A Blueprint for Alaska's Broadband Future

Updated and Revised 2019

The Denali Commission | www.denali.gov
Connected Nation | www.connectednation.org

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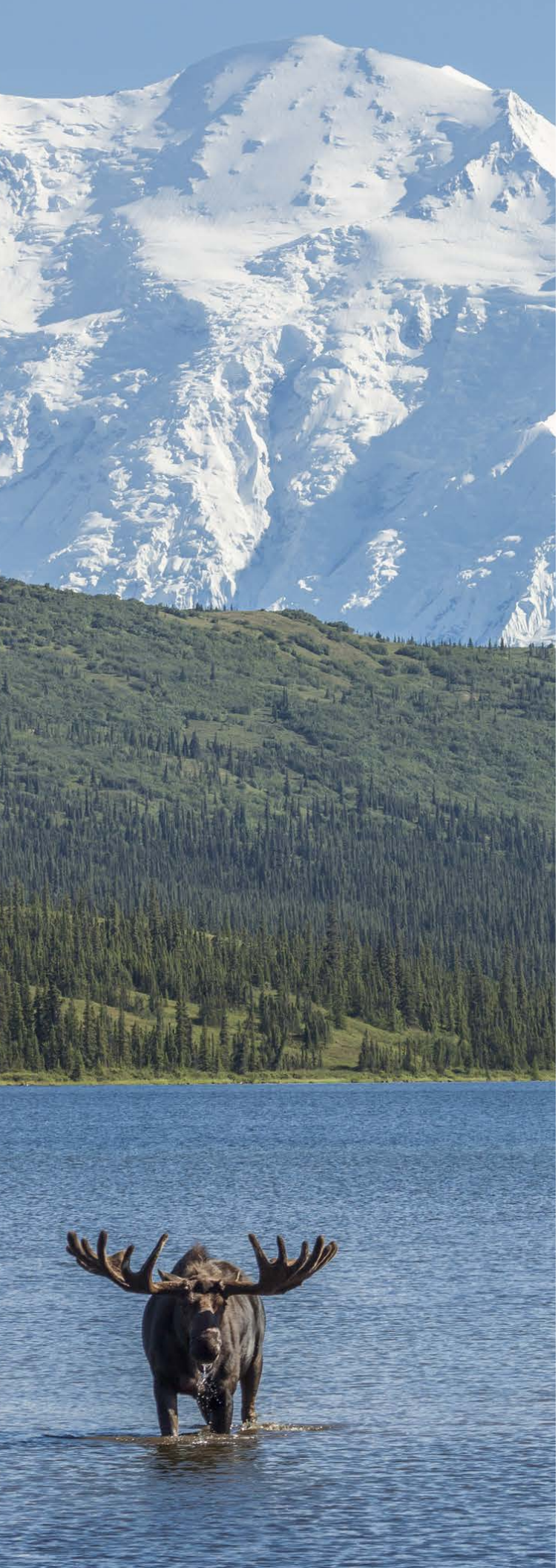

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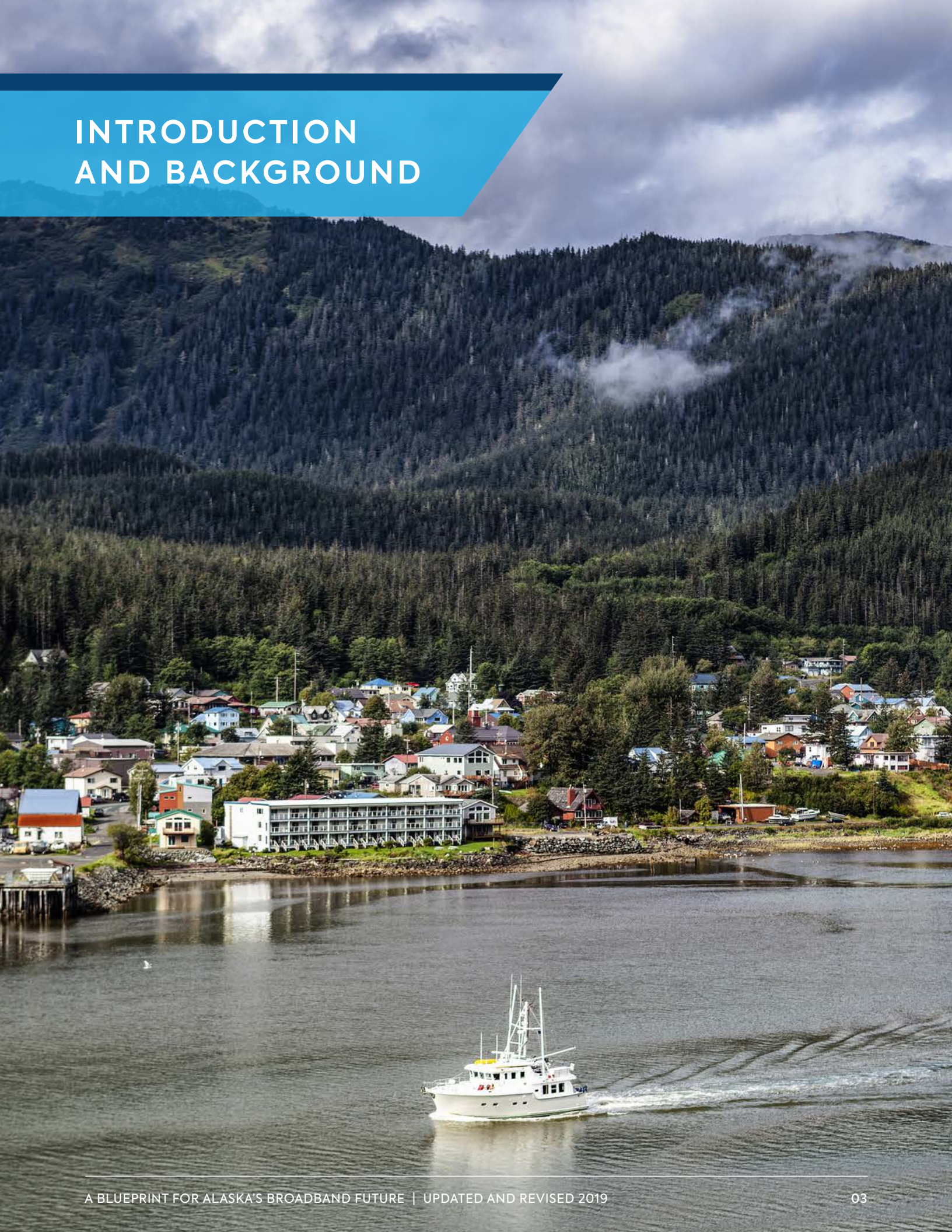
INTRODUCTION AND BACKGROUND



Released nearly 10 years ago, the Federal Communications Commission's National Broadband Plan outlined the vital importance of broadband to communities of everywhere:

"Like electricity a century ago, broadband is a foundation for economic growth, job creation, global competitiveness and a better way of life. It is enabling entire new industries and unlocking vast new possibilities for existing ones. It is changing how we educate children, deliver health care, manage energy, ensure public safety, engage government, and access, organize and disseminate knowledge." [1]

A decade later, this statement still holds true—only more so. As connectivity in the United States has become increasingly pervasive and robust, so too have the applications that have been designed to ride upon it—applications and services that now impact nearly every aspect of daily life. In Alaska, where vast distances separate communities, reliable and affordable connectivity is even more vital. In remote villages that lie outside the state's road system, internet connectivity serves as the primary link in support of a community's economic and social vitality, just as physical roads do elsewhere. If that link is too costly, too unreliable, or too slow, entire communities will suffer the consequences. The state of Alaska, therefore, has a greater public policy interest in ensuring affordable, reliable connectivity is available to all its citizens than most other states—not just for the purposes of education and telemedicine, but also to ensure that its remote communities survive and thrive in the 21st century economy.

While much progress has been made over the last decade to improve access in Alaska, many challenges still remain. In fact, one could argue that the "digital divide"—that is, the gap between areas that have access versus those that do not—is actually widening, as robust fiber and 5G gigabit wireless access is deployed in urban areas, while rural and remote areas of the country struggle to keep up with even basic levels of access. As content and application companies in Silicon Valley and elsewhere develop products to "ride" on top of these robust connections in urban markets, those applications and services may simply be inaccessible to everyone else, further exacerbating the divide.

Therefore, it is imperative that all stakeholders—public, private, and nonprofit — work together proactively to ensure that Alaska, and particularly rural and remote Alaska, is not left behind.

1 *See* "Connecting America: The National Broadband Plan." March 2010. https://transition.fcc.gov/national-broadband-plan/national-broadband-plan.pdf

Alaska's Unique Challenges

The challenge of deploying broadband infrastructure in Alaska remains great, as it is arguably more costly and logistically challenging to do so than anywhere else in the United States. Vast distances separate communities, with land in between controlled by the U.S. Department of Defense, the Bureau of Land Management, or the USDA Forest Service—making permitting and compliance with federal regulations a challenge. Additionally, many Alaska communities are only accessible by boat or plane, with no roads in or out. These facts, combined with challenging mountainous terrain and permafrost in many areas, harsh winter weather, limited business demand in parts of the state, and limited daylight hours in the winter months, all are hindrances — not only to initial deployment of services, but to ongoing operation and maintenance as well.

The vast distances that separate Alaska communities—and the lack of a road system in parts of the state to physically connect villages with the metropolitan areas of Anchorage and Fairbanks —offer ever-present challenges, particularly to the delivery of healthcare and education services. Therefore, telemedicine and distance learning are perhaps more critical in Alaska than anywhere else in the United States, especially during the winter months when harsh weather can make air travel dangerous.

Despite all these challenges, Alaska's telecommunications carriers have made significant strides over the last five years in developing Alaska's broadband landscape—progress that is explored in greater detail ahead.

The 2014 Alaska Broadband Plan

From 2011 to 2014, the Alaska Department of Commerce, Community, and Economic Development (DCCED) convened a multi-stakeholder group called the Alaska Broadband Task Force[2] to identify Alaska's broadband needs and unique challenges, establish broadband service delivery goals, and draft a plan to chart the course for its future. The plan, entitled, "A Blueprint for Alaska's Broadband Future,"[3] was released in October 2014 and produced in collaboration with Connect Alaska[4] (an initiative of nonprofit Connected Nation) and the Institute for Social and Economic Research (ISER) at the University of Alaska.

The plan ultimately made a total of 18 recommendations to achieve five overarching objectives, focusing largely on improving "middle-mile" and "last-mile" broadband infrastructure — concepts explained further below. The five objectives, which would require joint collaboration between the state of Alaska and private-sector service providers, were to:

- Encourage the development of businesses related to information technology, one of the fastest-growing segments of the U.S. economy
- Enable hospitals and clinics to make better use of telemedicine
- Provide Alaskans with greater access to education through distance learning
- Make Alaska more attractive to technology-driven businesses and corporations.
- Enhance public safety and emergency response systems

Overall, the plan established a lofty goal for the state—to connect every household in Alaska to internet access of at least 100 megabits per second (Mbps) in each direction (download and upload) by 2020.

2 *See* https://www.alaska.edu/oit/bbtaskforce/homepage.html
3 *See* http://www.connectak.org/sites/default/files/connected-nation/Alaska/files/statewide_broadband_task_force_report_final.pdf
4 *See* http://www.connectak.org

Updating the Plan

In November 2019, the Denali Commission engaged nonprofit Connected Nation to update the state's 2014 broadband plan by taking stock of the many improvements that have been made to the state's telecommunications ecosystem over the last five years and to develop a series of updated recommendations that can serve as guideposts for public-policymaking in the future.

It is not the objective of this document to comprehensively assess the state of Alaska's broadband landscape, nor identify every need that should be addressed. Such an endeavor would best be accomplished by empaneling another representative multi-stakeholder group, such as a broadband task force, as DCCED did in 2011, to ensure that all voices from every region of the state are heard.

However, the Denali Commission and the Office of the Governor see near-term value in producing an update to the plan—principally in light of the Federal Communication Commission's adoption of the Alaska Plan for Universal Service support in 2016, as well as the developments in Alaska's terrestrial transport infrastructure over the last five years. Therefore, the purpose of this document is to summarize the progress that has been made since 2014, highlight near-term needs and challenges, and identify recommended actions that can be taken to improve Alaska's broadband landscape over the next five years, particularly as resources become available at the state and federal levels to support broadband infrastructure development.

THE CURRENT STATE OF BROADBAND IN ALASKA

Understanding the Challenge: Federal Data on Last-Mile Broadband Availability

Five years after the release of the original 2014 broadband plan, the state of Alaska is not on track to achieve its goal to connect every home and business with bandwidth of 100 Mbps in each direction. In fact, few states across the country are nearing that point (and no state has yet achieved it), with rural areas generally lagging behind their urban counterparts.

Nonetheless, progress is being made, thanks to state, federal, and private investments in Alaska's telecommunications infrastructure. According to the FCC, 81.81% of Alaskans now have access to fixed terrestrial broadband at speeds of at least 25 Mbps downstream/3 Mbps upstream,[5] an increase of 20 percentage points since 2014. However, only 64.3% of Alaskans are served by mobile LTE wireless service at 10 Mbps downstream/3 Mbps upstream.

While the number of households on the wrong side of the digital divide is decreasing, the need for increased bandwidth keeps growing as applications and services become more advanced, which, as mentioned above, means the divide is growing. For example, in 2014, the FCC's minimum performance standard for Universal Service Fund support was 4 Mbps downstream and 1 Mbps upstream (4/1), while today, it is 10/1 Mbps. The FCC has also officially defined broadband, for the purposes of federal policymaking, as a minimum of 25/3 Mbps. The U.S. Department of Agriculture (USDA), through its Rural Utilities Service (RUS) grant and loan programs, are beginning to utilize this definition as Congress authorizes new programs such as the "ReConnect" Program, which is described further below.

SPEED TIER	SPEED AS OF JUNE 2018
10/1 Mbps	86.45%
25/3 Mbps	81.81%
100/10 Mbps	76.53%

This table outlines the percentage of Alaskans that have access to the various speed tiers of service, as described above, according to the FCC:

5 *See* https://broadbandmap.fcc.gov/#/area-comparison?version=jun2018&tech=acfow&speed=25_3&searchtype=state&searched=y

Unfortunately, the data above paint a rosier picture for Alaska than is actually the case. This is due to the way the FCC collects data from broadband service providers, via what is known as "Form 477." Twice per year, service providers are required to report, using this form, which census blocks they serve. If a provider is capable of providing service to at least one household in a given census block, then the entire block is reported as being served. This is a reasonable approach in urban areas, where census blocks can be as small as one-tenth (0.1) of a square mile. But in rural areas—the very areas where broadband is least available — census blocks can be several thousand square miles in area. In fact, the largest census block in the United States is in Alaska and is larger than 5,000 square miles— larger than the entire state of Connecticut. This approach to broadband reporting leads to significant overstatement in areas where census blocks are very large, and it certainly results in some level of overstatement being reflected in the availability numbers listed above. Additionally, these data do not reflect issues related to cost, as availability does not equal affordable access in Alaska. The 2014 plan stated accurately that "Alaska, more so than other states, has the most to gain from making sure that affordable and reliable high-speed broadband is available to all its residents

Fortunately, both Congress and the FCC are taking steps to significantly improve broadband availability data within the next two years, with the FCC voting to approve the creation of a new data collection program called the "Digital Opportunity Data Collection" (DODC)[6] at its recent August 1, 2019, meeting. The DODC will require service availability reporting on a serviceable location-by-location basis via geographic information system (GIS)-based polygon shapefiles of actual service areas. This represents a huge step forward in the granularity of service availability reporting.

Congress is also poised to pass legislation that will further define provider reporting requirements and establish a public feedback/challenge process to refine the resulting National Broadband Map over time. Still, it will likely take 18-24 months to fully realize the collection of more granular data, and for that data to be reflected on an updated and publicly accessible map. Some states, such as Kansas,[7] are choosing to implement their own broadband mapping programs in the interim until the new DODC program is fully in place—given that they have a near-term need to understand service availability gaps in order to shape state policymaking on broadband expansion.[8]

6 *See* https://www.fcc.gov/document/fcc-improves-broadband-mapping
7 *See* https://governor.kansas.gov/governor-announces-statewide-broadband-availability-map-requests-public-input/
8 *Note:* Connected Nation—through its Connect Alaska initiative—produced and updated a more granular broadband availability map of Alaska from 2010-2015 with funding from the National Telecommunications and Information Administration (NTIA)'s "State Broadband Initiative" (SBI) grant program. Congress did not authorize an extension to that program beyond 2015, however, and the state's map has not been updated since then.

Improvements in School Connectivity

One area of significant progress is in the area of school connectivity. In 2014, the FCC established a benchmark of 100 Kbps per student as the minimum recommended bandwidth to enable digital learning in the classroom. That goal increased to 1 Mbps in 2018, and organizations such as the State Education Technology Directors Association (SETDA) are calling for increases to that goal on a tiered basis by school district size by the 2023-2024 school year.[9]

According to federal data analyzed by nonprofit EducationSuperHighway,[10] Alaska schools have increased their average bandwidth per student from 78 Kbps in 2015 to 256 Kbps in 2019. Ninety-nine percent of Alaska schools are now meeting the FCC's 2014 bandwidth goal—a remarkable accomplishment given the complexities of delivering broadband to village schools in remote parts of the state. Still, according to the same data, no school in Alaska (0%) has met the current FCC benchmark of delivering bandwidth at 1 Mbps per student, as compared to 24% of schools nationally that have. It is important to note that such bandwidth in some cases is available in cities like Anchorage to be purchased, but school districts haven't yet elected to do so.

9 *See* https://www.setda.org/wp-content/uploads/2019/11/FINAL110519_Overview_Broadband-Imperative-III.pdf
10 *See* https://www.educationsuperhighway.org/ and https://s3-us-west-1.amazonaws.com/esh-sots-pdfs/Alaska_Snapshot_2019.pdf

As these benchmarks continue to move upward, more and more Alaska students will fall behind national standards if a concerted effort isn't undertaken to help them keep up. Unlike many states, where access to gigabit-capable fiber is increasingly available, and where fiber-provisioned service prices are on a steady downward trajectory, those two trends are generally not true in Alaska. It is therefore likely that trendline of the average bandwidth available per student will begin to plateau as districts confront the realities of the cost of delivering higher speeds to remote villages—costs that are driven by the high cost and bandwidth limitations of microwave or *LEGACY* satellite backhaul (i.e., "middle-mile" service) into those communities.

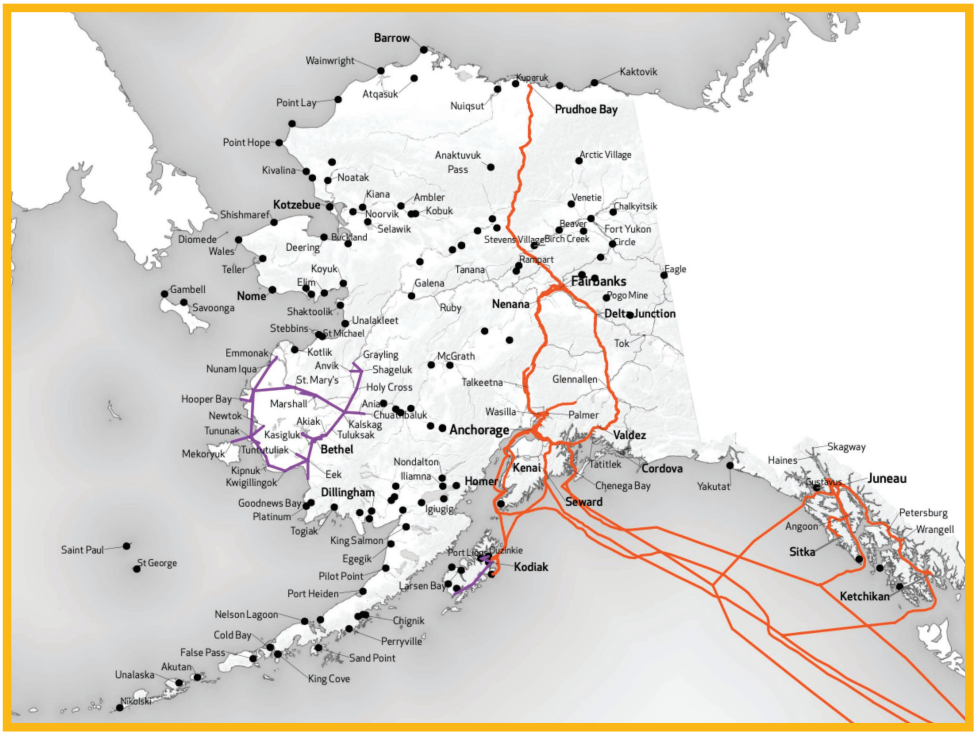
MOVING THE NEEDLE: FIVE YEARS OF PROGRESS

Despite the many challenges facing the state of Alaska, the state's broadband service providers have made significant progress in their efforts to expand and improve connectivity. This progress can be credited to a combination of federal investments made via the FCC's Universal Service Fund and USDA's Rural Utilities Service, as well as state and local investments, streamlining of permitting processes, and importantly, the private capital expenditures of many service providers. The state is indeed moving the needle toward ubiquitous, reliable connectivity for all Alaskans. Yet there is also still much work to be done.

"Middle-Mile" Infrastructure

One of the greatest areas of progress, and yet one of the largest issues still facing Alaska, is adequate transport or "middle-mile" connectivity–i.e., the fiber and/or microwave wireless infrastructure that connects the ultra-capacity long-haul networks coming into Alaska from Seattle and Portland with "last-mile" networks in communities (and ultimately the end-users within those communities). In 2014, much of the state—particularly those communities off the road system—was still connected to the rest of the internet via satellite backhaul, a costly and high-latency solution that severely constrained the amount of internet capacity available to Alaska's remote villages. After five years of federal and private investment, that is no longer the case. The following maps compare the extent of Alaska's middle-mile network infrastructure in 2010 to what is available today (or nearing completion by the end of 2019):

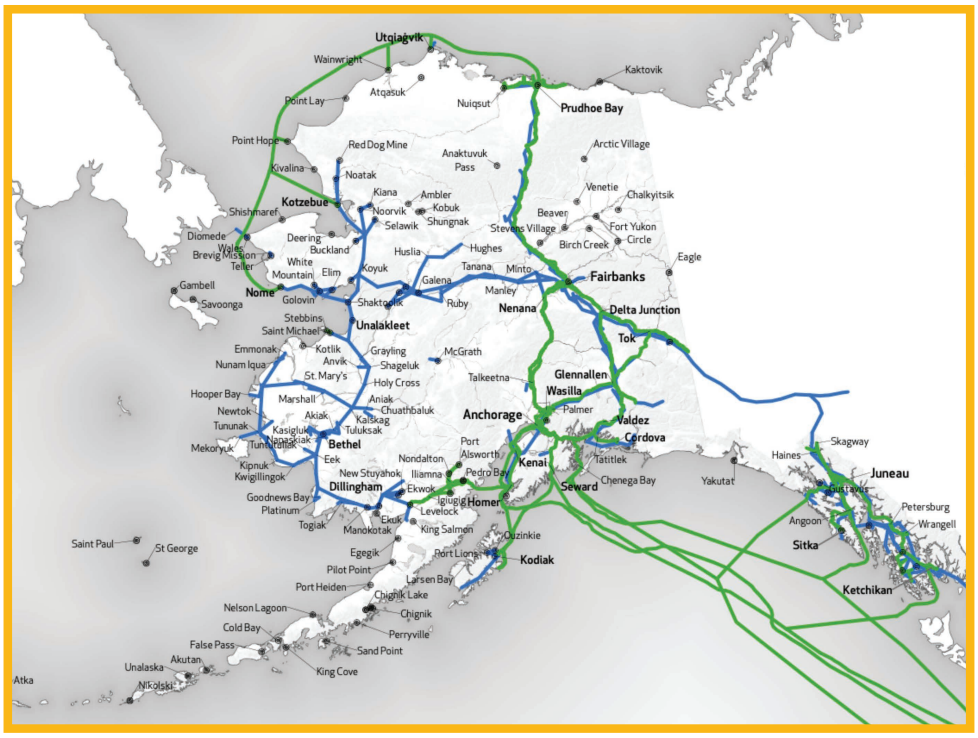
GCI's TERRA Microwave Network



ALASKA MIDDLE-MILE INFRASTRUCTURE 2010

- Fiber
- Microwave
- Satellite

Map credit: Alaska Telecom Association



ALASKA MIDDLE-MILE INFRASTRUCTURE 2019

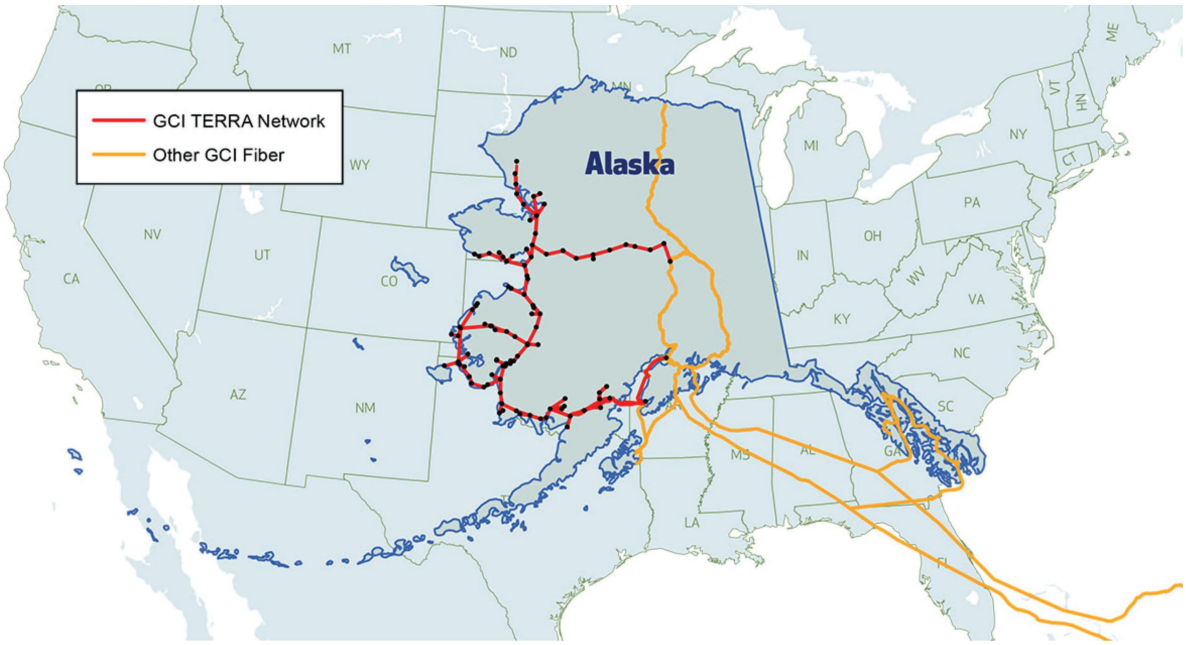
- Fiber
- Microwave
- Satellite

Map credit: Alaska Telecom Association

As these maps indicate, there are now just two significant regions of the state that lack terrestrial middle-mile connectivity: the communities along the Aleutian Island Chain, and the communities to the north and northeast of Fairbanks. The Aleutian Islands are home to the largest commercial fishing operations in the world, giving it the population and economic vibrancy to sustain an operational business case for fiber services, if only the financial resources were made available to enable the initial deployment. Alaska also has a number of rural villages scattered throughout the state that are (by Alaska standards) relatively close to providers' existing terrestrial infrastructure (e.g., Yakutat, Kaktovik, Hoonah and Gustavus), but that still have not been connected to terrestrial middle-mile infrastructure due to the cost of facilities construction. These are the areas that should be prioritized for federal program funding support, such as USDA's ReConnect Program, in the near term.

GCI's TERRA Project: At the time of the 2014 broadband plan's release, GCI had recently completed the southwest portion of its TERRA project, connecting the villages in southwest Alaska to Anchorage via a system of microwave wireless towers that were capable of delivering a total 10 gigabits of capacity to the communities along the network at a significantly reduced cost compared to satellite backhaul. Since 2014, GCI has continued to build out its TERRA network to a total of 84 villages, spanning more than 3,300 miles across a network of 95 towers and 108 sites in southwest, central, and northwest Alaska. The diagram below shows the extent of the TERRA network in red, overlaid at scale on a map of the lower 48 states.

GCI's TERRA Network and Fiber



Map Credit: GCI, Inc.

Quintillion: Despite facing numerous challenges over the past five years, another company, Quintillion Networks, has succeeded in building 1,687 miles of subsea and terrestrial fiber optic cable on the North Slope of Alaska, primarily along Alaska's Arctic Ocean coastline. According to filings with the FCC, the system is part of a three-phased construction project that will eventually connect the communities of the North Slope directly to Asia, Canada, and the United Kingdom via long-haul subsea cable. On December 15, 2017, Quintillion completed Phase 1 of its build and connected the communities of Nome, Kotzebue, Point Hope, Wainwright, and Utqiagvik (Barrow) via a 1,200-mile submarine fiber optic cable main trunk line to Prudhoe Bay, which then connects over Quintillion's terrestrial fiber cable system to Fairbanks. At Fairbanks, Quintillion's fiber connects to existing networks to reach internet exchange (IX) points in Seattle and Portland. This fiber network brings over 200 Gbps of total capacity to these villages. O3B's new mPower NGSO system is also focusing on more populated areas south of 50° North latitude.

Quintillion's Fiber Network

Map Credit: Quintillion Subsea Operations, LLC.

The 2014 plan mentioned the advent of High Throughput Satellite ("HTS") technology as a potentially significant component for solving Alaska's rural broadband problem. In the five years since that report was published, HTS has become a reality. Significantly, HTS differs from traditional widebeam ("legacy") satellite technology in that it is capable of providing orders of magnitude more capacity (i.e., 10s or 100s of gigabits) in highly concentrated areas, using the same amount of allocated orbital spectrum. In addition, the application of micro-miniaturization, digital processing, and beam forming—combined with substantial reductions in the cost of launching satellites to orbit—enable this new generation of satellites to provide highly reliable, high-capacity broadband at prices that are competitive with terrestrial alternatives.

11 *See* https://licensing.fcc.gov/myibfs/download.do?attachment_key=1773656

In addition to the new terrestrial middle-mile connections that are now online, several satellite companies have either announced plans or have begun launching constellations of low Earth orbit (LEO), non-geostationary (NGSO) satellites to provide significantly faster, lower-latency backhaul connectivity to areas that remain unserved by terrestrial middle-mile deployments. Two of the most promising LEO deployments are by OneWeb (backed by Airbus and Softbank, among others) and SpaceX's "Starlink" system. Other companies that have announced similar plans are Canadian firm Telesat and Amazon's "Project Kuiper," although Amazon has sought an exemption[11] from the FCC to limit service to below 56 degrees north latitude, meaning that much of Alaska would not be serviceable.

OneWeb: London-based OneWeb, which began launching a global network of 700+ low Earth orbit (LEO) broadband satellites in February 2019, announced plans in September 2019 to deliver a total of 375 Gbps of low-latency backhaul capacity to Arctic regions above the 60th parallel north. Unlike traditional geostationary satellites that have for years provided broadband backhaul from a distance of more than 22,000 miles above the Earth's surface, OneWeb's satellites will orbit at about 750 miles—a distance that makes low-latency applications like streaming HD video and two-way video applications possible.[12] As of the writing of this document, OneWeb has launched and tested its first six satellites and plans to have 24-hour service to the Arctic fully operational by early 2021. The tests conducted achieved downstream speeds of 400 Mbps.

Once fully launched, OneWeb's satellites over Alaska will communicate with an Earth gateway that is being built near Talkeetna to serve Alaska customers. From that gateway, traffic will traverse existing land-based and subsea fiber cables to Internet Exchange points in Portland and Seattle. On the other end of the satellite connection, OneWeb's local internet service provider partners will deliver service to homes and businesses via new and existing wired and wireless networks.

12 *See* "How OneWeb's Connectivity Works." https://vimeo.com/349766521

Pacific Dataport's Aurora Project: Pacific Dataport, Inc. (PDI) has announced plans to launch a Geostationary (GSO) High Throughput Satellite ("HTS") System that is purpose-built for optimum coverage of all of Alaska. The first PDI satellite is already fully funded, under construction, and set to launch in Q4 2020 on a SpaceX Falcon 9 rocket. The satellite, named Aurora 4A, will offer up to 7.5 gigabytes of broadband capacity across Alaska. PDI plans to launch a second satellite in the 2022 / 23 timeframe that will increase the system's broadband capacity over Alaska to 80 gigabytes or more.

Once deployed, the goal of PDI's "Aurora HTS System" is to provide full coverage across Alaska, and provide affordable broadband service whenever needed, anywhere in the state, with service offerings meeting and exceeding the FCC's current baseline tier standard for broadband performance in Alaska: 10/1 Mbps (speed), 150 Gbps (monthly usage allowance) at a price of less than $99 per month. Beyond this, the Aurora Project intends to provide service plans of 25/3 Mbps and even 100 Mbps.

The Aurora HTS System would complement the capabilities of terrestrial network operators in Alaska, offering wholesale capacity to meet their middle-mile requirements, at significant savings compared to traditional wide-beam satellite systems. PDI will provide hybrid systems with Aurora and NGSO capacity to leverage the benefits of both technologies. PDI will also provide wholesale capacity to third party resellers for direct customer sales in areas beyond the reach of terrestrial networks.

SpaceX's Starlink: SpaceX has also begun launching a similar network of LEO satellites, called "Starlink" — with 60 satellites launched in May 2019, followed by another 60 in November 2019. The Starlink constellation will orbit at an altitude of between 174 and 342 miles — lower than OneWeb's — meaning that it will require more satellites to achieve full coverage. According to recent news reports,[13] it will take about 360 satellites to achieve sufficient coverage at high latitudes including Alaska, and at least 1,440 satellites to achieve global coverage—with "economic viability" achieved at 1,000 satellites. The company said it plans for as many as 12,000 satellites in the constellation, depending on customer demand. SpaceX has demonstrated throughput of 610 Mbps in recent tests. It plans a cadence of launches every two to three weeks (at 60 satellites each) throughout 2020, which is made possible due to the utilization of reusable rocket components. SpaceX intends to focus first on accelerating broadband service to middle and southern states, as well as to Hawaii, Puerto Rico, and the U.S. Virgin Islands.

Starlink's satellite network design appears to function in much the same way as OneWeb's — linking local ISPs and other user terminals at one end of the connection (i.e., in remote areas) via a satellite link to Earth gateways that are connected via fiber to the rest of the internet.

13 *See* https://spacenews.com/spacex-launches-second-batch-of-starlink-broadband-satellites/

Long-Haul Infrastructure

MTA's "AlCan ONE" Project: MTA Fiber Holdings, LLC, a wholly owned subsidiary of Alaskan communications services and technology co-op MTA, says it has begun construction of a terrestrial fiber network to link Alaska to the contiguous United States "and beyond," extending from North Pole near Fairbanks down the Alaska Highway to the Canadian border. The Alaska Canada Overland Network (AlCan ONE) will have an initial capacity of more than 100 Tbps and is slated for completion by mid-2020. AlCan ONE will be the first long-haul fiber transport connection into Alaska that will be completely over land, as the only other two long-haul routes are subsea and extend from Anchorage to Pacific Northwest coast of the U.S. The benefits to Alaska will be significant, as the route will provide increased transport competition with ACS and GCI that should prices over time, increase overall capacity available to the state, and provide a third pathway of resiliency that will guard against the impact of natural disasters such as earthquakes on the other routes.

Provider Investment

Notably, there is an expanding list of broadband providers making investments in broadband infrastructure in Alaska. New entrants to the Alaska market are made possible, in part, by lower long-haul fiber transport costs. Incumbent carriers are also expanding coverage, and the overall affordability and reliability of broadband service is increasing. While it is difficult to quantify the "drive" of providers to help bring broadband to unserved Alaskans, their motivation to overcome technological, geographic, and other barriers has been nonetheless critical to the overall improvement of Alaska's broadband landscape during the past five years. In 2018 alone, Alaska service providers invested more than $272 million in capital expenditures for broadband buildout.

Federal Permitting

With extensive amounts of federally protected land, Alaska providers often find it challenging to expand service as efficiently as would be desired. In reaction to a presidential directive, the federal departments of the Interior, Agriculture, and Commerce have launched the American Broadband Initiative[14]—one component of which is an effort to cut through red tape and streamline the federal permitting process for broadband infrastructure. The National Telecommunications and Information Administration (NTIA) is working to develop a single-form application for use across federal agencies in an effort to ease burdensome filing processes.

14 *See* https://www.ntia.doc.gov/files/ntia/publications/american_broadband_initiative_milestones_report.pdf

State Leadership

The administration of Alaska Governor Michael Dunleavy should be credited with efforts to further streamline state regulation. In a May 29, 2019, Executive Order,[15] Dunleavy directed "the Commissioners of the Department of Natural Resources and the Department of Transportation and Public Facilities, to take the necessary and appropriate steps to streamline their respective permitting processes for broadband facilities deployment projects." The state also enjoys a generally favorable regulatory climate, including the ability for electric cooperatives to compete in the broadband marketplace like any other entity. These facts allow applications submitted by Alaska entities to USDA's "ReConnect" Program (described further below) to receive more favorable scoring under the rules of that program.

Additionally, on October 23, 2019, Senate Bill 83 (SB83) was signed in to law, offering several necessary regulatory updates to outdated statutes. SB83 sought to encourage additional investment and innovation by the telecommunication industry through these updates, which were necessary as the capabilities of modern technology and regulatory changes at the federal level by the FCC left various Alaska statutes as inefficient or functionally obsolete. SB83 reflected a wide array of expert opinions on how to make telcom regulations efficient and modern. The goal of was to maintain important consumer protections, appropriate Regulatory Commission of Alaska (RCA) jurisdiction, and maintain consistency with FCC regulations while at the same time allowing for greater flexibility to more rapidly take advantage of new technology.

Highlights of SB83 include moving prioritization away from landline services in order to account for modern usage of broadband and mobile services, as well as edits to carrier of last resort regulations, which needlessly duplicated other existing statutory requirements. SB83 also created new protections in statute for rural areas by requiring landline and long-distance rates terms and conditions to be the same as in larger towns, and the requirement that the Regulatory Cost Charge (RCC) be assessed and submitted to the RCA by telecommunications providers of all types, including municipalities and cooperatives.

15 *See* https://gov.alaska.gov/admin-orders/administrative-order-no-310/

Federal Investments: A Compendium

The FCC and USDA comprise the two primary federal agencies that offer funding in the form of subsidies, grants, and loans for the buildout of service in rural and difficult-to-serve areas of the United States. While these funding programs have overwhelmingly benefited Alaska, progress has not always been without its challenges. Stable, predictable federal funding, especially from the FCC's various Universal Service Fund programs, is absolutely critical to the continued enhancement of Alaska's broadband landscape. In rural markets, it is not feasible to deploy and maintain broadband infrastructure without significant federal support, as a purely private business case does not exist. In the hardest-to-serve markets, the need for support naturally is the greatest—perhaps more so than in any other region of the country. The following pages outline the major federal funding streams that are impacting Alaska.

The Alaska Plan: On August 23, 2016, the FCC adopted its "Alaska Plan," which secures $1.5 billion over 10 years ($152 million per year) for improving and expanding fixed and mobile broadband service to Alaskans across nearly 100 rural communities. Fifteen rate-of-return carriers and eight of their wireless affiliates elected participation in Plan.[16]

The Plan aims to impact wireline service in the following ways:

- Deploys fixed broadband speeds of at least 10 Mbps downstream and 1 Mbps upstream to 90% of the locations in remote Alaska, up from 60%
- Upgrades almost 70,000 locations to speeds of 25 Mbps downstream and 3 Mbps upstream
- Reduces the number of rural Alaska locations without 10 Mbps/1 Mbps service from 49,000 to less than 13,000

16 *See* https://www.fcc.gov/alaska-plan

For wireless service, the Plan does the following:

- Provides for the deployment of 4G LTE (or better) to at least 85% of the rural Alaska population, up from 9%
- Provides new LTE service to more than 100,000 rural Alaska residents
- Provides support specifically to bring mobile broadband to communities that currently have no wireless service at all[17]

Overall, the Plan's 10-year funding horizon provides participating service providers with a much-needed, stable source of funding for building out and maintaining service to some of the nation's hardest-to-reach locations, while also providing explicit verifiable commitments so that the general public and policymakers can track progress over time and quantify remaining coverage gaps.

The USDA "ReConnect" Program: On March 23, 2018, Congress passed the Consolidated Appropriations Act of 2018,[18] which funded an initial $600 million broadband grant and loan program to be administered by the Rural Utilities Service (RUS) under the USDA, which touted the program as a way to "catalyze private investment and bring broadband to unserved rural areas of the country."

Three types of ReConnect funding were available in Round I: 1) 100% grant, 2) 50% grant/50% loan, and 3) 100% loan. Applicants could only apply for one of the three funding options. The speed delivery requirement for all three categories was set at 25 Mbps download/3 Mbps upload.

FUNDING TYPE	AVAILABLE FUNDS	MAXIMUM GRANT	ELIGIBLE SERVICE AREA	MATCH REQUIREMENT	Due Date
100% Grant	$200 Million	$25 Million	100% of households without 10/1 Mbps	25%	April 29, 2019
50% Loan 50% Grant	$200 Million	$25 Million for loan $25 Million for grant	90% of households without 10/1 Mbps	N/A	May 29, 2019
100% Loan	$200 Million	$50 Million	90% of households without 10/1 Mbps	N/A	June 28, 2019

17 *See* http://www.alaskatel.org/alaska-plan
18 *See* https://www.congress.gov/bill/115th-congress/house-bill/1625/text

Applicants could be nonprofit, for-profit corporations, LLCs, cooperatives or mutual organizations, or state, local, territorial, or tribal governments.

Funds can be used for the following purposes:

- To fund the construction or improvement of buildings, land, and other facilities that are required to provide broadband service
- To fund reasonable pre-application expenses (which may not exceed 5% of the award amount)
- To fund the acquisition and improvement of an existing system that is currently providing insufficient broadband service(eligible for 100% loan requests only)
- To fund terrestrial based facilities that support the provisionof satellite broadband service

An area deemed eligible must be rural, defined as "any area that is not located in a city, town, or incorporated area that has a population of greater than 20,000 inhabitants or an urbanized area contiguous and adjacent to a city or town that has a population of greater than 50,000 inhabitants." Secondly, an eligible area must have at least 90% of its households currently lacking broadband at speeds of 10/1 Mbps. To avoid duplicative efforts to serve a disconnected community, the USDA will not fund applications with overlapping service areas, nor would it fund a project proposing to serve an area that has already received financial assistance for broadband service, including previous RUS funding, state funding, or FCC Connect America Fund Phase II (CAF II) support.[19]

19 *Note:* Entities that received CAF II funding under the auction held in Fall 2018 are only eligible to receive a loan at a fixed interest rate of 2%. They are not eligible for a combo or 100% grant award.

The scoring criteria and weights were the same for all three funding types in Round I, totaling 150 possible points. The criteria were as follows:

01 Rurality of Proposed Funded Service Area (25 points)

For population densities of six or less, 25 points was awarded. For population densities greater than six, zero points will be awarded. Population density was calculated in the following manner: total population of proposed funded service area, divided by the total square mileage of the proposed funded service area.

02 Farms Served (20 points)

Applicants received 1 point for each farm that "pre-subscribed" for broadband service, up to a maximum of 20 points.

03 Performance of the Offered Service (20 points)

For projects that were proposing network buildout capable of providing 100 Mbps symmetrical service to all premises, 20 points were awarded.

04 Businesses (15 points)

Applicants received 1 point for each business that "pre-subscribed" for broadband service, up to a maximum of 15 points.

05 Healthcare Centers (15 points)

For every healthcare center to be served, 1 point was awarded, up to a maximum of 15 points.

06 Educational Facilities (15 points)

For every educational facility to be served, 1 point was awarded, up to a maximum of 15 points.

07 Critical Community Facilities (15 points)

For every critical community facility to be served, 1 point was awarded, up to a maximum of 15 points.

08 Tribal Lands (5 points)

For applications where, at a minimum, 50% of the geographical area of the proposed funded service area(s) was on tribal lands, 5 points were awarded.

09 State Broadband Activity (20 points)

For projects that were in a state that has a broadband plan that had been updated within the previous five years, 10 points were awarded. An additional 5 points were awarded for projects located in states that allow any utility service provider to deliver broadband service. An additional 5 points were awarded for projects located in states that committed to expediting right-of-way and environmental permitting.

As of the writing of this document, USDA is in the process of announcing ReConnect Round I winners. To date, one Alaska provider—Cordova Telephone Cooperative — has been awarded a 100% grant. This award will provide $18,888,668 to build the fiber-to-the-premise (FTTP) infrastructure necessary to deliver high-speed broadband services to all businesses and residents in the community of Yakutat in southeast Alaska. The funded service area includes 270 households, three critical community facilities and two educational facilities spread over 497 square miles.[20]

While the application window for ReConnect Round I is closed, **the USDA is expected to announce a second round of ReConnect funding late in the fourth quarter of 2019 or the first quarter of 2020, thanks to an additional appropriation by Congress.** Modified rules, program parameters, and scoring criteria are expected. Updates can be found on the program website at https://reconnect.usda.gov.

USDA Community Connect Grant Program: The USDA Rural Utilities Service (RUS) offers other infrastructure construction and improvement funding to rural communities, including water and waste treatment, electric power and telecommunications services. Community Connect Grants fund broadband deployment into rural communities "where it is not yet economically viable for private sector providers to deliver service." Rural areas that lack existing broadband speeds of at least 4 Mbps downstream and 1 Mbps upstream are eligible. In the past, Alaska service providers MTA and ASTAC have been recipients of Community Connect Grant awards

20 https://www.usda.gov/reconnect/awardees

The funds may be used for the following:

- The construction, acquisition, or leasing of facilities, spectrum, land or buildings used to deploy broadband service for:
  - All residential and business customers located within the Proposed Funded Service Area (PFSA)
  - Participating critical community facilities (such as public schools, fire stations, and public libraries)
- The cost of providing broadband service free of charge to the critical community facilities for two years
- Less than 10% of the grant amount or up to $150,000 may be used for the improvement, expansion, construction, or acquisition of a community center that provides online access to the public.

Eligible applicants include most state and local government, federally-recognized tribes, nonprofits, and for-profit corporations, and matching funds of at least 15% from non-federal sources are required and can be used for operating costs.

USDA Distance Learning & Telemedicine Grants: USDA RUS also offers Distance Learning and Telemedicine Grants (DLT) to help rural communities use the unique capabilities of telecommunications to "connect to each other and to the world, overcoming the effects of remoteness and low population density." The program can link teachers and medical service providers in one area to students and patients in another.

Grant funds may be used for:

- The acquisition of eligible capital assets, such as:
  - Broadband transmission facilities
  - Audio, video, and interactive video equipment
  - Terminal and data terminal equipment
  - Computer hardware, network components and software
  - Inside wiring and similar infrastructure that further DLT services
- Acquisition of instructional programming that is a capital asset
- Acquisition of technical assistance and instruction for using eligible equipment

Eligible applicants include most entities that provide education or health care through telecommunications, including: 1) most state and local governmental entities, 2) federally recognized tribes, 3) nonprofits, 4) for-profit businesses, or 5) consortia of eligible entities. Applications are accepted through a competitive process, and applicants are required to provide a minimum 15% match. Awards can range from $50,000 to $500,000.

USDA Farm Bill Broadband Loans & Loan Guarantees: The Rural Broadband Access Loan and Loan Guarantee Program furnishes loans and loan guarantees to provide funds for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide service at the designated broadband lending speed in eligible rural areas.

Broadband loans provide funding on a technology-neutral basis for financing:

- The construction, improvement, and acquisition of facilities required to provide service at the broadband lending speed, including facilities required for providing other services through the same facilities;
- The cost of leasing facilities required to provide service at the broadband lending speed if such lease qualifies as a capital lease under Generally Accepted Accounting Principles (GAAP); and
- An acquisition, under certain circumstances and with restrictions.

To be eligible for a broadband loan, an applicant may be either a nonprofit or for-profit organization and must take one of the following forms: corporation LLC, cooperative or mutual organization, a state or local government, or Indian tribe or tribal organization.

Eligible area stipulations include:

- Proposed funded service areas must be completely contained within a rural area or composed of multiple rural areas.
- At least 15% of the households in the proposed funded service area are unserved.
- No part of the proposed funded service area has three or more "incumbent service providers."
- No part of the proposed funded service area overlaps with the service area of current Rural Utilities Service (RUS) borrowers or the service areas of grantees that were funded by RUS.
- Communities where USDA RUS has previously provided funding for construction of broadband infrastructure may not be eligible.

Other FCC USF Programs – E-rate: The Schools and Libraries Program, commonly known as the "E-rate Program," helps schools and libraries to obtain affordable broadband connectivity by providing subsidies in the form of a "discount" off the cost of eligible services.

Eligible schools, school districts, and libraries may apply to the program individually or as part of a consortium. Funding may be requested under two categories of service: external connections and internet access (Category 1), and internal connections (e.g., Wi-Fi, wired networking gear, etc.), maintenance, and managed internal services (Category 2). Discounts for support depend on the level of poverty and whether the school or library is located in an urban or rural area. The discounts range from 20% to 90% of the costs of eligible services.

The E-rate program has an annual inflation-adjusted cap of $4.15 billion but is based on demand. Eligible schools, school districts, and libraries must follow detailed RFP and bid evaluation requirements, and must establish an account on the Universal Service Administrative Company's "E-rate Productive Center" (EPC) platform. Details are available at https://www.usac.org/sl.

In E-rate funding year 2018, Alaska received funding commitments valued at $81,245,957.04, representing 3.6% of the national total committed.[21]

From 2015 to 2019, Alaska received $8.5 million in federal E-rate support to upgrade wireless networks alone.

E-rate support for school connectivity is critical for school districts to be able to afford reliable connectivity, especially in Alaska where such costs are higher than anywhere else in the United States. E-rate support is also just as critical for broadband service providers, as it provides a stable and relatively predictable funding stream for business planning and revenue forecasting purposes.

21 *See* USAC Schools and Libraries Program funding commitment data available at https://www.usac.org/

Other FCC USF Programs – The Rural Health Care Program (RHC): The RHC Program provides funding to eligible health care providers (HCPs) for telecommunications and broadband services necessary for the provision of health care. The RHC Program, according to the FCC, aims to "improve the quality of health care available to patients in rural communities by ensuring that eligible HCPs have access to telecommunications and broadband services."

By law, internet service providers must charge rural hospitals and clinics comparable rates for services that they charge their urban counterparts. To make up the difference, funding may be sought from the RHC Program to make up the difference. In 2019, the RHC Program had an annual inflation-adjusted cap of $593.8 million and is made up of three sub-programs: the Healthcare Connect Fund, the Telecommunications Program, and the Rural Health Care Pilot Program.

In Alaska, the RHC Program is vital for clinics in remote villages but has been the subject of some controversy.In 2017, the FCC's Wireline Competition Bureau found that two non-Alaska service providers were abusing the program and issued fines against the companies for $40 million. The agency subsequently requested documentation from Alaska recipients of the program, which ultimately resulted in a dispute with Alaska's largest service provider, GCI. For FY2017, the FCC found that GCI provided sufficient documentation for $77.8 million in funding of the $105 million that had been requested, effectively withholding 26% of the requested amount. As of the writing of this document, the dispute is still ongoing and the lack of certainty and predictability in the program has had a disruptive effect on continued service provider investment in rural Alaska.

Other FCC USF Programs – Rural Digital Opportunity Fund (RDOF): On August 1, 2019, the FCC voted to approve a Notice of Proposed Rulemaking[22] to establish a new "Rural Digital Opportunity Fund," which would provide at least $20.4 billion over 10 years to expand broadband in unserved rural areas across the country in the form of a multi-round, reverse, descending clock auction that favors faster services with lower latency and encourages intermodal competition.

The RDOF would focus on areas currently served by "price cap" carriers, along with areas that were not previously granted high-cost universal service support to expand service at 25 Mbps/3 Mbps.

The proposed framework includes targeting support to areas that lack 25 Mbps/1 Mbps service (and increase from CAF's 10 Mbps/1 Mbps benchmark) and an allocation of support under two phases:

PHASE 1 – $16 billion to wholly unserved areas
PHASE 2 – $4.4 billion to areas partially served,
as well as any areas not won in the first phase

The FCC is currently in the process of reviewing public comment and will need to vote on a final report and order before the program can proceed. Alaska is not expected to be eligible for RDOF funding due to the FCC's previous decision to offer frozen support to price cap carriers in non-contiguous areas participating in the CAF Phase II program.

Other FCC USF Programs – 5G Fund for Rural America: On December 4, 2019, FCC Chairman Pai announced plans to establish a 5G fund that would provide up to $9 billion to providers over 10 years in an effort to boost wireless services and connections in rural America. The fund would replace the previously planned Mobility Fund Phase II (MFII) subsidies, following robust criticism of the provider-submitted data that was used to identify eligible areas for MFII support.

Like the proposed RDOF program, the FCC plans to conduct a reverse auction to determine funding allocations, prioritizing rural and difficult-to-serve areas. The FCC will also set aside at least $1 billion from the fund to support precision agriculture, such as new technologies to increase crop yields or better monitor growing conditions.

22 *See* https://docs.fcc.gov/public/attachments/FCC-19-77A1.pdf

LOOKING AHEAD: RECOMMENDATIONS FOR THE NEXT FIVE YEARS

Measuring Success

In retrospect, the aspirational goals of the 2014 broadband plan were not achievable without first realizing significant investment in the state's terrestrial long-haul and middle-mile transport infrastructure. Five years later, much has been accomplished and the groundwork has finally been laid to see the delivery of much higher speeds at lower costs and latency, particularly in the communities that lie along the state's road system and along the North Slope. The speed and latency goals that were established to measure success in 2014 are also largely valid today, taking into consideration the fact that most modern applications and services can still function exceedingly well on connections of 100 Mbps in each direction. Therefore, the following performance measures are adopted to define success by 2024:

Performance Measures that Will Define Success (by 2024)

MEASURES	TARGETS
Download Speed (end-user)	100 Mbps
Upload Speed (end-user)	100 Mbps
Latency (terrestrial, within Alaska)	20 Milliseconds
Latency (satellite, covering Alaska)	NGSO: 100 milliseconds | GEO: 670 milliseconds
Reach (market serviceability)	100% of Alaska homes and businesses
User Cost	Monthly rates at or below 2019 rates in Anchorage
Reliability	99.99% uptime (with backup systems)
Adoption (subscription to service)	90% of adult population; 100% of homes with students
Progress	100% of 2019 recommendations achieved

While still aspirational, these goals are also guided by a realistic vision of what is achievable at the current pace of investment, while taking into account federal funding opportunities and technological innovations on the horizon, and the remaining middle-mile challenges that still confront many villages and insular areas highlighted above. Additionally, as long-haul fiber transport competition and capacity increases, cities like Anchorage and Fairbanks could realistically pursue more ambitious bandwidth goals that are in line with expectations in cities like Minneapolis and Seattle.

Guiding Principles – Infrastructure Deployment & Prioritization

The 2014 plan also established a set of guiding principles to inform its recommendations, which also largely remain valid today. The following principles are adapted from those in the 2014 plan, with added clarity and minor updates to reflect current realities:

Guiding Principles for 2019 Recommendations

01 Fiber optic systems offer great capacity advantages and the equipment used to light the fiber can be upgraded over time to improve efficiency and throughput.

02 Fiber optic systems (as last-mile solutions) are most practical to deploy in areas where household/business density is relatively high and total demand exceeds 300 users.

03 Fiber optic systems (as middle-mile/transport solutions), while costly, are most practical to deploy along roadways or across the sea floor.

04 Challenges that confront fiber optic deployments (of all types) include population dispersion, terrain, ice scour, vast distances between communities, permitting, and physical accessibility for installation.

05 Microwave wireless systems (as middle-mile/transport solutions) are typically the most affordable, technically achievable, and highest performance terrestrial alternative to fiber optics. Radios can be swapped out as technology improves.

06 Legacy satellite backhaul solutions are generally a last-resort option for remote and insular areas where fiber optics and microwave wireless systems are impractical, but new GEO HTS and LEO NGSO satellite networks that will be coming online in 2020 and 2021 should be explored as viable, competitive alternatives to microwave wireless system deployments.

07 Polar subsea projects that link the Alaska's North Slope directly to Asia, northern Canada, and Europe are encouraged if project financing and deployment are viable.

08 Funding should be supported for local last-mile projects where federal programs are insufficient.

09 More robust mobile wireless solution deployments (4G LTE and greater) are more practical and achievable when terrestrial middle-mile capacity has been improved.

10 As content and applications become more robust, their proximity to the end-user will become increasingly important. Establishing a carrier-neutral Internet Exchange (IX) peering point within Alaska for network interconnection and content cache-filling would increase efficiency, reduce latency, and reduce the need for traffic to be exchanged at distant IX facilities in Seattle and Portland, thereby freeing long-haul capacity for other uses.

2019 Updated Recommendations

Based on the above principles, and taking into consideration the many accomplishments since the writing of the 2014 broadband plan, the following 22 recommendations are intended to serve as guideposts for public policymaking and the pursuit of funding opportunities over the next five years (through 2024).

As in the 2014 broadband plan, recommendations are divided into four categories:

1 | General Recommendations
2 | Economic Development / Jobs
3 | Education
4 | Public Safety.

These recommendations are not ranked in order of priority.

General Recommendations

01 Adopt a minimum broadband speed goal of 100 Mbps (upstream and downstream) to households and businesses throughout Alaska by 2024.

02 Establish a Broadband Development Office within state government or at the Denali Commission to manage progress against the updated broadband plan, as well as coordinate future strategy, planning, and policy, and lend support to the pursuit of federal funding opportunities by eligible entities.

03 Develop and maintain a granular broadband availability map for Alaska to track progress and precisely identity remaining coverage gaps; develop a mechanism to validate, and if warranted, challenge broadband availability data that is collected and published by the FCC.

04 Support the pursuit of funding opportunities to develop terrestrial middle-mile infrastructure to regions of the state that do not have it, including the Aleutian Islands, and to support satellite middle-mile solutions where fiber is too expensive or impractical to build.

05 Support the private sector development of additional long-haul fiber transport connections between Alaska and the Lower 48 states for the purposes of increased capacity, network diversity, resiliency, competition, and lower costs.

06 Support the development of a carrier-neutral Internet Exchange (IX) point within Alaska to serve as a home for content and application companies and networkinterconnection/peering.

07 Establish public-private partnerships with industry innovators and entrepreneurs to accelerate broadband development and deployment within Alaska.

08 Identify and track critical broadband infrastructure that is reaching the end of its life cycle and support efforts to upgrade or replace it as warranted.

09 Encourage public and private advocacy efforts to maximize federal Universal Service Fund (USF) support for Alaska across all programs.

General Recommendations

10 Explore partnerships where appropriate with Canadian telecom networks at key cross border points where such partnerships could enhance network diversity and resiliency—particularly in Southeast Alaska.

11 Support the development of long-haul subsea fiber routes between the North Slope and Asia, northern Canada, and Europe, and to the extent practical, ensure that the main Pribilof Islands, the westernmost Aleutian Islands, and Kaktovik on the North Slope are connected as part of the design.

12 Continue to streamline the permitting process for broadband deployment projects to improve financial viability and shorten broadband deployment timelines.

Economic Development / Jobs Recommendations

13 Establish policies and procedures that attract and encourage investment in "big data" communication industries (such as data centers) in Alaska.

14 Create training programs for knowledge workers, technicians, military spouses, and web-based industries through the Alaska Department of Labor and Workforce Development that provide hands-on, long-term training to build business-level proficiency in digital media skills.

15 Partner with Alaska Native Corporations to create web-based job opportunities for Alaskans, particularly in village communities.

16 Support the commercial fishing industry by pursuing better connectivity solutions at key port communities, such as Unalaska.

Education Recommendations

17 Establish a state matching program to help school districts capture an additional 10% in federal E-rate Program support for broadband special construction projects, per the FCC's 2014 E-rate Modernization orders.

18 Establish funding to supplement E-rate Program support to help anchor institutions such as schools, libraries, and post-secondary institutions acquire the service goal for connectivity (100 Mbps) when it is available in their communities.

19 Establish priority funding for all public post-secondary institutions in Alaska that are not connected to an academic network with the service goal of at least 100 Mbps.

Public Safety Recommendations

20 Ensure public safety and emergency services agencies (state and federal), including the state's Emergency Operations Center, receive the highest priority for emergency communications traffic on available broadband networks.

21 Establish redundant backup connectivity for all public safety and emergency services locations.

22 Ensure that Alaska is well-served by FirstNet (the Public Safety Broadband Network) and that Alaska's unique needs are clearly understood and addressed by FirstNet leadership and its contractor, AT&T.

CONCLUSION

Since Alaska's original broadband plan was adopted in 2014, broadband access has become an even more integral part of everyday life. For those that do not have it, or struggle with poor, unreliable connectivity, life is very different indeed. Just as electricity and running water were the infrastructure priorities of the 20th century, broadband—and the social and economic vitality that it brings—must be the priority of the current age. As the 2014 plan so aptly stated:

"The same factors that make broadband deployment difficult in Alaska—geographic remoteness, lack of roads, high costs — also mean that Alaska, more so than other states, has the most to gain from making sure that affordable and reliable high-speed broadband is available to all its residents."

Therefore, it is incumbent upon Alaska's leaders to act, at every level of government, to do what they can to support Alaska's broadband service providers in delivering better, more reliable, more affordable connectivity to every community in the state. The enormity of the challenges confronting Alaska will likely always mean that increased funding will be an important element of the solution. But the will to take action, even to accomplish incremental gains, is also key to long-term success. This updated plan is intended to provide an encapsulation of the many success stories that have been achieved over the last five years, while also highlighting opportunities on the horizon and specific actions that can be taken to ensure continued progress. By working together, it is possible to achieve a better, more connected future for all Alaskans.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