2022)

Notes: Roads that were not tested in 2018 were removed.

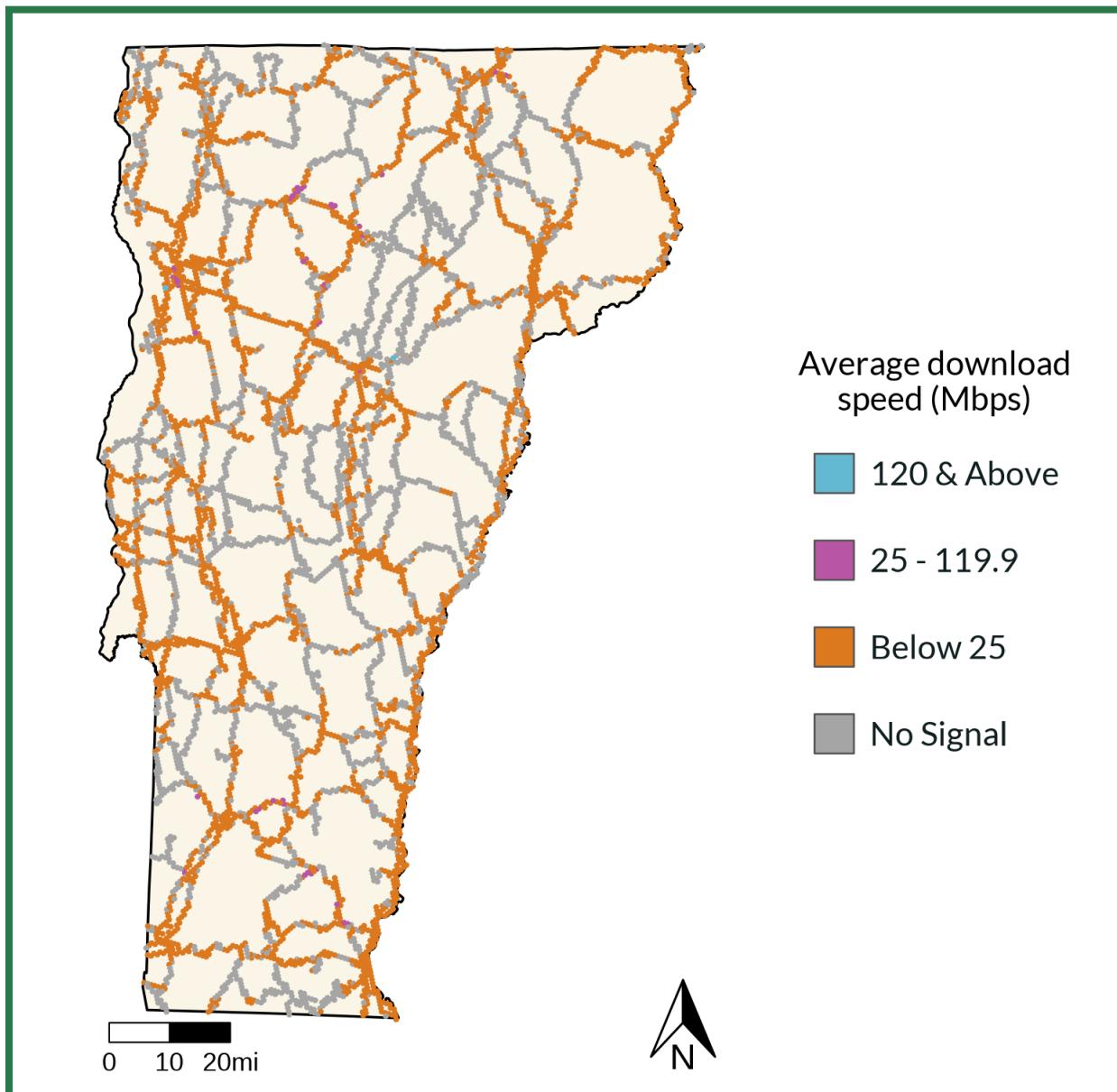
Figure 59: Average mobile wireless download speeds for T-Mobile on Vermont roadways in 2022



Source: Vermont Department of Public Service (2022)

Notes: Roads that were not tested in 2018 were removed.

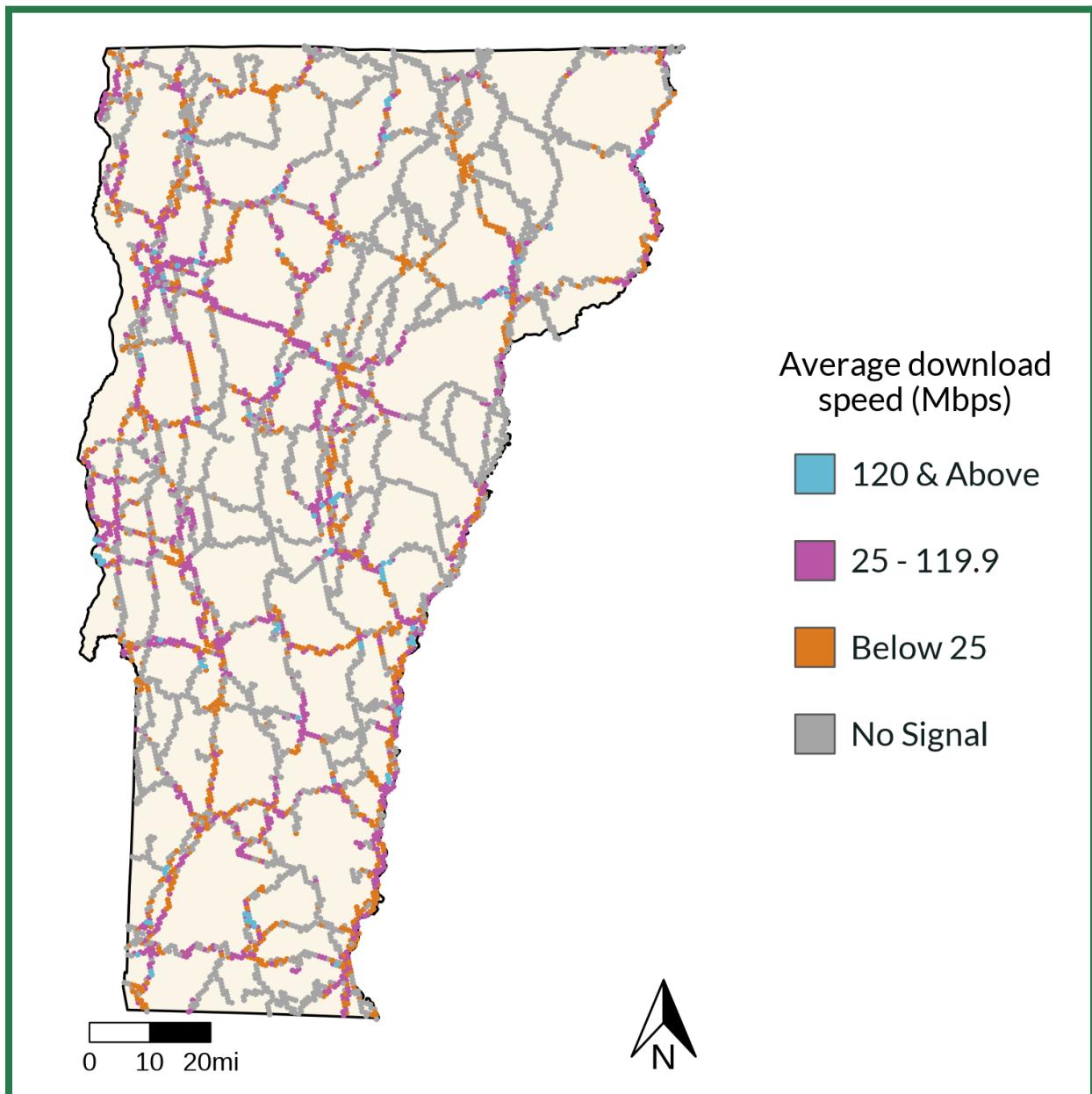
Figure 60: Average mobile wireless download speeds for US Cellular on Vermont roadways in 2022



Source: Vermont Department of Public Service (2022)

Notes: Roads that were not tested in 2018 were removed.

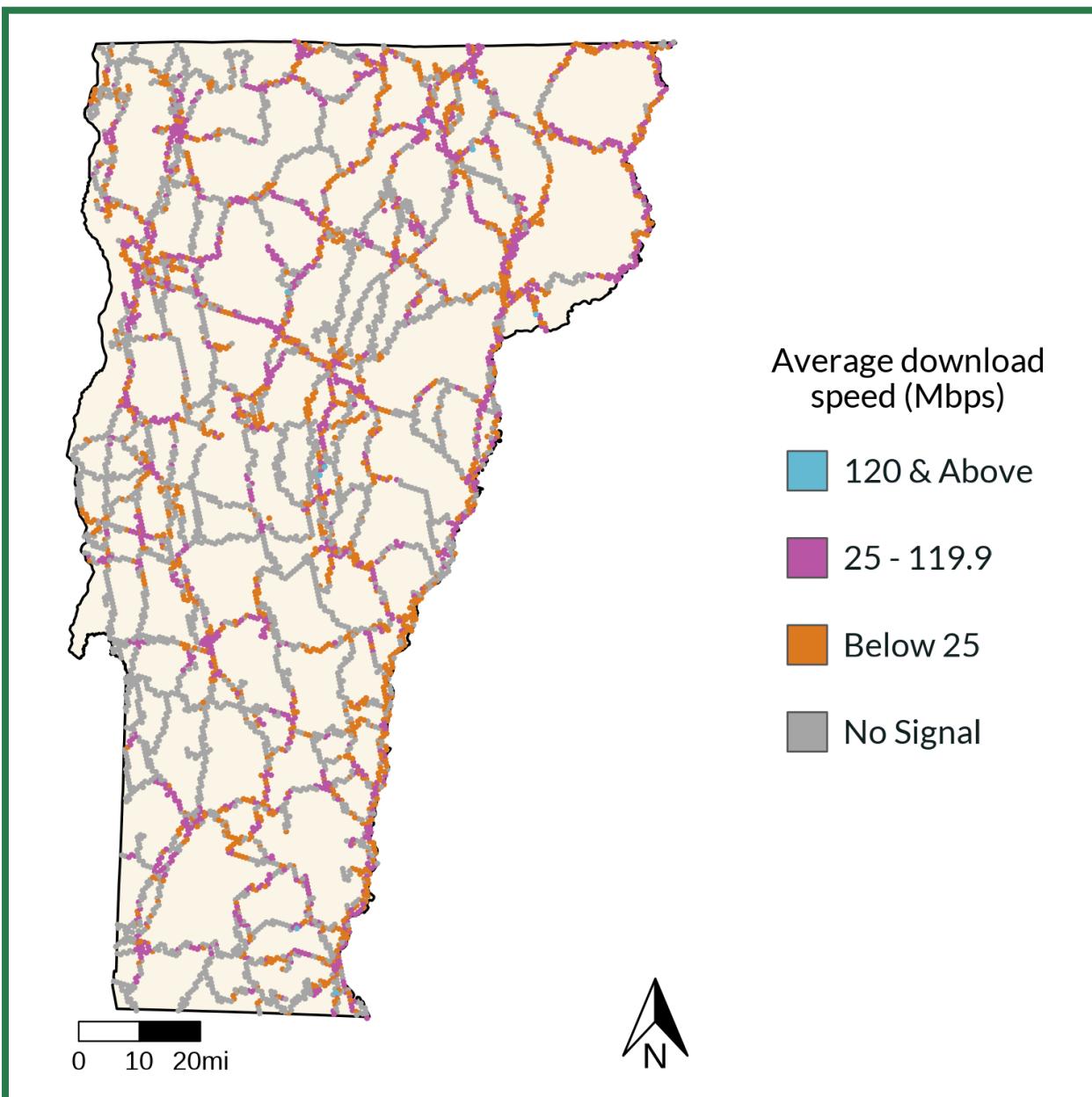
Figure 61: Average mobile wireless download speeds for Verizon on Vermont roadways in 2022



Source: Vermont Department of Public Service (2022)

Notes: Roads that were not tested in 2018 were removed.

Figure 62: Average mobile wireless download speeds for VTel on Vermont roadways in 2022



Source: Vermont Department of Public Service (2022)
Notes: Roads that were not tested in 2018 were removed.

Appendix L: Public Comments and Responses

2024 Telecom Plan - Input Session 1, March 18

Stephen Whitaker:

I think just to set the tone, which I will change later, I want to commend a couple of sections in the Plan.

The analysis of the importance and challenges of developing carrier-grade service on our fiber infrastructure or on the newly built fiber infrastructure is very good. Unfortunately, it's done in the context of expecting CUDs to do that, which is almost laughable.

The Plan describes what CUDs would need to do to meet carrier-grade requirements, and does not create the expectation that CUDs should do so.

And an open access statutory compliance been built into the CUD plans from the start, as is required by current statute, not the statute we're hoping will be someday. Then, I could imagine carrier-grade service providers jumping on and leasing the circuits they need to the points they need them to, and developing carrier-grade services. That is probably the only way we're going to get carrier-grade out of this.

This point addresses prior actions that are not relevant for this 2024 Plan. Further, Vermont statute encourages the “promotion” of open-access networks, not the requirement of open-access networks: “Support competitive choice for consumers among telecommunications service providers and promote open access among competitive service providers on nondiscriminatory terms to networks over which broadband and telecommunications services are delivered” (30 V.S.A. § 202c(b)6).

This ties somewhat together with the study of burying, if they're currently piloting the direct burial with Green Mountain Power. But yet the costs to add a conduit where they've already got the ditch open were so exorbitant for fiber to go in, that it was waived. The opportunity was waived in the pilot. And then another section of underground yet to be done was gonna require hundreds of 1,000s in the replacement poles, and [inaudible] decides they'll just charge that amount to drop the conduit in. So I believe that if we're going to do a study of direct burial, communications and fiber in the same operation as direct burial of the Green Mountain Power electric, it's going to have to be regulated like a rate case. And that plan is long overdue, because now all the CUDs have aerial plants, which it may be too late to switch horses.

This point addresses prior actions that are not relevant for this 2024 Plan.

So the neutral host analysis or I haven't seen the actual propagation analysis, but the analysis that so many lower poles in a small cell arrangement, I think, is a smart idea and

could work better in Vermont. Again, the assumption that the CUDs would own, build, and manage those is a fallacy. CUDs can barely ... in any case ... I'll refrain.

The grant program proposed leaves open the possibility of CUD involvement, but in no way requires or assumes it.

This CUD myopic aspect of this draft is, I believe, a result of the same firm writing the Plan, which is the same firm that wrote the last Plan and failed on nine out of ten statutory requirements, is also doing the engineering work for the CUD within the Department for the CUD plan review within the Department. So some of this future projections is kind of self-serving make work, or you know, the Department and CTC to have further butter for their bread.

Please see prior comments clarifying that CUD involvement is not assumed in wireless deployment.

But I'm going to point to some of the flaws in the process. I read the statute very literally, and I'm familiar with it for 30 years now. And let's, "Prior to preparing the Plan ... an overview, looking 10 years ahead, of statewide growth and development as they relate to future ... telecommunications services," that's missing. It's not in here. "Shifts in transportation modes, economic development, technological advances." That's not in here. The "factors that will significantly affect State telecommunications policy and programs," that's not in here. "The overview shall include an economic and demographic forecast sufficient to determine infrastructure investment goals and objectives," that's not in here. That's prior to preparing a Plan. So you've really gotten out ahead of yourselves in preparing a draft without reading what the precursors are.

Please see Appendix B: Alignment of Plan to Statutes for a full crosswalk between 30 V.S.A. § 202 c and d and the sections in the Plan. In particular, please see Sections 2.4, 2.5, 3.1, 4, 6, and 8, and the following:

- ***Assessment that telecom planning should assume a Vermont population of 800,000 despite current population trends (Section 4.3)***
- ***Description of remote work trends in Vermont (Section 2.5)***
- ***Analysis of technology trends, such as fiber scalability, cable upgrade options, Starlink service, text to satellite, and others (Sections 3 and 6)***
- ***Description of telecommunications technology as it relates to transportation and vehicle connectivity (Section 6.3)***
- ***Description and analysis of climate change impacts and patterns in Vermont (Section 4.2)***

The surveys are pretty good, but I question the "statistically significant," so the number of people that were surveyed. I'd have to talk to somebody who knows survey methodology better than I to see what's appropriate for this kind of scale.

Please see Appendix D for a description of the survey methodology.

In the 90s, we had hundreds of people participating in this planning process. And it's the Department's failure to write a Plan, failure to properly promulgate it, failure to hold hearings on a final draft, failure to even draft a Plan for several of the generations under O'Brien and Douglas that has caused this capacity of the public to atrophy. And so when I read that in developing, "*The Department shall establish a participatory planning process that includes effective provisions for increased public participation.*" This doesn't cut it, you know. Three meetings with one or two people at them is not anywhere close to what you need to be doing to draft such an important document. That's if all the homework were done first, and put out for review. So, "*To the extent necessary,*" I guess that's in whose determination, "*the Department shall include in the Plan surveys to determine existing, needed, and desirable plant improvements and extensions, access and coordination between telecommunications providers, methods of operations, and any change that will produce better service or reduce costs.*" Those are things that this contractor is too in bed with the CUDs and their plans to even think outside the box.

The PSD followed statutory guidance in 30 V.S.A. § 202d(d) in the creation of this Plan, including but not limited to:

- ***On 2/12/2023, the Department reached out to the local AMO to discuss strategies for promotion.***
- ***On 3/4/2023, an advertisement was placed on WCAX. It was posted both on the WCAX website banner and broadcast via video livestream.***
- ***On 3/7/2024, the public meetings were added to the Department of Libraries public meeting calendar for state agencies.***
- ***On 3/11/2024, a press release and announcement with a link to all of the meetings was posted on the Department of Public Service homepage.***
- ***On 3/13/2024, the press release was emailed to all stakeholders interviewed for the Plan.***
- ***On 3/13/2024, the Department reached out to VAN as we had not heard back from the local AMO. We were referred back to the local AMO, who then contacted us.***

You know, this, this broadband money ... we had one good model with WEC and CVFiber. For a time, I was integrally involved with CVFiber, and that fell apart because this easy money made it too easy to go and just take the money and not worry about WEC getting a low-interest RUS loan.

This comment does not relate to the content of the 2024 Plan.

So, the pole-owning utilities, in order both for resilience planning, for public safety, and carrier-grade capacity, and the ability to rapid restoration that having the skilled technicians in-state and readily at hand and ready and prepared and expecting a storm with their trucks and tools and parts loaded. It's not going to happen the way we've gone about it. We've gone about it with a bunch of out-of-state — especially Consolidated — a bunch of out-of-state, nonunion, fly-by-night contractors, and then they leave town and nobody can even figure out why this splitter's not lighting up. So, the pole-owning utilities, and it may be too late, but where we are in the Plan, I'm gonna keep raising it in case there's structural restearing that can be done. This pole-owning utility should be, especially in the underground, if we're

gonna go underground, even more so, because then we don't have increased cost of ditching that fiber underground. It's gonna go in as Green Mountain Power buries their own.

The 2024 Plan describes options for the participation of pole-owning utilities that are relevant to the broadband deployment planning happening in 2024 and beyond.

And since I'm doing that, I want to point out, I would ask people to go look at Appendix G of the last 10-Year Telecom Plan, and I put pages and pages of constructive and specific recommendations regarding resiliency and public safety needs, and it was all just swept off the table. Whoever was doing that, I presume it was Corey. You would know if you were doing it. I know it wasn't Clay. But my point is that that's again damaging the public participation. If you're going to bother to participate and provide a lot of input and it's just gonna get swept off and ignored, that doesn't bode well for you adhering to statute with your public participation.

This comment does not pertain to the 2024 Plan.

So the pole-owning utilities are the logical entity to build, own, and maintain and lease open access fiber. Competition, you know, wishful thinking that we're gonna get the benefits of competition just by saying we're gonna get the benefits of competition with monopolies, is lala land. You know, that competition creates an incentive of smart teams of people working against each other to drive prices down and drive quality and loyalty up, and that's a proven fact, again and again. And where in statute says it, you can't be writing a Plan for a statute you hope to change in years to come. And that's what this is. This says we're going to plow ahead with a monopoly service. We're going to keep all the monopoly arrangements secret between, you know, Waitsfield Telecom, and our GWI, and the CUDs, and we're going to grant huge new footprints to monopolies.

This is a misconstrual of the Plan's recommendation, which is to prioritize internet speeds, service quality, and cost as the ultimate benchmarks and goals of success. Fast speeds, great service, and low cost may be achieved through a number of mechanisms, one of which is competition.

We're not going to address, here's a gap. That vulnerability of unpowered lines for landlines is increasing dramatically as we shift to fiber. And nothing came out of it. Oh, we're just going to teach people to maintain batteries. It's like, that's a joke. Old people are not going to go in their basement and check on batteries to see if they're too old to be relied upon during a storm. We need strategies to make emergency calling available via fixed wireless that's hardened backhaul to public-safety grade. They can be reached with a short walk from most of the residences, or we need to maintain the copper.

The Plan agrees that expanding mobile broadband calling in the state is important for public safety reasons, among other reasons, and recommends initial steps for the state to take to improve mobile coverage.

But this reliability, we just, we see this pages and pages of propaganda about FirstNet and yet no mention of the massive outage on February 22, which took down all AT&T service

nationwide, including FirstNet. And no one can answer why, and the investigation will be secret. The after-action report will be secret. No mention of how FirstNet could failover with priority and preemption to other carriers in a neutral host model that we design and implement properly, not relying on CUDs, that's putting way too much faith and confidence in CUDs.

According to the Department of Public Safety and the Enhanced 911 Board, FirstNet, which is a Commercial Mobile Radio Services provider with an underlying network operated by AT&T, experienced an outage on February 22, 2024, from approximately 3:45 a.m. to 8:30 a.m.

Neither DPS nor E-911 has opened an investigation into the outage. Public information indicates that the FCC has opened an investigation at the federal level.

So, I heard the goals were drafted four years ago; these goals had been drafted and 20 years ago, 30 years, '87 is when this statute requiring this Plan was first passed. And then the, it was about 10 years ago, it was 10 years ago that we put the 100/100 by 2024 in place. And here it is 2024, oh let's move it to 2029. I'm like, if we had had this Plan in place when ARPA money came — or not this Plan, but a real Plan — when the ARPA money got here, we might have made some progress and we might have even made it by 2025 because the BEAD money's coming out slower, right?

Thank you for your comment. It does not pertain to the 2024 Plan.

Little to no service-area expansion, etc., in the last five years, and yet we say oh, AT&T's got 15 new towers. AT&T definitely defrauded the state with their promises and they were caught when the state paid Televate to go measure the coverage down in Bennington County, and the coverage wasn't there, and AT&T basically told the state "pound sand," we measure it differently, take it up with Washington, we don't answer to you. And that's why we shouldn't be advertising for them in this, pretending that they are the only game in town with priority and preemption.

The Plan makes clear that a significant portion of AT&T expansion happened via tower upgrades, not new towers. The remaining portions of this comment do not pertain to the 2024 Plan.

No mention that Verizon has priority and preemption that any first responder could sign up and scan their card credential and get priority and preemption turned on. No? And what of the neutral host model where multiple carriers can have priority and preemption and failover to each other in a disaster where any one carrier goes down. And that's what would be a plan.

The Plan has been updated to provide a high-level explanation of how first responder priority and preemption works.

So I don't understand what is being said. Montpelier was encouraged to bow out of ECFiber. We were a founding member of ECFiber. We were encouraged to bow out of ECFiber and let CVFiber, instead, nobody built fiber until Consolidated got here and now nobody will build

fiber. They see that CUDs were not allowed to build in cabled areas where 25/3 was already present, is my understanding. And yet I'm hearing that we're on track to have 100 megabit symmetric, which means fiber, to every address in the state, and it just doesn't add up to me.

This comment does not pertain to the 2024 Plan.

There's something I'm not understanding about that representation. And it may be couched in the word, we're going to "pass" all on-grid premises. That might mean that we're not going to have any breakout boxes or any service drops. We're just going to have run a long-distance cable through those communities. But that doesn't count for every E-911 address having 100/100 fiber speed. So are we presuming that, are we pretending that the cable companies are going to upgrade to DOCSIS 4, and we'll have 100/100 symmetric, but it's already time.

30 V.S.A. § 202c(b)10 states, "Support measures designed to ensure that by the end of the year 2024 every E-911 business and residential location in Vermont has infrastructure capable of delivering Internet access with service that has a minimum download speed of 100 Mbps and is symmetrical."

The Telecommunications and Connectivity Advisory Board hasn't met in years and has not provided any advice on upgrading the speed. It's time for our base speed to be gigabit symmetric. But are we going to have that at every address, including the cabled addresses, or are we pretending that the cabled addresses or the limitation on the ARPA money gives us a free pass to not provide fiber service to those addresses? That's a need for clarification here because it doesn't add up that we're not building, the CUDs are not designing as far as I know, we're not designing the areas that are cable-built. You're not allowed to use this money for that. And yet, we're representing that we're on track to have every on-grid address. So five are served.

The requirements of the Telecommunications and Connectivity Advisory Board are described in Section 11.3.4 of the Plan in context of 30 V.S.A. § 202f. The second portion of this comment does not pertain to the 2024 Plan.

And then five are served with competition. The opening paragraph of the Plan says, "*The Department shall be responsible for provision of plans for meeting emerging trends related to telecommunications technology, markets, financing, and competition.*" You can't just say competition, oh, that's inconvenient. You know, that'll make us work harder, that will make us have to design active fiber Ethernet networks instead of passive, so that we could with a few keystrokes lose somebody to a competitor they could keep that they determine.

This comment is a misconstrual of the Plan's recommendation in Section 11.3.2, which is to prioritize internet speeds, service quality, and cost as the ultimate benchmarks and goals of success. Fast speeds, great service, and low cost may be achieved through a number of mechanisms, one of which is competition.

So, I've got a nice marked-up copy of the draft and of the ... but I don't want to preoccupy this hearing. But I think the fact that nobody showed up ... oh, access media organization, "*the Department shall coordinate with Vermont's access media organizations when planning the*

public hearings required by this subsection." That's these hearings this week and next, and there's been no coordination with the access media organizations. That's why you don't have any turnout here. Among other things, but you need advertising, you need radio advertising, you need speakers on VPR, you know, ahead of time to say this is a big undertaking we're taking on and we need to, you know, get everybody up to speed. Here's some homework you can do ahead of time. Now, here's how to understand this Plan. That work hasn't been done, and you inherited this mess, I understand. But we really need to rethink how we're going about it. At this point, I'm thinking we need to create an amendment to a bill that's moving related to telecom and extend the due date and get this done right. And that's not going to be by RISI and CTC. They are conflicted and they should pay back the money they collected for the last Plan, which was not anywhere near close to the contractual terms.

The PSD followed statutory guidance in 30 V.S.A. § 202d(d) in the creation of this Plan, including but not limited to:

- ***On 2/12/2023, the Department reached out to the local AMO to discuss strategies for promotion.***
- ***On 3/4/2023, an advertisement was placed on WCAX. It was posted both on the WCAX website banner and broadcast via video livestream.***
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- ***On 3/13/2024, the Department reached out to VAN as we had not heard back from the local AMO. We were referred back to the local AMO, who then contacted us.***

The second portion of this comment does not pertain to the 2024 Plan.

Oh, another thing that's missing: the whole microwave system is missing. While they're embarking upon a \$99 million upgrade, which isn't in the state's ADS plans either, but there's an entire public safety task force that is already got a contractor underway who's going to do a PSAP call-volume fees analysis, and they really need to do it coupled with this. It's another reason to slow this rickety train down and get it on the right track. And that's going to be a year-long process. But the amount of knowledge we will have about radio systems, the regionally owned radio systems, the state-owned radio systems, that opportunity for cost-effective, concurrent design and build of LTE and LMR. If Public Safety's gonna have to densify their whole network to get P25 working, why aren't we putting LTE and LMR neutral hosts on those same poles in order to achieve the most cost-effective solution because they're all going to need generators. They're all going to need fiber backhaul or microwave backhaul. But then the statewide microwave system is a huge, totally missing from the Plan. Unless it's that reference to, you know, the state police's LMR backhaul, which is both fiber and [inaudible]. But the opportunity to redo the 911 system on a shared high-performance network, you know, there's no reason we couldn't have a network like Menlo Park and teach people to use it and attract people to come here and build businesses on it. But, the reason it's not happening is because we can't seem to get a Plan together.

According to the Department of Public Safety, there is no plan for a \$99 million upgrade to the state's microwave system. The Department of Public Safety states it has proposed to employ DOJ grant funding to migrate the Vermont State Police from its current ten-zone multicast analog topology to a ten-zone digital (P25) simulcast topology. Finally, the phrase "microwave system" is a misnomer. It consists of many individual point-to-point wireless circuits used for backbone connections for first responders.

Looking at B9, “An analysis of alternative strategies to leverage the State’s ownership and management of the public rights-of-way to create opportunities for accelerating the buildup of fiber-optic broadband and for increasing network resiliency capacity.” That was the language that was put into Act 71 that created the Broadband Board, that said a statewide, engineered, resilient design was both allowed and fundable with those funds. The Broadband Board chose not to do it on the claim that it would have slowed us down by two years. Well, here we are three years later, and it’s coming back to roost, that the lack of that statewide design means we’re not prepared with a resilience design to know where we would bury fiber with Green Mountain Power to create a carrier-grade, hurricane-proofed core network. What role should VELCO’s aerial fiber play?

The Plan discusses collaboration with utilities and the Vermont Community Broadband Board in Sections 1.3, 7.2, 9.2, 10.1, 12.8, and 12.9.

What role, what’s the potential of using similar Ciena dense wave division boxes at every CUD home to two different telco boxes to create a backbone that is self-healing and/or quickly restorable via, even if we have to go through New Hampshire or New York to get somebody lit back up after a fiber break. But that combined with underground fiber strategy, to support all the antennas that we’ll be putting up for this public safety initiative would have given us the best bang for the buck and probably come in under budget. So you wouldn’t have all the pole make-ready costs. You wouldn’t have all the pole-attachment costs. Central Vermont Fiber is \$400,000 a year for attachment costs. Those wouldn’t exist if the pole owners built, owned, and maintained the fiber and just leased it open access. CUDs would have a much simpler job. How did you get so far off course?

The overall roles of CUDs in the Vermont telecommunications landscape is discussed in Section 3.1.1. How individual CUDs make business decisions is not within the scope of the 2024 Plan.

Another thing that neutral host analysis for small cells fail to include the issue of spectrum, you know, FirstNet has 20 megahertz of valuable 700 megahertz spectrum. VTel’s got a lot of 700. The advantage that T-Mobile has around the rest of the country with the 2.5 spectrum is owned locally here. CBRS priority licenses are owned locally here in every county. We’ve got a lot of spectrum that could do a lot of good if we wrote a Plan that takes maximum advantage of it. Are we going to keep, you know, I talked to the Mac Mountain people and I don’t argue with the concept of neutral host but I don’t think we’re gonna get the carriers’ attention, one or two sites at a time. I think we would have to have aggregated the whole 200 sites or 400 sites and say we can provide this much additional coverage. But if we didn’t even get to the 76% that AT&T had offered in their secret plan to the governor, and experts have

said we should be shooting for 95% coverage. And if your in-laws come into town and they're on Verizon or you're on Verizon and they're on AT&T, y'all aren't connecting, you know, in the dead zones, so any state money at all should not go into single-carrier solutions, because it doesn't help.

This appears to call for the Department of Public Service to inventory the spectrum held by the state. The PSD is not aware of any spectrum assets held by the state or state instrumentality. Some private colleges held Educational Broadband Service spectrum, and the Vermont Telecommunications Authority entered into arrangements to assist these colleges to keep these leases intact. It is the PSD's understanding that the colleges nevertheless allowed these licenses to lapse.

And think about it from the public safety point of view. Let's assume all three major carriers had priority and preemption turned on for all eligible, but in a mutual aid, Vermont is mostly volunteers, 5,000 volunteers. They come from faraway areas. If they come from an area served by AT&T and they're coming to an area served by Verizon, their devices aren't going to work, right, without priority preemption roaming.

Both AT&T and Verizon claim to offer priority and preemption service to qualified first responders and there are no known issues with out-of-state first responders' connectivity.

So, that's just the safety imperative itself, and the increased coverage and the resiliency of failover for FirstNet and/or for Verizon public safety. I forget what they call their public safety offering. That brand name should have been in here too. And I don't know what T-Mobile's offering is either, but my point is that there's an opportunity to do this right, and the Plan is the place to flesh that out. Not by trying to undermine our competition statutes and not by trying to, you know, set up the Department as a grantmaker. Let's, you know, teach you all how to write a Plan first before we have you handing out grants.

The Plan has been revised to include the names of other carriers' public safety programs as appropriate.

The Telecommunications and Connectivity Advisory Board hasn't met in years, but back when they did, they gave \$16,000 per address to Comcast to build some addresses in Norwich, one of the wealthiest towns in the state.

Section 11.3.4 describes the current meeting cadence of the Telecommunications and Connectivity Advisory Board. The second portion of this comment does not pertain to the 2024 Plan.

So, there's a reference to all the Wi-Fi that was put up during the first year of the COVID pandemic, and nobody checked or logs the backhaul capacity that was speeding those. I mean, it was a lot of squandered money. And with, you know, nobody checked the battery backup. Nobody checked the longevity. Nobody put a contract under how long, and they were charged an annual maintenance fee with equipment was picked that required renewing an annual license for the software to use the Wi-Fi access point. Talk about encouraging people to turn it off. It was almost as big a fiasco as giving away all the Coverage

Co cells for \$1, \$100, or whatever it was. One cabinet was worth that for our future small-cell endeavors.

This comment does not pertain to the 2024 Plan.

2024 Telecom Plan - Input Session 2, Hearing March 20

Lauren-Glenn Davitian, Executive Director, CCTV Center for Media & Democracy, on behalf of Vermont Access Network (VAN):

Thank you for the opportunity to speak on the 10-Year Telecommunications Plan. Today I'm speaking in my capacity as Public Policy Director of CCTV and representing Vermont Access Network [VAN], as you know, I think a mutual aid society of Vermont's 24 access management organizations [AMOs], also known as community media centers. VAN is part of the state's social and civic infrastructure, from interactive local, state, regional public meeting and event coverage, election coverage, educational programs, including sports and media education, STEAM and skill-building for youth and people of all ages, nonprofit media production and planning support, open forums for the exploration of diverse ideas, and the preservation of local history. VAN's 24 community media centers deliver a breathtaking range of television and radio programs, counting more than 18,000 hours a year, and noncommercial local media services for free or below market rates to Vermonters in all corners of the state.

This point was brought home during the COVID-19 health emergency, when the legislature recognized Vermont's AMOs as an essential service that helped to keep the wheels of democracy turning through interactive and now hybrid meeting coverage, setup, and operations across the state. VAN members pull resources for joint projects, such as the video file-sharing Vermont Media Exchange (VMX), and the recently launched Vermont Community Television channel, which is available in HD on Comcast, cable, and stream live with programs and statewide interest at the website, vtcommunity.tv.

All of this is to make a larger point, which is that Vermont members, VAN members manage and deliver public, educational, and government access media services to cabled and noncabled communities alike. While PEG channels air on cable and are largely funded by cable TV subscribers, these services are now *largely delivered through the internet, and therefore should be considered part of the state's telecommunications planning concerns.*

Just as an example, CCTV and town meeting television just produced election coverage on town meeting day. Forums were covered all over the state by all the 24 centers, but our election coverage was viewed online by 7,000 people, and including our election forums, which counted probably three dozen, we had 21,000 views online. We're not able to count the cable views, but we know that we have a wide audience who are using fiber through their telcos, through their cablecos, essentially fiber, to access our services.

Thank you for providing this data and insight into access management organizations usage.

So just to start at the top very quickly, VAN offers the following comments on the draft 10-Year Plan. Given that the Federal Communications Commission just voted on Thursday to raise the benchmark for broadband internet to 100 megabits down and 20 up. This first

increase since 2015 is really important, and it's a speed at which all Vermonters should be able to expect. According to the Plan draft, 60% of Vermont households do not yet have access to these speeds, and this is in Section 202c(b)1, we agree with the Plan's recommendations to generally align the goals and directives across the statutes and in particular, to set universal 100/100 megabits as the goal for wireline broadband across all elements of telecommunications statute.

Regarding Section 202c(b)7, "*Support the application of telecommunications technology to maintain and improve governmental and public services, public safety, and the economic development of the State,*" we recommend that the Plan take a broader view than those recommendations outlined in Section 12.7 on page 65, and consider ways that telecommunications technologies can be applied using the partnership of Vermont's AMOs.

First of all, broadly speaking, we believe one of the recommendations should include that the state provide funding to support municipalities and regional bodies to plan, build, and implement hybrid public meeting coverage in those communities currently served and unserved by PEG AMOs. Funding for technical support and equipment purchased in those communities which lack the infrastructure could be implemented by Vermont's experienced PEG AMOs and/or by the public bodies themselves. This would extend the reach of democracy to all members of the community interested and willing to participate in local government and decision-making.

Thank you for your comment. Public, educational, and government access television was not part of the scope set for the 2024 Plan.

I think it's important to acknowledge the incredible asset that the archives of Vermont's 24 access media centers represent. CCTV's archives alone count more than 45,000 programs dating back to 1984. Recently, working with Middlebury College, we were part of a National Science Foundation five-year grant to establish Vermont Videographic Access Archive which would be accessed using online resources. So while this may not be germane to the Plan itself, which is quite preoccupied with broadband deployment, lateral goals to consider is the continued investment in the archivist's preservation position at the Secretary of State's office and to continue to support the Secretary of State's archival preservation program.

We are very concerned with the modernization of Vermont's telecommunications tax structure, and believe that public benefits in general could be modernized and rethought. That is happening in the legislature at this time, but it certainly is an incomplete process from our standpoint. And examining existing the telecommunications tax rates, including the Vermont Universal Service Fund, E-911, telephone personal property tax, and the cloud tax, and reconsider how these subsidies are distributed to users of the public network would be in order.

The Department is closely monitoring the work of the Legislature in considering changes to tax codes, and has testified about our views on that effort to committee.

Moving ahead to 202d(e), “*The Department shall coordinate with Vermont’s access media organizations when planning the public hearings.*” So while we were struck from the statutes the last time the statutes were updated as a concern of the Telecommunications Plan, we are included as a partner in helping to plan and to build an audience and to expand the reach of this process. So the first recommendation that we have is that you have a great list of stakeholders, including, for example, the Vermont League of Cities and Towns. And we think it makes sense given the important role that we play as an application of the telecommunications infrastructure that has civic, democratic, and social implications, that we be included as a stakeholder in future assessments.

Thank you for your feedback. The Department welcomes your comments to the 2024 Plan, and looks forward to your feedback on subsequent plans as well.

I have testified on more 10-Year Telecommunication Plans than I care to remember. Not that I care to remember, but that I probably can remember going back to the 1990s, at least. And it is a mystery to me why there are only one or two people here at these hearings, except that it's not a mystery. It's a lack of outreach. And given the amount of money that we're spending on the Plan for the research and the writing, which I understand is really necessary, I think that the Department, or the legislature, or whoever has to make the decision, I would put this in the recommendation, needs to seriously invest some resources into a) preparing these materials in advance so that they're easy for people to understand along the lines of the presentation that you just made, and that a serious outreach strategy be developed in order to include people who could, with this information, and with insight, could be educated to participate in this process. Otherwise, you're pretty much stuck with the stakeholders that you've listed, which I'm sure gave great input. I've no doubt about that. But what's the point of having a public hearing if there isn't outreach to make sure people come?

So one part of that is to provide VAN with more notice than 10 days, or even two weeks, of the dates of these hearings so that we can assist with using our network to help bring people in as well as broadcasting needs on our channels, but in particular to really think seriously about who are the groups, the advocacy groups, the organizations that represent low-income people, that represent public safety, that represent older people, all of these advocacy groups have constituents. And those constituents need to be mobilized in order to weigh in on these questions that affect where they live, where they work, and essentially their existence, functional existence, in the state of Vermont. So thank you very much for your time.

The PSD followed statutory guidance in 30 V.S.A. § 202d(d) in the creation of this Plan, including but not limited to:

- ***On 2/12/2023, the Department reached out to the local AMO to discuss strategies for promotion.***
- ***On 3/4/2023, an advertisement was placed on WCAX. It was posted both on the WCAX website banner and broadcast via video livestream.***
- ***On 3/7/2024, the public meetings were added to the Department of Libraries public meeting calendar for state agencies.***

- **On 3/11/2024, a press release and announcement with a link to all of the meetings was posted on the Department of Public Service homepage.**
 - **On 3/13/2024, the press release was emailed to all stakeholders interviewed for the Plan.**
 - **On 3/13/2024, the Department reached out to VAN as we had not heard back from the local AMO. We were referred back to the local AMO, who then contacted us.**
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F. X. Flinn, Chair, ECFiber:

So I want to begin by saying this is by far the best 10-Year Telecommunications Plan I've ever read. And you guys did a bang-up job. So two thumbs up.

Thank you for your positive feedback.

I just want to offer a couple of comments, suggestions, and I will provide you with my marked-up copy of the Plan. So taking it in order of what we need to do locally here in Vermont, as opposed to nationally, and things that we need to do immediately, versus things that are going to take a while. I want to address the workforce concerns, I want to address the mobile enhancements, particularly the small-tower program, I want to talk about burying infrastructure, and I want to talk about affordability. And I'm doing all of this based on my role and experience as chair of ECFiber.

VCUDA is going to be coming on Friday evening, the board of VCUDA. I'm the secretary treasurer of that organization. We're going to be meeting tomorrow and discussing that. I'm sure that VCUDA is going to be bringing in some comments as well. So I'm not trying to anticipate those.

Alright, with respect to workforce, the VCBB and the state colleges got serious about working on this. And it's been a very, very tough row to hoe. Okay. I honestly believe that the state needs to recognize that there is no way we're going to be done in 2029 with the amount of workforce that's available to us. And I think the state needs to think seriously about looking to see whether or not it can create some kind of a long-term incentive program to get another 20 or 40 or 60 people to come here and work here for the next five to seven years, at which point in time, they would get a significant bonus of some sort. Just an idea, but it's that serious a problem that if there is not some way to super incentivize people to come up here and do it despite the housing challenges, despite the cold weather challenges, we just are not going to meet that 2029 goal. Okay.

Section 8.3 has been revised to include the suggestion that an incentive program similar to existing workforce incentives be considered.

Secondly, with respect to the idea of the small towers, now that pilot project is one that relies on ECFiber's fiber in that area, and ECFiber would like to go ahead with this. I know Mac Mountain would like to go ahead with this. But nobody wants to put up that million, \$2 million, \$3 million to get it off the ground and see, you know, whether or not this can really

work because there are open questions about what kind of revenue will flow through. Will it be enough to sustain it in terms of any repairs, equipment upgrades, things like that. In concept, it looks like it should work. But there's a limit to the willingness to invest in this idea without knowing that the state's kind of got our back. I think that, because face it, if this proved out, and it would make sense on its own, there would be private capital available, right, and the state wouldn't have to get involved. So it's a really inexpensive way for the state to find out whether that'll work.

Thank you for your comment. The Department concurs that a pilot project is the appropriate next step to test and refine the viability of this approach. Section 10.2.3 details the proposed pilot grant program.

I also saw a few things in this Plan about CUDs and other small carriers needing to become carrier grade or enterprise grade. And I have to say, I read that as the big cellular companies not wanting to get involved with doing small towers, or anything else, because they, you know, they are looking at huge costs to go with dark fiber from the major dark fiber providers, who in many cases would not be, you know, who are enterprise grade, who in many cases are not on these small roads, they would have to put up, you know, additional fiber, and then charge the cell companies rates far above what, say, ECFiber would charge for dark fiber. But by the same token, ECFiber, we don't, we're not in a position to offer the kind of contracts for businesses that show that you are carrier grade, or show that you're enterprise grade. And the willingness to invest, to get to that point does not exist right now because we're busy enough, fulfilling our original mission of building out in a Vermont where when we're talking about residents and businesses, you know, we're really talking about small businesses, essentially, residential service's fine for them. And, you know, the big institutions, the hospitals, the major manufacturing firms, they have long been able to go and purchase carrier-grade internet, at market rates, you know, wherever they locate themselves in Vermont, so there's not a market incentive for us to ramp up to that, because frankly, there just isn't enough business that we might win from those folks in our service territory. So I would be careful about giving a lot of voice to this call for carrier-grade CUDs and enterprise-grade CUDs at this state of CUD development. I mean, here we are ECFiber, we've been in business for 13 years, and we're not ready to take that step. So it's the 10-Year Plan we do in 2030 might more fruitfully address this, okay.

Thank you for your comment. Sections 7.3.3 and 9.3 of the Plan have been adjusted to provide additional clarity regarding carrier-grade and enterprise-grade service.

In terms of burying infrastructure, you know, right now, and understandably, Green Mountain Power is deciding where and when they're going to do, you know, what aspect of this of this grid hardening. That's understandable, but it's frustrating for me to talk with our operator and say, hey, when we were going over the build-out plans up in Newbury and Topsham and we noticed that long run of easement poles going across hill and dale, now that's exactly the kind of thing Green Mountain Power wants to get into underground along the road. So, you know, can we make sure that that gets done now and if they're not going to do it now, then maybe we should go out and contract with somebody and we should put the conduit down the road and make sure we put in conduit sufficient for GMP and then they can buy that work for us. Well, GMP is not having that type of conversation with us. Okay. Not

that they don't want to necessarily, but it's that they're not far enough along either and I don't know what the incentive is, but if the state's 10-Year Plan can incentivize all of us to be focused on that issue, I think that would be a huge improvement.

The Department affirms that coordination and communication between utilities and fiber builders is critical; thank you for relaying your experience. The Plan discusses collaboration with utility companies in Section 10.

And then finally, my last point about the affordability issues. I'm just a little bit disappointed that the fact that ECFiber offers a \$20 private subsidy on top of the \$30 ACP subsidy isn't noted in this report. I think that's kind of a cool thing that we do as a district. I also, I would say that we have a lot to bring to the table, a lot of learning that we did, because ECFiber donated \$250,000, over the course of the last three years, to stand up Equal Access to Broadband, which went through the process of finding out how to identify and reach out to and do navigation for households in order to get them qualified for the ACP. And, you know, frankly, it turned out to be really like pulling teeth, because EAB was not granted recognized agency status by the state. So they couldn't find out which households, in a particular town that we had complete service in, should be contacted to see if they would like, you know, can we help you get into ACP, etc., etc. So it became a, you know, became a super difficult process. And there's, there's all that learning.

Thank you for your comment. Section 5.3 of the Plan has been updated to include a reference to ECFiber's subsidy.

And, on top of that, you know, we've got the BEAD digital equity thing going on. Now we have the proposal that is coming into the legislature, where they're going to give, they're going to create this additional or new or revised telecommunications tax, they're gonna put some of that money into the agency for social services to figure out what to do. And I'm telling you, at VCUDA, we're like, ah, wait a second, okay, we can't have three different things going on.

We've got to get all the stakeholders together at a table. So VCUDA will be recommending to the legislature that they establish a study group that makes sure that every single stakeholder in the state, who either knows about how affordability actually works on the ground with a customer and an ISP, to how households can be identified, i.e., the Capstone agencies, to the people who are doing digital equity work nationally who are influencing and helping put together the digital equity program for BEAD in Vermont, which will result in a grant, and that grant money, it can't go to the state broadband office, i.e., VCBB, okay, it goes, it's got to go to a private entity, so you would think, okay, the Capstone agencies, right? Or VCUDA or something like that. I don't know, I just think that in Vermont, we can be smarter about this. And, we can get this right. But we have to realize that we can't, there's not a lot that we can do right now, immediately.

Thank you for your comment about VCUDA's upcoming legislative activity.

And this idea of, you know, \$19 million. Really, if you ever got that passed, it would immediately be a \$40 million program, because it'd be so much easier for people to take part in. So it's not really a \$19 million program. It's really a \$40 million program. I just looking at

the politics of everything right now, especially with what was going on with the schools, hard for me to see that getting started at this stage of the game in the legislature, not going to be until next January. There's a lot of time between now and then. Get all the stakeholders together, figure out a way forward. And if that way includes action that the state legislature has to take, then when the legislature convenes next January we'll be all set with, you know, with draft laws.

The Department concurs with your comment. Section 5.5 notes that interest in a state-run plan is likely to be greater than interest in a federal program.

And finally one last thought that there's no affordability without availability. And I was really happy that the Plan emphasized that the CUDs need to focus on getting their network built right now. They really should not be distracted by an effort to force them to be the most affordable option everywhere in their district, right now. ECFiber's not there and we've been at it for 13 years. So I'll just say that. Okay, thank you.

The Department concurs with your comment. Section 9.3 focuses on the current capacity of the CUDs.

Senator Irene Wrenner, Chittenden North district:

My name is Irene Wrenner, the Solo Senator of the Chittenden North District. I was appointed last fall to the Joint Information Technology Oversight Committee. I am new to the world of telecom, but I have worked in another tech field in the past. I am not representing anyone but myself, and I am here to gain my own understanding of the issues.

I would echo the comments from Lauren-Glenn about more effective outreach. We've grown accustomed to remote participation, but lighting, sound, and bandwidth can vary from site to site.

I would suggest returning to a VT Interactive TV model, so that all the residents could attend a remote session in their region and have equitable access to these proceedings.

The PSD followed statutory guidance in 30 V.S.A. § 202d(d) in the creation of this Plan, including but not limited to:

- ***On 2/12/2023, the Department reached out to the local AMO to discuss strategies for promotion.***
- ***On 3/4/2023, an advertisement was placed on WCAX. It was posted both on the WCAX website banner and broadcast via video livestream.***
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Vermont Interactive Television – later called Vermont Interactive Technologies – ended in 2015. At this moment, the Department does not advocate for resurrecting that program, especially since home broadband is expanding significantly and access is improving rapidly across the state.

I see a couple of pages in here devoted to FirstNet. And also priority and preemption are defined, but only for that carrier. I wonder what is the failover solution when FirstNet goes down as it did just a few weeks ago. The Plan also doesn't speak to the recurring problem of fiber cuts. Plan should document recent ones as case studies so we might better prevent and remediate future outages. Thanks.

According to the Department of Public Safety and the Enhanced 911 Board, FirstNet, which is a Commercial Mobile Radio Services (CMRS) provider with an underlying network operated by AT&T, experienced an outage on February 22, 2024, from approximately 3:45 a.m. to 8:30 a.m. Many first responder agencies employ multiple unrelated communications methods – including subscribing to different providers, using LMR networks, or even satellite-based services – to protect against service failures in individual providers.

The Department has communicated with the Agency of Digital Services, which manages the statewide network. Vermont can mitigate the risks of fiber cuts with redundant and diverse routes from different providers, which is described in Section 10.5.

Section 9 has been revised to provide a high-level explanation of how first responder priority and preemption works.

Stephen Whitaker:

I'm gonna touch on a number of topics. Especially regarding the public safety, the Public Safety Communications Task Force met today. It could be almost weekly or biweekly. And what's lacking in that regard is again, I've pointed at the deficiencies of prior plans, we could have by now established in a plan two or three iterations back what the architecture for a statewide public safety network building from the state microwave network, which is kind of the last resort when all the grid collapses, it's generator protected, it's line of sight. It's fiber to those towers. I don't know whether it's buried or not. But presumably it is, if not, it should be. That's in effect maybe the only way for us to deliver 911 calls and transport radio signals to towers after a big disaster.

And beneath that is the state police statewide Land Mobile Radio Network that utilizes that microwave network for long haul, but also has fiber [inaudible] diversity.

And then there's the regional networks, and the recent RFPs for the public safety planning surprised everyone by saying they're building a statewide trunk radio network in the future. But no one has ever agreed to that, authorized that, put any cost numbers. That could be hundreds of millions of dollars, because they'll also have to replace every portable radio of every first responder and every vehicle radio that are compatible with a trunk system. So without this architecture having been defined, we're squandering money and we're going down dead ends in a very reckless manner. While the \$9 million in congressionally directed spending is at risk of being forfeited if we don't spend it by the end of the year. But they're kind caught in a vice between spend it without a plan or spend it on assumptions that haven't been validated yet. And it's chaos and that's the purpose of a plan is to guide those decisions. But if the plans haven't been done year after year after year, we're flying blind or we're rebuilding the airplane engine while we're in flight. And it's a lot of shared responsibility there. So, I've made a graphic of that concept, but I won't will try to...

Portions of this comment do not pertain to the 2024 Plan. However, to provide clarity, there are no plans for a statewide trunk radio system. In addition, the \$9 million grant funding has been extended to the end of 2025 and a scope change is in the process of being approved at the federal level.

There is a, the administration is interpreting the statute founded 3 V.S.A. 3301. There's a definition of information technology activities. And those, that definition governs telecommunications network because all telecommunications networks today are built out of information technology: routers, switches, circuits, microwave, fiber, whatever. It's all information technology, including all the phone carriers, all the broadband carriers, it's all information technology under that definition. But yet, and that's what triggers planning requirements in 3 V.S.A. 3303. Those planning requirements are to protect both the integrity of the planning, as well as the finance. We've had lots of big IT disasters over the years. And I think we're heading for one again with our broadband investments. But my point is that it can't be left to the agency that's supposed to conduct our contract for the independent review of these massive investments. And anything over a million dollars has to have an independent expert review. Anything over half a million has to have a whole series, it's laid out in 3303, a series of elements of plans that are all to be on file at ADS. The problem is that they're claiming that these public safety IT investments are not IT investments, therefore we don't have to plan. So we're headed for a train wreck there. Again, precisely because we haven't planned, we haven't defined what it is we're doing or how the statutes apply to it.

This comment does not pertain to the 2024 Plan. 3 V.S.A. § 3301 refers to the Agency of Digital Services.

Similarly, Alex spoke about the Statewide Communications Interoperability Plan. You can't hold that hostage for more money. You've got a staff, you've got a department, we've got a telecommunication staff president in the room, y'all should be writing the Plan, not squandering \$400,000 on a firm that cheated us last time. Y'all should be writing the Plan. And if I have my way, we're going to extend the deadline for this Plan, conclude their contract, they'll take the money and run. And y'all will finish the Plan and make it right this time, because they've proved that they can't do it.

This comment misconstrues Section 9.5.3, which addresses the SCIP. The second portion of this comment does not pertain to the 2024 Plan.

So the senator brought up the issue of the failure of AT&T and FirstNet. It failed for upwards of 11 hours on the 22nd of February. The governor opted into FirstNet in 2017, even though we had evidence ahead of time that there was not a disaster recovery plan. It was missing. They claimed that document was secret. I didn't think so. I thought it was essential to put it out there. The legislative committees refused to look at it. So here we are.

According to the Department of Public Safety and the Enhanced 911 Board, FirstNet, which is a Commercial Mobile Radio Services (CMRS) provider with an underlying network operated by AT&T, experienced an outage on February 22, 2024, from approximately 3:45 a.m. to 8:30 a.m. Many first responder agencies employ multiple unrelated communications methods – including subscribing to different providers, using LMR networks, or even satellite-based services – to protect against service failures in individual providers.

Six years later, this draft Plan says that we don't have substantial more coverage than we did in 2018. But yet FirstNet claims they put 50 towers out there using our \$25 million and our \$30 million worth of band 14 spectrum. Those both the \$25 million cash from NTIA and \$30 million worth of spectrum, that's an educated estimate, would have been at our discretion to use to build a reliable grant that would not have been vulnerable to AT&T's policy update processes. So oh, this Plan refers to the public safety, governance, and the SCIP as being governed by, it's so blatant the misinformation that it refers to, oh, it's being advised by the Emergency Communications Advisory Council. The Emergency Communications Advisory Council was created four years ago by executive order, but it's never had anybody appointed to it. So to be putting in the Plan, that this ghost empty council is advising on this stuff is absolute fallacy. You know. Why didn't y'all fact check this thing before you put it out for public comment? That's just one example. Right? I've raised it. My last comment.

The Plan does not claim that AT&T put up 50 FirstNet towers; instead, it makes clear that a substantial number of FirstNet sites were upgrades to existing towers. Also, the Plan reflects the governance structure described in the current SCIP, available on the State of Vermont's website and linked in Section 9.5.3 of the Plan.

Oh, I'm going to pause for a second. The transcription that I received even though it did have names in it is useless. That accuracy of the transcription is useless. I asked the director of electrical planning, I believe there's a statute that requires statutorily required public hearings to be transcribed professionally. These hearings are too important.

There is no staff member with that title. The Department is also unaware of any statute requiring professional transcription.

But my way of viewing it if y'all didn't do the precursor prerequisite, you got to start over anyway, you've got to do the 10-year forecast, all the things that it says you have to do before you put the Plan together, you've got to go back and do those and then put a preliminary draft out. So I would ask you to read the darn statute very carefully. Because I've been paying attention to it for 30 plus years, and it was only written like 35 years ago. So take heed.

Please see Appendix B: Alignment of Plan to Statutes for a full crosswalk between 30 V.S.A. § 202 c and d and the sections in the Plan. In particular, please see Sections 2.4, 2.5, 3.1, 4, 6, and 8, and the following:

- *Assessment that telecom planning should assume a Vermont population of 800,000 despite current population trends (Section 4.3)*
- *Description of remote work trends in Vermont (Section 2.5)*
- *Analysis of technology trends, such as fiber scalability, cable upgrade options, Starlink service, text to satellite, and others (Sections 3 and 6)*
- *Description of telecommunications technology as it relates to transportation and vehicle connectivity (Section 6.3)*
- *Description and analysis of climate change impacts and patterns in Vermont (Section 4.2)*

I did a public records request to the Department of Public Safety regarding the FirstNet outage, the AT&T outage. And, I should have done it to you, Hunter, because it says the only people who got this email from Barb Neal, were Hunter, Jenn Morrison, Commissioner of Public Safety, and the E-911 Board Chair Roger Marcoux. Now they're claiming it's governor executive privilege. Right. But it's about policy development advising the governor, the record is protected on operational decisionmaking and communication strategy? Well, regardless of whether it's executive privilege or not, how to prevent and what did we learn from this massive outage of the too-good-to-fail FirstNet should have been in this Plan. You know. You'll have to break executive privilege, breach executive privilege to put it in the Plan. Because why did it happen? We can't let it happen again. We need to failover to the other carriers with priority and preemption. You know, and that's a whole architecture that should be in the Plan. Instead, you're advertising for Mac Mountain, ignoring VTel's assets, you know, you're advertising for FirstNet, ignoring Verizon's assets with priority and preemption. This is ludicrous. Did y'all not catch these blocks? Right? Are you just taking whatever Alex and RISI feed you because they got the \$400,000?

The CUDs are attempting to merge to better position themselves to compete for BEAD funds. BEAD funds are competitive based on the number of unserved addresses, and they fear that Consolidated or Comcast will win their share of BEAD funds, because they have a greater concentration of unserved addresses within their reach than the CUDs don't have. And so by combining CUDs, this was done in Environment and Energy Committee today, by combining CUDs, they'll better position the quantity of unserved addresses to compete.

This comment does not pertain to the 2024 Plan. However, according to the Department of Public Safety and the Enhanced 911 Board, FirstNet, which is a Commercial Mobile Radio Services (CMRS) provider with an underlying network operated by AT&T, experienced an outage on February 22, 2024, from approximately 3:45 a.m. to 8:30 a.m. Many first responder agencies employ multiple unrelated communications methods – including subscribing to different providers, using LMR networks, or even satellite-based services – to protect against service failures in individual providers.

But why didn't, when Southern Vermont CUD decided to partner with Consolidated, why didn't they put a prohibition, a noncompete clause in there? And say, if you're going to take this work, you can't compete against us, you'll be fined. It's like who advised that contract? And how did we, how did you adhere to a statutory goal of competitive choice and open access in entering that contract? Instead of laying out strategies to accomplish the statutory goals of competitive choice for consumers and open access for competitors, this draft attempts to end around them and says, oh, we'll change those, we'll get somebody to change those for us so that we don't have to have competition. But to pretend that we're going to accomplish the goals, I just heard this twice now, we're going to accomplish the goals of competition, meaning better speeds and lower costs and better customer service, by granting monopolies when you've got no lever to accomplish those goals. It's a wing and a prayer. You're not going to. These are volunteer-run organizations.

This comment does not pertain to the 2024 Plan.

I'll jump to the carrier grade issue, again, that requires engineers, \$200,000 a year engineers, to do carrier grade. So the idea is absolute fallacy that we're going to turn to CUDs and get carrier grade, because they're never going to have the economics. Most of them don't have the economics to create a sustainable staff. But the lack of transparency, the lack of transparency of what they are doing and what their agreements with the operators are doing and how that's affecting rates and how quickly things are going to be fixed. We're going to leave a lot of people without landlines during power outages with only a fiber connection, and possibly not even cell coverage, without an ability to call for help. And that's going to be that's going to be on y'all. You know, I hate to say it, but this is the problem of failing to plan year after year after year or decade after decade.

This comment inaccurately reflects Section 9.3, which focuses on the current capacity of the CUDs.

So I got like, just a couple more things. Okay, so an inventory is needed, an inventory is needed of what's in our right-of-way, in order to inform the legislative process about where we're going to get the money to do this work. There's the 911 shortfall, there's the Lifeline shortfall, TDD, 211, 988, PEG access. I'd also recommend that the AMOs. They made a good pitch today for what services they provide. I think we need to elaborate or consider at least that y'all in the Plan should consider positioning the AMOs as the first public information vehicle during disasters. They could and should have generators, they could and should have diverse connectivity, even underground. They should have potentially low-power FM, they should be taking the load for public information off of the first responders to be out there saving people and beginning to remedy that disaster. The demand for information on first responders should be outsourced to the AMOs with proper funding and infrastructure. That's a viable, especially in that they're asking for continuing public money, that's a good quid pro quo to expect something back. The inventory needs to be done statewide. And I believe that, at this point, ignoring the electric infrastructure in the public right-of-way, ignoring the gas infrastructure, and ignoring VELCO, ignoring Green Mountain Power's fiber is a mistake. I think we need to inventory everything into GIS that's in our public right-of-way, and then tie that to a financial model, and allow the legislature to then tinker with who's exempted, who pays what rates. But with that kind of a system, you can fine-tune

subsidies and accommodations for new emerging competitors or CUDs or whatever, whoever needs the handicap. But without that kind of, that's an information infrastructure to complement the utility infrastructure in the right-of-way and to create a revenue source to sustain it.

Thank you for your comment and suggestions.

The other, the neutral host model proposed, I believe there's some weaknesses in the Mac Mountain chapter. But the whole elaboration of neutral host options based on spectrum, based on shared radios, or new Open RAN radios where the individual carriers could have their own infrastructure needs to be elaborated, because there's a potential, and I verified this, there's a potential to use those roaming agreements in that spectrum in a way that generates revenue to maintain the public safety radio network. This is something we really need to consider because ongoing funding for this public safety communications is as difficult an issue. That stuff needs to be replaced every 15-20 years. And so we're talking \$100 million, maybe more, and then another \$100 million. So we need to be really acting now to put the information infrastructure which is based on GIS inventory of what's in the public right-of-way.

Thank you for your comments regarding Section 7. We agree that ongoing public safety funding is important. Section 7 has been revised based on comments from others.

As far as secrets, there's just been some language crafted for a professional study by a lawyer and an engineer to tease apart all the alleged needs for secrecy. Deal with Homeland Security, critical infrastructure, deal with trade secrets, deal with system security exemptions, but otherwise, tease it apart. Even CUDs. They don't need, they need secrecy of what they're going to build next so that Comcast or Consolidated doesn't run out ahead of them. They don't need secrecy for what their operating agreement with Waitsfield is. You've just expanded the footprint of Waitsfield as a regulated ILEC by tenfold via the CUD agreements and fiber VOIP, and yet no regulatory teeth at all. And yet, that's exactly what we should be doing with the backup power to make sure people can call for help in an emergency. I'll leave it at that.

This comment does not pertain to the 2024 Plan.

2024 Telecom Plan - Input Session 3, Hearing March 25

Stephen Whitaker:

I'm a bit dumbfounded that even after having provided the information a week ago about the Department of Public Safety and the Public Safety Communications Task Force efforts that this presentation is still so misguided. Specifically regarding the consolidation of PSAPs. I'm gonna cover a number of points here and I'll probably run over three minutes. So if you notice anybody else jump on, I'll take a pause.

Statute is statute. 202 c and d and Title 30 are not to be wished away because we're trying to get away with writing half a plan or impose a new ideology on Vermonters. So I found your transcript kind of useless. So statute is statute. Act 71 is not a binding factor on, or it's not a notwithstanding clause that allows you to violate 202d with regard to how you go about this Plan. The Department and the Telecommunications Division cannot abdicate its responsibility to make sure 202d is adhered to strictly even though you've signed a \$400,000 contract with RISI, which I consider snake oil. They failed us last time, they're failing us this time, and we need to put a stop to it. Every prerequisite as laid out in 202d must be met before the Plan is prepared and these hearings are held. I pointed out to you a handful of prerequisites that have not been met. I've seen Hunter nodding in agreement. Every element such as public participation and an effective public participation process must be met. Coordination with the access media organizations must be met. Are you not at all suspicious that only one person showed up last Monday and only one person appears to be here tonight, that you haven't met your basic threshold of an effective public participation process? And you must address every element it set in the goals and policies of 202c. Those aren't optional. Where it says shall "*support competitive choice for consumers,*" shall support open access for competitors. These are not things you can let your contractor try to wish away and write a Plan that dodges them and pretends we're going to just get lower costs and higher service by wishing it were so. That's delusional thinking. Statute actually says that we'll have 100/100 by 2024. And yet, the failure to write a Plan over the last decade has left us in a place where we still don't have a Plan to get it done by the end of this year. So our fiber strategy is fundamentally flawed and yet it's also been left out of this draft.

The PSD followed statutory guidance in 30 V.S.A. § 202d(d) in the creation of this Plan, including but not limited to:

- ***On 2/12/2023, the Department reached out to the local AMO to discuss strategies for promotion.***
- ***On 3/4/2023, an advertisement was placed on WCAX. It was posted both on the WCAX website banner and broadcast via video livestream.***
- ***On 3/7/2024, the public meetings were added to the Department of Libraries public meeting calendar for state agencies.***
- ***On 3/11/2024, a press release and announcement with a link to all of the meetings was posted on the Department of Public Service homepage.***

- **On 3/13/2024, the press release was emailed to all stakeholders interviewed for the Plan.**
- **On 3/13/2024, the Department reached out to VAN as we had not heard back from the local AMO. We were referred back to the local AMO, who then contacted us.**

Please see Appendix B: Alignment of Plan to Statutes for a full crosswalk between 30 V.S.A. § 202c and d and the sections in the Plan. In particular, please see Sections 2.4, 2.5, 3.1, 4, 6, and 8. The full and correct language of 30 V.S.A. § 202c is available in Appendix A.

CUDs aren't even happy with this draft because it's all focused on wireless and other priorities that don't address the merits or the guidance or the returning of the fiber strategy. Since this program was initiated, build costs have increased dramatically, as have labor costs, as has the cost of money. Additionally, the CUDs have not built the right-of-way charges into their economic models. So you're headed towards a whole bunch of bankrupt CUDs and a whole bunch of fiber getting sold to the highest bidder, which might be, you know, Consolidated or Comcast. That would be a supreme disaster. And yet y'all are keep supporting this keeping of unnecessary secrets of the financial models. The secret financial models will not lead to affordable broadband.

The Plan discusses CUDs in Sections 3.1.1, 7.3, and 9.3. In addition, CUDs have contributed public comments included in this Plan.

We need a network design over all the whole state, and this was defeated by the language that was put in Act 71 to allow a unified statewide resilient engineered fiber design and the Broadband Board ignored it and proceeded with this hodgepodge of different strategies of network architectures that don't support competition, that don't support failover in resilience. So we need remotely reconfigurable. We could have and should have built on the VELCO architecture and required every CUD to buy a compatible remote add/drop multiplexer that can be even managed by VELCO and keep and reroute around fiber breaks during big storms, all from a single console in Rutland. That would have been the most affordable way to go about this. But the backhaul trunking in place on an existing networks. We need to be using FirstLight's fiber, CCI's fiber. We have open access conditions on some of FirstLight's fiber because we granted the money to Cybernet in the beginning. That has never been elaborated or elucidated in the Plan. Exactly where do we have what rights of access, at what cost to Cybernet's fiber that we paid for under the BTOP Program.

Similarly, with Consolidated Communications, as a condition of a service quality investigation, they accepted the millions from the FCC and they built the interoffice fiber to the remote terminals. We should have open access to that fiber too before they get another incentive plan approved. And this same firm, recommended oh don't tie open access fiber to incentive reg plans, that's the only lever we have with regards to incentive reg plans is the teeth in this Telecommunications Plan.

The comment misinterprets the legal framework available to the State of Vermont in regulating the entities described in this comment.

I would encourage you to get familiar with 226b in Title 30 and understand that this Plan's most effective statutory leverage is in no incentive reg plan can be adopted or approved by the Public Utilities Commission if it's not found to be consistent with this Plan. So that's a way that we could have and should have implemented open access to the interoffice fiber that was paid for by that settlement.

There's been some talk of carrier grade or some analysis, which is useful. And then you have Evan Carlsen, who was here for the faux TCAB meeting saying that we're all building carrier grade, and F. X. saying we've been at it 13 years and we're nowhere close to providing carrier grade. So you've got a disconnect there, but public safety-grade, carrier grade, utility grade, the distribution utilities are implementing an architecture of distributed storage and distributed generation, big battery containers and solar fields and wind turbines that can be accessed and access the grid and even fall into microgrids to keep folks online when the whole regional grid might go down. That can't be done with consumer-grade fiber designed for, you know, that requires a level of engineering that we have failed to do here and we can't afford to waste this money and do a half-baked job. So we need an integrated planning process. It's going to be challenging to change paths at this date, but we must. We must if we're not going to waste this money and end up with the job half done.

We need integration of dense wave division multiplexing building off of the VELCO network. We need active fiber Ethernet. We of course need internet, that's what we seem to be fixated on. We need fixed wireless access. It's not going to be economical for the Northeast Kingdom and many other areas to do, you know, an extra mile of fiber to serve one address. You know, it will never pay itself back. Everywhere that fixed wireless access can provide a final or replacement fiber drop, it'll leave more money to get the job done in the more dense areas. We need neutral host LTE to fill the dead zones and to provide public safety failover when FirstNet fails again.

We need a failures analysis. We've had fiber cuts, I believe three in my memory in recent years, that took down all the state systems. And yet there's no analysis of that, what caused it, or how to prevent it in the future in this Plan. In this trap. We need an analysis of cloud hosting. Our state government phone system, our Zoom and Teams video platforms, our Cisco video platforms are all hosted on out-of-state cloud servers that will not be functional after a big storm and a lot of backhaul is taken down. So what state applications are dependent on remote cloud and what needs to be hosted on in-state cloud in order to support restoration from a disaster?

These state-level functions are led by the Agency of Digital Services and discussed in Section 9.1.

GMP underground, there's scant mention of that. GMP has begun and done a few pilot projects of underground burial of power cables. It's called a vibratory plow and it can bring four tubes at once, bury four tubes at once, in one pass, repacking over the top four feet deep. That's typically going to be three phases of AC current and a second conduit that can be used for communications. That begs the question, which communications carrier's gonna get in there first, or are we going to insist that that be a neutral host platform that any carrier can provide in those spans? This is urgent because once those ditches are open and

closed, we're not going back to redig them in the same place, and that machine can only reach so far off the road. There needs to be statutory authority to constrain what municipal officials can make unrealistic expectations of how far off the road they're asking the vibratory plow to go. So the machine can't reach 20 feet off the road. So if we're going to do this, who's going to pay for settling later, as this ditch settles and culverts or whatever need to be fine-tuned? Is that the electric ratepayers, is that on Green Mountain Power, is it on the fiber conduit, is it on the contractor? You know, these things need to be addressed or we will have another huge missed opportunity to not get.... I'm especially concerned with getting buried cable up to the mountaintops where our emergency communications are located already or will additionally be located, because we can't afford to have a windstorm or an ice storm tear down our backhaul to our emergency radio systems.

The Plan discussed coordination with utilities and private entities in Sections 7.2, 10.1, and 12.9.

So the pole-owning utilities should be building and maintaining the fiber, including repair obligations. That's the only economical way to take maximum advantage, to adhere to the open access statutory requirement. I mean, have you all not called your contractor on the absurdity of ignoring the open access requirements? It's in statute and pretending, oh, we'll just fix that with changes in the statute later. Are you really thinking of allowing RISI to get away with that? That can't be, you can't have written a contract that allows that. The contract says you will adhere to statute and are you just overlooking that? That's smoke and mirrors.

Open access networks are addressed in Section 7.4. The rest of this comment does not pertain to the 2024 Plan.

So we need to rethink our design and pursue a statewide integrated design. We need to address the secrecy of CUDs, and what is legitimately critical infrastructure, what is legitimately security sensitive, and what is legitimately trade secret. And everything else should be public. Again, that information analysis is missing. So again, either the integrated planning is required now with Green Mountain Power, FirstLight, CCI, VTel, the CUDs, VELCO, and Lumen. I know AT&T still has a few strands of fiber from the old days. I'm not sure we would try get on any of that.

The Plan discussed coordination with non-state entities in Sections 7.2, 10.1, and 12.9. Section 3 details the current state of telecommunications infrastructure and coverage in Vermont.

The neutral host LTE infill strategy is going to require spectrum. It's going to require towers, it's going to require engineering and maintenance expertise. It's going to require billing, it's going to require roaming agreements. The pathetic proposal to try to pick it off one little pilot project at a time, you know, is really absurd. It will not get, we will not see success. And this has to be totally integrated with the work that Mission Critical Partners is doing for the Public Safety Communications Task Force. You really need to get up to speed and get....

Thank you for your comment. Section 9.5 has been revised to provide additional context on the work of the Public Safety Communications Task Force.

Again, I don't have any illusion that we're going to be able to do turn this sow's ear into a silk purse by June. I think we're gonna need to postpone the adoption of this Plan for another year and figure out what team is going to clean up the mess after RISI fumbled it for a second iteration and \$600,000 of public money later, or go after return of some of that. So you need to get busy with the prerequisites for a Plan and the AMO coordination to get the public involved to participate in this. You can't just run on and pretend you're going to get away with carrying on a charade of a statutorily required process and implement this Plan.

Distance education, public meetings, statewide public meetings managed by the statewide channel that was part of the settlement with the access media organizations, prisoner visitation, courts, arraignments, etcetera. We need high-quality sites for along the VAT model where the lighting, the microphones, the bandwidth, the speakers for people who are present in the room are all first rate. We cannot compromise the rights of prisoners. We cannot have the historical archive of our public meetings be unintelligible as some of these transcripts and some of these recordings are, based on insufficient attention to detail of where these people are trying to connect from. It may be that remote participation and legislative process in these hearings should have to be at a certifying site that has the proper lighting, microphones, and bandwidth to support proper participation and recording.

Same with [inaudible], the nursing program flunked everybody out when the colleges switched to, you know, there'll be platform, literally more than half of the students flunked out. It just didn't work.

And I'll touch briefly on the wireless. The initiative that we did at the beginning of COVID: throw a lot of wireless access points out there and not check whether the backhaul connectivity was sufficient to support any number of users at a time and then let that whole system atrophy. We should have planned that properly and strengthened it so that the next storm or disaster, people know where they will be able to go and pick up some Wi-Fi if all their home systems are down.

Locating what's in the public right-of-way needs to be a priority. Comcast has been hiding for years behind the fact that their amplifiers that power the nodes, the green boxes this, you know, two-foot cube boxes, when those lose power from a car accident or a meter getting smashed or whatever, an entire section goes dead and no one can make a 911 call. And that can't be allowed. We need to strengthen that network and as well as strengthen solutions for all customers, new and emerging, current and emerging, to have emergency calling access, regardless of the grid status.

I think those were the couple points I'd forgotten.

This comment does not pertain to the 2024 Plan.

Emailed Public Comments

AARP-Vermont:

Introduction

On February 27, 2024, Vermont's Telecommunications & Connectivity Division, within the Vermont Department of Public Service (DPS), released its draft "Vermont 10-Year Telecommunications Plan" (Plan). On behalf of its 117,000 members, AARP appreciates the opportunity to comment on the comprehensive 274-page draft Plan.¹⁶⁵

Reliable, affordable, easy-to-use telecommunications access is essential to older adults' safety and well-being. The availability of affordable, reliable, high-speed internet access, supported by digital literacy training and affordable equipment, is also essential to the well-being and health of older adults. High-speed internet access enables older adults to age in place safely and with a higher quality of life than would otherwise be possible: among the many benefits are remote access to state-of-the-art health care, overcoming loneliness,¹⁶⁶ remote learning, employment, and civic engagement.

AARP has been actively involved with federal and state telecommunications and high-speed internet advocacy for many years. AARP has, for example, advocated for the continuation of the Affordable Connectivity Program (or a successor program), provided comments on the originally proposed guidelines for the Notice of Funding Opportunity (for the BEAD and state digital equity grants) issued by the National Telecommunications and Information Administration (NTIA), and recently reviewed more than 30 different draft state digital equity plans. AARP also brings its many years of experience working on behalf of older adults on issues such as health care, transportation, livable communities, and housing as well as its extensive experience with high-speed internet advocacy to its review of Vermont's Plan.

The success of the Plan, of course, depends on its implementation: AARP looks forward to collaborating with the DPS and other stakeholders in achieving universal and affordable access to telecommunications and high-speed internet access, making progress toward digital equity throughout the state, and ongoing monitoring progress in achieving the important goals that the Plan sets forth.

Thank you for your comments on the 2024 Plan and willingness to collaborate.

"2.1.9 Aging, Low-Income, and Other Vulnerable Groups Have Greater Need to Call 911 Than Other Groups"

¹⁶⁵ AARP identifies the sections about which it is commenting by reproducing the relevant section numbers and titles, within quotation marks.

¹⁶⁶ <https://www.nytimes.com/2023/09/06/opinion/loneliness-epidemic-solutions.html> and <https://www.nytimes.com/2023/04/30/opinion/loneliness-epidemic-america.html> and <https://www.nia.nih.gov/news/social-isolation-loneliness-older-people-pose-health-risks>.

AARP seeks clarification of the relationship of the heading of this section's reference to "aging" groups and the text and tables that follows. The heading indicates that aging adults are among the groups with the greatest need to call 911, yet Figure 13 suggests just the opposite (22% for those 60 and older call 911 versus the average of 29%). AARP certainly concurs that the ability to reach 911 service reliably is critically important to older adults.

Thank you for pointing out this typographical error; the heading for Section 2.1.9 has been revised.

Looking forward, AARP supports the ongoing tracking of data regarding the demographics of those calling 911 as well as the ongoing tracking of data regarding callers' ability to reach 9-1-1 on the first attempt. The Plan observes:

Among those who have used a mobile subscription to call 911, 86 percent were able to connect to 911 on the first attempt. Unfortunately, only 77 percent of those calling using Verizon, the most common provider in the state, were able to connect on a first attempt.

AARP would welcome the Plan's inclusion of additional information regarding this critically important topic. As older adults gradually increase their reliance on wireless service, the wireless connection to 911 service becomes increasingly important to their safety and health. AARP welcomes additional data not only in the Plan but also during the upcoming ten years, including, for example, callers' ability to reach 911 on the first attempt when using different platforms (copper landlines, Voice over Internet Protocol (VoIP) and wireless). As Vermont guides its citizens through transitions among differing telecommunications platforms, it is critically important to monitor the impact of that transition on citizens' safety and health and to ensure that such transitions do not jeopardize timely access to emergency services.

Thank you for your comment. While survey length limits us from asking everything we could ask, we agree that tracking metrics over time is important. We will consider asking the above question again, and the other questions you propose, for the next version of the Plan.

"4.3 Demographic Challenges"

The Plan reports that the state's median age is higher than the national average (43.2 in Vermont versus 39.0 nationally, as of the 2022 American Community Survey). The Plan observes: "The ongoing work to deploy broadband cannot be completed without an adequate workforce, and since Vermont has a higher median age than the national average, the proportion of working-age residents is smaller." Although many older adults may not be poised to deploy broadband infrastructure, older adults are increasingly postponing retirement, and so can certainly continue to contribute to Vermont's workforce by relying on

such infrastructure.¹⁶⁷ Indeed, a state-of-the-art telecommunications and high-speed internet access infrastructure – with services offered at affordable prices – will facilitate such continuing employment by older adults, and their contribution to Vermont’s economy.

The Plan reports: “This being said, the Vermont Futures Project — a nonprofit think tank — estimates that the state’s total population needs to increase to 802,000 by 2035 to fill its workforce needs in all sectors, not just broadband-related industries.” AARP is hopeful that the final Plan recognizes that although Vermont’s average age may be increasing, so too are older adults’ continuing involvement in the workplace. A successful Plan will facilitate workplace engagement by older adults by ensuring adequate digital literacy training and affordable access to reliable high-speed internet access.

Thank you for this suggestion. Section 4.3 has been revised to reflect the continued involvement of older Vermonters.

“4.4.2 ILEC Carrier of Last Resort Obligations”

AARP appreciates the Plan’s thoughtful discussion of the implications and importance of carrier of last resort (COLR) obligations. As the Plan aptly explains (footnote omitted):

However, this Plan advises that shifting the responsibility from ILECs to other entities may present challenges for the state. For one, ILECs transferring COLR obligations to fiber networks run by different operators could allow the ILECs to deprioritize the maintenance of copper networks — potentially leading to a greater incidence of disrupted service — and allow them to decline to connect new landline phone service in certain circumstances. These copper networks are still used by many people in the state and are essential to various components of connectivity. Further, some of the entities that are currently building fiber (such as smaller ISPs and CUDs in the state) do not currently have the organizational capacity or infrastructure to match the service levels, maintenance and repair capacity, and experience of the current COLR providers. Because of this, policymakers and regulators should carefully consider the potential implications of changing the COLR responsibilities of ILECs in Vermont.

As the Plan observes, many states have been and are addressing this issue. In California, hundreds of consumers have spoken up during the COLR public participation hearings held recently by the California Public Utilities Commission (CPUC) and more than 6,000 comments have been filed with the CPUC.¹⁶⁸ Many Californians emphasized the importance

¹⁶⁷ <https://www.aarp.org/work/careers/surging-older-workforce/> “Who’s Working More? People Age 65 and Older: They are the fastest-growing part of the labor force, data shows,” November 29, 2019. Article states, among other things: “These workers ‘are vital because they have a lot of experience,’ says Stefano Scarpetta, director of employment, labor and social affairs for the OECD. ‘They’ve been contributing to the economy and to their own work. They’re living longer in good [health]. They have a great potential. And this notion that beyond a certain fixed age they are no longer productive, that they can no longer contribute to the society, is nonsense.’”

¹⁶⁸ CPUC A23-03-003.

of COLR and landlines, especially in rural areas and for older adults. Continuing access to landlines is of widespread importance.¹⁶⁹

Thank you for your comment concurring with the 2024 Plan.

"Section 5: Broadband Affordability in Vermont"

AARP concurs fully with the Plan's discussion of the importance of affordable broadband in Vermont. In the approximate 30 different state digital equity plans that AARP reviewed, affordability is mentioned as a major barrier to digital equity. AARP has been actively engaged with advocacy on the Emergency Broadband Benefit Program (the precursor to the Affordable Connectivity Program (ACP)), the ACP, and attempts to either continue or replace the ACP. AARP has also been engaged with outreach and education on the ACP.

"5.2 Federal Programs to Support Affordability"

The Plan points out the low ACP enrollment in Vermont (footnote omitted):

Unfortunately, Vermonters are not utilizing the ACP as much as they could. According to data retrieved from the Institute for Local Self-Reliance's ACP Dashboard on December 7, 2023, only 21.2 percent of eligible Vermont households are enrolled in the ACP (out of 115,003 eligible households, only 24,337 households are enrolled), meaning that \$2,719,980 of potentially available monthly subsidies are not being utilized in the state.

AARP is hopeful that, regardless of the future of the ACP, providers in Vermont will offer affordable broadband service, and that BEAD recipients will commit to affordable offerings. Also, AARP recommends that the Plan recognize that affordability is a barrier not only for those who may be eligible for subsidies (and as the Plan aptly observes, the \$9.25 federal subsidy is important but insufficient), but also for those who do not qualify but nonetheless are struggling to pay bills. Unless affordability is addressed, many Vermonters will be left on the other side of the digital divide.

"5.4 How Should Vermont Define "Affordable" Connectivity?"

AARP appreciates that the Plan seeks to define affordability. The Plan recommends "an affordability goal that low-income Vermonters pay no more than 2 percent of income for all of their connectivity needs, established at 100 percent of the federal poverty guideline for a family of four," which translates into "an affordability goal that low-income Vermonters pay no more than \$50 per month for all of their connectivity subscriptions." AARP recommends that the Plan also address the benchmark for affordability for those with moderate and fixed

¹⁶⁹ See

<https://www.washingtonpost.com/technology/2024/03/23/landline-emergencies-home-phones/>;

<https://www.nytimes.com/2024/03/16/business/landline-phones-att.html>;

<https://www.sfchronicle.com/bayarea/article/att-lose-landline-california-cpuc-18654712.php>.

incomes – including those who are not low income but yet may also struggle to make ends meet.

"5.5 State Actions to Encourage Affordability"

AARP concurs with the Plan that:

[T]here is not likely to be a market-based solution for providing connectivity services at levels considered affordable in Vermont. Relying on individual fixed or mobile ISPs to provide affordable service is not viable, especially in a very rural state where many ISPs will have limits as to the prices they can offer and still be financially healthy."

Even in non-rural areas, market forces will not yield affordable high-speed internet access services. A monopoly or duopoly dominates high-speed internet markets, which does not result in competitive prices.

AARP concurs with the Plan: "If the legislature chooses to ensure affordable service for Vermonters, this Plan recommends they fund a program to replace or augment the ACP, which (as of the writing of this Plan) will run out of funding in April 2024." AARP supports the Legislature's funding of a program to replace or augment the ACP. Digital equity cannot be achieved unless services are subsidized for those who cannot afford high-speed internet access.

AARP commends DPS for analyzing the cost of such funding, which brings the proposal that much closer to being translated into a program. The Plan states (footnote omitted):

The Vermont Joint Fiscal Office used a monthly \$117 expense for "telecommunications" when determining the 2022 basic needs budget for either an individual or a single parent. Using this metric and the recommended target for affordability of \$50 per month per household, a state-level subsidy program should provide a total of \$67 per month. At the current ACP enrollment rate in Vermont of 24,337 households, a \$67 subsidy would result in an annual cost to the state of approximately \$19.5 million, without administrative expenses. Of course, setting the eligibility threshold at 185 percent or 135 percent would decrease the total number of people eligible, but not likely by a proportional amount, because a program that is more generous than the ACP – and associated with the state rather than the federal government – would likely see increased interest and participation.

AARP also supports the Plan's recommendation that Vermont "consider enabling more municipalities and community anchor institutions to provide public Wi-Fi with sufficient range for use in their parking lots." Enabling residents to adopt high-speed internet access in their homes is of course preferable, but until and unless this occurs, public Wi-Fi is an important element of making high-speed internet access affordable to Vermonters.

Thank you for your comments on broadband affordability. Section 5 has been revised to further emphasize the connectivity needs of moderate- and fixed-income Vermonters who may not qualify for the subsidy.

“Section 7: Opportunities for Neutral Host Arrangements, Shared Infrastructure, and Open Access”

This section of the plan focuses on mobile networks and the development of wireless infrastructure. AARP recommends that this section of the Plan cross-reference Section 9.3 of the Plan, which describes the accomplishments and ongoing work of Communication Union Districts relative to the ownership and operation of wireline networks. Municipally owned networks often provide service at prices that are more affordable than are services that are offered by commercial, for-profit companies. Of course such endeavors should occur only where technically and financially feasible.

Thank you for your comments. We concur that technical and financial feasibility are the driving factors for deployments of wireline and wireless networks.

“Section 9: Review of Additional State Telecommunications Systems and Practices”

“9.2 Vermont Community Broadband Board”

The Vermont Community Broadband Board (VCBB) is an important asset. The Plan describes this entity as follows (footnote omitted):

Led by a five-member Board and supported by eight staff, the Vermont Community Broadband Board (VCBB) has facilitated significant gains in the Vermont wireline broadband landscape since 2021, when the Vermont Legislature established the VCBB through Act 71. Act 71 lists eight goals for the VCBB, including ensuring broadband availability for all Vermonters, public accountability for maintaining and upgrading critical broadband infrastructure, and providing leadership for coordinating the development of Vermont’s CUDs and their partners.

AARP lauds the VCBB for its impressive contributions, which the Plan describes (footnotes omitted):

A sample of notable achievements and milestones include:

- Distribution and oversight of approximately \$441.8 million in ARPA and Capital Projects Funds awarded to Vermont for broadband
- Publication of the BEAD Five-Year Action Plan, Initial Proposal Volumes 1 and 2, and Digital Equity Plan, which demonstrate national leadership on connectivity strategies and an aspirational vision for meeting Vermont’s wireline telecommunications goals
- Support of business and feasibility planning efforts across the state to ensure no town is left without a path toward to universal service
- Establishment of construction guidelines to ensure resilient networks that will last for decades and meet state needs

- Leadership on workforce training and planning, including leading the nation in partnerships to foster apprenticeship opportunities

AARP supports the Plan's findings and recommendations regarding the important ongoing and future role of the VCBB, the value in expanding VCBB's responsibilities, and the importance of extending it at least through 2030 as "the best methodology for post-construction compliance and monitoring" of BEAD-related deployment. The Plan explains that the BEAD funding will require construction to occur within four years of receipt of funding (which DPS anticipates will occur in the fourth quarter of 2024).

That said, the VCBB's work is far from over. While there are a wide range of entities listed below, the VCBB is – by design of the legislature and in practice – the logical convener of policymakers and stakeholders, and the driver of practices related to broadband deployment.

"9.3 Communication Union Districts"

The Plan appropriately recognizes the important role of Communication Union Districts (CUDs) in achieving universal high-speed internet access deployment and adoption. The Plan states among other things: "At the time of publication, five of ten CUDs have deployed fiber and connected customers, using partnerships with ISPs that vary greatly in form, and one CUD has completed building to every on-grid premises." AARP supports the Plan's recommendations for supporting and enhancing CUDs' efforts.

Thank you for your comments.

"10.5 Increasing Network Resiliency"

Resilient telecommunications and high-speed internet access networks are essential to public safety and to Vermonters' well-being. As is the case across the country: "Vermont is projected to continue to experience more frequent and intense weather-related disasters over the coming decade – especially riverine flooding, hurricanes, and ice storms, which result in infrastructure damage and service disruptions." Recognizing the inevitability of and importance of preparing for extreme weather patterns is an essential element of Vermont's Ten-Year Plan. AARP commends DPS for describing various best practices relating to achieving the goal of network resiliency.

AARP recommends that the Plan also identify and describe the importance of incumbent local exchange carriers' efforts to maintain their copper plant and to replace defective outside plant when and where necessary. Copper networks function during power outages and are deployed throughout Vermont's rural areas and so they provide an excellent level of reliability --- *provided that they are properly maintained.*¹⁷⁰ Older adults disproportionately rely on copper-based landlines. It is AARP's experience, based on its familiarity with service

¹⁷⁰ If an incumbent local exchange carrier, for example, fails to repair an out-of-service dial tone line in a timely manner, that failure would jeopardize public safety and thwart the achievement of network resiliency.

quality investigations throughout the country (AARP has not, however, examined the status of service quality in Vermont), that incumbent local exchange carriers are not maintaining their copper networks adequately, which jeopardizes networks' resiliency and older adults' ability to reach 911 services reliably.¹⁷¹ Therefore, AARP urges DPS to include the goal of adequate and timely maintenance of copper networks as an integral element of its plan to achieve network resiliency. Moreover if Vermonters have expressed concerns about the timely repair and maintenance of copper dial tone lines, AARP recommends that the Plan cross-reference such concerns.

Regarding high-speed internet access reliability and resiliency, AARP recommends that the Plan include intentions to:

- Seek legislative authority to oversee the collection, tracking, and resolution of consumer complaints regarding internet access services;
- Seek legislative authority to require high-speed internet access providers to report to the DPS data regarding (1) outages and (2) complaints they receive; and
- Report data regarding high-speed internet access reliability to the general public so that (1) consumers can make informed purchasing decisions and (2) to enhance accountability by providers.

Thank you for your comments. These recommendations regarding data collection are addressed by pending bills in the Vermont Legislature. The maintenance of copper networks is being addressed by the PSD with providers on an ongoing basis.

"11.2.1 Ensuring Broadband Speed Definitions Are Cohesive and Modernized"

AARP fully supports the Plan's recommendation that the Legislature "consider modernizing [the] statute to clearly document the speeds at which Vermonters should be considered served, underserved, and unserved, and ensure data collection practices are standardized to this definition, and also that "[a]dding a provision to reevaluate and update the definitions at a regular cadence will ensure they do not become obsolete in the future." Differences among the various statutory definitions for high-speed internet access speeds should be forward-looking and consistent.

"11.3.2 Aligning Statutory Goals With Current State Infrastructure Strategies"

The Plan aptly describes the potential conflict between the goal of supporting competitive choice, which is "the sixth goal of 30 V.S.A. § 202c(b)," and Vermont's establishment of "CUDs as an essential vehicle for connectivity and policies to make sure CUDs are financially

¹⁷¹ See, e.g., Pennsylvania Public Utility Commission Docket No. C-2023-3037574, Office of Consumer Advocate and Office of Small Business Advocate v. Commonwealth Telephone Company, LLC d/b/a Frontier Communications Commonwealth Telephone Company, *Initial Decision*, March 21, 2024. <chrome-extension://efaidnbmnnibpcapcglclefindmkaj/https://www.puc.pa.gov/pcdocs/1821439.pdf>. See also California Public Utilities Commission Order Instituting Rulemaking Proceeding to Consider Amendments to General Order 133, Rulemaking 22-03-016 (the CPUC is investigating the quality of service provided by incumbent local exchange carriers).

sustainable." AARP supports competitive choice where it is a sustainable option. However, in those parts of the state where high-speed internet access deployment is not financially attractive, it is unrealistic to expect competitive choices to exist, at least for the foreseeable future. For this reason, AARP supports the Plan's analysis and recommendation:

The CUD model uses public ownership to work toward the same benefits that competition and open access may bring. This is a viable and successful path toward providing customers with great service, faster speeds, and long-term downward pressure on prices. With this in mind, this Plan recommends that the legislature consider whether a better strategy might be to establish the positive outcomes competition brings to the open market, rather than setting competition as the goal.

AARP has been a long-time advocate for emphasizing *adoption* of high-speed internet access as well as the goal of *deployment*. The build-out of a reliable high-speed internet access infrastructure is of course critical to Vermont's economy and to the health, employment, education, and well-being of its citizens. But infrastructure alone will not yield those benefits. AARP supports the Plan's discussion (excerpted below) of this point as it relates to the need to revise statutory goals, with one suggested edit: Instead of the phrase "after deployment goals are met" AARP recommends the phrase "while deployment goals are being met and after they are met." AARP supports the inclusion of "demand-side" matters *during* the deployment of high- speed internet access – for example, digital literacy training need not await the completion of infrastructure roll-out; telehealth pilots in one part of the state can inform the way in which infrastructure is deployed in another part of the state to congregate living situations such as assisted living and independent living communities. BEAD and digital equity programs should go hand-in-hand. With this suggested edit, AARP support the Plan's recommendation:

Lastly, the goals presented in 30 V.S.A. § 202c are predominantly focused on supply-side telecommunications issues – in other words, facilitating deployment of critical technologies. However, a significant portion of the connectivity challenge falls on the demand side, concerning affordability, digital skill building, cybersecurity practices, device ownership, accessibility, and more. The legislature should consider including goals that address the demand-side challenges that the ecosystem of telecommunications stakeholders should be focused on after deployment goals are met.

"11.3.4 Reconsidering the Role of the Telecommunications and Connectivity Advisory Board"

DPS observes that "despite the best efforts of the Department of Public Service, the Board is no longer functioning as the legislature intended," and recommends that the Telecommunications and Connectivity Advisory Board be disbanded. AARP is not acquainted with the reasons that the Board is not functioning as had been intended and so does not wish to second-guess DPS on this matter. AARP is hopeful, however, that Vermont provides some forum for stakeholders (e.g. CUDs, state agencies, representatives of the eight "covered populations" designated to benefit from digital equity grants, and industry) to share best practices and contribute collaboratively toward the effective disbursement of BEAD and

digital equity grants. In the context of the ten-year Plan, AARP is hopeful that the Plan incorporates a commitment to facilitating such collaboration during the years to come.

Thank you for your comments supporting and emphasizing various portions of the Plan.

"12.6 Supporting Competitive Choice for Consumers and Promoting Open Access"

AARP appreciates the Plan's recognition of the importance of data collection and reporting to inform consumer choice. The Plan states in part that Vermont:

[S]hould measure the quality of service across the state by the following attributes:

- Customer Service Quality: By measuring online customer reviews, and consumer complaints and resolutions at the ISP level, the PSD can evaluate the quality of service ISPs are providing.
- Speeds: By using speed tests, and comparing consumer-reported speeds to advertised speeds, Vermont can assess whether ISPs are providing consumers with speeds that meet their needs and are aligned with ISP marketing claims.
- Costs: Vermont can track the cost of connectivity from different service providers. Importantly, as the BEAD Proposals suggest, the state should prioritize tracking and evaluating against long-term affordability goals to understand if ISPs are exerting downward pressure on prices.

AARP supports fully Vermont's commitment to collect, analyze, and report data regarding high-speed internet access deployment, adoption, prices. (See also Section 10.2.1 "Mobile Broadband Data Collection and Practices," which recommends improved "data collection practices to support [Vermont's] mobile broadband deployment strategy and progress evaluation.") Data collection, analysis, and reporting are essential to:

- Ensure accountability where public monies are used to subsidize deployment and adoption;
- Measure progress in achieving digital equity (e.g., adoption, prices, reliability, platform used to provide high-speed internet access, adoption of computers); and
- Inform the sharing of best practices throughout the state.

AARP also urges DPS to collect, analyze, and report adoption data at a demographically and geographically granular level to ensure that both short-term and long-term policies and programs can be designed for digital literacy and to facilitate broadband adoption. Community-based organizations such as Vermont's Communications Union Districts can assist with appropriate outreach measures, especially if they have information about where adoption gaps exist. These data collection efforts should be comprehensive, including not only low-income households, but all households. Toward that end, AARP recommends that the Vermont Legislature provide DPS with explicit authority to require broadband providers to submit detailed data about adoption.

Thank you for your comments. Some of the recommendations regarding data collection are addressed by pending bills in the Vermont Legislature. However, the Department remains committed to complete and detailed data collection as resources allow.

Other topics recommended for inclusion in the Plan

High-speed internet access is an essential utility, and should be treated as such, and the Vermont Legislature should authorize explicitly Vermont's oversight of broadband.

AARP believes that Vermont has the authority to regulate many aspects of broadband. Indeed, in the view of many, the *Mozilla* court case in 2019,¹⁷² which upheld the Federal Communication Commission's decision to not regulate high-speed internet access as a "Title II" service but instead to subject it to the lighter "touch" of "Title I" regulation, opened the door for states to independently regulate certain aspects of high-speed internet access, such as regarding privacy, net neutrality, network resiliency, and consumer protection.¹⁷³ AARP supports Vermont's exercise of its oversight of broadband services, and to the extent that additional clarity would bolster that oversight, AARP urges the State Legislature to provide that authority in such areas as data collection, network resiliency, and public safety.

Conclusion

AARP commends DPS for its comprehensive and thoughtful ten-year telecommunications Plan. All Vermonters, including older adults, will benefit from access to reliable and affordable telecommunications and high-speed internet access. AARP is hopeful that transitions to new technologies and platforms will enhance rather than jeopardize timely and reliable access to 911 services. AARP looks forward to continuing to contribute to sound and visionary telecommunications policy and planning in Vermont.

Thank you for your comments. The FCC has reinstated broadband regulation under Title II, though that may change again under future administrations.

Jennifer Morrison, Commissioner, Department of Public Safety:

P. 16 – I think the term PSAP may not be used correctly, or at least not clearly defined. There are six PSAPs in VT, but 38 public safety communications or "dispatch" centers. PSAPs means there is a 911 call taking function happening. This only happens at six locations. I've copied Barb Neal to see what her input is on this section. It's clear by the bottom of the paragraph

¹⁷² Mozilla v. FCC, 940 F.3d 1 (D.C. Cir. 2019) [https://www.cadc.uscourts.gov/internet/opinions.nsf/FA43C305E2B9A35485258486004F6D0F/\\$file/18-1051-1808766.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/FA43C305E2B9A35485258486004F6D0F/$file/18-1051-1808766.pdf).

¹⁷³ As one analysis explains: "In its repeal, the FCC preempted states from imposing their own net neutrality laws. 'No dice,' the majority opinion responded. If the US government chooses to abdicate regulatory authority, the judges argued, it can't simultaneously take that authority from states." "Net neutrality is alive and well after this week's crushing court defeat," Michael J. Coren, Quartz, October 5, 2019. [Net neutrality is alive and well after this week's crushing court defeat](#).

that the writer knows the difference between a PSAP and dispatch center, but it could be confusing to readers.

P.19 – first bullet under “Strengthen the state’s emg.comm.systems” – this work is ongoing and is in the purview of the Public Safety Communications Task Force. It is not specific to PSAPs, but more broadly to public safety communications. It strikes me that as written, it seems the writer is unaware of the requirements of Act 78 last year or the ongoing work. Suggested leads should include the PSCTF.

Thank you for your comments. The Executive Summary has been adjusted to provide additional clarity to the reader.

Costa Pappis, Transportation Planning Coordinator, Agency of Transportation; feedback from presentation of Plan during March 22, 2024, meeting of the Telecommunications and Connectivity Advisory Board:

I also had a comment on the subsidy for mobile services. I was curious as to why they were combined with wireline. It seems to me with the MVNL's out there the cost of mobile services has dropped dramatically, and it was curious as to why they were bundled with wireline that tend to be way more expensive than MVNL services on the wireless side.

- Clarify the difference between AOT's section 1111 access permits fees and Right-of-Way rents. The draft plan toggles between these two types of fees leading to some confusion.
- Clarifies the end of COVID-related permit fee waivers.
- Update old information on AOT using wireless broadband to communicate with our Changeable Message Signs, which gives us the ability to change messaging.
- Correct the statement that AOT no longer owns around 15 miles of fiber between I-89 Exit 2 in Sharon and the I-91 SB Rest Area in Hartford.

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Recommendations

- Continue taking action to make the ongoing wireline fiber deployments as efficient and effective as possible.
 - Leverage state-owned rights-of-way by providing right-of-way ~~fee rent~~ waivers to infrastructure builders deploying in unserved and underserved areas until Vermont meets its broadband goals (suggested leads: Agency of Transportation [AOT] and VCBB).

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Safety is also the foundation for AOT's need for mobile-connected electronic roadway signs. ~~While other states, such as New Hampshire, have signs that can be managed remotely via~~

wireless broadband, AOT does not have remote operated signs, and so staff must go out and manually change signs at their locations. This not only puts staff at higher risk while they stop at an interstate highway location—it also means they cannot be responsive to changing weather conditions. During an interview, AOT leadership specifically discussed Vermont's inability to warn drivers of small areas of winter weather conditions or a significant accident ahead so drivers can begin to reduce their speed. New electronic signs require access to mobile broadband, which is not universally available along all of Vermont's interstates and major roadways.

p.185

10.3 Leveraging the Rights-of-Way

Currently, the Agency of Transportation requires a ~~right-of-way~~ permit and *application fee* for accessing Agency-managed ~~land~~ rights of ways. The permit is required for all public and private entities, and *application fees* for nonresidential or agricultural purposes range from \$100 to \$2,500. Large-scale infrastructure projects may require dozens of ~~right-of-way~~ permits depending on the specific deployment and construction plans. In addition, any remaining infrastructure in the right-of-way is subject to fair market value rent unless *it is an allowed use under federal guidelines* or the Agency determines that the infrastructure serves a public purpose.

These ~~fees~~ costs are incurred by infrastructure builders in the state and increase project costs. Because of this, until the state's universal 100/100 Mbps wireline goal is achieved, rights-of-way *application fees and rent actually* impede deployments.

In recognition of this dynamic, the state created a system to provide rights-of-way ~~fee rent~~ waivers for broadband builders under 19 V.S.A. § 26a(b), as long as the entity requesting the right-of-way permit "offers to provide comparable value to the State so as to meet the public good as determined by the Agency and the Department of Public Service." The statute explains that "comparable value" should be "construed broadly to further the state's interest in ubiquitous broadband and wireless service availability at reasonable cost."

This section is misleading. The statute currently allows for a waiver and for the Agency of Transportation to set a reasonable rate for rent. The Agency has implemented an overarching waiver that is noted in the permit and a reasonable rate of \$0.

Stakeholders interviewed for this Plan reported that through the end of 2023, the waivers were working as intended and enabling better broadband deployment in unserved areas. However, during the writing of this Plan, the Vermont Legislature discussed revisions to the waiver system via H.657 and the Agency of Transportation stopped granting fee waivers.

The Agency stopped granting permit application fee waivers which were put in place during the COVID response. That waiver was recently stopped as COVID related projects are complete.

As indicated by their testimony on February 7, 2024, PSD supports the continuation of the ~~rent waivers system~~ until the state achieves universal 100/100 Mbps broadband because right-of-way fees ~~rent~~ increase the costs of deploying in the most difficult-to-reach areas. Therefore, this Plan recommends leveraging state control of rights-of-way by providing ~~fee rent~~ waivers to infrastructure builders deploying in unserved and underserved areas until Vermont meets its broadband goals.

p.194

The original intent for including these agencies may have been their previous ownership or management of telecommunications systems; however, the responsibilities of these agencies are far different now than when the statute was established – ~~for example, the Agency of Transportation no longer owns fiber assets~~. If the legislature wants agencies other than the PSD to participate directly in PSD processes, the legislature should consider codifying that direction in the official descriptions of those agencies' functions.

Thank you for your comments. Sections 9.4, 10.3, and 11.3 have been revised to reflect the above suggestions. Regarding your question about providing the subsidy for both wireline and mobile subscriptions, some consumers use MVNO services, but the vast majority of Vermonters do not. In addition, a significant number of consumers rely on mobile smart phones as their primary device – especially lower-income and housing-insecure Vermonters.

Evan Carlson, Board Chair, NEK Community Broadband; feedback from presentation of Plan during March 22, 2024, meeting of the Telecommunications and Connectivity Advisory Board:

I just wanted kind say I do really appreciate the kind of updated format in the summary recommendations, which include suggested leads and kind of who should be taking on the work outlined in the recommendations. So definitely think that's vastly improved version from what was produced from the last plan. So thank you for that. A couple other things, just kind of generally speaking is I think it would be really helpful to include specific measurements for success on each of these items and potentially recommended timelines for them, like when would be kind of the drop-dead date for some of these different proposals that are there. You know, obviously things like the updates to the statutory requirements for VCBB, that's something that needs to happen pretty soon. I think you know, obviously the legislature has a lot of different things they would like to do. But you know the idea of having you guys helping push that forward and making sure that is priority will be important because all these other things are also important as well. And I could definitely see that those things falling to falling lower on the list, if not continually pushed.

So, on the mobile wireless side of things. There wasn't a timeline. I think really the idea of leveraging the CUD's that do have fiber infrastructure for getting some of the deployments into place for some of the small files or for some of the test sites that you're talking about deploying would make a lot of sense. And so, I think there just needs to be some level of

deeper collaboration between this CUDs and that mobile plan. We have this publicly on infrastructure and so it should be utilized to the fullest extent from my perspective.

Just for my clarity, and I know it's outlined, but I just would like to have it outlined here is just the next steps in process that you're planning to take to kind of move this forward?

Thank you for your comment. The 2024 Plan's recommendations have been revised to include timelines as is appropriate and feasible.

David Snedeker, Chair of the Board, Northeastern Vermont Development Association; feedback from presentation of Plan during March 22, 2024, meeting of the Telecommunications and Connectivity Advisory Board:

One question I had some of the recommendations, especially those like regarding workforce and the sun setting of the Vermont Community Broadband Board or the funding for the wireless grant program or any of those actually, is there any legislation being proposed in this session that we need to be aware of? There's a lot to keep track of these days as you know, so. The wireless grant program funding that you mentioned was a recommendation.

Thank you for your comment. As of April 2024, there is no known legislation addressing the items you listed in your comment.

Mac Mountain:

"That said, there are new efforts to deploy neutral host mobile wireless in Vermont – primarily by a company called Mac Mountain – that state officials could monitor to gather more data on the viability of neutral host deployments as a statewide solution.

Mac Mountain is a private business that recently invested in Great Works Internet (GWI) in Maine, which is a fiber-based ISP providing internet service in partnership with three of Vermont's CUDs: ECFiber, DVFiber, and Northwest Fiberworx. In addition to its participation in fiber construction, Mac Mountain will be launching a pilot program in Windsor County with small cell, neutral host wireless radios placed on utility poles, creating contiguous mobile broadband service from Woodstock to Pomfret. Stakeholders from Mac Mountain reported that they have the committed participation of *DELETE: one major carrier and are in the process of soliciting participation from two others.*

Please Use: three carrier partners allowing the delivery of mobile connectivity to mobile customers of the project.

Representatives of the company also noted that they have an ongoing pilot program in Maine using an MVNO structure with a local ISP that involves deploying CBRS radios – which typically use about 150 MHz of spectrum around the 3.5 GHz band, and can be accessed via

newer mobile devices. Through a partnership with a white-label MVNO service, Mac Mountain reports that users of the MVNO service will be able to utilize AT&T, Verizon, and T-Mobile networks on mobile devices in areas outside of the ISP's local Wi-Fi or CBRS range.

The Vermont attempt – as well as the Maine pilot, which is happening in a very similar geography and context – will provide valuable data for the state as neutral host solutions continue to be tested and considered.”

Thank you for your comments. Section 7.1 has been revised to reflect the updates about Mac Mountain's pilot program.

Barbara Neal, Executive Director, Vermont Enhanced 911 Board:

Section 1.1, “A cornerstone of this Plan is a robust survey of Vermont residents.”

This seems like a fairly small sample. Is there any information about the geographic locations of the respondents? If so, that could provide some additional context to the data/conclusions. For future plan development, would an online survey work better than telephone?

Section 1.1, “14 percent of respondents who have called 911 from a cell phone were unable to connect to emergency services on the first attempt.”

Note: on page 54, the report indicates this number is 12%??

The statewide 911 system has not experienced any outages since 2016, so these survey results could be an indication of the consequences of a lack of robust or consistent wireless coverage in areas of the state.

In 2023, 911 had 23,021 abandoned calls which was 11% of the call total. wireless class of service made up 19,585 of the total abandoned calls, which is about 85%. In these cases, the caller may have accidentally called 911, or may have had marginal signal that could not establish or maintain a connection to wireless network.

Did the survey collect any information about the general areas of the state from which the 911 calls were placed?

Section 1.2, “Strategically placed 50-foot wireless facilities achieve almost the same coverage efficiency as 140-foot towers due to the topology of Vermont and the curvature of the Earth.”

Any plan to deploy these or similar devices must include whatever work is necessary to ensure all FCC wireless location requirements are met. This was a point of contention in the

Coverage Co project and everyone should know that the 911 Board can not "waive" FCC location requirements (nor would we).

There may be opportunities for future carriers of this type to provide the caller's location with the call pursuant to the NENA i3 standards, if they are capable.

Section 1.2, "Public Safety Answering Point (PSAP) consolidation is a complex topic currently being considered by some lawmakers."

The Public Safety Communications Task Force has been directed by Act 78 to oversee the transition to a statewide public safety communications system which MAY or MAY NOT include a consolidation component....the Task Force has made no determination regarding dispatch consolidation and is expecting system planning options in Q1 2025

Agree with Jen's comments - the writer does not seem to be aware of Act 78 nor the work of the Task Force.

Distinction needed between PSAP and dispatch centers for clarity.

Section 1.3, "Use the analysis of PSAP consolidation factors in Section 9.5.4 to decide whether to fund a dedicated, comprehensive consolidation study that includes estimates of initial costs of consolidation and potential long-term savings (suggested lead: Vermont Legislature)."

SCTF is a lead on this work per Act 78. Work is underway. Writer needs to understand Act 78 and the work that is underway already and this should be incorporated into this report.

Section 2.1.5, "Monthly Costs Are Greater for Verizon and Lower for Alternative Providers."

Are these costs just for service, or do they also include phone payment? If the latter, needs to include a statement to that effect here.

Section 2.1.9, "There is near universal benefit to expanding access to 911 calls throughout the state."

May be better worded as....benefit to expanding access to wireless service which will result in improved access to 911.

Section 2.1.9, "These data suggest that these groups may present the most urgent needs in terms of mobile coverage for public safety."

How much overlap is there among these various population groups? For example, how many households with school age kids are also LGBTQ+ households, or households with a disability etc.?

Section 2.1.9, “Unfortunately, only 77 percent of those calling using Verizon, the most common provider in the state, were able to connect on a first attempt.”

Is there any data on where these calls came from? Is there any other data source to corroborate this finding?

Section 2.3, “Connectivity – especially mobile broadband – is a public safety issue. In locations along roadways without mobile service, motorists need a cellular signal to call for help after an accident or if their vehicle breaks down, particularly along the state’s 8,550 miles of dirt road, where distances between houses may be greater and traffic volume lower.

Similarly, people in emergency situations inside homes may also need to call 911 using a cell phone due to not subscribing to a landline, lack of immediate access to a landline, or needing to seek help discreetly in domestic violence situations.”

Agree.

Section 2.3, “however, 12 percent of those who called were not able to connect to a dispatcher on their first call.”

In executive summary this is reported as 14%.

Section 3.3.3, “E-911 premises scattered in census blocks across the state.”

The more precise term may be E-911 physical address. We are not sure "E-911 premises" will be clear to the reader. This term is used in multiple locations in report.

Section 6.3, “However, safety capabilities in automobiles today – including lane-departure warning, smart breaking, collision warning, and blind-spot detection – work via onboard cameras and sensors that do not require constant connectivity.”

Does there need to be a specific reference to telematics here? We see telematics calls into the 911 system on a daily basis.

Section 7.1, “911 service created a high fixed cost. The contract for providing 911 service to CoverageCo locations was around \$50 per month per site at the time, regardless of the volume of calls at the site, representing nearly half of the total operating cost of each location.”

What contract is this referencing?

Section 7.1, “Some of the operational costs, such as 911 service or perhaps even electric metering costs, could be altered via legislative action.”

Wireless location requirements are set by the FCC and can not be waived by the state. The 911 Board does not charge any company a fee to connect to 911.

Section 7.3.3, "However, stakeholder interviews indicate that CUDs are not uniformly aware of the capabilities they would need in order to provide carrier-grade service."

What efforts are underway to educate the CUDs on these capabilities?

Section 9.5.4, "Public Safety Answering Point Consolidation and Integration."

Need to cite work of PSCTF and make a distinction between PSAP and dispatch center.

Section 9.5.4, "A professionally trained dispatcher speaks with the caller."

When speaking about the 911 system, the term "call-taker" needs to be used instead of dispatcher. The "dispatcher" term is used incorrectly in multiple locations.

Section 9.5.4, "...and coordinates the appropriate first responder activity."

and offers pre-arrival instructions to the caller, when appropriate.

Section 9.5.4, "Changes in technology have added many facets to the dispatcher role."

call-taker

Section 9.5.4, "...a lack of adequate cell phone service or safety concerns during a domestic violence situation."

Text to 911 is also a critical service for the deaf and hard of hearing community.

Section 9.5.4, "The connection and consolidation are facilitated by a statewide fiber optic network called an Emergency Services IP Network (ESINet)."

"connection and consolidation"...not sure I understand this phrasing.

Section 9.5.4, "...creating high-availability IP network connections between incoming calls, PSAPs, and dispatching."

"and dispatching" ??

Section 9.5.4, "Calls are routed to the geographically closest PSAP."

Calls are routed based on PSAP catchment areas that are defined by PSAPs and towns; not necessarily closest geographical.

Section 9.5.4, “calls are directed to the first available dispatcher at another PSAP.”

call-taker

Section 9.5.4, “There are ongoing discussions about the potential to consolidate.”

The use of this term feels misleading. This work is under the purview of the Task Force. Consolidation is not a pre-determined outcome.

Section 10.2.2.1, “To reach that conclusion, coverage predictions were first modeled from existing 248a and E-911 tower sites.”

May be better stated as - "To reach that conclusion, coverage predictions were first modeled from existing 248a and E-911 Geographic Information System site data."

Thank you for your comments. The Plan has been revised to address the typographical errors you noted. Survey methodology and the full results are available in Section 2 and Appendix D of the Plan – and we note that an online survey may be used in future plans, but carries different methodological challenges. The phrase “E-911 premises” has been revised to “E-911 physical address.” Section 7.1 has been revised to provide clarity on what operational costs can and cannot be adjusted by the legislature. Section 9 has undergone revision based on your feedback to provide a broader landscape of the work in progress and how emergency communications staff refer to themselves.

Anonymous comments submitted via online form:

Section 1

The plan is comprehensive, indicating areas needing improvement, though fiber expansion to date is excellent. Wireless needs to be sited with care. It's not feasible or desirable to envision wireless accessibility everywhere.

Section 2

Fiber to the premises providing reliable, secure connection is preferable to a scattershot wireless approach. Greater density areas can be wired in a "once and done"; once installed it

is built infrastructure - no additional cost, less maintenance. Cheaper, more reliable than wireless.

Section 3

I have Verizon and I'm satisfied with coverage in the Manchester environs and beyond.

Section 4

My town crafted specific bylaws and ordinances designating zones and appropriate siting for cell towers. Telecoms sought to site towers in both Residential and Mixed Use zones which prohibit cell towers. Ht.s exceeded town limits as well. Arrogant and off-putting, trashing Town Plan.

Section 5

I had Consolidated, now Fidium. Better connection. Monthly bill significantly less expensive.

Section 6

50-ft towers in population dense areas indicates 5G, an unsafe technology using higher frequency spectrum. Better to invest in Fiber to premises where homeowners have option of WiFi or ethernet. 5G has short reach so not effective in extending cell range beyond immediate vicinity.

Section 7

Co-locating on suitably placed cell towers. Still, needless redundancy and overlap. Ideal model is Norway's Telenor, 77% state owned. Monopoly avoided if telecoms merged for greater efficiency with sufficient oversight.

Section 9

Individual satellite like Starlink may work for remote locations.

Section 10

Very happy fiber deployment continues throughout the state. Top speeds and secure connections.

Section 11

Overemphasis on wireless

Section 12

Antiquated 1996 Telecommunications Act prohibits mention of RFR environmental effects. Ignoring a major environmental pollutant is foolish and irrational. Going forward, health effects must be part of the conversation to avoid preventable harm to people and the environment.

Other

Antiquated 1996 Telecommunications Act prohibits mention of RFR environmental effects. Ignoring a major environmental pollutant is foolish and irrational. Going forward, health effects must be part of the conversation to avoid preventable harm to people and the environment.

Thank you for your comments. Sections 1 and 2 specifically refers to mobile wireless, also referred to as mobile broadband or cell coverage. Section 6 discusses tower sighting in relation to mobile wireless only. Other comments do not pertain to the 2024 Plan.

Berge Ayvazian, Senior Analyst and Consultant, Wireless 20/20, submitted via online form:

Section 1

Wireless 20/20 is pleased to submit the following comments regarding the Draft VT 10-Year Telecommunications Plan. We have prepared and respectfully submitted the following specific comments using the designated fields.

Wireless 20/20 is an independent market research and consulting company, focused on the rapidly evolving fiber, wireless and mobile broadband markets, headquartered in neighboring NY State with an office nearby in Boston. The principals of Wireless 20/20 bring over 75 years of direct market experience and provide critical market intelligence to assist our clients to make the right strategic decisions.

We commend the Vermont Department of Public Service for its comprehensive 2024 10-Year Telecommunications Plan, a pivotal step toward enhancing Vermont's telecommunications landscape aimed at advancing Vermont's statutory telecommunications goals. This Plan provides a roadmap for advising public officials about

how to remedy gaps in broadband connectivity and addresses other communications systems in the state including mobile cellular coverage, public safety, and more.

Wireless 20/20 published a White Paper in November 2023 that provides a comprehensive analysis of whether the funding allocated through the BEAD Program would be sufficient to connect all unserved locations in Vermont with fiber.

<https://wireless2020.com/images/white-papers/Wireless-2020-Case-Study-of-BEAD-11132023.pdf>.

Our review concurs with several of the Plan's recommendations, especially the allocation of funding for neutral host telecom service providers to bolster telecommunications infrastructure across Vermont. Wireless 20/20 has been engaged in developing Business Cases for Wireless Neutral Host Networks since 2019. By addressing our suggested areas for improvement—specifically, defining bidder qualifications and establishing a transparent selection process—Vermont can significantly increase its potential to meet and exceed its telecommunications goals. We look forward to contributing to and supporting these efforts. Our more detailed comments regarding Section 7: Opportunities for Neutral Host Arrangements, Shared Infrastructure, and Open Access have been e-mailed to the department directly at PSD.Telcom@vermont.gov.¹⁷⁴

Section 2

The comprehensive research and needs assessment conducted for the plan found that many Vermont residents experience telecommunication gaps in internet access, speed of internet service, and indoor and outdoor mobile voice-and-data services. In many parts of the State, reliable, high-speed Internet is not available. Because Vermont is a predominantly rural state with a dispersed population amidst hilly terrain and heavy tree foliage, it has higher than average costs to deploy broadband infrastructure.

Wireless 20/20 research leveraging our WiROI™ db Geospatial database and SaaS Platform concurs with many of these findings from the plan regarding Vermont:

- many Vermont communities experience lower rates of broadband availability and adoption.
- 20% of Vermont households lack access to 100/20 Mbps or better broadband connectivity.
- 51,000 Vermont homes have no cable internet or fiber to the home.
- 185,000 homes have internet access, but their connections are not capable of 100 Mbps symmetrical upload/download service.

¹⁷⁴ Please see Haig Sarkissian's comments below for the referenced feedback regarding Section 7 from Wireless 20/20.

- Up to 40% of physical locations and 6,000 miles of roads are unserved with outdoor mobile voice and – a public safety issue.
- 412 miles of road do not have mobile broadband coverage from any provider.
- Approximately 63% of homes lack indoor mobile voice and data.

Section 3

The 10-year plan lays out ambitious goals of extending broadband capable of 100 Mbps symmetrical fixed broadband services to all Vermont addresses. These goals are more ambitious than the FCC's new and improved national fixed broadband speed benchmark increased to 100/20 Mbps from its current definition of 25/3 Mbps. In December, some fiber providers asked for the FCC to set "future-proof benchmark speeds" of at least 100/100 Mbps, to ensure the broadband needs of rural communities can be met as demand continues to grow.

Vermont is funding the Vermont Community Broadband Construction Grant Program, a formula grant program that provides funding to communities for the construction of locally defined and prioritized broadband infrastructure projects through Communications Union Districts (CUDs).

The Broadband Construction Grant Program is designed to provide internet service with speeds of 100/100 Mbps symmetrical to households and businesses upon project completion. This goal could facilitate competition between internet service providers and choice for residents and build telecommunication systems that are resilient, secure, and future-proof – meaning they can be upgraded to gig-speed symmetrical service to keep pace with increasing demand in years to come. However, it may divert funds away from providing basic fixed broadband speeds of 100/20 Mbps to the most remote and rural households.

Section 4

The Wireless 20/20 WiROI™ db Geospatial database and Fiber Business Case Analysis Tool was used to evaluate the Business Case of BEAD funded Fiber Projects in Vermont. Our findings suggest that Vermont may encounter challenges in providing fiber connectivity to all 34,695 unserved locations in the state using the allocated \$229 million BEAD funding alone. Though Vermont has made an additional \$60 million in funding available to address these challenges, it is imperative that the Vermont Community Broadband Board (VCBB), like other state broadband agencies, adopt a discerning approach based on Geographic Information Systems (GIS) to ensure that a majority of unserved areas receive fiber connectivity. This involves prioritizing the most promising applications while remaining mindful of the financial viability of each project. We recommend that the state extend the

mandate for Vermont Community Broadband Board to oversee and monitor BEAD deployments.

Section 5

The plan also explains how Vermont can maximize its investment by addressing broadband affordability and digital equity by including subsidy programs for low-income subscribers. The plan also explains how Vermont can maximize its return on investment by addressing broadband affordability and digital equity by including subsidy programs for low-income subscribers. Wireless 20/20 agrees that any investments in new infrastructure to increase the availability and speed of broadband in Vermont must be aligned with a robust understanding of subscriber demand, income and ability to pay for broadband services.

Section 6

Several new telecom technologies are currently being developed and should be carefully monitored to assess their impact on the Vermont 10-Year Telecommunications Plan. These include:

- Next Generation Fixed Wireless Access (ngFWA) - that uses sophisticated radio wave management to provide stable and fast NLOS Wireless 100 Mbps symmetrical broadband speeds in various environments, including urban, suburban, and rural areas.
- New generation Low Earth Orbit (LEO) satellites with the potential to deliver fast, high bandwidth affordable internet access using small subscriber antennas in rural and remote areas.
- Fiber-optic technology is evolving to provide multi-gig bps symmetrical upload and download speeds.
- Even as 5G cellular technology will continue to evolve throughout this decade, 6G networks will be able to use higher frequencies and provide substantially higher capacity and much lower latency

Section 7

The Plan rightly identifies the importance of a neutral host telecom service providers and shared infrastructure. It also relies heavily on the concept of Open Access Neutral Host Fiber Networks and Communications Union Districts (CUDs) as a unique kind of Vermont municipality governed by a board of delegates, each appointed by the member towns' select boards.

We have reviewed the current use of Neutral Host Fiber for Middle-mile Networks in Vermont. Vermont's CUDs administer a middle-mile fiber optic network consisting of 340

route-miles of open-access dark fiber. Each segment contains 144 strands of fiber that allow access to multiple tenants. This initiative should be used to bring together the CUDs and private fiber network owners with transparency to facilitate fiber trades in Middle-mile and ultimately last-mile FTTP projects. A careful and thorough review of this Middle-mile initiative should be conducted before extending the model to last-mile FTTP projects.

In order for neutral host fiber to be considered to be truly "open access," it must be available to any paying applicant for any lawful purpose, whether it is for long haul transmission or as a component of a last-mile FTTP project. For such a provider to be successful, it must possess key assets and capabilities, including:

- Ownership or access to necessary spectrum.
- An established presence as a telecommunications provider within Vermont.
- A proven track record in serving the state's constituents.
- Adequate customer support facilities and network operational expertise.
- Ownership of fiber infrastructure and existing roaming agreements with major carriers (AT&T, Verizon, T-Mobile).
- A core network supportive of neutral host architectures and a fully operational NOC (Network Operations Center).

Section 10

The Draft Plan currently lacks a detailed definition of qualifications for bidding entities, which could hinder the selection of the most capable providers. Establishing clear criteria is crucial for ensuring the success and efficacy of the allocated funds.

- Need for Transparent Selection Process: There is also an absence of a defined process for qualifying and scoring applicants. Drawing from the NTIA, ARPU, and CPF guidelines, Vermont's Plan would benefit significantly from integrating transparent and objective qualification and scoring criteria.
- Recommendation for Process Improvement: We suggest the adoption of a clear, transparent, and objective process for applicant evaluation. This approach should align with best practices outlined by federal guidelines, ensuring the selection of highly qualified entities to implement the telecommunications initiatives.

Section 12

The 2024 10-Year Telecommunications Plan is a pivotal step toward enhancing Vermont's telecommunications landscape. By addressing the aforementioned areas for improvement—specifically, defining bidder qualifications and establishing a transparent selection process—Vermont can significantly increase its potential to meet and exceed its telecommunications goals. We look forward to contributing to and supporting these efforts.

Thank you for your comments on the 2024 Plan and validation of many of its findings. The Plan has been adjusted to include some additional context around qualifications for bidding entities.

Haig Sarkissian, Co-Founder, Principal Analyst, and Consultant, Wireless 20/20:

Introduction

We commend the Vermont Department of Public Service for its comprehensive 2024 10-Year Telecommunications Plan, aimed at advancing Vermont's statutory telecommunications goals. Our review concurs with several of the Plan's recommendations, especially the allocation of funding for a neutral host telecom service provider to bolster telecommunications infrastructure across Vermont.

Recommendations and Observations Regarding Section 7:

Opportunities for Neutral Host Arrangements, Shared Infrastructure, and Open Access

Section 7.1 Neutral Host Arrangements

Support for a Neutral Host Provider: The Plan rightly identifies the importance of a neutral host mobile wireless service provider. However, the State of Vermont funding a mobile wireless neutral host provider that relies on General AccessAccess (GAA) CBRS spectrum, as described on p. 120-121, would be of limited effectiveness to address the State's mobile wireless coverage challenges.

Focusing on General Authorized Access (GAA) within the CBRS spectrum might not fully meet the state's coverage needs due to the spectrum's limitations. GAA represents the unlicensed part of CBRS, whereas Priority Access Licenses (PAL) offer a licensed alternative, generally seen as more reliable for comprehensive coverage. Given these considerations, leveraging PAL over GAA could be more effective in addressing Vermont's unique geographical challenges.

Using the CBRS (3.5GHz) spectrum, either GAA or PAL, may not offer the best coverage in Vermont's challenging landscapes, characterized by hilly terrains and dense foliage. Telecom experts generally recommend a blend of low, mid, and high band spectrums for broader and more efficient coverage. Investments tend to favor networks based on licensed spectrums over GAA-only networks, which lack the assurance of licensed bands, making them less appealing for comprehensive network development.

For such a neutral host mobile wireless provider to be successful, it must possess key assets and capabilities, including:

- Ownership or access to necessary spectrum band, including Low Band, Mid Band and Licensed high band spectrum such as CBRS PAL licenses.

- An established presence as a telecommunications provider within Vermont.
- A proven track record in serving the state's constituents.
- Adequate customer support facilities and network operational expertise.
- Ownership of fiber infrastructure and existing roaming agreements with major carriers (AT&T, Verizon, T-Mobile).
- A core network supportive of neutral host architectures and a fully operational Network Operations Center (NOC).

The Plan is also deficient in defining selection criteria for a mobile neutral host provider, specifically:

Lack of Clear Qualification Criteria: The Plan currently lacks a detailed definition of qualifications for bidding entities, which could hinder the selection of the most capable providers. Establishing clear criteria is crucial for ensuring the success and efficacy of the allocated funds.

Need for Transparent Selection Process: There is an absence of a defined process for qualifying and scoring applicants. Drawing from the NTIA, ARPU, and CPF guidelines, Vermont's Plan would benefit significantly from integrating transparent and objective qualification and scoring criteria.

Recommendation for Process Improvement: We suggest the adoption of a clear, transparent, and objective process for applicant evaluation. This approach should align with best practices outlined by federal guidelines, ensuring the selection of highly qualified entities to implement the telecommunications initiatives.

Section 7.4 Opportunities for Open Access Fiber Networks

The Plan also relies heavily on the concept of Open Access Neutral Host Fiber Networks and Communications Union Districts (CUDs) as a unique kind of Vermont municipality governed by a board of delegates, each appointed by the member towns' select boards. As the Plan notes, the State has a statutory goal of supporting and promoting open access telecommunications ("In 30 V.S.A. § 202c, the state establishes a goal to "support competitive choice for consumers among telecommunications service providers and promote open access among competitive service providers on nondiscriminatory terms." (Plan p.128). In order for neutral host fiber to be considered to be "open access," it must be available to any paying applicant, on a competitively neutral basis, for any lawful purpose, whether it is for long haul transmission or as a component of a last-mile FTTP project. The State has a significant opportunity to advance this policy goal by requiring that publicly-funded municipal fiber networks adhere to the open access principals as a condition of funding.

Conclusion

The 2024 10-Year Telecommunications Plan is a pivotal step toward enhancing Vermont's telecommunications landscape. By addressing the aforementioned areas for improvement—specifically, defining bidder qualifications and establishing a transparent

selection process—Vermont can significantly increase its potential to meet and exceed its telecommunications goals. We look forward to contributing to and supporting these efforts.

This submission is designed to constructively address the areas where the Plan could be enhanced, ensuring that Vermont can leverage its resources most effectively to achieve its ambitious telecommunications objectives.

Thank you for your comments. The Department has made some small revisions to Section 7 based on your feedback.

Timothy O. Wilkerson, President, New England Connectivity and Telecommunications Association:

The New England Connectivity and Telecommunications Association (“NECTA”), on behalf of its members, submits these comments in response to the State of Vermont’s Draft 10-Year Telecommunications Plan (“Draft Plan”). NECTA is a five-state regional trade association representing substantially all private cable telecommunications companies in Vermont, Connecticut, Massachusetts, New Hampshire, and Rhode Island. NECTA members serve 190 Vermont municipalities with broadband, video, voice, and home security and automation services. Over the past decade, our members have collectively invested over \$200 million developing state-of-the-art networks in Vermont. Today, we provide high-speed broadband to 157,000 homes and businesses through approximately 9,000 miles of fiber.

NECTA values the Department of Public Service’s (“DPS”) efforts in developing the Draft Plan. Our members share Vermont’s goal of connecting all unserved and underserved locations in Vermont and ensuring that all residents have access to reliable, high-quality, affordable broadband, as demonstrated by our submissions during the Draft Emergency COVID-19 Response Telecommunications Recovery Plan of 2021, and our multiple submissions to the Vermont Community Broadband Board during the Broadband Equity Access & Deployment Initial Proposal development. NECTA members have a long and proven track record of success in expanding broadband access and adoption in Vermont, including through public-private partnerships. As our members have played a critical role in connecting Vermonters to high-speed broadband, NECTA offers these comments to several sections of the Draft Plan as we want to continue to be active partners in pursuing solutions that achieve Vermont’s long-term telecommunication planning objectives.¹⁷⁵

Section 1.3 Recommendations

¹⁷⁵ We understand that other stakeholders were afforded an opportunity to provide information to DPS prior to issuance of the Draft Plan. Going forward, we respectfully request that NECTA and its members be afforded the same opportunity.

Vermont should explore all available options to expand broadband, including partnerships with existing internet service providers. NECTA members have invested in Vermont for decades, resulting in the robust deployment of state-of-the-art broadband networks, unparalleled cybersecurity protection and customer service resources, and innovative digital equity initiatives and community-based partnerships across the state. NECTA members have the experience, resources, scale, and commitment to deliver a comprehensive, reliable, and sustainable approach to provide connectivity to currently unserved and underserved areas of the state.

For example, Comcast has a long history of partnering with the DPS and the former Vermont Telecommunications Authority to successfully expand high-speed broadband coverage in the State. Comcast's investments also serve as multipliers for public funding, including previous existing grants from the DPS's Connectivity Initiative and Line Extension Customer Assistance Program ("LECAP"). Through LECAP investments, Comcast completed 112-line extension projects, connecting an additional 308 customers throughout Vermont. Additionally, in the past five years alone, Comcast expanded broadband access to more than 24,000 additional Vermont homes and businesses, a 9.5% increase in addresses with access to Xfinity and Comcast Business products and services. It is important to also point out that for these projects, no matter the circumstance, Comcast always delivered on its commitments to the State on time and under budget. Similarly, Charter extended its service to approximately 100 unserved locations in over 18 communities through LECAP which included an 80-home build that Charter partnered with DPS to complete at a reduced cost to the state.

In addressing concerns about finding a skilled and experienced workforce, NECTA members also bring a well-trained workforce to the table. Our members currently employ 175 Vermonters. The on-the-job training our employees receive is a core component of building a skilled and diverse workforce that can be hired with little to no background in broadband deployment. The National Telecommunications and Information Administration even highlighted Charter specifically for its Broadband Field Technician Apprenticeship Program.¹⁷⁶

Section 2: Needs Assessment Overview

As the Draft Plan notes, 99.7% of respondents reported using and owning a mobile phone.¹⁷⁷ The importance of providing reliable cellular phone service to residents cannot be overstated and NECTA agrees with DPS that mobile phones play a critical role in connectivity

¹⁷⁶ <https://internet4all.gov/blog/case-study-charters-broadband-field-technician-apprenticeship-program>.

¹⁷⁷ See Draft Plan, page 21.

in today's modern society. This is why NECTA's members proudly offer mobile services with competitive pricing and flexible plans.

Comcast offers Xfinity Mobile across all areas it serves in Vermont. Xfinity Mobile provides the fastest mobile service across Comcast service areas by combining 5G and 11,700 WiFi hotspots in Vermont.¹⁷⁸ Xfinity Mobile pricing is some of the most competitive in the industry with the best price for two lines of Unlimited at \$30/month, saving customers hundreds of dollars per year when they switch from another provider. Xfinity Mobile offers unparalleled convenience by offering customers a choice of Unlimited or By the Gig options to customize a plan to meet their unique needs. Customers can also change their plans, even in the middle of their billing cycle, and manage every aspect of their account through the Xfinity app.

Charter offers Spectrum Mobile in their service areas in Vermont. All Spectrum Mobile data plans include nationwide 5G access at no extra cost; unlimited talk and texting; the flexibility to change rate plans as needed for free; interest-free monthly installment plans; and a robust bring-your-own-device program. A line of Unlimited data currently costs \$29.99/month and existing customers who switch to Spectrum Mobile pay just \$15/month per Unlimited line for 12 months when they get two lines. Spectrum Mobile's distinction as J.D. Power's highest ranking mobile virtual network operator in 2024 reflects its focus on providing superior mobile connectivity with consumer-friendly plans and affordable prices backed by exceptional service.¹⁷⁹

Section 3: Current State of Telecommunications Infrastructure and Coverage in Vermont

The Draft Plan's characterization of NECTA's member networks as "coaxial cable coverage" is antiquated. Comcast is building a single fiber-rich network that uses both hybrid fiber coax (HFC) technologies and fiber-to-the-home (FTTH) network to deliver data to customers. Regardless of the type of wire that connects the home, Comcast's network can deliver a reliable, secure and ultra-fast connection to residential and business customers.¹⁸⁰ In addition to the deep fiber penetration in our networks in Vermont, 100% of the 278,400 Vermont homes and businesses that Comcast's network currently passes have access to speeds of 1.2 Gbps or more, with over 99.9% network reliability. This is only the beginning. In what is the nation's largest and fastest multi-gig rollout, by 2025, more than 50 million homes and businesses in Comcast's current footprint will have access to DOCSIS 4.0

¹⁷⁸ Based on consumer testing of mobile WiFi and cellular data performance from Ookla® Speedtest Intelligence® data in Q3 '23 for Comcast service areas, including its WiFi footprint, verified by Ookla for Comcast's analysis.

¹⁷⁹ <https://www.jdpower.com/business/press-releases/2024-us-wireless-customer-care-study-volume-1>.

¹⁸⁰ <https://corporate.comcast.com/broadband-partnerships>.

multi-gig download and upload speeds.¹⁸¹ In addition to fast speeds, DOCSIS 4.0 leverages breakthrough Full Duplex technology to dramatically increase upstream speeds without sacrificing downstream speeds, enabling customers to receive even greater reliability and capacity to power multiple data-intensive applications. In Vermont, Comcast also continues to invest heavily in its local network and completed over \$93 million in technology and infrastructure projects over the last three years, which includes broadband network upgrades.

Similarly, Charter has effectively managed, operated, and continually upgraded its Vermont network since 1999. Charter is a leading connectivity company providing superior products and services through its Spectrum brand of services and investing in the infrastructure, technology, and people powering the future. Charter is at the intersection of technology and entertainment, facilitating communications that connect more than 32 million residential and business customers in 41 states, including Vermont. Charter is also committed to expanding broadband access across urban, suburban, and rural areas to connect more Americans. As part of this effort, Charter has invested more than \$40 billion in infrastructure and technology over the last five years, including the addition of almost 1,000 passings in Vermont as a result of expanding its network by over 230 miles. Charter's Vermont system is an integral part of its New England network, which includes a regional fiber ring that provides critical network redundancy to enhance network reliability.

Charter also continues to invest significantly in infrastructure and technology to enable the company to better meet its customers' needs for reliable, high-speed Internet with enough capacity to support even the highest bandwidth activities. Over the next three years, Charter plans to enhance its HFC network using a number of technologies, including spectrum expansion, initially to 1.2 GHz and then to 1.8 GHz, high splits to increase upstream speeds, Distributed Access Architecture ("DAA") and DOCSIS 4.0 technology. Charter will transform its network to enable multi-gigabit data speeds to customers. Those faster speeds will be offered in conjunction with the Spectrum mobile product and Advanced WiFi, providing customers seamless and convenient, ultra-fast converged connectivity in attractively priced packages, including Spectrum One, introduced in October 2022. In addition, Charter expects its network evolution to enable it to offer fiber on demand across the majority of its footprint.

Section 4: Challenges with Expanding Telecommunications in Vermont

¹⁸¹ See Press Release, Comcast Corp., *Comcast Accelerates Nation's Largest and Fastest Multi-Gig Rollout*, (Feb. 9, 2023) <https://corporate.comcast.com/press/releases/comcast-multi-gig-rollout-xfinity-10g-network-upgrade>.

The Draft Plan recommends maintaining a consistent policy regarding net neutrality. NECTA companies have a longstanding commitment to the "net neutrality" principles ensuring an open Internet and continue to call on Congress to codify these protections at the national level under a clear, modern, and enduring law. Our members have invested billions of dollars in their broadband networks to ensure they exceed ever-expanding consumer demand. Those robust networks are the byproduct of continuous and intensive capital network investments and upgrades. Providing world class Internet speeds is the hallmark of our companies, and we have no incentive or desire to diminish customers' experience through violations of "net neutrality" principles. To be clear, NECTA members do not block, throttle, or otherwise interfere with the lawful online activity of our customers and have consistently reaffirmed these commitments since the FCC's first articulation of open Internet principles in 2005. It is important to underscore that these commitments are more than a mere pledge, they are a part of our companies' operating DNA. The Federal Communications Commission has made clear that national uniformity is necessary to ensure consistency and predictability; as Chairwoman Rosenworcel put it, we need a "uniform legal framework [that] applies to the whole country.¹⁸²

Section 5: Broadband Affordability in Vermont

As noted in Section 5, NECTA members offer affordable low-cost broadband options for low-income consumers as they have done since before the COVID-19 pandemic. Our members are committed to continuing these types of programs despite the apparent sunset of the Affordable Connectivity Program ("ACP").

Comcast's Internet Essentials ("IE") is the largest and most successful broadband adoption initiative in the industry, connecting more than 10 million Americans to broadband Internet at home since launching in 2011.¹⁸³ This includes connecting 44,000 low-income Vermont residents in 11,000 homes to the Internet with IE since 2011. Comcast was in Vermont with IE before the ACP and will continue to offer IE after the ACP. IE is designed to be a wrap-around solution to eliminate barriers for financially constrained households and help more families benefit from home Internet access.¹⁸⁴ IE provides participants with access to broadband service at speeds of 50/10 Mbps for \$9.95 per month or 100/20 Mbps for \$29.95 per month (for IE Plus), access to 11,700 Xfinity WiFi hotspots in Vermont, a wireless gateway at no additional cost, the ability to obtain low-cost or no-cost computers, unlimited data and free

¹⁸² 2023 Open Internet NPRM, Statement of Chairwoman Jessica Rosenworcel, at 2.

¹⁸³ See Broderick Johnson, *The Road to Digital Equity: Where We've Been and Where We're Going*, Comcast Stories (Dec. 13, 2022),

<https://corporate.comcast.com/stories/the-road-to-digital-equity-where-weve-been-and-where-were-going>.

¹⁸⁴ See *Internet Essentials*, Comcast Corp., <https://corporate.comcast.com/impact/digital-equity/internet-essentials> (last visited June 23, 2023).

digital skills training.¹⁸⁵ Recognizing the critical need for Internet-ready devices in addition to a broadband connection, Comcast has distributed more than 200,000 free and subsidized laptops.¹⁸⁶ Through IE, Comcast also provides free digital skills training, which helps address the digital skills gap. To become an IE customer, there is no credit check required, no term contract requirement, and customers who do not have a social security number (or prefer not to provide their social security number) may provide other forms of identification to apply.

In addition to IE, Comcast's Internet Essentials Partnership Program ("IEPP") was launched to help accelerate Internet adoption and provides the opportunity for school districts and other organizations to fund and quickly connect large numbers of students and families to broadband access. Past IEPP partners include Winooski School District, Champlain Valley School District, and Central Vermont Council on Aging.

Similarly, Charter has a history of helping to close the digital divide with a comprehensive approach that addresses broadband access, adoption, and affordability. Charter has worked very hard to ensure those who qualify are aware of and able to participate in low-income programs and ensured that notice was provided to all consumers about the availability of the ACP program. Charter's significant success with ACP was in part based upon its ongoing success and favorable experience marketing its high-speed, low-cost broadband service for low-income consumers,¹⁸⁷ Spectrum Internet Assist ("SIA").¹⁸⁸ It is also important to note that SIA, like all of Charter's Internet offerings, currently have no modem fees and no contracts so customers can change plans or cancel anytime without penalty.

The Draft Plan notes in section 5.3 that the enrollment process in Internet Service Provider-based programs may be difficult based on eligible persons either being unaware of the programs or having tried to previously enroll. NECTA disagrees with the inference that enrollment may be difficult without specific data points describing the difficulties people may have experienced. Understanding that those enrolling in low-cost programs may not have vast experience navigating websites, our members make enrollments as straight-forward as possible. Comcast, for example, breaks down enrollment to three steps to make enrollment as easy to understand as possible, in addition to addressing language barriers through IE call center agents that can help IE applicants in more than 240

¹⁸⁵ See *Internet Essentials*, Comcast Corp., <https://corporate.comcast.com/impact/digital-equity/internet-essentials> (last visited Dec. 21, 2023).

¹⁸⁶ Comcast Corp., *Internet Essentials Progress Report 30*, https://update.comcast.com/wp-content/uploads/sites/33/dlm_uploads/2022/06/IE-ProgressReport_6-23-22.pdf.

¹⁸⁷ SIA is a 50/10 Mbps low-cost service product for seniors and households with families of school-aged children that qualify for certain low-income programs.

¹⁸⁸ <https://www.spectrum.com/internet/spectrum-internet-assist>.

languages as well as American Sign Language.¹⁸⁹ To enroll in a low-income program, there is no credit check required, no term contract requirement, and customers who do not have a social security number (or prefer not to provide their social security number) may provide other forms of identification to apply. Additionally, Section 5.5 of the Draft Plan recommends using LI-HEAP as an eligibility requirement. NECTA members have broad qualifications for enrollment including the National School Lunch Program, housing assistance, Medicaid, and SNAP and would encourage that any planning to reach low-income families incorporate broad qualifications for eligibility.

Section 6: Emerging Telecommunications Technologies

As addressed in detail in our comments to Section 3 of the Draft Plan, NECTA's members continue to take connectivity technology to the next level from the role out of the 10G platform¹⁹⁰ to ensuring that our customers have seamless connectivity whether they are on their mobile phone or in their home office. Due to the continuous investments in company networks, our members are meeting the demands of customers today, and well into the future.

Section 7: Opportunities for Neutral Host Arrangements, Shared Infrastructure, and Open Access

With respect to section 7.3.3 of the Draft Plan that discusses a possible role for Communication Union Districts in mobile broadband backhaul and Enterprise Solutions, NECTA members already provide these services¹⁹¹ and cybersecurity is built into their services.¹⁹²

Conclusion

NECTA members are committed to Vermont and are ready and willing to partner with the state to close broadband gaps through broadband expansion and adoption efforts. As DPS finalizes the Draft Plan, we urge the state to focus on targeting its effort at ensuring every household in Vermont has access to high-speed broadband as soon as possible, without

¹⁸⁹ Press Release, Comcast Corp., *Comcast Commits to Investing \$1B Over Next 10 Years to Reach 50M Low-Income Americans With Tools and Resources to Succeed in Digital World* (Mar. 24, 2021), <https://corporate.comcast.com/press/releases/comcasts-internet-essentials-program-hits-ten-year-mark>; <https://www.xfinity.com/learn/internet-service/internet-essentials/apply>.

¹⁹⁰ <https://www.cablelabs.com/10g>.

¹⁹¹ Comcast Business Offers Enterprise Grade Mobile 4G Backhaul. <https://business.comcast.com/enterprise/products-services/data-networking/cell-backhaul>.

¹⁹² E.g., Comcast Business Cybersecurity <https://business.comcast.com/enterprise/products-services/cybersecurity-services>.

favoring one product or provider over another. Our members are prepared to deliver high-speed, affordable broadband today. Exclusive approaches to providers and technology can only put Vermont residents at a disadvantage regarding speed of deployment and reliability and choice of services.

Thank you for your time and consideration of these comments. Please do not hesitate to reach out with any questions.

Thank you for your comments regarding the Plan, including the context about Charter's and Comcast's recent expansion, the services and products they offer, and technologies they use. The Plan has been revised based on your note that "coaxial cable" is an antiquated description and that in some cases, hybrid fiber/cable is more accurate.

Stephen Whitaker:

Will Vermont's 2022 Broadband Building Bonanza come to be remembered as our 2024 Broadband Boondoggle?

We seem to be in a giddy stage of everyone spewing effusive "*thank you so much*" and dreaming of the presumed inevitable Broadband Panacea, a Garden of Eden where everyone is abundantly connected, everyone has all they need in the way of broadband, housing, health care, telemedicine, education, mental health counseling and increased access to a more responsive government.

WE NEED A REALITY CHECK!

But we are far from that. In fact, we're heading towards a cliff with our COVID face masks up, blinders on and we may well fall off if we're not careful.

We have not had a completed state Telecommunications Plan, duly adopted, since 2004. We have no coherent state strategy for achieving broadband either.

The currently proposed broadband legislation is a drive to primarily utilize Communications Union Districts instead of established electric distribution utilities to construct the fiber infrastructure needed to fill all the gaps in Broadband coverage. These are the same gaps that the for-profit providers have ignored for good reason for all this time. This is a recipe ripe for disaster. In fact, disaster is almost assured on the current trajectory.

We could easily see Vermont's Legislature sinking hundreds of millions of dollars into CUDs which lack management expertise, which lack construction expertise, which lack utility

management staff, which lack financial expertise, which lack legal expertise, and most importantly, which lack transparency. We appear on track to do this without required adherence to our statutory goals, no plan nor strategy with much of this negotiation and planning going on in secret, contrary to traditional and essential transparency required of all other Vermont municipal entities.

This comment does not pertain to the 2024 Plan. There is no currently proposed legislation as described in this comment. Act 71 was signed into law on June 8, 2021.

For informational purposes, previous Vermont Telecommunications plans are available at <https://publicservice.vermont.gov/about-us/plans-and-reports/department-state-plans/telecommunications-plan>. The Broadband Equity, Access, and Deployment plans are available at <https://publicservice.vermont.gov/vt-community-broadband-board-vcbb/broadband-equity-access-and-deployment-program> and the Vermont Digital Equity Plan is at <https://publicservice.vermont.gov/vt-community-broadband-board-vcbb/digital-equity>.

These many honorably intentioned and dedicated CUD volunteers are no match for the teams of strategists, lawyers and marketing experts behind the scenes at Consolidated Communications, Comcast and Firstlight. ValleyNet and Waitsfield Champlain are included too to a lesser degree.

So if we seriously intend to craft a good outcome we must immediately address fundamental issues of whether we will insist on policies, funding conditions and rules to cultivate a managed competitive environment, transparency, resiliency and affordability.

Without a competitive environment for Broadband, we will not only perpetuate and extend the prior monopolies, but we will sow the seeds of the CUDs' demise and the squandering of most of the public investment in them. Monopolies soon grow stale, reward poor customer service, guarantee increasing prices while diminishing repair time responsiveness and service quality. Monopolistic practices and their results are very well documented.

And yet our statutes, for more than a decade, have made clear that *competitive choice* for consumers and *open access to infrastructure* for the delivery of telecommunications and Broadband by competitors at non-discriminatory rates. This is our state policy and these are our goals! These policies and goals have never been implemented in rules however, nor in any plan or as grant conditions so these statutory policies and goals of 30VSA 202c are being flagrantly ignored today.

The Plan discusses the goals of open access and competition at length.

Yet somehow both of the proposed bills before the legislature sidestep this fundamental

premise. It's given short shrift in every committee discussion. Every CUD brushes it aside and says, "oh we don't need/want competition"; "We can't deal with competition."

There's also no emphasis on cell coverage. In fact several representatives of CUDs said in testimony "We'll deal with cell coverage after we finish building Broadband." Well, it's going to take four or five years, maybe even ten, to build Broadband out to all the fiber unserved Vermont locations. Interim fixed wireless? Ignore it too is the collective ostrich mentality. Yet we need cell coverage today for calling 911, based on an obvious public safety priority.

There is a large emphasis on cell coverage in the 2024 Plan.

We are clearly at risk of sinking hundreds of millions of dollars into an experiment where we see naive Communications Union District volunteers "partner" with Consolidated as an operating entity, and then Consolidated, under the secrecy of NDAs, picks the areas that they already know are profitable and they build those. Then they leave the dregs, the crumbs, the shavings for the Communications Union District to build spending public money, IF they can even find a competent contractor as all are committed for the next few years. To whom? Guess!

There's then not enough revenue left from those remaining undesirable areas to sustain any CUD staff, operating expenses, marketing expenses, repairs, upgrades and the

Communication Union District soon fails. That leaves the public fiber investment stranded on the poles, either to be purchased at below cost by Consolidated or it reverts to State ownership. In that scenario, the state has no capacity nor desire to manage it. The infamous VanuCoverageCo 2G neutral host small cells are still mounted but disconnected, hanging on a hundred or more poles across Vermont, or they may well have been stolen or cannibalized by now.

Vermont's statutory framework for telecommunications planning under 30VSA 202d requires planning to be participatory, and a transparent process. It involves multiple draft plans, public hearings and even a joint legislative hearing. What is going on now with CUDS, the Department and these potential "partners" is all happening behind closed doors, under signed NDAs, and this is antithetical to all of our statutes and public policy.

So this is all a recipe for a massive disaster and yet, none of the powers-that-be care to conduct the due diligence, understand the pitfalls, consider the more prudent and cautious path. Everyone's giddy with the flood of approaching federal money and the potentials, and still no one is taking a sober look at what strategy is going to actually, realistically get fiber built quickly and build a long-term reliable, competitive, resilient, Public Safety Grade

broadband network that can be recovered quickly after storm damage and that also supports healthy competition.

Competition brings competitive pressure to lower rates. Shared infrastructure means lower capital costs for all competitors. We have an opportunity to use this money in a way that reduces or even fully covers the large up-front Capital costs, thereby reducing the Debt Service and making sure that the operating costs are low enough to result in affordable broadband rates for Vermonters. This is key!

Thank you for your comments. Appendix A provides the full and accurate text of the guiding statutes. Appendix B provides a crosswalk between the Plan and those statutes, indicating full compliance.

The PSD followed statutory guidance in 30 V.S.A. § 202d(d) in the creation of this Plan, including but not limited to:

- *On 2/12/2023, the Department reached out to the local AMO to discuss strategies for promotion.*
- *On 3/4/2023, an advertisement was placed on WCAX. It was posted both on the WCAX website banner and broadcast via video livestream.*
- *On 3/7/2024, the public meetings were added to the Department of Libraries public meeting calendar for state agencies.*
- *On 3/11/2024, a press release and announcement with a link to all of the meetings was posted on the Department of Public Service homepage.*
- *On 3/13/2024, the press release was emailed to all stakeholders interviewed for the Plan.*
- *On 3/13/2024, the Department reached out to VAN as we had not heard back from the local AMO. We were referred back to the local AMO, who then contacted us.*

There's so far been little to no discussion about creating affordable, even close to uniform rates in the \$50 to \$60/month range for gigabit Broadband, which currently does exist but only in one ILEC territory in Vermont.

Other's broadband rates such as ECFiber, Kingdom Fiber, FirstLight are three, four, five or even six times that. So we need to get real with the costs and prices of this technology. We also need to get real with the fiber architecture. If we're going to build a passive fiber architecture, which can never be fully symmetric nor competitively neutral, we are being penny wise and pound foolish. This is not the "future proof" network as Congressman Welch insists we assure happens as we spend this one time money. Active versus an passive fiber architecture is how competitors could deliver a 1Gbps, 10Gbps or even a 100Gbps circuit directly to the customer without interfering with the incumbent or requiring a new build-around the installed passive splitters.

Section 5.1 and Appendix I provide tables of pricing from providers that address this comment.

So as I see it, the only rational model for quickly building all this new fiber, considering that all the fiber building crews have been fully booked by Consolidated for the next several years, a strategy that utilizes the federal TARP/ARPA money in the most efficient way is the model being pursued today by Washington Electric Co-op in cooperation with CVFiber and using RUS low interest 2% financing.

This model is sound, where the electric distribution utility builds, owns and maintains the fiber along all of the electric utility right-of-way, possibly higher on the poles in the electric space. They already have the trucks and crews. They own the poles. This strategy does require skilled union labor which already exists and more could be quickly recruited as there is a career path and job security for these well paid, cross trained Fiber/Electric utility crew jobs.

Notably, this strategy also alleviates the need for the expensive independent pole surveys and inventories, for time consuming and expensive pole Make-Ready work and eliminates the recurring expenses for monthly pole attachment rental.

The electric distribution utilities would then lease fiber capacity to the CUDs and others, reserving a few strands for grid management, or they might use the revived Vermont Telecommunications Authority as their leasing agent. The same could work for VELCO fiber. The VTA can then make that fiber available affordably to Communications Union districts, small cell providers and Public Safety entities requiring resilient, public safety grade radio backhaul. The VTA should also assure resiliency of regional, managed, self healing fiber rings within reach and accessible by all CUDs and public safety organizations for mission critical communications.

Are we ready and willing to require this bold action by the PUC, of GMP, VEC and VPPSA municipal electric member utilities?

This is a proposal for a competitively neutral scenario that can get fiber built quickly, accountable under PUC supervision and that can create the greatest number of sustainable jobs. The fiber will be installed by Union labor who live here in Vermont and will therefore be available in an emergency when there's an inevitable need to repair and restore the fiber and to rebuild and splice quickly after wind and ice storms or even hurricanes.

Building Vermont's fiber infrastructure otherwise, using hit and run out of state labor, the way Consolidated Communications is pursuing it today, will leave Vermont very vulnerable

and last on the regional restoral priority list in the aftermath of a large storm or hurricane passing through New England. Recall Puerto Rico.

This proposal would require a fundamental change of strategy from the haphazard and reckless pursuit of half a dozen different CUDs partnering with incumbents. We are only in this predicament due to the chronic failed planning and the inadequate understanding and oversight by the legislature compounded over years as statutes were ignored, plans not produced and policies not implemented.

Pursuing this solution would also require a resolution to again treat the electric utilities as the regulated utilities they are, and to begin to reframe the relationship where these utilities have over time, in many cases captured the Department of Public Service, the Public Utility Commission and legislative oversight committees.

So we are at this pivotal moment. Not just on the cusp of broadband enabled future economic, social and educational recovery, but on the cusp of realizing sound planning, resilience, reliability, competition and true Economic Development resulting in a much more equitable prosperity.

Will we rise to the occasion?

The 2024 Plan cannot recommend a wholesale change in broadband strategy that runs counter to Act 71 and other state policies as this comment suggests doing. This comment does not pertain to the 2024 Plan, nor the authority of the Department in regulatory manners.

Rob Vietzke, Program Director, Vermont Communications Union Districts Association:

The Vermont Communications Union Districts Association is pleased to provide comments to the Department of Public Service on the February 27th, 2024 draft "Vermont 10-Year Telecommunications Plan". We have organized our comments roughly in the order of the document. We would welcome a follow-up conversation with you to discuss these observations and recommendations.

As a general note, the plan includes some excellent recommendations and insights and we are grateful for the thoughtful treatment and recommendations in many of the sections. We do make suggestions that the Department treat the Communications Union Districts equally with other providers in its comments. The draft includes statements about CUDs that appear slightly incorrect. We do not recall that these topics were the result of

engagement with VCUDA or any structured CUD leadership engagement, so we are surprised to see them stated the way they are. Given the longevity of this plan, we have taken the time to redirect the sections where we felt the CUDs were treated differently than other providers the Department may work with.

The Executive Summary (end of P. 11 through the top of P. 12) correctly catalogs a number of current activities, however, it could be more aspirational and set a clearer vision for the next 10 years. We would encourage the Department to relegate much of the history currently in the executive summary to later in the document and to use the executive summary to (briefly) highlight the great progress that is being made while also laying out an aspirational vision for what still needs to be done. Section 12 lays out 10 high-level recommendations that could be summarized in the executive summary of the plan. Many of them are aspirational and others are foundational. These would be good topics to briefly highlight while the reader is engaged at the start of the plan.

Thank you for this suggestion. The Executive Summary was intended to provide a general summary of all aspects of the Plan for readers who do not have time to read the entire Plan – rather than focusing more on some aspects of the Plan and ignoring others.

We note that in its current order, the first section after the executive summary is extremely wireless-centric and there is little transition from the executive summary to what is titled “Needs Assessment”. We make recommendations to adjust the flow of the document that would both provide better context on the role of wireless in the state’s overall strategy and allow the full set of technical, policy, and financial issues across all telecommunications sectors before the document narrows to what we recommend should be retitled the “Mobile Wireless Needs Assessment”.

Thank you for this comment. The Plan was intended to focus on wireless so as not to duplicate the work done in the BEAD Plan and associated documentation, which lay out in great detail significant information about residential fiber deployment.

Finally, we found Section 12: Recommendations and Action Plan” to be clear and succinct. These full recommendations are currently buried at page 198 and are not much longer than the Summary of Findings in Section 1.3 beginning on page 17. Given a reader’s potential time to review this document, we would ask the Department to consider moving the entire section 12 from page 197 to replace the “Summary of findings” in Section 1.3 on page 17. We believe many readers would be drawn in by the recommendations and would then go to the supporting sections. As currently structured, we doubt many readers will even see the recommendations section. We understand this may not follow the standard format of a state report, but believe the recommendation is sound and hope it will be considered.

In the following pages, please find our section-by-section reviews of the draft document.

Thank you again for what clearly is an important and thorough review completed by the Department. We look forward to working with you to consider and implement many of the recommendations.

Executive Summary

We recommend replacing the Executive Summary with a more forward looking and aspirational outlook on what successful implementation of the plan might look like. If the Department does keep the current executive summary, we offer these comments about the current draft.

The executive summary describes the BEAD and related federal investments as a critical part of the state's wireline strategy, however, VCUDA would prefer the language to be more aspirational and certainly less "past tense". It is true that a number of activities have already occurred, however the majority of the BEAD program is in front of us, not behind us. It is hard to fully understand if the statement that "final tranche of funding necessary to deploy universal fiber broadband" is true at this time. Just to name a few of the current complicating factors that may impact this: the FCC's consideration of RDOF amnesty, the NTIA/VCBB determination on inclusion of off-grid addresses, the rising costs of construction and workforce availability/cost. Any of these factors (and others) could still impact the ability of Vermont to complete its universal service plan within the NTIA's \$229M allocation and the four years described. We would encourage the Department to consider ways to restructure this critical paragraph in the executive summary to recognize that BEAD is still a work in progress that, while well underway and holding great promise, is not complete nor at the point of implementation yet.

We have adjusted language to reflect some of the nuances you described to emphasize the in-progress nature of BEAD and the non-duplicative efforts between this Plan and the BEAD proposals.

The final paragraph of the opening summary appears to bury its lead statement. The last sentence states: "In doing so, this Plan avoids devoting resources to the duplication of work, and instead provides the state with specific analysis and recommendations in service of state goals that build on the momentum created by the BEAD Program and other federal resources made available to the state." We would encourage the Department to make its strategy of making this plan focus on non-duplicative efforts more explicit. The heavy focus throughout the document on mobile and the narrow language throughout may be lost on the casual reader. We believe the department should be more careful to set context for the reader throughout. In other words, if the plan is not going to integrate the wireline activities

of the VCBB, then the statement about non-duplication should be repeated throughout the document whenever the focus narrows to wireless only.

The plan needs to always set context that the State's 100/100 fiber-wireline goal is foundational to this entire plan. Where wireless strategies are described, it is important to highlight that especially where there is not line of sight between towers, the need for wireline infrastructure is fundamental to wireless. This should be repeated and explained in multiple ways throughout the plan. For example, the final paragraph of the executive summary (or the start of the needs assessment section) could start: "This plan focuses its primary attention on the additional strategies beyond those for universal wireline fiber broadband. The plan offers recommendations to continue the momentum in wireline, but we chose to focus this plan's stakeholder survey and needs assessment exclusively on wireless."

The Plan affirms this comment that the need for wireline infrastructure is fundamental to expanding mobile wireless service. This is discussed in multiple places, and will be reiterated in the Executive Summary.

Presumably, the executive summary will close with a strong statement about what the plan is and isn't, and will articulate why this plan is important to Vermont's future. We would encourage the Department to explicitly share its vision in the plan and be unequivocal about the need for a full set of programs and technologies to meet the State's needs.

Section 1.1 Summary of Surveys and Stakeholder Feedback

Following the executive summary, it is a stark transition to the next section 1.1, which focuses nearly exclusively on data gathered about wireless services under the premise that "a cornerstone of this Plan is a robust survey of Vermont Residents". Upon review of the Appendix D through G questions that were asked to Vermont Residents, it is hard not to notice this survey focused only on wireless. Appendix D through G confirm that the Survey did not ask contextual questions about how respondents viewed wireline -vs- wireless or how respondents viewed other communications systems to fulfill the health care, public safety, and business communications needs. The survey is narrowly focused only on how each sector views wireless.

For example, it appears the first question a respondent was asked was "Do your employees use mobile cell service to perform their core job functions". Although this question is important, a more general question of "what communications technologies do your employees use to perform their core job functions" with responses that might include wired telephone, wired broadband, mobile cell, radio, television, satellite, or others, which might have provided better context on Vermont's future needs.

Given the data collected is wireless-centric and may skew the reader of the plan to think wireless is the primary solution for Vermont's 10-year plan, we would encourage the Department to consider switching section 1.1 and 1.2, allowing context to be set before sharing the survey data. Alternatively, if the survey section is to follow the executive summary, we highly encourage the Department to take time to transition and explain in explicit terms why it focused its survey only on wireless.

We also encourage the Department to relabel this section "Mobile Wireless Needs Analysis".

Thank you for this comment. Given our intent not to duplicate the summary performed for the BEAD Plan, this Plan's survey did focus predominantly on mobile wireless.

Section 1.2 Summary of Findings and Analysis (p. 15-17)

This section does an excellent job of succinctly presenting many key issues for consideration. We appreciate the breadth and simplicity of this section.

Section 1.3 Summary of Recommendations (p. 17-20)

We found the section on wireline and wireless Affordability to be a good start towards a vexing and long-term challenge. VCUDA would like to see the Department advocate for an active role for itself in assuring that Vermonters who will have access to modern telecommunications also have the tools to ensure affordability. The Department is in a unique position to understand the economics of building, operating, and sustaining access to modern telecommunications in the State, while also understanding what State programs may need to be in place so that all Vermonters can gain access to those services. We would encourage the Department to advocate for a direct role in supporting affordability in the plan and to call out the linked but separate needs to build sustainable and modern infrastructure while also making sure all Vermonters can afford to access it.

The findings related to the undergrounding and grid-resiliency efforts currently led by GMP have important implications for telecommunications providers, environmental opportunities, and economic efficiencies. We would also like to see the department advocate for a broader role beyond analyzing costs, but also helping to develop and coordinate the programs that would allow telecommunications, power, and other right-of-way users to efficiently build and rebuild their infrastructure in the spirit of "dig once", efficiency and long term resiliency. There are a myriad of alignment issues across utility, wireline, wireless, and other sectors where the Department could play a key role.

This Plan agrees that the Department may play an ongoing role in coordinating programs and aligning actors involved in utilities in the state. Section 12 affirms that the role of the state should be more than just analyzing costs.

Section 2: Needs Assessment

We also encourage the Department to relabel this section “Mobile Wireless Needs Analysis”.

Section 2.1 Residential Survey Results and Analysis (p. 21 to 54)

We believe it would be helpful to describe why the Department focused only on Mobile cell service in these 33 pages of the report. A better title for this section might be “Residential Survey regarding Mobile Cell Service Survey Results”. Some expanded explanation of the narrow focus on Mobile service would help the reader put this section in context that the Department only surveyed residents on a narrow portion of the overall plan’s content.

This context setting is particularly important considering the narrow questions beginning in section 2.1.10 “Expressed Policy Preferences for Investments in Mobile Cellular Coverage”. The questions in this section are written as if a cellular provider was surveying to support their own lobbying effort before the legislature. We would expect the Department would want to set explicit context for legislators that may read this section about why the questions were so narrowly crafted and in a way that appears could be misconstrued by policymakers.

Section 2.2 on Health Care and Section 2.3 Public Safety and Section 2.4 Business Connectivity Needs (through page 54)

These sections also appear to focus exclusively on Mobile Broadband. The Department should consider retitling these sections to reflect their exclusive focus on mobile investment strategies or should highlight how Health Care, Public Safety, and business also rely on other telecommunications services. For instance, the Department could say it encourages use of both wireline and wireless strategies for Public Safety, Health Care and Public Safety and describe how these technologies can be used together for maximum resiliency, capacity, efficiency, and flexibility. As written, these sections do not broadly represent the full set of issues that the State needs to address to have a comprehensive, resilient, scalable, and efficient set of tools for Health Care and Public Safety.

Section 2.5 Remote work

No comments.

Thank you for your comments regarding Section 2 of the Plan. It has been revised to reiterate the focus on elements of telecommunications planning that are not addressed in the simultaneous work being done as part of the BEAD Program.

Section 3.1.1 Communications Union Districts

VCUDA appreciates the inclusion of CUDs in this section, however would urge the Department to use a more updated description of the activities and progress. The language and map appear to show data from early 2023, over a year ago. In the time since the language and map were developed, two CUDs have completed their initial mission (SoVT CUD and ECFiber) and four have begun serving hundreds of previously unserved addresses with world-class fiber broadband.

We would recommend replacing the current paragraph:

CUDs are committed to achieving universal service, prioritizing all unserved on-grid addresses. Infrastructure construction is underway or planned throughout the state; as of the publication of this Plan, SoVT CUD has completed their network build and other CUDs have begun building their networks – like CVFiber, DVFiber, ECFiber, Maple Broadband, NEK Broadband. Deployments are reportedly planned for the spring and summer of 2024 for Chittenden County CUD, Lamoille FiberNet, Northwest Fiberworx, and Otter Creek CUD. The following map shows which CUDs have builds in progress or completed:

With the following:

CUDs are committed to achieving universal service, prioritizing all unserved on-grid addresses [new footnote]. These publicly owned and community-governed non-profit municipalities are mission-driven to ensure all the addresses in their districts have fiber broadband service. Given the historically incomplete deployment of modern broadband by existing providers, CUDs are often building fiber broadband to those residences that traditional private investment has failed to reach since residential broadband began decades ago. The CUD model builds on the successful 15-year history of ECFiber, Vermont's first communications union district, which grew from grass-roots investments from citizens throughout east central Vermont into a sustainable and thriving modern fiber broadband provider. In 2023, ECFiber celebrated the completion of its original 23-town service area, delivering fiber broadband to every on-grid address in all 23 towns.

Infrastructure construction is underway or planned throughout the state; as of the publication of this Plan, SoVT CUD and ECFiber have completed their original network builds, providing universal service in 38 towns. CVFiber, DVFiber, ECFiber, Maple Broadband, and NEK Broadband have collectively built 3,673 road miles of new infrastructure and are in

the process of passing over 29,000 new addresses with world-class fiber Broadband (data as of April 2, 2024 from:

<https://www.arcgis.com/apps/dashboards/75eb5dd3e4454c18a31ef25d97b3d3da>). Thousands of previously unserved homes now have world-class fiber broadband offered by these CUDs. Deployments are reportedly planned to begin shortly for Chittenden County CUD, Lamoille FiberNet, Northwest Fiberworx, and Otter Creek CUD.

[New Footnote] – The National Telecommunications and Information Administration’s Broadband Equity Access and Deployment program (NTIA BEAD) does not distinguish on-grid and off-grid addresses as Vermont’s Act 71 program did. CUDs and other competitors in the BEAD program will be required to serve all addresses found in the FCC’s Broadband Serviceable Location (BSL) listings as part of the BEAD program. VCBB and other providers are working to have the FCC eliminate some hunting cabins, sugar shacks, trailheads, covered bridges, and inaccessible locations currently listed on the FCC BSL list. VCUDA encourages the department to include updated maps prior to publication. The town makeup of CUDs, the status of their construction and availability of services to previously unserved consumers is evolving rapidly and the maps in the draft plan are already significantly out of date.

Thank you for your comments regarding Section 3 of the Plan. Section 3.1.1 has been revised to include any new build-outs that took place during the production of the 2024 Plan. The maps used were the most up-to-date maps available during the production of the 2024 Plan.

Section 4.2 - Climate Challenges (p.88)

VCUDA agrees with the analysis and the call for collaborative planning between infrastructure providers and other stakeholders on how best to invest in resilient infrastructure. During the next 10 years, the Department has an important role to play coordinating efficient collaboration across utility sectors that maximize cross-sector investments for climate-tolerant infrastructure.

Section 4.3 - Demographic Challenges (p.91)

The state is making a series of strategic decisions related to housing and other systems to support the changing demographic needs of the State. The Department has a role to play in assuring that new housing initiatives explicitly support the deployment of world-class telecommunications infrastructure. The Department may wish to consider its role as a stakeholder in assuring that new Housing initiatives include plans for competitive broadband deployment. This is especially important for temporary housing, manufactured housing, multi-dwelling units, and related housing plans.

4.4.2 Regulatory Challenges related to Carrier of Last Resorts (p.97)

VCUDA agrees with the Department's analysis that transition of COLR away from the copper telephone line providers and the related people, process, and tooling necessary to support COLR on fiber networks is a critical issue for policymakers. VCUDA suggests section 4.4.2 could be rewritten to encourage an active policy discussion in this area. Done correctly under a well-thought-out plan, there may be opportunities to leverage the new fiber networks that are being deployed for benefit in some of the state's most rural areas where legacy copper networks are the most difficult to maintain. VCUDA would like to see the Department establish criteria and standards to evaluate COLR and to put in place recommendations that allow a smooth transition to more modern technologies like fiber. Such a plan would need reasonable and high standards that protect Vermont citizen's interests, but allow the possibility of leveraging the robust new fiber networks that are being deployed. The Department would be well-positioned to develop such standards.

Thank you for your comments regarding Section 4 of the Plan. The Plan's inclusion of COLR concerns was meant to inform lawmakers and encourage active discussion in that area.

Section 5 - Broadband Affordability (p. 100)

Broadband Affordability is a key concern for mission-based municipal providers like the Communications Union Districts. Assuring not only that world-class broadband is available at every address, but also that resources exist to ensure every resident can access the service is a critical part of establishing digital equity in Vermont.

The plan currently does not call out the unique nature of the CUDs, which are building networks to serve the most rural and previously unserved addresses first. By nature, the business models and broadband pricing the CUDs must use to achieve sustainability using the most difficult and previously unserved addresses is a different challenge than a provider that has a multi-state footprint that blends dense urban areas into its rate base. We would ask the Department to recognize explicitly that sustainability of networks needs to be a goal (as required by 30 V.S.A. § 8086 (G)) and that the customer density is part of what drives pricing for each provider.

It is also important to note that developing subsidies required for some Vermonters can not always be generated by the individual provider supporting that customer. This is especially true for small rural providers like the CUDs, who were established explicitly to serve the areas that the commercial broadband companies had failed to serve and that lack the customer density and excess revenue (even with high rates) to cross-subsidize from one customer to another. The most rural providers who already require public subsidies to build

areas that the commercial companies previously did not serve, do not have a large enough customer base to cross-subsidize customers that need affordability subsidies.

Ideally, the Department's plan would recognize the unique need for small, local, rural-only providers to both be sustainable and affordable as it describes the need for a state subsidy. The plan could describe the criticality of sustainability contemplated by 30 V.S.A. § 8086 (G) while also stating that given a goal of sustainable rural providers with world class services, subsidies can not be reasonably expected to be derived from those same providers' excess revenues. Simply: subsidies must be developed from a larger customer pool across all provider types and sizes to adequately fund affordability across all providers.

Section 5.4 takes a clear position on this, which we believe should also be supported with context and repeated here. From Section 5.4 of the draft:

"There is not likely to be a market-based solution for providing connectivity services at levels considered affordable in Vermont. Relying on individual fixed or mobile ISPs to provide affordable service is not viable, especially in a very rural state where many ISPs will have limits as to the prices they can offer and still be financially healthy."

Thank you. The Plan affirms your point in that it does not suggest that subsidies must be generated by the providers that offer them. Further, the Plan encourages CUDs to focus on sustainability before all else, which could include developing subsidies or affordable products.

Section 5.1 - Current Broadband Pricing (p. 101)

This section describes it being difficult to ascertain the true cost of broadband due to introductory pricing and bundles, and then shows the simple pricing offered by six CUDs before returning to saying that Mobile Broadband pricing is also difficult to capture. In general, the CUDs are attempting to provide simple pricing that is not difficult to capture. The Department's chart appears to show it was not difficult to capture CUD pricing. If the Department agrees the CUD pricing was easier to capture than the other providers it surveyed, it would be better to separate the CUD fee table from the two [negative] paragraphs describing the complex marketing and pricing schemes of the other providers.

The department would do well to remind readers that CUDs were created because no broadband provider wanted to offer service on any terms. However, some who could afford it were able to have the phone company build them special circuits – often at a cost in the high 5 figures – for which they paid \$1000 or more a month. This created an affordability issue for the other 99%. CUDs came along and their business models assume 100% coverage but only expect to get 50% take rate because the service won't be free – but it will be affordable for

half the population. Let's not lose sight of the fact that the affordability question has been being answered for 12+ years, and that the first step to achieving affordability for all is creating sustainable availability for all. Sustainable availability means pricing that enough customers can afford to make the business of the provider a "going concern." That is affordability accomplished at the CUD regional level. Moreover, because CUDs will not be faced with the same pressures for-profit businesses do, over time their constant prices (ECFiber has never raised prices – since 2011) will automatically become more accessible to more households. Beyond that, targeted state or federal subsidies for qualifying households, and not price or service mandate to ISPs, is the way to address affordability.

The Plan affirms that targeted state or federal subsidies for qualifying households are the most viable way to address affordability statewide.

Section 5.2 - Federal Programs to Support Affordability (P. 103)

As of April 1, 2024, it appears that the Federal ACP program will not be renewed. We would encourage the Department to update this section to reflect the end of ACP and to describe the impact that will have on Vermonters ability to access broadband services.

Section 5.3 - ISP-Based Affordability Programs

In addition to national affordability programs offered by commercial providers, this section should mention efforts by ECFiber, NEK Broadband, Maple Broadband, and CVFiber to offer their own limited affordability programs. Notably, ECFiber funded the not-for-profit organization Equal Access to Broadband (EAB) to assist subscribers with ACP enrollment as well as offering direct subsidies – a total of \$275,000 over three years. EAB has since been mothballed and remains a potential resource as part of a statewide strategy for addressing digital equity. The main problem EAB encountered was the unwillingness of state social service providers to engage with it absent funding their staff, and the inability of EAB to access state data on households to expedite outreach. With the lack of ongoing funding to support EAB as a stand-alone entity, ECFiber, CVFiber, Maple Broadband and NEK Broadband are each offering a limited affordability subsidy to customers, and are working toward more comprehensive solutions. It has become clear that a statewide accessibility plan is necessary to achieve these goals.

Section 5.4 - How should Vermont Define "Affordable" connectivity

Section 5.4 might be used to describe the recently approved Digital Equity Plan and its findings on affordability. The Department's plan adds additional data points and recommendations that could be aligned with the new State Digital Equity Plan. In addition,

the Department may want to comment on how the Digital Equity Capacity Plan and the competitive Digital Equity program should be used for state programs.

Section 5.5 - State Actions to Encourage Affordability

The draft plan includes a thoughtful analysis of what an actual subsidy may need to be, especially for small providers in the most rural areas to support digital equity needs. VCUDA is recommending that the legislature consider establishing a study group of government, industry and public sector stakeholders to further look at this issue and to come up with a plan for legislation to address affordability during the 2024-2025 legislative session.

The imminent demise of ACP is going to have an immediate impact on Vermonters and both short-term and long-term plans will be required to not lose ground on the promise of equity that ACP began to deliver on. We would welcome the Department's inclusion of a call to action for any stopgap programs as well as a call to finalize and implement a long-term plan in the next 18 months.

Thank you for your comments regarding Section 5 of the Plan. We agree that setting up a long-term plan responsibly, but at the earliest opportunity, is best for the state and vulnerable populations.

Section 7 - Opportunities for Neutral Host Arrangements, Shared Infrastructure and Open Access (p. 117)

VCUDA does not believe the current inclusion of CUDs in the section summary is necessary or appropriate. We would ask that the sentence at the opening be deleted: "This section also explores what CUD involvement in expanding mobile broadband could look like, again with the benefits and risks associated with that course of action."

As a general note, VCUDA did not notice similar instructions or analysis of any other providers' explicit role in this plan and it is unaware that CUDs were consulted about the findings in this section. To be consistent with the way other providers are treated in the document, and to assure the Department has engaged with the stakeholders it is writing about, we recommend this section be deleted.

The CUDs welcome opportunities to collaborate with the Department on future services and the development of standards and capacity to enter into new business areas. However, more conversation and development work would be required to include such ideas in a plan such as this.

A better place to highlight CUDs as a potential partner might be in the list of providers in section 7.2. In general, we agree with the analysis in section 7 through 7.2.

Section 7.3 - Opportunities for the Public Sector or CUDs to Participate in Neutral Host and Shared Infrastructure Broadband Deployments (p. 122)

VCUDA and its CUD members were surprised to see section 7.3.1 included in the draft document. We do not recall any conversation with the Department that would lead to a section like this. The section itself calls out some important issues, but often makes what appear to be judgemental statements about CUD capacity without any apparent discussion or knowledge gathered from CUDs themselves. Further, the section makes judgemental statements like “some of the logistical skills and challenges CUDs would need to overcome – such as accessing power and poles – are achievable with concerted effort” (p. 124). This is out of place stylistically and contextually with the rest of the document, which is quite good.

The statement is confusing because every CUD already accesses power and poles. “Accessing poles and power” is not a challenge that would need to be overcome. CUDs fully recognize the difference between communications-space attachments and power-space (or higher) small cell attachments and would (obviously) address such differences if the CUDs were considering such projects either on their own, or in conversation with the Department. However, because those conversations never happened, the draft language is judgmental, incorrect, and misleading.

Our recommendation to the Department is to review this section and to remove the judgmental and potentially inaccurate statements about CUDs. In the places where the Department’s draft speculates about a future that hasn’t been discussed with stakeholders yet, let the analyses of issues and discussion points stand on their own and remove the negative and confusing speculation about what it means until a collaborative and substantive conversation on the topics can occur.

“Current CUD staff and operational partners may not have these skills or capacity.”

Why this should be removed: No CUD would take on a new technology direction without a business plan to sustainably support the new area. CUDs are engaged in public-private partnerships to ensure skills and capacity as needed to build and operate its networks. Therefore, this statement lacks a base understanding of how CUDs do business and does not properly recognize that if a CUD was to consider a new line of business it would seek the skills or capacity for such activity.

“CUD plans with small operating margins may struggle financially to incorporate these expenditures.”

Why this should be removed: No CUD would take on a new financial obligation without a business plan and revenue model to sustainably support the new area. Therefore, this statement lacks a base understanding of how CUDs do business.

"Though some of the logistical skills and challenges CUDs would need to overcome – such as accessing power and poles – are achievable with concerted effort, some of the bigger challenges around business plans are context specific to deployment locations and MNO partners, and would require careful planning and likely outside expertise to investigate on a case-by-case basis."

Why this should be removed: A CUD would not take on a new technical obligation without sourcing experienced talent to sustainably support the new area. Therefore, this statement lacks a base understanding of how CUDs do business.

We urge the department to review this section in the context of the entire document and to recognize the overreach on these statements and how they take away from a core message of opportunity to collaborate with CUDs. By dropping the incomplete and inaccurate commentary about a future that has not been discussed, the document is stronger and opens opportunity for future collaboration on an important topic.

The Department included the analysis of potential CUD involvement in neutral host, small wireless facilities, and related mobile wireless deployment frameworks due to significant questions from a range of stakeholders about whether the CUD model could be extended to mobile wireless services. There is general interest in understanding the possibility of publicly owned infrastructure in Vermont from a range of legislators and stakeholders, and the CUD vehicle has been established to facilitate such public ownership. The Plan is meant to inform and educate the range of stakeholders who drive telecommunications policy, and we heard questions about extending CUD involvement from enough people that we decided to include nonjudgemental evaluations of the conditions that CUDs would need to meet to be successful in this effort.

7.3.2 Operating Traditional Wireless Infrastructure

We would encourage the Department to delete any reference to CUDs in section 7.3.2. No CUD has had any conversations about operating traditional tower-based infrastructure and this entire section is speculative, somewhat inaccurate and premature. The CUDs would welcome a conversation with the Department on this topic, restrictions that would need to be addressed and opportunities to support an important need.

7.3.3 Mobile Broadband Backhaul and Enterprise Services.

We would encourage the Department to delete any reference to CUDs in section 7.3.3 or to delete the section in its entirety. The section would be less problematic if the word “CUD” was deleted in each section and “potential provider” was replaced. Nonetheless, the section shows a lack of experience and knowledge about Mobile Broadband Backhaul and Enterprise Services by the authors and the writing is not at the same level of quality and analysis as the rest of the report. We would recommend its deletion or substantial review to make sure it accurately reflects the current state of infrastructure in Vermont as it relates to these services.

To be clear, no CUD has had any conversations about operating mobile broadband backhaul as a specific statewide service offering with the Department or the authors of this plan, and this section shows a lack of understanding of what CUDs are, what networks they have built, and how Mobile Backhaul might work in Vermont. The description of CUDs role in such a service and the infrastructure changes that might be required seems wildly speculative and inappropriate.

As a general note, the CUD deployment model varies greatly enough across the 10 CUD districts, that a traditional Mobile Broadband Backhaul approach may not be possible without substantial new investments in several of the districts.

We are surprised that a section about CUDs would be written and included without talking to CUDs in advance. As community-based organizations, the phrase “nothing about us without us” comes to mind.

CUDs were all invited to interviews, and Appendix C provides a list of those that responded to requests. Contrary to this comment, all CUDs interviewed were asked about their operational and technical capacity and aspirations – including their understanding of, and ability to provide, enterprise- and carrier-grade service. We received different responses from CUDs – including, for example, a note from one CUD that they already provide enterprise-grade services, and a note from another CUD that it would take a decade or more to provide that service.

7.4 Opportunities for Open Access

VCUDA appreciates the thoughtful understanding and presentation of open access represented throughout section 7.4.

Section 8.0 Workforce Readiness, Analysis and Best Practices

VCUDA generally agrees with the analysis that the Department has completed in Section 8 related to Workforce Readiness. The expected headcount needs across sectors seem reasonable based on the number of individuals currently delivering on broadband projects in the state when taken to scale. However, updated numbers are likely needed as the availability of workforce is constantly shifting and will continue to shift as BEAD funds become available, which will increase demand for qualified resources.

We would encourage the department to include employers (including the Vermont-based companies providing telecommunications services and the contractors and out-of-state firms that provide services here) to be directly engaged in the workforce conversation.

Labor force challenges are the principal barrier to construction that all providers face. Moreover, it is not simply about construction, but also about staffing sales, marketing, accounting, customer support, technical support, planning, and development. Vermont is a difficult sell to young people, to people who don't like the cold, and to top-tier talent willing to relocate but unable to find suitable housing. Absent efforts that are beyond the ability of the telecommunications industry, there is little or no chance that the 2029 goals of BEAD can be met.

Section 9.2 - Vermont Community Broadband Board (p. 147)

The section calling to “replace the \$20 million borrowed from the VCBB” is now unnecessary. In March 2024, the legislature included the replacement of these funds in the budget adjustment act that was signed by the governor.

VCUDA applauds the Department’s call to “develop a comprehensive analysis of the costs to bury telecommunications infrastructure in Vermont”. We would like to add context to the correct assessment that we are concerned about the cost to underground communications as GMP’s plans proceed and remind the Department of the enormous timing pressures both GMP and CUDs face to meet customer expectations.

As the Department is aware, the CUDs are currently aggressively completing new infrastructure across the state. Millions of dollars have been spent to make poles “ready” for this infrastructure deployment and thousands of miles of new broadband plant have been completed in rural areas in the last 2 years. More millions of dollars have gone into hanging fiber, deploying equipment and connecting customers with aerial drops. The long-term business depreciation lifecycle of those networks, which will support their eventual replacement, is just beginning and accumulated reserves to relocate massive portions of the newly completed infrastructure are sparse.

Although CUDs would welcome the operational and environmental benefits of moving to underground, there is not funding to rebuild a recently built CUD network immediately after its completion, nor is there consumer appetite in areas that have not yet been built for CUDs to delay more than a few months for build-out to an area that may be on GMP's multi-year undergrounding plan.

These problems are not insurmountable, but they will require additional funding and attention and are not easily solved with simple "coordination". Moreover, actual coordination would need to take place in the 6 to 18-month timeframe, but even GMP is not working this far out in its plans. There is no question that their present program is going to impose significant unexpected costs on telecommunications providers over the next few years without a comprehensive multi-entity planning mechanism.

Thank you for this comment providing additional perspectives on the potential need for greater coordination among utilities and fiber builders in the state. We have revised the Plan to provide the most recent update on the return of the \$20 million.

Section 9.3 - Communications Union Districts (p. 150)

We believe that at least 6 CUDs have already started deployment and are offering service. These include SoVT, Maple Broadband, CVFiber, DVFiber, NEK Broadband, ECFiber. Otter Creek and Lamoille may be starting deployment by the time this plan is adopted.

In regards to the role of VCUDA, CUDs have begun leveraging VCUDA for the purposes listed in the plan. VCUDA has already acquired legal, regulatory, financial, accounting and software services for its member CUDs and has active groups working across the areas listed in the draft plan.

In regards to offering Enterprise-grade services, VCUDA would welcome a more in depth discussion with the Department. It seems out of place in the plan for the Department to be recommending a new line of business for a provider, especially without a structured conversation among stakeholders. We do not see the Department recommending new lines of business or structural changes for any other provider elsewhere in the plan. The CUDs would welcome the opportunity to collaborate, but the appropriate outreach and communications has not happen to allow documentation of such options in this plan.

VCUDA appreciates the thoughtfulness of the Department's remaining recommendations.

Thank you for your comments regarding Sections 8 and 9 of the Plan. The Plan does not mean to imply that CUDs should develop enterprise-grade service; the Plan does assert, however,

that mobile wireless expansion will be supported most effectively if more fiber owners and operators in the state can provide that service.

Section 10.2.3 - Recommendation for a Mobile Broadband Pilot Grant Program (p. 182)

The CUDs are supportive of the proposal to fund a pilot grant program for mobile broadband, and we agree with the Department's general framework for the program. As the program is more fully realized, we would recommend the Department consider staging the program with an educational and collaboration stage for stakeholders prior to deployment of grants to providers. A planning and collaboration stage would allow the Department to better understand on-the-ground knowledge from the providers and would likely result in a better RFP process for grantees and the Department. Perhaps the program could have at least two rounds of funding, where after the educational stage an initial pilot could prove out the overall grant program and evaluation criteria before expanding to broader scale pilots. In general, the CUDs would like to see an iterative process that helps stakeholders learn and share knowledge with one another and the department through successive stages. This would be a substantially improved process that would help evolve and develop best practices through the pilot program and would be a substantial win for the Department over more typical one-time grants favored by commercial entities.

Section 10.5 - Increasing Network Resiliency (p. 187)

A missing component of resiliency strategies in Vermont is middle-mile connectivity. The Plan does not address the state's needs to be well interconnected to regional exchange points in New York, Boston, and Montreal, nor does it address middle-mile strategies within the state to ensure that the proliferating number of critical infrastructure points are well interconnected with diverse routing and well-understood resiliency strategies.

The Department's plan would benefit by adding a focus on the middle mile that assured that both the intra-state and interstate needs of the telecommunications network were well understood and appropriately structured. Such a section would also support some of the carrier-grade and enterprise discussions the Department raises in 7.3.3 and 9.3.

We agree that middle mile is an important resiliency component, as is diverse routing. The BEAD Plan, which governs the deployment of fiber, is required to have components related to increasing resiliency, and that Plan dictates the resiliency measures that last-mile broadband deployers must take.

Section 11.2 - Alignment Across Statutes and Statutory Sections (p. 192)

VCUDA recommends that Vermont update all statutes to at least align with the recently announced FCC broadband standards as a minimum standard, with the State goal of 100 Mbps symmetrical remaining as the minimum for any new state investment. Ideally the state would set a framework that would allow the Department and VCBB to increase both the minimum standard and the state funding availability standard on a regular basis, perhaps every 4-5 years.

VCUDA applauds the section at the end of page 196 which states: "the goals presented in 30 V.S.A. § 202c are predominantly focused on supply-side telecommunications issues – in other words, facilitating deployment of critical technologies. However, a significant portion of the connectivity challenge falls on the demand side, concerning affordability, digital skill building, cybersecurity practices, device ownership, accessibility, and more. The legislature should consider including goals that address the demand-side challenges that the ecosystem of telecommunications stakeholders should be focused on after deployment goals are met."

This is well said and deserves attention as part of the executive summary.

Thank you for this feedback.

Section 12: Recommendations and Action Plan (p. 198)

Overall, we find the recommendations section to be well written and succinct. It is unfortunate that this section starts at the bottom of page 198, as it is unlikely that many readers will make it to this section. We might recommend moving this entire section 12 to the start of the document, within the first 20 pages. Then the remaining sections could be included as supporting documentation following these recommendations.

Regarding the mobile wireless pilot in 12.3, we recommend the bullet points include the iterative and staged grant process described in our response to section 10.2.3.

In Section 12.4, the plan again recommends that CUDs consider developing enterprise services. We do not object to the recommendation that CUDs consider this, but again question why the Department finds it necessary to single out CUDs for unfunded business obligation and expansion when its plan makes no demands on any other providers, other municipalities or other agencies.

The Department would be well served to directly engage the CUDs on such topics before including them in a plan. The Department may find the CUDs to be willing partners in such a discussion, however mandating a new line of business without prior discussion with the

potential partner is not productive. Further, the plan does not talk about the role that other providers (Firstlight, Velco, VTEL, CCI, etc.) might play in such requirements.

The Department included the analysis of potential CUD involvement in neutral host, small wireless facilities, and related mobile wireless deployment frameworks due to significant questions from a range of stakeholders about whether the CUD model could be extended to mobile wireless services. There is general interest in understanding the possibility of publicly owned infrastructure in Vermont from a range of legislators and stakeholders, and the CUD vehicle has been established to facilitate such public ownership. The Plan is meant to inform and educate the range of stakeholders who drive telecommunications policy, and we heard questions about extending CUD involvement from enough people that we decided to include nonjudgemental evaluations of the conditions that CUDs would need to meet to be successful in this effort.

Section 12.5 again mentions replenishing the \$20M that has already been replaced by the March 2024 Budget Adjustment Act. This paragraph can now be deleted.

Section 12.8 states: "As described in Section 9.2, the VCBB is successfully supporting the deployment of fiber broadband infrastructure – and will have distributed over \$500 million in wireline grants by the end of 2024." This should be updated to reflect the likelihood that VCBB will not have begun release of any BEAD funds by the end of 2024. Mid to late 2025 is the currently likely timeline for that level of disbursement.

Thank you for your comments regarding Sections 10 and 12 of the Plan. The Plan has been revised to address the replenishment of the funding and the current timeline for BEAD funding.
