# INYO COUNTY

## BROADBAND PLANNING AND FEASIBILITY STUDY

TILSON

2023


# TABLE OF CONTENTS

# TABLE OF CONTENTS

SECTION 01 INTRODUCTION: ..... 7

1.1 Executive Summary ..... 8

SECTION 02 INDUSTRY OVERVIEW, BROADBAND BENEFITS AND CHALLENGES: ..... 19

2.1 Overview of Broadband Terminology ..... 22

2.1.1 Physical Infrastructure and Delivery ..... 22

2.1.2 Speed and Performance ..... 24

2.2 Broadband Technologies ..... 27

2.2.1 Wired and Wireless ..... 27

2.3 Broadband Benefits ..... 32

2.4 Broadband Barriers and Challenges ..... 37

Technologies, Benefits, and Barriers Conclusion ..... 40

SECTION 03 CURRENT AND FUTURE NEEDS ASSESSMENT: ..... 41

3.1 Broadband Needs Assessment ..... 43

3.1.1 Economic Development and the Role of Broadband ..... 43

3.1.2 Unserved and Underserved ..... 44

3.1.3 Broadband Speed and Bandwidth ..... 46

3.1.4 Affordability and Adoption ..... 49

3.2 Stakeholder Asset Inventory ..... 55

3.2.1 Community Anchor Institutions (CAIs) ..... 55

3.2.2 Community Anchor and Business Needs Survey Results ..... 56

3.2.3 Needs of Tribal Communities ..... 59

3.3 Overview of Smart Community Technologies ..... 62

SECTION 04 ANALYSIS OF CURRENT BROADBAND MARKET AND EXPANSION STRATEGIES: ..... 66

4.1 Introduction and Expansion Strategy Roadmap ..... 67

4.2 Residential Providers and Service Breakdown ..... 74

4.3 ISP Survey Review ..... 83

SECTION 05 ASSET INVENTORY AND GAP ANALYSIS: ..... 85

5.1 Middle-Mile Fiber Route Inventory ..... 86

5.2 Additional Inventory of County Assets ..... 88

5.2.1 CALTRANS Alignment and Golden State Net Middle Mile Project ..... 89

5.3 Broadband Gap Analysis ..... 91

5.3.1 Discussion of County Network Design Process and Expansion Considerations ..... 91

SECTION 06 BROADBAND FUNDING STRATEGIES: ..... 94

6.1 Applying to a Network Deployment Funding Opportunity ..... 97

6.1.1 Common Considerations for Deployment-Focused Funding Opportunities ..... 97

6.1.2 Organizational Capacity and Partnership Considerations ..... 98

6.2 Broadband Deployment Grant Programs ..... 101

6.2.1 California funding opportunities overview ..... 101

6.2.2 Federal Programs with Broadband Deployment Funding Options ..... 113

6.3 Funding Opportunities that Complement Deployment Projects ..... 117

6.3.1 Financing Programs ..... 117

6.3.2 Wiring to/through Buildings ..... 118

6.4 Mapping and Challenge Processes ..... 118

6.4.1 Overview of Challenge Processes ..... 120

6.4.2 Local Challenge Strategies ..... 121

6.4.3 FFA Challenges ..... 123

6.4.4 BEAD Challenges ..... 123

6.4.5 FCC Challenges ..... 125

SECTION 07 FOSTERING A HEALTHY BROADBAND DEPLOYMENT ENVIRONMENT: ..... 127

7.1 Improving Access to Information ..... 129

7.2 Improving Local Governmental Coordination ..... 131

7.3 Improving Permitting Processes, Local Deployment Policies, and Asset Access Practices ..... 133

7.3.1 Construction Rules and Regulations ..... 134

7.3.2 Permitting Processes ..... 135

7.3.3 Coordination Rules and Policies Best Practices ..... 136

7.3.4 Encourage Coordination Agreements ..... 138

**SECTION 08 DIGITAL INCLUSION CONSIDERATIONS AND STRATEGIES; ..... 140**

8.1 Affordability and Adoption ..... 142

8.2 Service Subsidy Programs ..... 147

8.3 Reviewing and Assisting with CAI Efforts ..... 149

**SECTION 09 WHAT IS A SMART COMMUNITY? ..... 151**

9.1 Defining a Smart Community ..... 152

9.1.1 Foundational Elements of Smart Communities ..... 152

9.1.2 Benefits of Smart Communities ..... 153

9.2 Inyo County's Existing Conditions ..... 153

9.2.1 Climate, Natural Hazards, and Other Issues ..... 153

9.2.2 Community Plans and Initiatives ..... 156

9.3 Initial Smart Community Strategies ..... 157

9.3.1 Digital Community Infrastructure ..... 158

9.3.2 Climate Adaptation, Hazard Monitoring, and Resilience ..... 158

9.3.3 Connected Public Infrastructure ..... 159

9.3.4 Smart Transportation Operations ..... 159

9.3.5 Smart Agriculture & Food Systems ..... 160

9.4 Prioritized Strategies ..... 160

9.4.1 Strategy: Expand Flood and Landslide Monitoring Systems to Improve Safety ..... 161

9.4.2 Strategy: Expand Wildfire Detection and Monitoring Systems to Improve Safety ..... 167

9.4.3 Strategy: Deploy Charging and Fueling Infrastructure to Support Zero Emissions Vehicles and Electric Vehicles ..... 173

9.4.4 Strategy: Improve Digital Access and Equity ..... 177

9.4.5 Strategy: Expand use of Clean and Renewable Energy Systems to Reduce Carbon Emissions, Increase Community Equity, and Improve Resilience ..... 181

9.5 Goal, Objectives, and Policies ..... 186

9.6 Implementation and Funding Sources ..... 188

9.6.1 Community Engagement ..... 188

9.6.2 Project Development ..... 188
9.6.3 Smart Communities Plan and Documentation ..... 188
9.6.4 Funding Sources ..... 188

**SECTION 10 RECOMMENDATIONS AND NEXT STEPS: ..... 191**

10.1 Recommendations ..... 192
10.2 Identifying and Developing Broadband Infrastructure Projects ..... 193
10.3 Developing a Better Broadband Deployment Environment ..... 195
10.4 Developing Broadband Project Funding Strategies ..... 198
10.5 Developing Smart Community Strategies ..... 202
10.6 Next Steps ..... 204

**SECTION 11 APPENDICES AND GLOSSARY: ..... 208**

Appendix A: Survey Results and Analysis ..... 209
Appendix B: Overview of Previous Funding and Possible Funded Areas ..... 220
Appendix C: Further Detail on Materials for California Last-mile Network Funding Opportunities ..... 223
Appendix D: California's Three Primary Last-Mile Funding Programs: Considerations for Prospective Applicants ..... 224
Appendix E: Summary of Federal Funding Opportunities ..... 226
Glossary ..... 243
County Feedback Response ..... 248

E·D·A
U.S. ECONOMIC DEVELOPMENT ADMINISTRATION

30 YEARS ANNIVERSARY
GOLDEN STATE
Finance Authority®

SECTION

# 01

# INTRODUCTION

# 1.1 Executive Summary

Tilson was engaged by the Golden State Finance Authority (GSFA) to research the telecommunications industry landscape in Inyo County, including the locations of existing fiber optic cable and other assets, the service areas and service offerings – by technology – of retail Internet service providers (ISPs) in the county, the locations of premises lacking access to adequate broadband service, and available funding for broadband infrastructure. These findings then informed custom recommendations to support Inyo County's pursuit of network deployment.

We are currently experiencing a monumental period for broadband infrastructure funding opportunities. The Coronavirus Pandemic has led to the passage of significant federal and state legislation providing billions of dollars for broadband infrastructure nationwide, including over eight billion dollars in California alone. The American Rescue Plan Act Capital Projects Fund (ARPA CPF) allocated the State of California with $540,249,909 in broadband infrastructure funding,[1] and the Infrastructure Investment and Jobs Act Broadband Equity, Access, and Deployment (IIJA BEAD) program allocated another $1,864,136,508.[2] In addition to these federal funds, California has allocated $6 billion to broadband infrastructure with the passage of Senate Bill 156, with $2 billion of this earmarked for broadband infrastructure to unserved residences and $3.25 billion earmarked for "an open-access statewide broadband middle-mile network."[3] In total, the California Public Utilities Commission (CPUC) plans to distribute $4 billion statewide between 2022 and 2028 for infrastructure to unserved and underserved homes and businesses.[4]

**Table 1: Broadband Deployment Funding Summary**

| Funding Source | California's Total | Last Mile | Middle Mile | Other |
|---|---|---|---|---|
| **California SB156** | **$6,000,000,000** | $2,000,000,000 | $3,250,000,000 | $750,000,000 |
| **IIJA BEAD** | **$1,864,136,508** | $1,864,136,508 | | |
| **ARPA CPF** | **$540,249,909** | $540,249,909 | | |

The CPUC will distribute these federal and state funds using multiple competitive grant processes that differ in a few respects, such as how they define eligible deployment areas, what requirements applicants must satisfy, and how projects are evaluated for funding. For the purpose of grant funding eligibility, the term *unserved* generally means any location without access to service of speeds at or above 25 Mbps download and 3 Mbps upload, while the term *underserved* means any location without access to services of speeds at or above 100 Mbps download and 20 Mbps upload. However, grant programs may include or exclude certain technologies from this service availability evaluation. The BEAD program considers all wireline and licensed fixed wireless services, while California's Federal Funding Account (FFA) generally focuses on cable and fiber services. Eligible locations may also be limited to those meeting each program's definition of *unserved* but may consider the

[1] U.S. Treasury, "Coronavirus Capital Projects Fund Allocations for States, District of Columbia, and Puerto Rico," August 2021, https://home.treasury.gov/system/files/136/Allocations-States.pdf.

[2] National Telecommunications and Information Administration (NTIA), "Biden-Harris Administration Announces State Allocations for $42.45 Billion High-Speed Internet Grant Program as Part of Investing in America Agenda," June 26, 2023, https://www.ntia.gov/press-release/2023/biden-harris-administration-announces-state-allocations-4245-billion-high-speed.

[3] California SB 156 (2021-2022 Regular Session), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB156; https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-implementation-for-california.

[4] California Public Utilities Commission (CPUC), "Last Mile Federal Funding Account," https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-implementation-for-california/last mile-federal-funding-account, accessed August 2023.

inclusion of served locations under certain circumstances. All currently available broadband infrastructure funding heavily favors the deployment of wireline technology, primarily fiber.

The amount of federal and state funding currently available for broadband infrastructure is more significant than any time in history and will likely never be exceeded again. Now is the time to connect critical unserved and underserved locations within Inyo County, bridge the digital divide, and provide historically unconnected communities with internet service that allows residents to work remotely, participate in distance-learning opportunities, and take advantage of telehealth services. With this level of funding, local governments and other broadband leaders have a wider range of options to facilitate deployments to unserved and underserved locations throughout the county. In particular, opportunities for ISP coordination, support, and even formal partnerships have improved significantly. ISPs that may not have been willing to expand to these locations can now apply for grants covering a higher portion of deployment costs, making new network construction more feasible. To expand broadband service options in the state, California Senate Bill 156 also significantly expanded opportunities for public entities to deploy broadband networks and offer broadband services to the public.[5] Publicly owned broadband providers operate as non-profits and can use different financing options, enabling them to bring services to areas that have not been connected by other ISPs.[6] Formed as result of this legislation, the Golden State Connect Authority (GSCA) is working with 40 member counties, including Inyo County, to develop networks that can serve county residents.

To provide a review of Inyo County's broadband needs, current availability, suggested broadband expansion strategies, and funding opportunities, this document is divided into nine additional sections. The sections are ordered to be easily accessible as standalone sources if a reader has focused interests or would like to concentrate on actionable sections, such as funding strategies, permitting, digital inclusion or smart communities.

**Section 2: Broadband, Benefits, and Challenges** reviews essential concepts and details about broadband that are necessary to understand the deployment and funding landscape. Broadband service has become a vital part of communities' economic development, education, public health, and other social policy strategies, so the benefits of broadband are discussed across a number of policy areas. Leaders looking to combat the digital divide are also provided with a review of the basic economic and social barriers that have led to the availability and adoption challenges in their communities.

**Section 3: Current and Future Needs Assessment** looks more closely at the digital divide in Inyo County, identifying the portions of the households that remain unserved or underserved and exploring factors that further shape adoption challenges in the county. The section also reviews the broadband needs of businesses, community anchor institutions (CAIs), and tribal communities within the county. Using the BEAD program's eligibility definitions, Inyo has:

- 3,035 households (32.1 percent) classified as *unserved*, lacking 25/3 Mbps service[7]
- 4,579 households (48.4 percent) classified as *underserved*, lacking 100/20 Mbps, but not 25/3 Mbps service

[5] California SB 156 (2021-2022 Regular Session), § 4-5.

[6] See, e.g., Congressional Research Service, "Expanding Broadband: Potential Role of Municipal Networks to Address the Digital Divide," August 25, 2022, pp. 4, 7-8, https://www.everycrsreport.com/files/2022-08-25_R47225_6a672f8610bb763b38436b2242bc1e1fe2091e5a.pdf.

[7] This data is derived from the FCC's National Broadband Map Area Summaries, which detail these percentages by "units." Residential Broadband Serviceable Locations (BSLs) may represent single-family homes or buildings like apartments that contain multiple distinct dwellings. "Units" represent individual dwellings or households, so a BSL with an individual FCC Location ID can contain multiple units. FCC, FCC National Broadband Map – Data Download, June 2023, https://broadbandmap.fcc.gov/data-download/nationwide-data?version=jun2023; CostQuest Solutions & Technology Team, "About the Units in the Broadband Serviceable Location Fabric Data," CostQuest Associates, September 19, 2022, https://www.costquest.com/resources/articles/about-the-units-in-broadband-serviceable-location-fabric-data/, (providing the number of residential household units).

**Section 4: Analysis of Current Broadband Market and Expansion Strategies** identifies the current service areas of each ISP offering retail broadband services in Inyo County, using maps and availability information to develop an understanding of where broadband services with different performance characteristics are and, more importantly, are *not* available.

Local governments and other leaders who seek to facilitate connectivity to unserved and underserved locations must become familiar with the reasons those locations remain insufficiently connected and identify deployment strategies that are most likely to connect them.

To develop this understanding, Section 4 provides a review of the economic factors that influence broadband expansion strategies, then analyzes how those factors impact ISP expansion opportunities in different unserved and underserved parts of the county. Chief among these factors, ISPs can typically extend their networks to nearby unserved locations at a lower cost than an ISP without nearby infrastructure.[8] However, larger clusters of unserved and underserved locations can be attractive to ISPs lacking nearby infrastructure, because a new network connecting many locations is more likely to cover operational costs and be financially sustainable.[9]

Publicly owned, non-profit broadband providers such as CSCA will also consider deployment opportunities to more areas, because their mission includes the goal of establishing connectivity to households that have long remained unconnected. As a public entity, the GSCA can also construct its open-access, last mile networks using a wider range of financing opportunities and can deploy to areas that will achieve an ROI over a longer time frame, making it a financially viable option to connect certain unserved regions.

Two primary factors, California's upcoming open-access middle mile network and the significant amount of upcoming grant funding, have significantly changed how ISPs are viewing their expansion opportunities. As this middle mile network connects more remote portions of the county, ISPs without existing networks or prior access to affordable middle mile connectivity can now consider entering into entirely new areas at a significantly lower cost. New grant-based funding options have also reduced ISP investment costs, making many expansion opportunities more viable.

Section 4 begins by analyzing how prevalent each broadband technology is across the county and identifying the county's core connectivity challenges. A market analysis of each currently operating ISP within the county will highlight important network upgrade and nearby expansion opportunities. These insights can be used by local governments and broadband policymakers in the county to understand which ISPs are among the most likely to connect specific clusters of unserved and underserved locations, essential information when developing funding or coordination strategies to facilitate deployments.

[8] See, e.g., National Telecommunications and Information Administration (NTIA), "Economics of Broadband Networks: An Overview," March 2022, https://broadbandusa.ntia.doc.gov/sites/default/files/2022-03/Economics%20of%20Broadband%20Networks%20PDF.pdf.

[9] Generally, an ISP entering a new area must expect to have a sufficiently high number of consumers and resulting revenue from that area to cover local operating expenses, such as local installation, repair, and service personnel, local marketing efforts, and a local office. This minimum economy of scale hinders most ISPs from being able to connect smaller clusters of unserved and underserved locations in more remote areas.

**Table 2: Households Receiving Each Level of Service across Inyo County[10]**

| Households (HHs) – 9,468 Total | 25/3 Mbps | 100/20 Mbps | 250/25 Mbps |
|---|---|---|---|
| **HHs served by any wireline or fixed wireless** | 67.9% (6,433) | 19.6% (1,854) | 14.6% (1,380) |
| **HHs served by any wireline** | 63.0% (5,964) | 16.0% (1,515) | 14.6% (1,380) |
| **Wireline Technologies:** | | | |
| ➢ **High-speed option (Fiber and/or Cable)** | 59.9% (5,667) | 14.6% (1,380) | 14.6% (1,380) |
| ➢ **DSL** | 8.0% (757) | 1.6% (148) | 0.0% |
| ➢ **DSL as only wireline option at speed** | 3.1% (297) | 1.4% (134) | 0.0% |
| **Fixed Wireless Technologies:** | | | |
| ➢ **Fixed wireless** | 11.9% (1,125) | 5.1% (479) | 0.0% |
| ➢ **Only fixed wireless at speed** | 5.0% (469) | 3.6% (339) | 0.0% |

- **Levels of Broadband Service Availability:**
  - **Many locations are still critically unserved:** Inyo County has a reported 2,676 locations (28.3 percent) that do not yet receive any wireline or wireless service meeting the 10/1 Mbps standard, according to FCC data.
  - **Moderate dependence on fixed wireless:** An estimated 469 households (5.0 percent) can receive only basic broadband service via fixed wireless technologies across Inyo County, while 339 households (3.6 percent) depend upon it for access to 100/20 Mbps services. This connectivity has been vital for these households, but in the long term, they should remain a priority to receive high-speed wireline services.
  - **Available DSL is inadequate:** A claimed 2,723 households (28.8 percent) in Inyo County have access to DSL services offering at least 10/1 Mbps. However, only 757 households (8.0 percent) in Inyo can receive DSL service offering the minimum broadband speed of 25/3 Mbps set by the FCC in 2016. ISPs providing inadequate DSL service may not have an incentive to upgrade these networks if the projected return on investment is insufficient. However, if provided financial support, these providers may be best positioned to deploy fiber through their DSL service areas using existing access to telephone poles and rights-of-way to install fiber at a lower cost than competitors.
  - **High-speed broadband availability gap:** A reported 40.1 percent of households cannot receive high-speed broadband service. This level of availability is low compared to the rest of California and the nation.
  - **Available cable services are generally not upgraded:** While a reported 5,615 households (59.3 percent) can receive :cable services offering speeds of at least 25/3 Mbps, only 355 households (3.8 percent) can receive cable services offering 100/20 Mbps or more. Where available, cable networks in other markets have generally been upgraded to offer high-speed services of at least 250/25 Mbps, and cable providers in Inyo County should follow suit.
  - **Insufficient fiber-to-the-home availability:** Only 10.8 percent of homes in Inyo County can receive fiber services.
  - **Large areas do not have adequate wireline broadband:** Aspendell, Laws, Keeler, Cartago, Tecopa, Death Valley Indian Village, and several areas in the eastern portion of the county all have large collections of unserved and underserved locations that should be among the highest priorities to be connected. The state middle mile network will come within

[10] Note that this table and other tables reporting availability data by the number and/or portion of households are based on the FCC's National Broadband Map Area Summaries and additional data provided by CostQuest. Ibid.

5 miles of most of these locations, but ISPs will need to construct approximately 25 miles of fiber down Trona Wildrose Road to reach some of the most remote locations. This effort may require collaboration between Kern and Inyo Counties.

- **Inyo County Broadband Market Summary:**

Inyo County has three primary residential wireline ISPs: Optimum, Lone Pine Communications, and Frontier.[11] Optimum's cable network has the greatest reach, connecting a reported 5,077 locations to its cable service in the most populous portions of the county. However, the network seldom can offer speeds of 100/20 Mbps, so locations served by this older cable network are mostly classified as "underserved" under the BEAD program. Frontier has the second greatest reach, connecting 2,314 locations with its DSL network and fiber services to another 1,167 locations. Frontier has expressed interest in upgrading their existing areas in Aspendell, Alabama Hills, Lone Pine, and Kern County to fiber through multiple submitted FFA projects. Lone Pine Communications focuses on the Lone Pine area, connecting 370 locations with cable services.

An estimated 469 households (5.0 percent) rely on fixed wireless services to obtain basic broadband speeds of 25/3 Mbps in Inyo County. There is only one primary fixed wireless provider in the county. T-Mobile reaches a claimed 7,218 locations. Verizon reports to serve 22 locations as well, but this service area is so small that it is not likely to have a notable impact on the market unless it is expanded significantly. A major portion of these locations served by T-Mobile do not receive speeds necessary to be considered broadband. In another FCC data set, a reported 6,605 households (69.8 percent) in Inyo County can receive some form of fixed wireless service, but 5,480 of those households (57.9 percent) cannot even reliably receive speeds of 10/1 Mbps.

- **Inyo County Improvement Opportunities Summary:**

  - Frontier's fiber presence in Bishop and West Bishop can be extended along US 395 to areas with existing DSL service, such as the Big Pine, Fish Springs, Independence, Lone Pine, Olancha, and Haiwee areas, though state or other available middle mile with their existing right-of-way and pole agreements. Their FFA applications in Aspendell, Alabama Hills, and Lone Pine have signaled their intent to adopt this approach.
  - Lone Pine Communications and Optimum, the cable providers in Inyo, will need to modernize their existing service offerings to offer services capable of at least 100/20 Mbps and preferably offer download speed of up to 1 Gbps, then expand into other nearby areas.
  - The state middle mile network will be able to be leveraged by any provider willing to establish services in some of the most remote areas of the county, or a new entrant, to connect areas, such as Tecopa, Park Village, Furnace Creek, and Death Valley Indian Village along State Route 190.
  - AT&T's existing presence may be very small, but it remains a possible entrant to connect unserved areas if the primary wireline providers in the county do not connect all of the BEAD-eligible unserved locations over the next couple of years. They could also expand deeper into Bishop or along any available state middle mile routes, these expansion possibilities are not very likely.
  - Other improvement opportunities are covered in more detail in Section 6's review of Broadband Infrastructure Account and BEAD suggested areas for consideration.

[11] We note that a few other providers claim to offer services to a very small number of residential locations. TPx Communications offer DSL to a single location. AT&T offers DSL to 11 locations, and fiber services to a reported 6 locations.

**Section 5: Asset Inventory and Gap Analysis** presents the current middle mile infrastructure available to ISPs across the county to better understand ISPs' backhaul capabilities and how California's planned open-access middle mile network may change any deployment strategies.

**Section 6: Broadband Funding Strategies** reviews a number of state and federal funding programs that can be used to develop grant-eligible broadband deployment projects. These opportunities can support network expansions to areas that would otherwise be difficult or impossible to serve. While these programs share many requirements and rules, they also have subtle differences regarding location eligibility, buildout requirements, applicant matching requirements, and other project planning considerations. These differences can make a particular funding option better suited for a given area in need. This section focuses on three significant last mile funding opportunities:

**Table 3: Location Eligibility Considerations for California's Three Primary Last Mile Grant Programs**

| Grant Program | Grant Availability Timing | Eligible Areas | Additional Location Considerations |
|---|---|---|---|
| **Last Mile Federal Funding Account (FFA)** | First application cycle ended Sept. 29, 2023; cycles expected every 6 months | Must lack access to 25/3 Mbps service from "reliable" wireline source | DSL and cable using DOCSIS 2.0 or below are presumed not "reliable."[12] |
| **California Advanced Services Fund Broadband Infrastructure Account (BIA)** | Recent application cycle ended June 1, 2023[13]; expected to occur annually | Must lack access to 25/3 Mbps service from wireline or fixed wireless sources | Strong focus on areas without any service whatsoever. Median household income also influences priority areas.[14] |
| **Broadband Equity, Access, and Deployment Program (BEAD)** | First application cycle expected to begin mid-2024 at the earliest; at least two application cycles expected | Likely restricted to locations that lack access to 25/3 Mbps service from "reliable" wireline or licensed fixed wireless | "Reliable" defined as "available with a high degree of certainty."[15] |

- **Federal Funding Account:**

The State of California allocated $13,221,784 to Inyo County to be distributed through the FFA program. In September of 2023, the CPUC received three applications for Inyo County, all from Frontier. One project will span both Inyo and Kern Counties and requested $6,629,936, only a small portion of which will come from Inyo County's allocation. The other two projects located exclusively in Inyo County requested $3,568,487 to connect 706 FFA-eligible locations at an average cost of $5,055 per location. These funding requests are presented in the table below.

[12] CPUC, Federal Funding Account Program Rules and Guidelines, Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California, Rulemaking 20-09-001, Decision 22-04-055, Appendix, April 21, 2022, pp. A-8, A-16, ("FFA Guidelines"), https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M470/K481/470481278.PDF; CPUC, "Frequently Asked Questions(FAQs) – Federal Funding Account, Last Mile," April 2023, p. 3, https://www.cpuc.ca.gov/-/media/CPUC%20Website/Files/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Communications_-_Telecommunications_and_Broadband/FFA%20Webpage%202023-04/FFA%20FAQs%20V2.pdf.

[13] CPUC, "Second Postponement of the 2023 CASF Infrastructure Application Deadlines," April 18, 2023, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-infrastructure-and-market-analysis/2023-letters/20230418-exec-dir-casf-infra-extension-deadline-letter.pdf.

[14] CASF, Broadband Infrastructure Grant Account Program Requirements, Guidelines and Application Materials, Order Instituting Rulemaking Regarding Revisions to the California Advanced Services Fund, Rulemaking 20-08-021, Decision 22-11-023, Attachment 1, p. A-10, updated May 31, 2023, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-infrastructure-and-market-analysis/broadband-infrastructure-grant-account---landing-page/decision-docs/d2211023attachment-1casf-guidelinesw-coverheader053123.pdf.

[15] NTIA, Broadband Equity, Access, and Deployment Program Notice of Funding Opportunity, 15, May 12, 2022, ("BEAD NOFO"), https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf.

**Table 4: Applications for Inyo County Submitted to the Federal Funding Account by September 29, 2023**

| Organization | Project Name | Amount Requested | Unserved Locations |
|---|---|---|---|
| Frontier | Inyo 1 | $1,413,619 | 441 |
| Frontier | Inyo 2 | $2,154,868 | 265 |
| Frontier | Kern* | $6,629,936 | 523 |

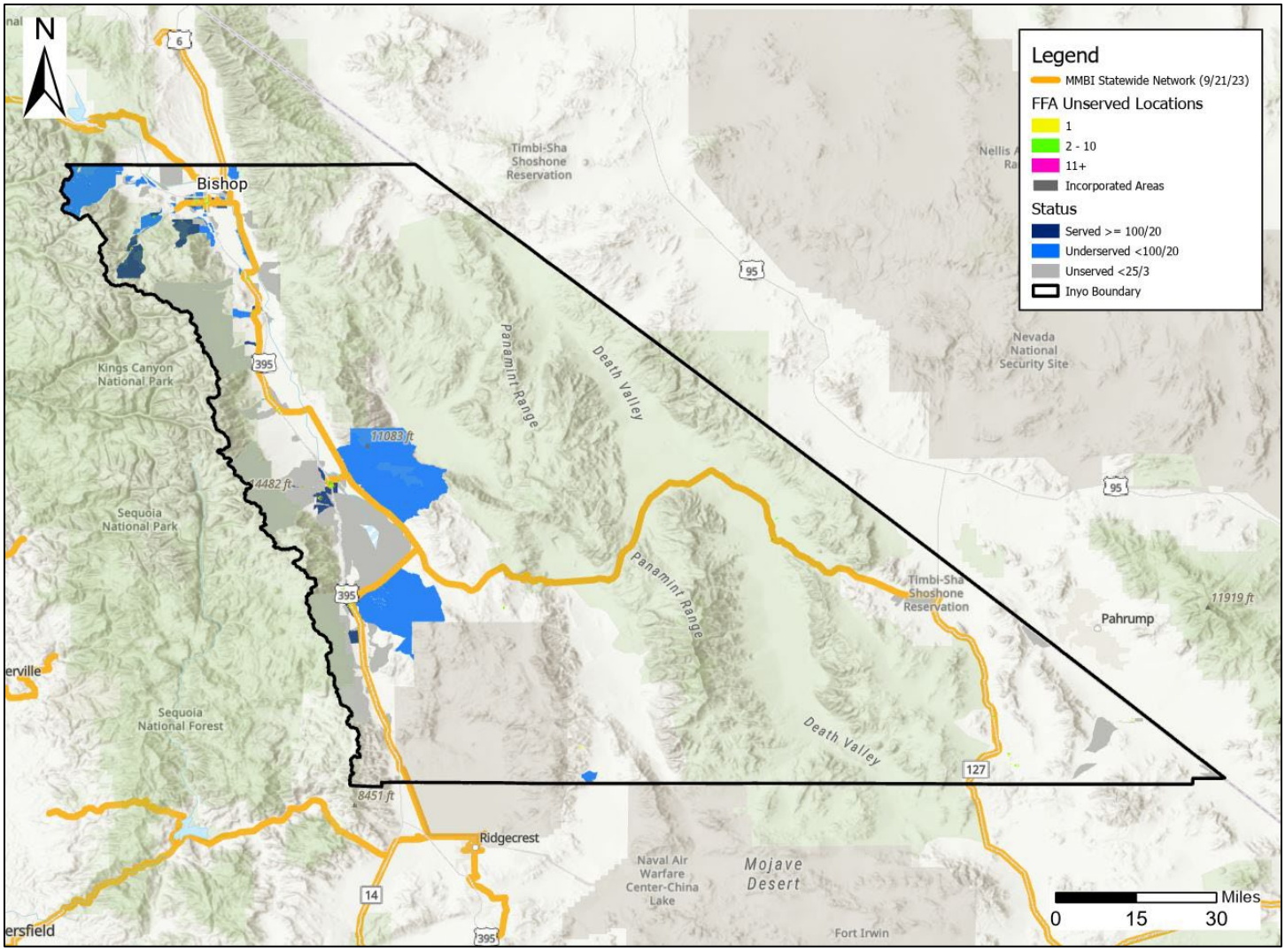
**Denotes a project that spans multiple counties*

At the time of this writing, applications are still being reviewed, and winners have not yet been announced. Detailed information about each application, including maps of proposed funded service areas, can be found here:

https://broadbandportal.cpuc.ca.gov/s/objection-page

Given the impact each project award would have on future network deployment efforts in the county, ISPs and municipalities must be flexible when planning for projects that can best utilize the other funding opportunities available over the next two years. The map below shows the locations eligible for the FFA program. We note that the eligibility criteria are broader than the BEAD program's definitions of "unserved" locations.

**Figure 1: Inyo County FFA Application Final Candidates and BEAD Eligible Unserved and Underserved Areas[16]**




Considering Frontier's proposed projects during the first round of the FFA program, several areas could be covered with any remaining FFA funding. We suggest considering the following:

- Lone Pine Communications could consider extending its wireline service area to reach Olancha, expanding to eligible for the FFA-eligible addresses to the south, or expanding eastward to reach eligible areas in Keeler, to the east of Owen's Lake. The state's middle mile network will be constructed along US 395 and could serve as the basis for another provider's deployment through Olancha, but Lone Pine Communication's existing unlicensed fixed wireless

[16] Figure uses FCC National Broadband Map and Broadband Data Collection (BDC) program data to identify all census blocks that contain no locations served by wireline or licensed fixed wireless services offering speeds of at least 25/3 Mbps ("unserved" within the BEAD program) and all census blocks that contain no locations served by wireline or licensed fixed wireless services offering speeds of at least 100/20 Mbps but do contain at least one location receiving at least 25/3 Mbps services from one of the listed technologies ("underserved"). Unfortunately, this map does not identify census blocks that contain only a portion of locations served by either 25/3 Mbps or 100/20 Mbps, so there may be individual unserved locations in underserved census blocks and unserved or underserved locations in served census blocks. To highlight partially served census blocks, we have also provided the CPUC's information about where locations unserved by either fiber or high-speed cable networks are found. More details are found in Section 4.

service in the area could provide a competitive advantage with this areas' customers, as the Lone Pine likely a recognized brand within the community and could transition them to fiber wireline service more easily.

- In the west-central Inyo County, many locations that are already served by Frontier's DSL network are eligible for the FFA program. Frontier could consider pursuing additional support from the FFA to upgrade these networks to fiber in Independence and locations directly to the north of this community. As Frontier has already secured access to poles and rights-of-way in these areas, the provider will likely be able to deploy fiber at lower cost than a new market entrant could.
- Big Pine, in northwest-central Inyo, contains locations eligible for the FFA program that are within both Frontier and Optimum's existing service areas. As the state's planned middle mile network will extend down US 395, both providers could consider using the transport services introduced to the area by this network to facilitate this deployment. If ambitious, this project could include FFA-eligible locations in the very southwestern edge of Big Pine, just off of Sugar Loaf Road.
- Lastly, many locations through Bishop, in north-central Inyo County, are eligible under the FFA program, despite the many providers that serve this population center. In fact, every wireline provider with a presence in Inyo County could consider applying to the FFA to serve these locations, as AT&T, Frontier, Optimum, and Lone Pine Communications all maintain networks somewhere in the city.

■ **Broadband Infrastructure Account:**

Inyo County has a reported 2,676 locations (28.3 percent) that do not yet receive any service meeting the 10/1 Mbps standard, 1,358 locations (14.3 percent) of which are reported to not receive any form of internet service. This latter group is prioritized by the BIA program, regardless of the income characteristics of the area, but to identify these locations, the county will need to license access to the CostQuest address fabric. With a significant portion of unserved locations also located in low-income census blocks, ISPs looking to expand their current service areas should consider using the BIA to expand beyond their current service areas or to upgrade services to low-income households currently receiving DSL services offering less than 10/1 Mbps. Nearly all of the project area suggestions made for the BEAD program below should be considered for the BIA program as well, once the ISP or municipality obtains access to the address fabric and can evaluate the current service characteristics (or more importantly, lack thereof) to each location in those suggested areas.

BIA projects can identify areas as small as individual properties and combine them in one application, so long as the residents of each property are low-income households or lack current service entirely. As a result, this program is a unique option for project proposals across the county that focus on expanding or upgrading existing networks to reach a number of small, non-contiguous areas. Including areas that may already receive 10/1 Mbps service but not 25/3 Mbps service, there are a few clusters in low-income census blocks that are worth highlighting to be considered for the BIA program:

- In the northwestern portion of the county, along a bend in US Highway 6, the Laws area contains low-income census blocks that have been marked unserved. Frontier and Optimum both have nearby infrastructure and can easily connect these locations.
- Near the western edge of the center of the county, there are a scattered number of unserved homes in low-income census blocks near Fort Independence Reservation and the Seven Pines campground area. Optimum may be encouraged to expand its cable reach into these areas by connecting to the state middle mile route along US 395, but Frontier's DSL network could be upgraded and expanded to these locations as well.
- Lone Pine Communications could upgrade their cable network in Lone Pine and extend it into the eligible low-income neighborhoods to the west, particularly along W Whitney Portal Road and Granite View Drive.

- Along US 395 near Haiwee, there appear to be scattered unserved locations in low-income census blocks. Portions of these unserved areas extent to the western boundary of the county from the communities of Coso Junction to Grant. There is another small cluster surrounding the South Haiwee Reservoir. Frontier DSL network could be partially replaced with fiber and extended to these unserved locations.
- The Timbi-Sha Shoshone Reservation, near Death Valley Junction, is largely unserved and at least partially classified as low-income. The state middle mile route will pass through the junction, making this area a potential opportunity to interested ISPs. By deploying in this area, the ISP could extend to the southeast corner, including the town of Charleston View, and locations along Old Spanish Trail Highway, just east of South Nopah Range Wilderness Area.

- **BEAD Grant Program:** A portion of BEAD-defined unserved locations are likely to be scattered in partially served census blocks, but there are a few areas that should be highlighted:
  - All of the areas suggested for BIA consideration above should also be considered for the BEAD program. The Laws area in the northwestern portion of the county, the Lone Pine area, and a number of scattered unserved locations found within a few miles of US 395 throughout the county should all be considered for BEAD-funded projects. The state open-access middle mile network is planned to run near a majority of these areas as well, so while Frontier, Lone Pine Communications, and even AT&T may not be near each area, any one of the three could decide to use BEAD funding to establish itself along different portions of US 395.
  - The unserved areas in the southeastern portion of the county, such as locations in and near Charleston View, Death Valley Junction, Shoeshone, Tecopa, and Sandy Valley, have been designated as BEAD high-cost areas, so projects to connect these areas will have a much lower matching requirement, if any. The CPUC may designate this area as an "extremely high cost," which would allow fixed wireless ISPs to submit plans for high speed wireless networks capable of providing services of at least 100/20 Mbps if wireline networks to this area are not economically viable. However, the state middle mile network is planned to run along State Route 127, so many locations in this area may be able to receive fiber service to their homes.
  - There are a few clusters of unserved locations west of West Bishop, particularly in the outskirts of Round Valley, Starlight, and further southwest in Aspendell. The state middle mile network will run to the intersection of W Highway 168 and Ed Powers Road. If Frontier elects to use the state middle mile network it could extend its existing fiber network to these clusters in West Bishop.

Section 6 also reviews how counties and municipalities can work to ensure that unserved locations are eligible for grant funding. These funding programs require applicants to rely upon broadband service maps from either the FCC or the State of California, but not all locations are accurately classified on these maps. Local governments, ISPs, non-profits, and in some cases, the residents themselves may attempt to reclassify locations to make them eligible for funding if sufficient evidence is gathered to demonstrate that a location is not served. Local governments can implement a number of strategies to gather this information and ensure residents with unreliable or slower services can be included in deployment planning during this unique and brief funding window.

**Section 7: Fostering a Healthy Broadband Deployment Environment: Permitting, Coordination, and Other Local Policies** reviews how municipalities can help to encourage ISPs to serve unserved and underserved areas by adopting policies and strategies that can reduce deployment costs in their communities. From improving permitting and asset access policies to improving local coordination both within the local government and between other key stakeholders, municipalities can reduce the costs and efforts required by ISPs to expand services while developing strategies that can benefit from the input of community groups, businesses, and neighboring municipalities.

**Section 8: Digital Inclusion Considerations and Strategies** expands upon the analysis of broadband needs found in Section 3 and provides more ways of understanding the different groups needing broadband service adoption assistance. Municipalities are encouraged to work with community anchor institutions (CAIs) to improve the use of service subsidy programs such as the Affordable Connectivity Program (ACP) and the California LifeLine program and to expand local efforts to close the digital divide by planning programs that will utilize a new wave of digital inclusion programming soon to come from the IIJA's funding to California, funding that is in addition to the IIJA BEAD infrastructure funding.

**Section 9: Smart Communities** analyzes how Inyo County can best utilize the capabilities of broadband-enabled technologies to improve quality of life for all residents. Vanasse Hangen Brustlin (VHB), a firm with extensive experience in urban planning and smart community strategy, partnered with Tilson for this study to evaluate critical smart community applications to consider when addressing broadband deployment, area funding prioritization, and enabling technologies that help mitigate risk to constituents. By analyzing environmental, transportation, energy, economic, and other factors within the county, this section develops a list of prioritized strategies and reviews how they and other smart community strategies can be planned and implemented. Inyo County's top smart communities strategy priorities should include:

- Expand Flood and Landslide Monitoring Systems to Improve Safety;
- Expand Wildfire Detection and Monitoring systems to Improve Safety;
- Deploy Charging and Fueling Infrastructure to Support Zero Emissions Vehicles (ZEV) and Electric Vehicles (EV);
- Improve Digital Access and Equity;
- Expand use of Clean and Renewable Energy Systems to Reduce Carbon Emissions, Increase Community Equity, and Improve Resilience

**Section 10: Recommendations and Next Steps** presents a list of actions and strategies that Inyo County can use to prioritize broadband funding to address the digital divide. Drawing together insights found throughout the rest of this report, these recommendations will pull together the market assessment, review of infrastructure assets, funding opportunities, and digital inclusion considerations to develop a roadmap that the local governments of Inyo County and incorporated towns and cities within it can follow to guide their next steps toward a more digitally inclusive future.

SECTION

# 02

# INDUSTRY OVERVIEW, BROADBAND BENEFITS AND CHALLENGES

The telecommunications industry has a history of significant transformation driven by technological advances and regulatory changes. What was once an industry that delivered television signals over the air and telephone calls over wires now provides telephone service over mobile wireless networks and high-definition video over wired broadband networks. This flip has occurred due to bandwidth demands of new applications, technological advances of wireless and wireline networks, regulatory changes in retail and wholesale competitive practices and access to the wireless spectrum.

Competitive changes in the telecommunications industry stem directly from the 1982 antitrust case and consent decree that brought about the divestiture of the Bell System and AT&T's separation from the Regional Bell Operating Companies.[17] Subsequently, the 1996 Telecommunications Act mandated the Regional Bell Operating Companies provide wholesale access to certain telecommunications facilities to competitive carriers. This wholesale access facilitated competition in several service markets, including voice services, long distance, and eventually DSL.

Since these fundamental transformational events, competition in the telecommunications industry has expanded due to regulated access to additional licensed spectrum for fixed and mobile wireless services, the creation of spectrum bands for unlicensed use, and the establishment of subsidy regimes to incentivize carriers to provide voice and broadband service to even the most difficult to serve locations.

Technological changes have perhaps been the industry's most significant. The transition from copper telephone lines to mobile calling and from broadcast television to the high bandwidth demands of 4K and even 8K streaming video required advances in wireless and fiber technology (and to a degree the technology behind hybrid fiber-coax cable television and cable broadband networks). Advances in wireless technology have largely centered around the creation of the mobile wireless industry and widespread deployment of mobile wireless networks. Mobile telephone calls now greatly outnumber landline telephone calls and smart phones are now ubiquitous. The mobile industry, and the advent of smartphones and the mobile networks capable of handling the data traffic they produce, have caused a paradigm shift in American culture around communication and access to information. These technological advances were enabled by access to portions of the radio frequency spectrum and technological advances allowing smartphone capabilities and cost efficiencies of enabling hardware.

Advances in the wireless industry extend to advances in the fixed wireless industry as well. While technological advances have been significant in terms of speed, performance, hardware size and cost, these advances have also been enabled by access to portions of the frequency spectrum not previously available for commercial use. Higher frequency portions of the radio frequency spectrum allow for higher bandwidth and faster speeds but do have the drawback of having a shorter range and being more susceptible to signal degradation from foliage and topography. As a result, more wireless nodes are typically required to achieve the desired coverage and performance. The type of fixed wireless technology most often used to provide rural internet service, point to multipoint technology, which involves a base station radio (the "point") that serves multiple end users (the "multipoints") has seen impressive advances in technology over recent years as a result of newly available spectrum such as the Citizens Band Radio Spectrum (CBRS) and the Educational Broadband Service (EBS) spectrum. Fixed wireless point to multipoint systems can now provide service in excess of 100 Mbps download speeds. However, these systems are still largely asymmetrical meaning the upload speeds are limited and the actual speeds and performance at a subscriber's location will depend entirely on the signal strength at that particular location which can be greatly affected by foliage and topography. Also, technological advances allowing for low-cost consumer-grade hardware have been critical.

Technological advances in the fiber optics industry are also significant. Not just the technological advances and speeds and capacity of modern fiber networks, but also the widespread implementation of fiber networks over copper networks by providers building new broadband networks. Fiber has categorically replaced copper in most aspects of the

[17] United States v. AT&T, 552 F. Supp. 131 (D.D.C.1982). See, e.g., Christopher S. Yoo, "The Enduring Lessons of the Breakup of AT&T: A Twenty-Five Year Retrospective," Federal Communications Law Journal: Vol. 61: Iss. 1, Article 2, p. 2 (2008), explaining that this case serves as a starting point to examine the major telecommunications competition policy issues that occurred after it.

telecommunications industry. Major circuits between regions, undersea cables, long haul cross country circuits, are all now ubiquitously fiber. Copper is an antique in the telecommunications industry, oxidizing and rotting away and waiting to be replaced by fiber. Even in the cable television industry, which has enormous sunk costs in their decades-old, hybrid fiber coax networks, the switch to all fiber networks has begun.

As with the specific advances in point to multipoint wireless technology, advances in fiber technology have also centered around advances in point to multipoint fiber to the premises (FTTP) technology. Historically, fiber has been a point to point technology, with every connected location having a dedicated fiber home run from it to the serving switch port. More recent technology, known as Passive Optical Networks (PON), are able to use a single switch port (the "point") to serve dozens of end users (the "multipoints"). This technology allows the deployment of fiber to the premise networks at a significantly lower cost. Less fiber is required, fewer active electronics are required, less splicing, less labor, etc. Recent advances in PON technology have brought the standard from GPON with a shared downstream path of 2.4 Gbps and a shared upstream path of 1.2 Gbps (typically shared among 32 users) to XGS-PON with a shared symmetrical 10 Gbps (typically shared by 32 to 64 subscribers). Even more advanced PON technologies are under development that will allow for even greater capacity.

More recent industry advances take the form of historic amounts of grant funding currently available for broadband infrastructure. The COVID-19 pandemic revealed the true inequities of households without broadband and ushered in significant pieces of federal and state legislation, providing funding for broadband infrastructure not seen before and likely never to be seen again. Early into the COVID public health emergency and the migration of activity from businesses and schools to the home, the challenges of legacy technologies became more apparent. Much of the country discovered that what functioned as acceptable connectivity for basic home consumption no longer functioned for work, school, and usage by multiple people at the same time.

During the pandemic, the federal government expanded its broadband deployment funding programs significantly, but it also recognized the scope of the challenge was too large for federal agencies to address alone. Many of these funding opportunities included provisions for broadband, devices, and access, such as the Coronavirus Aid, Relief, and Economic Security Act (CARES); Coronavirus Response and Consolidated Appropriations Act of 2021; and American Rescue Plan Act (ARPA).[18] In November 2021, the Infrastructure Investment and Jobs Act (IIJA) was passed, with billions of dollars to develop broadband infrastructure and digital equity programs.[19] [20] All four of these federal funding packages identified the need for better broadband technology and higher service speeds, raising the standard for broadband service above and beyond past standards.

In December 2020, the California Broadband Council released the California Broadband for All Action Plan with support from state legislators, agencies, and local organizations.[21] The plan outlines the current state of broadband availability and adoption across California, challenges, opportunities, and a plan of action to ensure universal adoption for all Californians through access to affordable highspeed broadband, devices, and skills to use devices and connectivity. The plan recognizes the challenges specific to California, considering geographic as well as socio-economic barriers.

In July of 2021, the California State Legislature passed Senate Bill 156 (SB156), which allocated $6 billion toward broadband efforts, introducing new funding, financing, and planning programs. The legislation also significantly updated the program

[18] Benton Institute for Broadband & Society, "Federal Broadband Support During the COVID-19 Pandemic," April 23, 2021, https://www.benton.org/blog/show-us-money-federal-broadband-support-during-covid-19-pandemic.

[19] Infrastructure Investment and Jobs Act (IIJA), 135 Stat. 429, 117th Congress, November 15, 2021, https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf.

[20] Federal Communications Commission, "Emergency Broadband Benefit Program," https://www.fcc.gov/emergency-broadband-benefit-program, accessed August 2023.

[21] California Broadband Council, *Broadband for All Action Plan, 2020* December 30, 2020, ("CA Broadband for All Action Plan"), https://broadbandcouncil.ca.gov/wp-content/uploads/sites/68/2020/12/BB4All-Action-Plan-Final.pdf.

requirements of existing broadband funding opportunities to meet unserved Californians' current and future broadband needs.[22] The bill allocated $3.25 billion of this funding to construct a statewide open access middle mile network that would extend deep into the rural areas across California, significantly reducing the cost to deploy last mile networks needed to connect nearby unserved locations. SB156 also allocated $2 billion dollars for last mile fiber to the premises networks, which is in addition to the $1.8 billion allocated to the state of California by the IIJA BEAD program, also for broadband last mile networks.

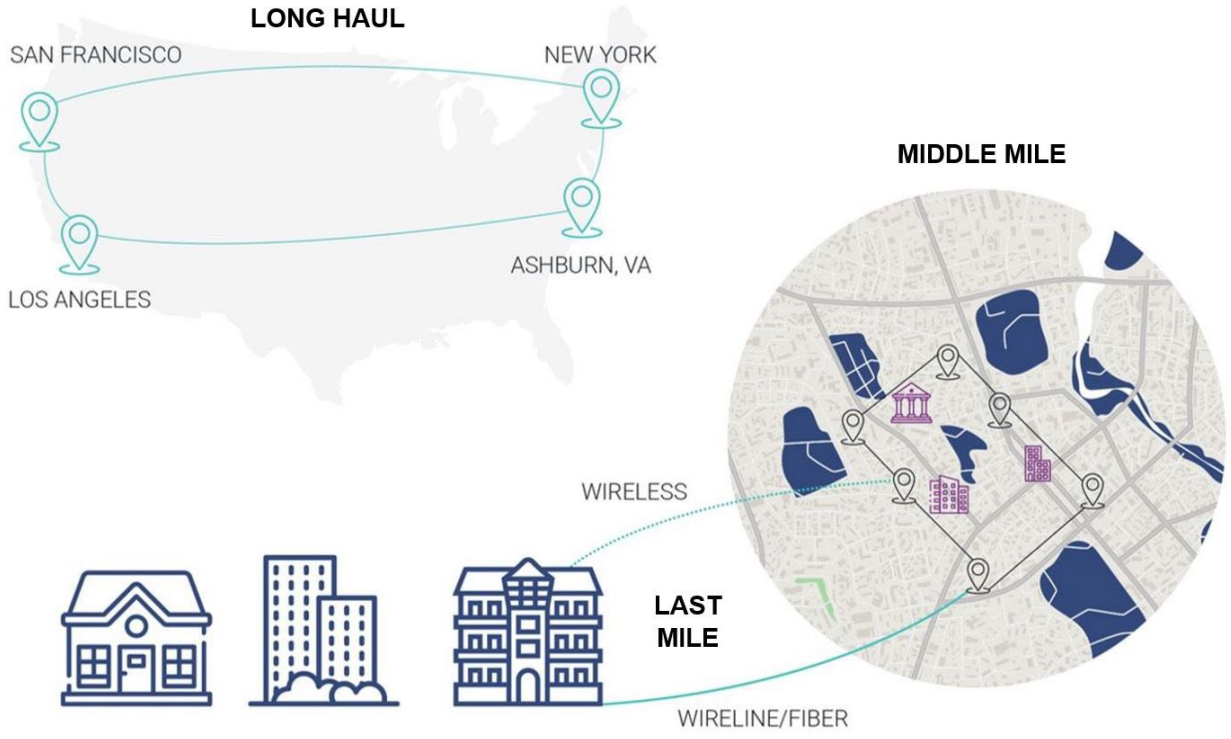
# 2.1 Overview of Broadband Terminology

This section is a primer and reference for the reader to understand, engage with, and utilize the terminology of this Inyo County Feasibility Plan. This section will outline common terms, define them in plain language, and provide examples where appropriate. If the reader feels a broadband industry primer is not required, they can proceed directly to other sections.

## 2.1.1 Physical Infrastructure and Delivery

The terms *Long Haul, Middle Mile*, and *Last Mile* describe the fundamental network segments of broadband delivery. In much the same way as roads connect a delivery driver with a package to a home or business, these networks deliver content to and from a home, business, or Community Anchor Institution (CAI). Long haul, middle mile, and last mile can refer to both wireless and wired connections.

**Figure 2: Network Types**




[22] California SB 156 (2021-2022 Regular Session), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB156.

### Long Haul

Long haul infrastructure can be compared to an interstate highway, allowing large volumes of traffic to move long distances and at high speeds. This infrastructure moves data over long physical distances, connecting major cities across the county to one another or across international boundaries.[23] This network level is usually buried fiber optic infrastructure that covers hundreds and even thousands of miles, including undersea cables.[24]

Long haul fiber optic networks are the backbone of all internet and phone traffic, providing national and global transport of data. Long Haul networks generally connect major internet points of presence in major cities and geographic areas such as Los Angeles, San Franscisco, Seattle, Denver, Dallas, Chicago, New York and Miami. Continental long haul networks connect to international long haul networks from Europe, Asia and South America at submarine cable landing stations along the Pacific coast and the atlantic coast. There are currently eight submarine cable landing stations along the California coast.[25] Long haul networks offer virtually unlimited capacity, offering large fiber strand counts and employing the latest technology. While long haul networks do traverse through many rural communities on their way from point A to point B, they are often inaccessible locally due to their design and operating model.

### Middle Mile

Middle mile networks are like regional long haul networks, spanning distances between major connection points at the state or regional level. The middle mile is the infrastructure between communities and major routes within communities. Sometimes middle mile networks provide direct connections to high bandwidth users such as schools and hospitals, but they do not provide direct connections to homes or small businesses. In the road metaphor, middle mile is a state highway or major thoroughfare through a community. Fiber middle mile can be *lit*, with the middle mile operator providing transmission services, or *dark*, allowing a company to lease individual fibers, connect its own electronics (to "light" the fiber), and control the transmissions itself. This choice enables last mile providers of different sizes to choose between purchasing bandwidth as a service and focusing on other efforts or operating their own middle mile facilities in conjunction with their last mile operations and expansion efforts. The closer a middle mile connection point is to a potential service area, the less last mile infrastructure needs to be installed, so last mile extensions can be very convenient when new middle mile networks are added.

The State of California's middle mile initiative plans to offer access to as much as ten thousand miles of underground fiber optic cable traversing all counties in the state.[26] This network will be available for use by projects locally, allowing any last mile networks, including those funded by current and future broadband infrastructure grant programs, to connect to it for transport to internet points of presence in Los Angeles and San Franscisco where the data traffic can be handed off to a Long Haul network as needed for transport to other states and countries. Details on middle mile providers in the county and California's state Middle Mile Initiative are included in Section 5.

### Last Mile

Last Mile networks provide the final connection to homes, businesses, local government facilities and other community anchor institutions and connect them to middle mile networks such as the state middle mile network,[27] which in turn connect

[23] The Pew Charitable Trusts, *Broadband Basics: How it Works, Why It's Important, and What Comes Next*, August 18, 2023, https://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2023/08/broadband-basics-how-it-works-why-its-important-and-what-comes-next.

[24] California Legislative Analyst's Office, Overview of Last Mile Broadband Infrastructure Project Administration and Funding, April 6, 2022, accessed August 2023, https://lao.ca.gov/handouts/socservices/2022/Last mile-Broadband-Infrastructure-040622.pdf.

[25] https://www.submarinecablemap.com/

[26] https://middle mile-broadband-initiative.cdt.ca.gov/

[27] Nevada County, California, Last mile Broadband Grants Program, accessed August 2023, https://www.nevadacountyca.gov/2894/Last mile-Broadband-Grants-Program.

to long haul networks to move data between end users regardless of their location. To continue the comparison between broadband networks and road networks, last mile networks are akin to the neighborhood streets. The part of the network connecting the last mile to the house or business is known as a service *drop* or *line extension* and can be thought of as a driveway.

Last mile networks can be wireline or wireless, however the optimal solution is generally considered to be a fiber to the premises (FTTP) network where each premises can receive a service drop of fiber cable directly to their building. Last mile FTTP networks can be installed either on existing utility poles or buried underground, the latter being more expensive but also more resistant to service outages. Underground fiber is generally protected from things that typically affect aerial fiber cabling such as wildfires, ice storms or cars crashing into utility poles.

### 2.1.2 Speed and Performance

*Bandwidth* is the capacity of a broadband or other telecommunications network to move data across the network, similar to how a road system moves vehicle traffic. Internet speeds are measured in *bits per second* or *bps*.[28] Previously, data was measured in *kilobits per second* or *Kbps* – this unit was used to describe the bandwidth of dial-up modems and is still applied to fax machines. Today we measure data in *Megabits per second*, or *Mbps*, and *Gigabits per second*, or *Gbps*. Each of these measurements is 1,000 times faster than the prior measurement: Gbps is 1,000x faster than Mbps, which is 1,000x faster than Kbps.

It is important to note that speed is not the only measure of an internet connection's performance. The latency, or delay, of a connection is also very important. High latency can be caused by a bottleneck or point of congestion in a network. For example, if a last mile network connects to a middle mile network with an insufficient connection (or a middle mile network connects to a long haul network with an insufficient connection) that does not have enough capacity to allow all traffic to flow without contention, this will cause data to be buffered or even dropped. This will slow the overall delivery of data regardless of the advertised speed of an internet connection. Latency is frequently a problem during times of heavy network usage.

Network congestion and contention can also cause jitter, which is a time delay in the delivery of data caused when data packets are dropped and need to be resent. Jitter often takes the form of streaming video pixelation and voice delays, interrupting applications that rely on real-time usage. ISPs and network operators can control both latency and jitter by maintaining sufficiently robust connections not only to their last mile customers, but to middle mile and long-haul connections.

- **FCC Definition**

The FCC defines *broadband service* as internet service that provides a minimum of twenty-five (25) megabits per second (Mbps) download and three (3) megabits per second upload, commonly written as 25/3 Mbps. *Download* is the consumption of data from the internet, such as watching YouTube videos, checking emails, and surfing the internet. *Upload* is sending data over the internet, such as sending emails or posting pictures to Instagram. One of the challenges many people and organizations discovered through the wide use of Zoom, Teams, Hangouts, and FaceTime is the need for faster upload speeds. Any speed below 25/3 Mbps is not considered broadband and locations with this level of service are considered

[28] The Pew Charitable Trusts, "Broadband Basics: How it Works, Why It's Important, and What Comes Next," August 18, 2023, https://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2023/08/broadband-basics-how-it-works-why-its-important-and-what-comes-next.

unserved by the FCC. Still, there have long been discussions that 25/3 Mbps is too low a threshold[29] and does not reflect the needs of advancing technology.[30]

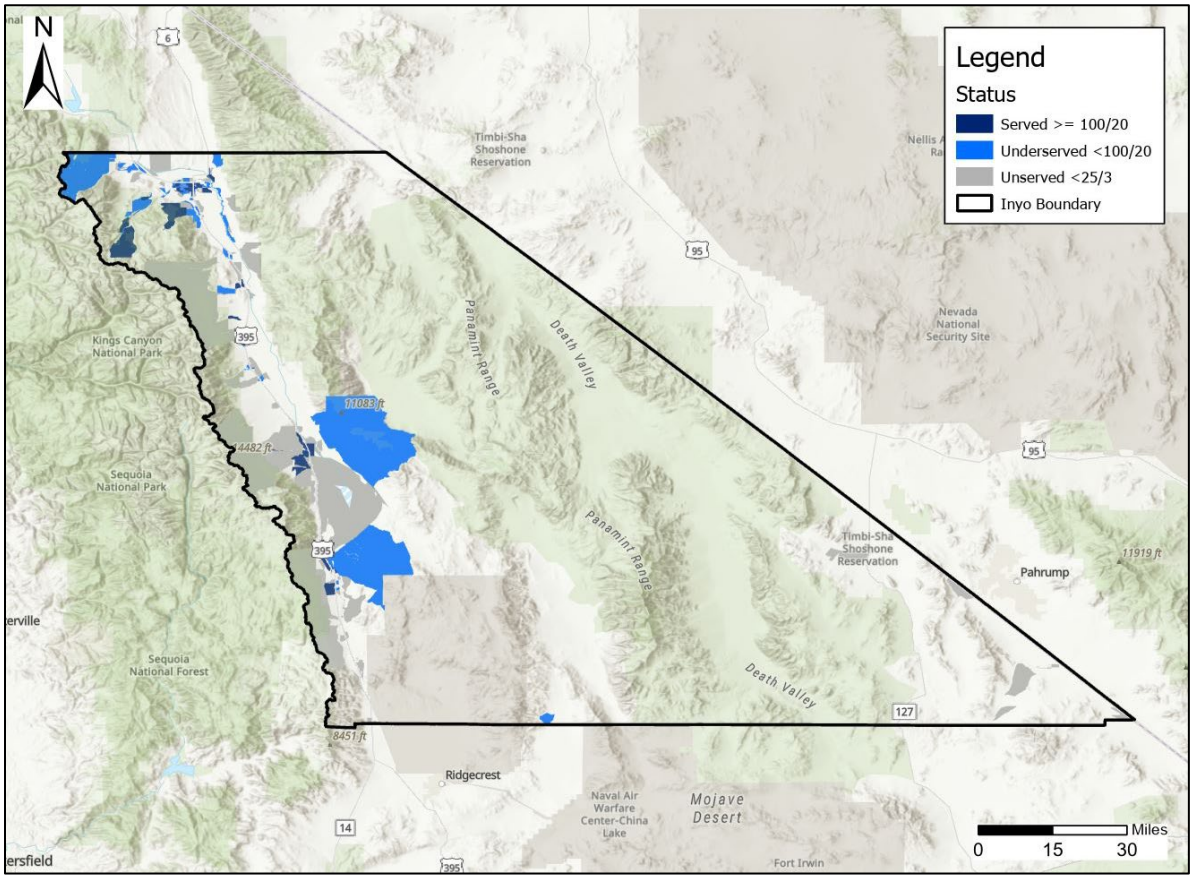
## Infrastructure Investment and Jobs Act

The Infrastructure Investment and Jobs Act (IIJA) of 2021 set aside unparalleled funding for broadband and digital equity deployment.[31] As part of this legislation, the IIJA added the classification of underserved, in addition to unserved. The Broadband Equity, Access, and Deployment (BEAD) program, established in the IIJA, defines the two as follows:[32]

- Unserved are those locations without any service offerings at or above 25/3 Mbps
- Underserved are those locations with 25/3 Mbps but less than 100/20 Mbps

Figure 3 below illustrates the areas of Inyo County that are unserved, underserved, and served as defined by the IIJA.

**Figure 3: Served, Underserved, and Unserved Areas in Inyo County**




*Note: Each census block shows the highest service speed available from the wireline or fixed wireless services in that area. This map uses the BEAD program's definitions for served, underserved, and unserved locations.* See Section 6 for details.

[29] Congressional Research Service, *Raising the Minimum Fixed Broadband Speed Benchmark: Background and Selected Issues*, July 12, 2021, https://crsreports.congress.gov/product/pdf/IF/IF11875/2.

[30] US Government Accountability Office, *Broadband Speed: FCC Should Improve Its Communication of Advanced Technologies Capability Assessments*, April 25, 2023, https://www.gao.gov/products/gao-23-105655.

[31] Infrastructure Investment and Jobs Act, Public Law 117–58, 117th Congress, November 15, 2021, https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf.

[32] BEAD NOFO, p. 7.

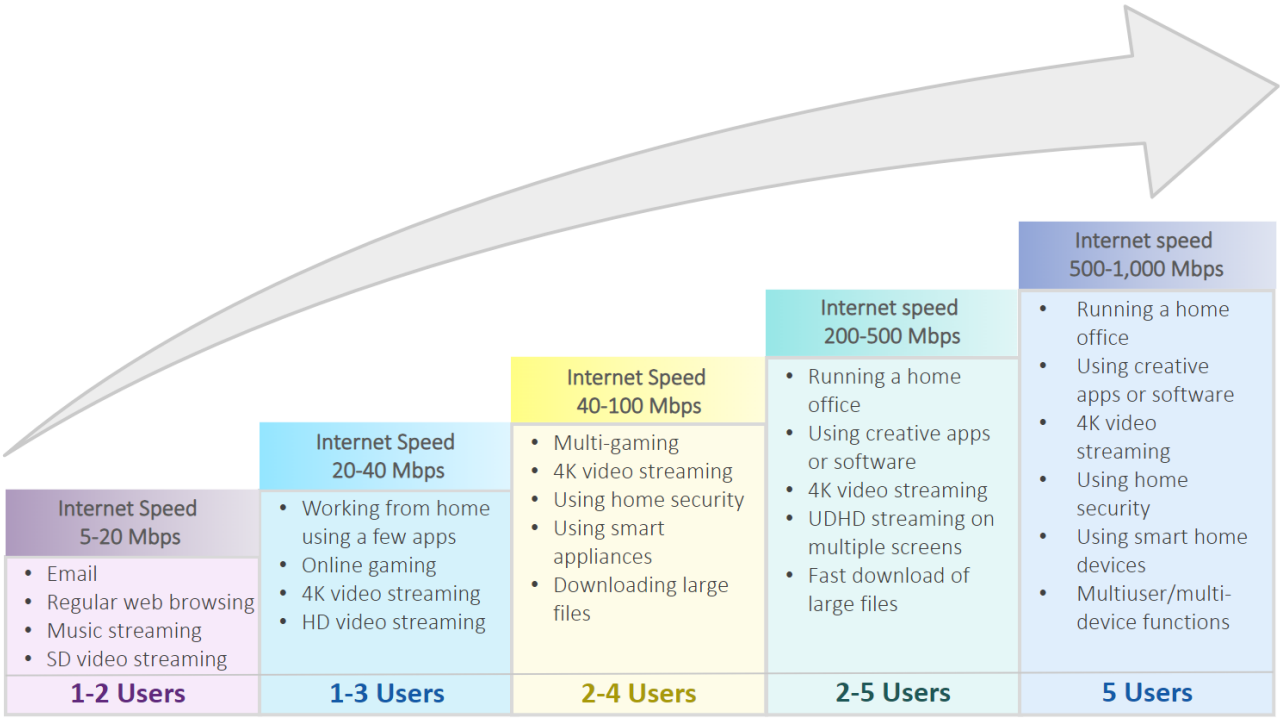
Most of the county is classified as unserved or underserved, with speeds of less than 100/20 Mbps available.

This is significant, as the IIJA and BEAD program recognize the need to scale data consumption to meet future connectivity needs. The IIJA dictates that any networks constructed with funding from the BEAD program must be capable of delivering speeds of at least 100/20 Mbps to end-users to account for ever-growing capacity demands and prioritizes the funding of high bandwidth fiber to the premises last mile networks.[33]

## California Definition

The 2020 California Broadband for All Action Plan (Action Plan) advocated that the minimum speed used to define broadband in California be increased dramatically from 6/1 Mbps to at least 25/3 Mbps, to align with the FCC standard. Additionally, the Action Plan called for the goal of all deployments be at least 100/20 Mbps, aligning the State with federal funding requirements.[34]

**Figure 4: Estimated Home Service Speeds Needed per Number of Users[35]**




[33] Infrastructure Investment and Jobs Act, Ibid.

[34] California Broadband Council, *Broadband for All Action Plan 2020*, December 2020, https://broadbandcouncil.ca.gov/wp-content/uploads/sites/68/2020/12/BB4All-Action-Plan-Final.pdf.

[35] All Connect, "Frequently Asked Questions on Internet Speeds: What Are Mbps and How Many Do I Need?," https://www.allconnect.com/blog/faqs-internet-speeds-what-speed-do-you-need, accessed August 2023.

# 2.2 Broadband Technologies

## 2.2.1 Wired and Wireless

There are a variety of technologies and methods to bring connectivity into homes and businesses. Generally, two basic transmission technologies provide internet connectivity: wired and wireless. Within each category, there are multiple variations. Simply, *wireless* is connectivity that uses electromagnetic waves through the air to transmit information, while *wired* is connectivity that uses physical transmission media such as copper wire or fiber optic cable. This section will provide the reader with a high-level summary of each common type of technology.

In this feasibility plan, satellite technology is generally not considered, nor is it factored into our service availability maps and discussions. Areas that receive only satellite service, whether it be from Low Earth Orbit satellites, such as Starlink, or traditional geosynchronous orbit satellites, including HughesNet and ViaSat, are not considered served by current funding opportunities, regardless of the coverage or speeds.

### Wired Technologies

- **Digital Subscriber Line**

When using Digital Subscriber Line (DSL), data is transmitted over copper telephone wires consisting of a twisted pair of thin copper wire. Often, these telephone wires are decades old and nearing the end of their useful lifespan. The speed and performance of a DSL internet connection is very distance sensitive, the farther a subscriber is from the main hardware (the Digital Subscriber Line Access Multiplexer (DSLAM)) the more signal quality declines and speeds decrease. Copper lines are also used by fax machines and older dial-up modems. While DSL can provide speeds above 25/3 Mbps, residential consumers typically cannot receive speeds above 100/20 Mbps. Factors affecting DSL's capabilities include equipment, infrastructure age, and distance between the customer premises and the DSL network equipment. Distance to facilities and age of DSL systems are generally more acute in rural areas than in urbanized areas.[36] Many current funding programs, such as those created by IIJA, will not fund the deployment of this technology due to the inability to consistently reach 100/20 Mbps and scale to higher speeds.[37]

Some internet service providers (ISPs), such as AT&T, are phasing out their DSL offerings. As of October 1, 2023, existing subscribers will be able to continue their service, but AT&T will not offer new DSL services.[38] In many areas, they now offer a fixed wireless service using their mobile networks to offset this loss, but as AT&T and other providers face higher repair costs from aging DSL infrastructure often dating back to the prior century, DSL networks are gradually being replaced in favor of fiber when feasible.

[36] Alisher Aldashev and Birzhan Batkeyev, "Broadband Growth Infrastructure and Economic Growth in Rural Areas," *Information Economics and Policy*, December 2021, https://www.sciencedirect.com/science/article/abs/pii/S016762452100024X.

p[37] Federal Communications Commission, "Types of Broadband Connections," https://www.fcc.gov/general/types-broadband-connections#dsl, accessed July 2023.

[38] AT&T has stated that it "no longer offers DSL services" on the company website. AT&T, "AT&T Internet – DSL," https://www.att.com/internet/dsl/, accessed October 2023.

**Table 5: DSL Providers in Inyo County**

| Provider | Availability Number of Locations | Infrastructure Type |
|---|---|---|
| **FRONTIER** | 2,314 | DSL |
| **AT&T Inc** | 11 | DSL |
| **TPx Communications** | 1 | DSL |

## ■ Cable

*Cable* generally refers to coaxial cable made up of a copper inner conductor insulated from a conductive shield. Cable is usually installed on utility poles or buried in the rights-of-way (ROW), and then terminated into the building. Cable internet uses the same infrastructure that provides cable television to homes. Cable television systems were originally engineered and installed to broadcast television signals in one direction, from the satellite head end down to subscribers' homes. To provide internet access the cable systems had to be reengineered to be bidirectional, allowing data to be transferred both upstream and downstream. As a transmission medium, cable has more resistance and signal loss across distances when compared to fiber.

Most modern cable plants are Hybrid Fiber Coax (HFC) systems which use fiber optics to transmit data deep into neighborhoods, then transferring to coaxial cable within the neighborhood. To provide higher speeds, Cable ISPs must install fiber deeper into neighborhoods than they had in the past as capacity demands increase. When placed sufficiently close to the end user HFC cable systems can support downloads of 1 Gbps or more. However, most cable systems are asymmetric and simply cannot provide the high upload speeds offered by fiber systems.

Cable systems depend on transmission electronics throughout multiple nodes from the originating data center to the end user's location. These electronics use different transmission standards to send and receive signals through the cable at different frequencies, packing more data through more sophisticated use of these signals. Currently, the most widely used standards are DOCSIS 3.0 and 3.1,[39] which can provide 1 Gbps download speeds but allocate most of the capacity to downloads. The next standard, DOCSIS 4.0, can allocate more transmission capacity to upload speeds, but will require that cable ISPs upgrade electronics across many sections of their networks. DOCSIS stands for Data Over Cable Service Interface Specifications.

**Table 6: Cable Providers in Inyo County**

| Provider | Availability Number of Locations | Infrastructure Type |
|---|---|---|
| **Optimum** | 5,077 | Coaxial cable |
| **Lone Pine Communications, Inc.** | 370 | Coaxial cable |

## ■ Fiber Optics

Fiber optic cables are glass filaments, roughly the width of a human hair, that carry data in the form of light to equipment that converts the light to electrical signals.[40] Fiber is generally considered the gold standard of broadband as it has practically

[39] DOCSIS stands for Data Over Cable Service Interface Specification.

[40] Federal Communication Commission, "Types of Broadband Connections," accessed July 2023, https://www.fcc.gov/general/types-broadband-connections#fiber.

infinite speed and data capabilities, limited only by physics and the performance capabilities of the equipment used to light the fiber and recognize the light sent through these glass tubes. The main thoroughfares of the first layer of the internet are in the form of fiber optic subsea cables and cross-county long haul routes, transmitting hundreds of terabits of data per second between and across continents. Fiber optics have been utilized for decades to transmit data in this manner, but until recently, it was relatively uncommon to have fiber reach private residences. Fiber cables are also long-lasting with an expected lifetime of 50 years or more without requiring significant maintenance. As fiber middle mile becomes more accessible and components become cheaper, deploying fiber to a residence has become the end goal for many providers because of low upkeep costs and the ability to upgrade to electronics to keep up with demand well into the future.

Fiber to the Premises (FTTP) systems generally use Passive Optical Networking (PON) technology, where a single strand of fiber is connected to a port (generally a 10Gbps capable port) at an ISPs facility such as a hut or a cabinet, and that single fiber then goes into a neighborhood where it is split, using passive splitters requiring no electronics or power, into 32 or 64 fiber strands that connect to 32 or 64 premises. This shared (or tapped) technology lowers deployment costs by reducing the strand count of fiber and labor required.

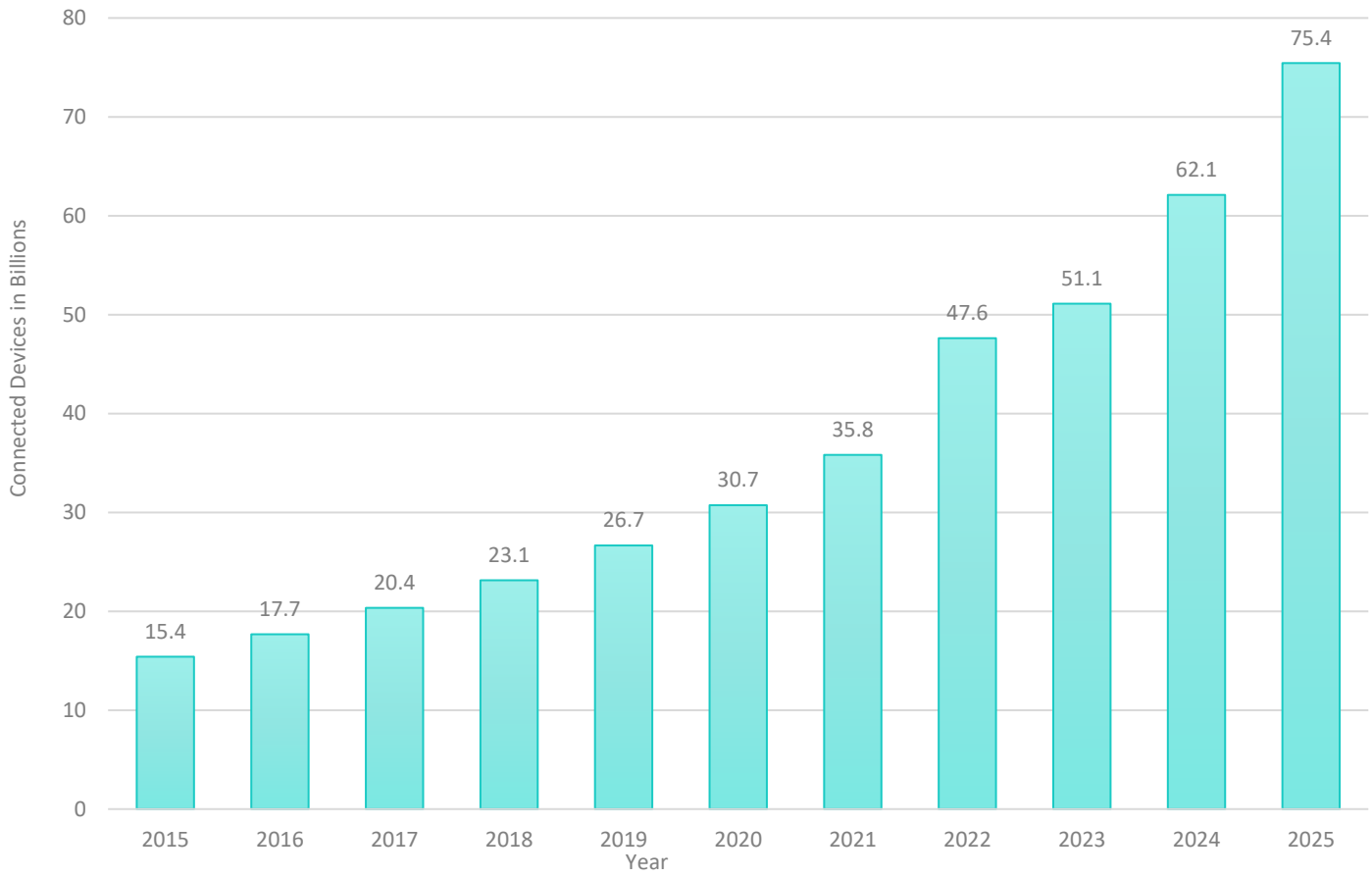
**Table 7: Fiber Providers in Inyo County**

| Provider | Availability Number of Locations | Infrastructure Type |
|---|---|---|
| **FRONTIER** | 1,167 | Fiber to Premises |
| **AT&T Inc** | 6 | Fiber to Premises |

## ■ Wired Connections Summary

As with most other broadband connections, not all locations have access to the fastest speeds due to a number of factors, that include: distance from connection points, infrastructure age –both the in-home wiring and the cable in the ROW or on the utility pole, and equipment age such as the consumer's modem or Internet Service Provider (ISP) equipment. As the number of smart devices, home assistance applications, coupled with an increasing number of computers, tablets, smart phones, and gaming systems connected to the internet grows, the need for increased bandwidth and speeds also grows. The growing need for an always-connected life with multiple devices has led to an exponential growth in the speeds and bandwidth of broadband technology.

**Figure 5: Number of Devices Estimated to be Connected to the Internet Globally[41]**



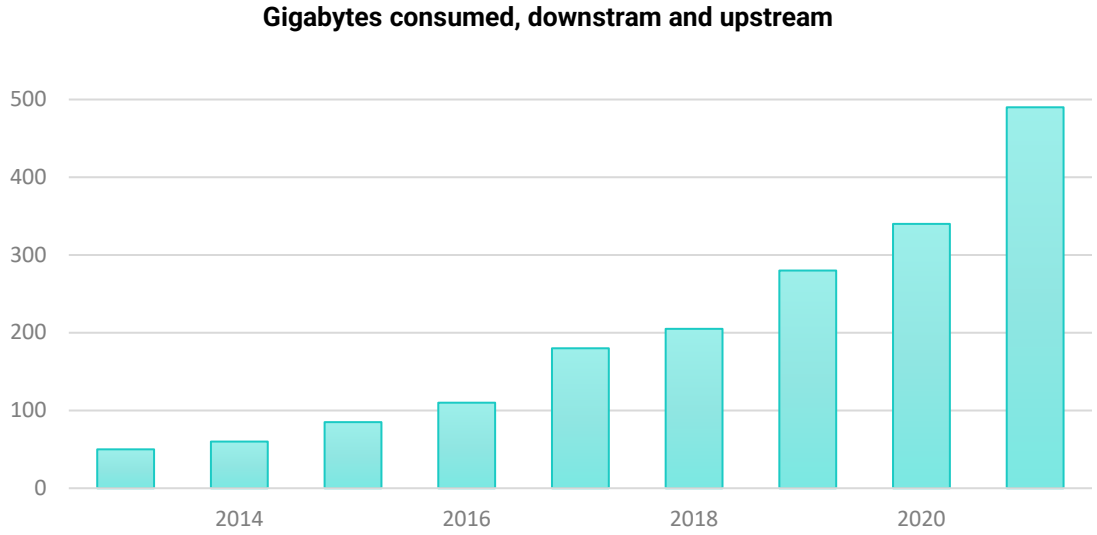

As implied by Figure 5, the need for increased bandwidth and speed grows as both devices and data consumption increase. Unsurprisingly, broadband technology that can scale with increased use is essential. This exponential growth is leading to the push and growth of scalable technologies such as FTTP. Upcoming federal and state funding are generally focused on bringing fiber and other scalable technologies to homes, businesses, and community anchor institutions.

In densely populated markets, FTTP and high-performance coaxial cable systems have become widely available. The majority of connected households in these areas have rapidly increased demand for and use of data. At the end of 2022, the average household downloaded nearly 600 GB of data per month, up from 462 GB in early 2021 and more than double the average household's use of 270 GB per month at the end of 2018.[42]

[41] T. Poongodi et al, "IoT Sensing Capabilities: Sensor Deployment and Node Discovery, Wearable Sensors, Wireless Body Area Network (WBAN), Data Acquisition," in Peng, SL., Pal, S., Huang, L. (eds), *Principles of Internet of Things (IoT) Ecosystem: Insight Paradigm*. Intelligent Systems Reference Library, vol 174. Springer, Cham, Switzerland, (November 2019), https://www.researchgate.net/publication/337259363_IoT_Sensing_Capabilities_Sensor_Deployment_and_Node_Discovery_Wearable_Sensors_Wireless_Body_Area_Network_WBAN_Data_Acquisition.

[42] OpenVault, *Broadband Insights Report*, Q1 2021, p. 6, https://openvault.com/ovbi-average-monthly-broadband-usage-nears-600gb/; OpenVault, *Broadband Industry Report*, 4Q 2019, p. 2, https://openvault.com/NEW-SITE-OV3/wp-content/uploads/2021/02/Openvault_Q419_OVBI.pdf.

**Figure 6: Average Broadband Consumption per Household[43]**




## Wireless Technologies

Wireless broadband functions much like wired broadband but sends data through the air via a link between equipment on a tower and the consumer's house or business. Wireless connectivity includes mobile or cellular connectivity, fixed wireless, and community or campus wide Wi-Fi networks. Speeds vary greatly depending on the equipment, the internet service provider's middle mile connection, number of people on the network, and obstructions between or proximity to the antenna or tower.[44] Even weather conditions such as heavy rain can negatively affect the performance of certain wireless systems. Generally speaking, when compared to FTTP or cable networks wireless last mile networks are far less expensive and faster to deploy but provide reduced speed, performance and reliability.

### ■ Fixed Wireless

Fixed wireless networks are simply wireless networks that are point to multi-point, such as from a tower to homes in a neighborhood. Usually, a line (preferably middle mile fiber) is run to a vertical asset such as a tower, tall building, or pole which feeds a wireless access point (AP) that communicates with a subscriber module (SM) receiver on a consumer's property to obtain internet access through the wireless link. They are not mobile, as the SMs are 'fixed' to a static location such as the sidewall or eaves of a house, unlike cellular networks. Additionally, the capability of this technology depends on the amount of wireless spectrum available for the ISP to utilize. Traditionally, unlicensed fixed wireless relies on line-of-sight (LoS) between the AP and SM to communicate and is operated at a relatively low transmit power. However, licensed spectrum, which is more costly and resource intensive to acquire, can penetrate through trees and some structures using higher transmit power, depending on the frequency of the spectrum.

Wireless technology can also be used as backhaul for wired network deployments, with dedicated multi-gigabit per second capacity being used to move information between two towers.[45] Some companies have seen success in using this model to

[43] Sara Fischer and Margaret Harding McGill, "Gigabytes Consumed," *Axios*, May 4, 2021, https://www.axios.com/2021/05/04/broadband-usage-post-pandemic-increase.

[44] Federal Communication Commission, "Types of Broadband Connections," https://www.fcc.gov/general/types-broadband-connections#wireless, accessed July 2023.

[45] An 18GHz radio between two towers with LOS can achieve this level of backhaul connectivity.

deploy fiber to certain households, then use a multi-gigabit wireless link to bring the signal into and out of remote communities too far from existing middle mile fiber. While this can cause some issues, such as lack of redundancy and susceptibility to obstructions and weather, this hybrid approach is a powerful way of providing modern connectivity to homes where middle mile fiber backhaul would be extremely costly.

- **Wi-Fi Networks**

Wi-Fi Networks are commonly used in households and businesses to create a wireless network for devices used in the business or home. The equipment in the house or business translates a wired or wireless signal to a Wi-Fi signal that devices can understand. Wi-Fi networks can be limited to a single building or can span entire city blocks or college campuses. Wi-Fi networks are particularly convenient for users because most commercial internet devices, such as smart phones, tablets and laptop computers come with a Wi-Fi radio built into the device.

- **Mobile & 5G**

Mobile wireless, commonly referred to as cell or cellular, allows the user with a connected mobile device to move about a wider area than a Wi-Fi connection would allow. Mobile wireless APs are located on towers or other vertical assets in close enough proximity to one another such that when a user is moving, in a car or otherwise, their data can seamlessly be handed off from one tower's AP to the next without the consumer realizing there has been a handoff. Examples of mobile devices include smartphones, tablets, and portable hotspots. These devices use a radio within the device that is different than a Wi-Fi radio.

Recently, mobile providers such as Verizon, T-Mobile, and AT&T have started offering a home internet service based on mobile networks. By using the same tower based equipment and the same licensed spectrum they use for their mobile wireless service, they provide a fixed wireless service by providing consumers with an antenna and radio (SM) that can be mounted to the house or even kept inside the house, preferably near a window with good exposure to the serving tower. This service can provide important connectivity to homes that are otherwise unable to receive any other service. However, in some instances, these service offerings will create barriers for those seeking grant funds to deploy higher capacity wireline networks such as fiber and coaxial cable.

5G is shorthand for fifth-generation mobile connectivity standard, which does offer improved performance compared to 4G. Hardware vendors rely on established standards to manufacture products that can be widely implemented. The 5G (and 4G) standard can be used for both fixed wireless and mobile networking. Prior to the pandemic, many ISPs were promoting 5G as a solution to connectivity challenges. Post-pandemic, the broadband funding landscape has changed and does not support grant funding for the deployment of 5G or any cellular connectivity as solutions to connect homes, businesses or CAIs.

# 2.3 Broadband Benefits

Before the pandemic, internet connectivity was used for a wide variety of purposes: education, entertainment, business, social networking, telehealth, reverse 911 and more. Many rural and urban households and businesses struggled with connectivity – both access and affordability. The pandemic intensified the need for affordable access to high-quality and high-speed broadband. In the pandemic-altered world, access to affordable broadband services has become a necessity. Unfortunately, many rural and urban households and businesses continue struggling to gain access to affordable, high-speed internet service. This section highlights some of the multifaceted benefits of high-speed connectivity.

### Education

Broadband can facilitate access to education, from the K-12 system to higher education including certifications, continuing education, and advanced degree programs. While many online programs were growing prior to the COVID-19 pandemic, access to online education has only accelerated after the public health emergency.

Before the pandemic, students ranging from grade school to graduate school utilized the internet to do research at home and on campus. Many students struggled with connectivity at home prior to the pandemic. In California public schools with the highest rates of poverty, three in ten households reported lacking the ability to do basic online activities.[46] As social distancing forced students home and into online education, the need for high quality broadband access was accentuated.

In addition to supporting primary and secondary education, broadband can also facilitate access to postsecondary programs. Individuals can take continuing education courses, gain numerous certifications, and receive technical degrees such as nursing and medical billing. In recent years the number of bachelor's, Master's, and even PhD programs online have expanded greatly. Continuing education, technical degrees, and higher education opportunities benefit individuals, households, and communities through increased earning potential. Improved access to education is especially important in communities that lack local education options.

### Economic Development

Economic development is very closely tied to educational opportunities.[47] Individuals with some education past high school or a GED typically have higher incomes, those with bachelor's degrees and higher also have higher wages than their counterparts with a high school or equivalent education. In California, average earnings are close to twice as much with a bachelor's degree compared to high school graduates.[48] Ensuring individuals and households have access to broadband can help support educational attainment, and therefore increased income. With an increased income, broadband can bring additional funding outside of the community through remote work, tourism, and business growth. Access to broadband and increased opportunity can maintain local circular economies within a community through increased spending locally, thus supporting local businesses and jobs.

Improved access to broadband can also facilitate economic development by connecting, attracting, and retaining businesses. Small, local establishments increasingly rely on online advertising to reach customers and cloud-based applications to support productivity. When evaluating locations to establish new facilities, many larger employers in industries including logistics and manufacturing require that suitable connectivity is already present. These industries rely on speeds capable of supporting large file transfers and near-continuous updates to internal databases. Broadband is therefore critical to both retaining local businesses and attracting new employers.

### Remote Work

Another aspect of economic development enabled by broadband is the growing availability of remote work opportunities. While some effects of the pandemic were temporary, such as students needing to learn from home, the effects of the pandemic on remote work are more permanent. Many companies have embraced remote work for certain jobs, either fully remote or hybrid, and find the reduced cost of less office space a benefit to their operations. While communities have historically focused on attracting employers as an economic development initiative, often using tax and other incentives, they

[46] Jackie Botts and Ricardo Cano, "The Wires May Be There but the Dollars Aren't: Analysis Shows Why Millions of California Students Lack Broadband," CalMatters, April 18 2021, https://calmatters.org/projects/california-broadband-student-access/.

[47] Center for American Progress, "Better Learning Outcomes Can Help Kick-Start the Economy," August 26, 2020, https://www.americanprogress.org/article/better-learning-outcomes-can-help-kick-start-economy/.

[48] Hans Johnson and Marisol Cuellar Mejia, "Higher Education and Economic Opportunity in California," Public Policy Institute of California, November 2020, https://www.ppic.org/publication/higher-education-and-economic-opportunity-in-california/.

can now also attract remote workers directly, provided the community has sufficient broadband infrastructure to facilitate remote working. By combining the availability of broadband infrastructure capable of facilitating remote working with other aspects of the community, such as recreation and quality of life, communities can attempt to attract remote workers from almost any industry from anywhere in the country. One example of a concerted effort to attract remote workers is Tulsa Remote, where a philanthropic organization, working in concert with the city of Tulsa, offers remote workers a monetary stipend and other incentives to move to the city of Tulsa, and bring their remote job with them.[49]

### ■ Public Safety

Improvements in connectivity for law enforcement, fire departments, emergency medical services, and other public safety services can be realized from the expansion of broadband services. A more comprehensive network allows for faster response times, increased information, and better mapping while responding to incidents. More public safety benefits are discussed in Sections 3 and 7.

Inyo County has experienced seven disastrous fires and/or winter storm events that were large enough to be declared National or State Emergencies since 2015. Two of those events have occurred since December of 2022 and the drafting of this document.[50] Designing broadband networks for resiliency so that people and businesses in disaster-prone areas can connect with vital support and services is critically important.

### ■ Local Governmental Functions

Broadband can help promote civic engagement by providing convenient options for online participation. Broadband can help support increased productivity and efficiency by enhancing organizational coordination via online communication, leading to a reduction in labor costs. Government offices and facilities connected to a common last mile or middle mile network can save money by sharing services such as data disaster recovery locations and software licensing.

Access to robust high-speed connectivity is rapidly changing how governments operate. Broadband is critical to modern IT, GIS, and other technology-based departments of county, municipal, and quasi-governmental organizations. Many different applications such as GIS software, Microsoft Office, Google Workspace, video conferencing, and many others now operate as cloud-based services. The shift from on premise software to cloud-based software can provide cost savings through the reduction of software deployment costs, equipment replacement costs, and increased cybersecurity capabilities.

### ■ Civic Engagement

Community engagement underpins all government functions, from planning to participation in public meetings and budgeting. Before the pandemic, public engagement usually required attending meetings and events in person. However, the pandemic forced rapid changes to community engagement. As local agencies were forced to pivot to online engagement, many local governments experienced an increase in public participation. Community members and other stakeholders were able to attend meetings and contribute to public discourse in larger numbers due to technology and broadband access. Numerous communities and counties now utilize in-person and online applications for public participation, while various companies have developed software and tools for hybrid approaches to civic engagement.

[49] https://tulsaremote.com/

[50] State of California Franchise Tax Board, "List of California Disasters," https://www.ftb.ca.gov/file/business/deductions/disaster-codes.html, accessed August 2023.

### Smart Transportation Applications

Smart transportation operations involve the use of advanced technologies and data analytics to enhance transportation efficiency. This includes integrating sensors, GPS, and AI to collect and analyze data for informed decision making in route planning, traffic management, and vehicle maintenance. Decarbonized mobility is another focus, emphasizing the shift from fossil fuels to low-carbon or zero-emission transportation, including electric and hydrogen vehicles. Strategies include utilizing intelligent transportation systems, offering mobility as a service, implementing digital wayfinding, smart parking solutions, and deploying charging and fueling infrastructure for zero emissions and electric vehicles, as well as microtransit solutions to reduce congestion and expand transportation options. The overall goal is to improve mobility, reduce emissions, and ensure safe and efficient transportation.

### Natural Resource Management

Communities depend on a healthy and vital ecosystem for their economic success and personal well-being. A region's natural resources have a direct impact on the success and sustainability of agriculture, fishing, manufacturing, tourism, transportation, and other industries. A number of federal, state, and local organizations each monitor different parts of the ecosystem, such as a region's water, air, soil, and plant and animal life, and develop strategies and rules that ensure those resources are used responsibly. Some of these organizations also manage response strategies when natural disasters occur, helping communities to react in ways that minimize harm to people and resources. To perform these roles effectively, these organizations depend upon access to information about environmental characteristics, enabling them to adjust their efforts and focus on potential problems as they are developing.

As broadband connectivity has continued to improve, these organizations have been able to develop better monitoring systems that provide more environmental details, increasingly in real time. The number and density of environmental sensors has steadily increased, and the webs of monitoring devices have extended deeper into protected spaces. As the quality of environmental data has improved, governmental organizations have also been able to coordinate more closely, and responses to environmental emergencies can be improved using better, more timely data. These trends are ongoing, and as more remote areas continue to get access to better, more reliable connectivity, protected and undeveloped areas can be monitored more closely. Overall, broadband connectivity has enabled these organizations to improve their planning and response strategies.

Broadband connectivity also allows more people to become involved in these natural resource management efforts. Many farms have begun to adopt environmental monitoring systems, which have enabled them to make more efficient use of water and other resources to improve their output and reduce their demands on natural resources. As other industries begin to adopt similar practices, they will create additional environmental benefits. Section 9 discusses how broadband technologies can be applied to many environmental applications covering water use, forestry monitoring and wildfire response strategies, and other natural resource management issues.

### Utility Operational Efficiency

Traditionally, utility management required monitoring, testing, visual inspection, and significant field work to find damage in utility systems. With the advent of new technology, providers can automate much of the monitoring and testing. Remote monitoring supports the continuous observation of utility operations. Utilities that use fiber optics to monitor operations include water, wastewater, and electric systems. Remote monitoring systems can proactively reduce maintenance and operational costs to utility systems in the following ways:

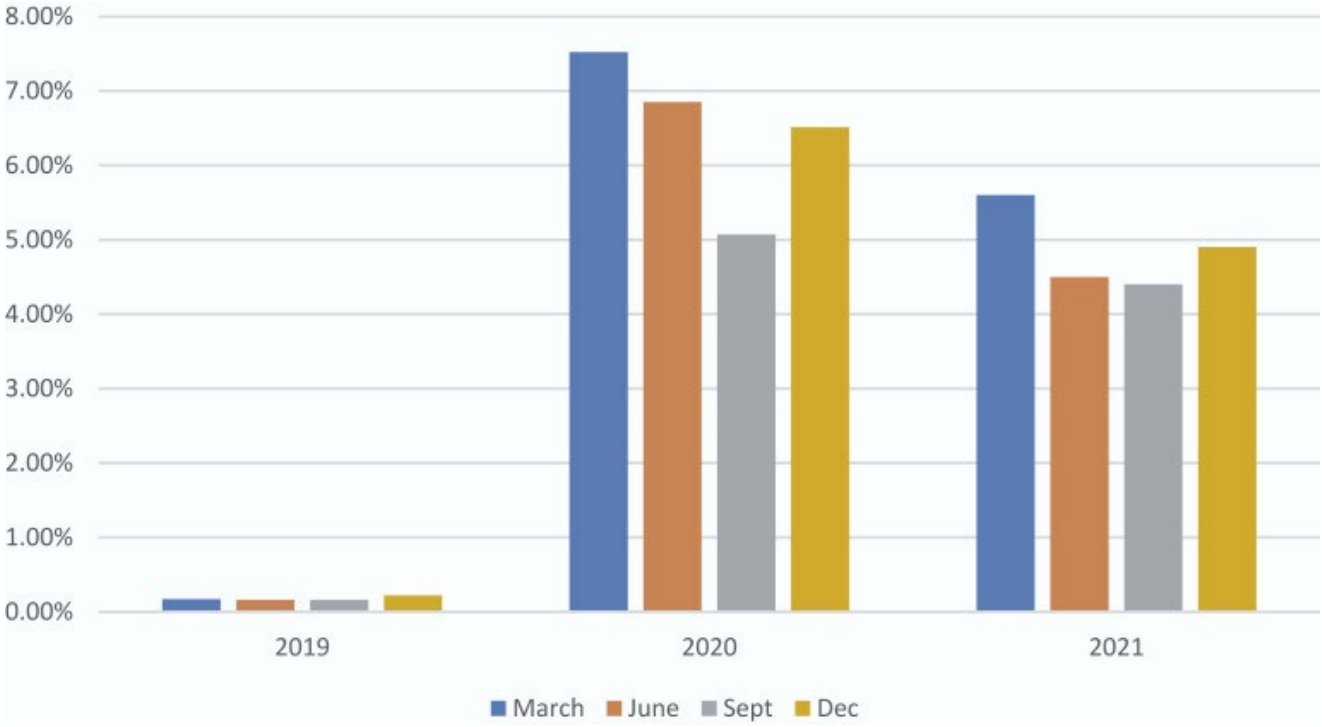
- Sensors can detect temperature and pressure of water and wastewater systems and notify staff of changes and locations to prevent expensive leaks,
- In-stream sensors monitor, in real time, the quality of water and the effluence of wastewater. These systems help maintain quality compliance with state and local laws,

- In electric utility systems, a remote sensing system can provide information about operations, line damage, power surges, and the ability to turn off systems during fire and weather events.

## Healthcare

The U.S. Department of Health and Human Services (HHS) declared an end to the COVID-19 public health emergency in the United States, effective May 11, 2023.[51] While the public health emergency has ended, the long-term effects of the pandemic continue to resonate through society. Telemedicine allows access to healthcare and specialists without the cost and time of trips to the nearest hospital. In the rural areas, telemedicine is even more important with the closure of many rural hospitals in recent years.[52]

**Figure 7: Increase in Telehealth Visits from 2019-2021[53]**




During the COVID-19 pandemic many people were unable to access doctors due to travel restrictions, concern for infection risks in public spaces, and lack of access to specialists. Due to the public health emergency, telehealth became widespread. For example, Medicaid saw a drastic increase in use of telemedicine, 15x the pre-pandemic levels, while Medicare saw a 10x increase.[54] Working-age individuals also benefited from online healthcare access, with a 766 percent increase in telehealth encounters from March 2020 through July 2020.[55] Many individuals were able to access medical care as video and phone visits became eligible for insurance reimbursement as part of the COVID-19 response.

[51] David J. Sencer CDC Museum, "COVID-19 Timeline," , accessed October 2023.

[52] Alexander Marré, "Bringing Broadband to Rural America," *Community Scope*, 8(1), 2020, https://www.richmondfed.org/-/media/RichmondFedOrg/publications/community_development/community_scope/2020/community_scope_2020_no1.pdf.

[53] Ibid.

[54] U.S. Government Accountability Office, "Telehealth in the Pandemic – How Has it Changed Health Care Delivery in Medicaid and Medicare?," September 29, 2022, https://www.gao.gov/blog/telehealth-pandemic-how-has-it-changed-health-care-delivery-medicaid-and-medicare.

[55] Julia Shaver, "The State of Telehealth Before and After the COVID-19 Pandemic," *Prim Care*, 49(4): 517–530, December 2022, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9035352/.

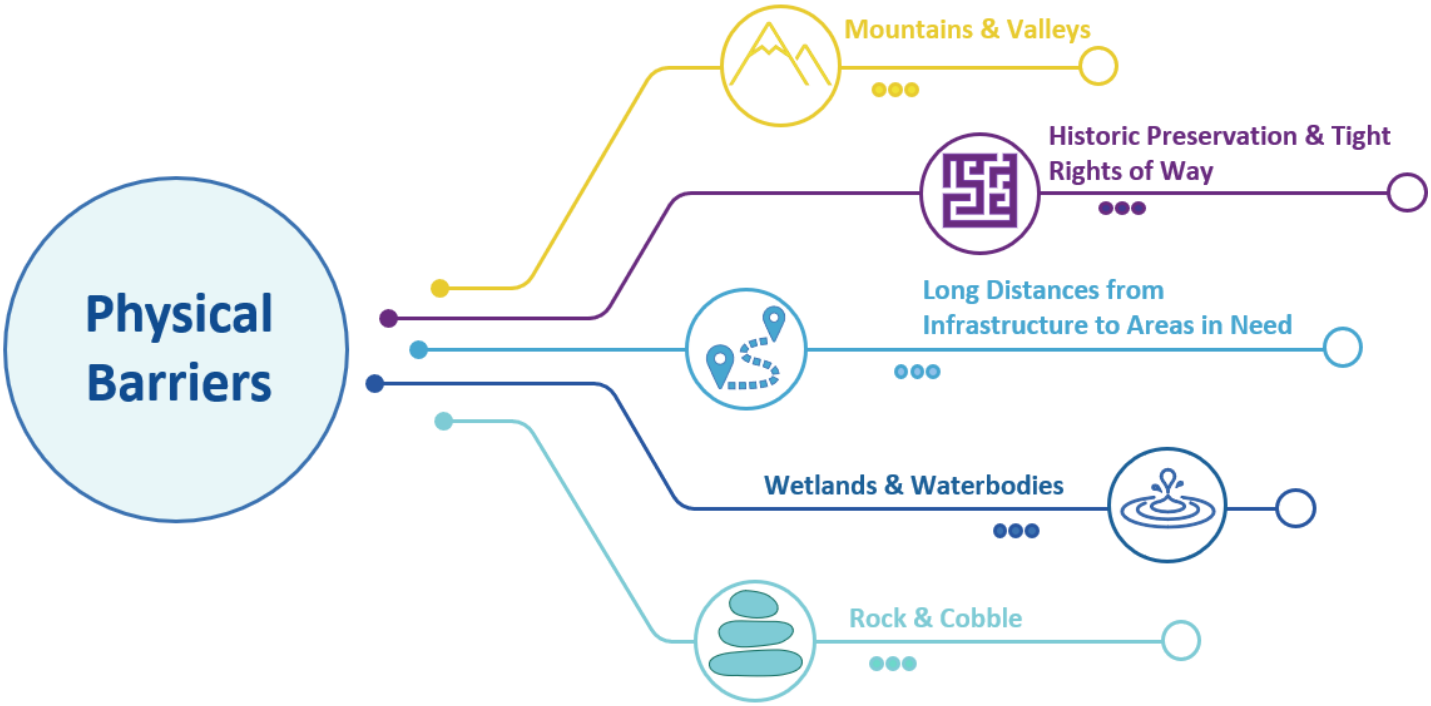
# 2.4 Broadband Barriers and Challenges

Barriers to broadband adoption can range from physical, social, and economic. Physical barriers create high costs to install infrastructure while social and economic barriers create obstacles to affordability and service adoption. Regardless of what the barriers are, they make providing service to rural, lower income, low English literacy users and across physically challenging terrain such as mountains and forests more difficult.

## Physical Barriers

Much of broadband planning requires an assessment of the geographic areas surrounding a planned network deployment. Buried lines are laid through trenching or directional drilling and take substantial equipment to install. Fiber is usually placed 24-48 inches below the surface, but in many areas of California, it is placed deeper to protect the assets from damage from natural disasters, including wildfires. In locations where fiber can be hung from utility poles, this approach can be more cost effective. However, in more rural areas, utility poles may be aged and unable to support the additional weight and loading of fiber optic lines. These older utility poles also may not meet cable height and spacing requirements if more lines are added. In these instances, poles must be replaced, which can be very costly.

**Figure 8: Physical Barriers to Broadband Development**




In areas such as the Central Valley, where the soil is soft and the land is generally flat, it is vastly easier to install buried infrastructure than in areas such as the Sierra Nevada Mountains where the soil horizon is thin, and the land is steep and rocky. Hard rock and steep terrain increase deployment costs significantly, to the point of deterring infrastructure development in some instances. Topography can create challenges for wireless broadband development as well, with valleys and hills limiting the required line-of-sight needed for a suitable signal.

State and federal rules require many infrastructure projects to submit an Environmental Impact Statement. Common environmental and historic preservation considerations affecting network deployment include:

- Wetlands, bodies of water, rivers, streams, and irrigation ditches must be protected to maintain animal habitats and preserve water sources. These features can create challenges when deploying broadband infrastructure through areas with many waterways. Working with state and local agencies to adhere to regulations during the planning phase can help minimize these challenges.
- Historic preservation is important to maintain the character and heritage of a community. However, encountering historic artifacts, buildings, and other items of significance during deployment can delay projects. Broadband planning efforts should engage with the California Office of Historic Preservation (OHP) and the Tribal Historic Preservation Office as needed, to manage any potential issues.[56]

### Social and Economic Barriers

Equally as important to the development of broadband infrastructure are the social and economic barriers preventing service adoption. These barriers can be as challenging to overcome as physical obstacles, and include unaffordable service, unaffordable or inadequate devices, and insufficient digital skills. Despite this, ISPs, local governments, and nonprofit organizations can help communities overcome these challenges by developing deployment and digital equity strategies with the following factors in mind:

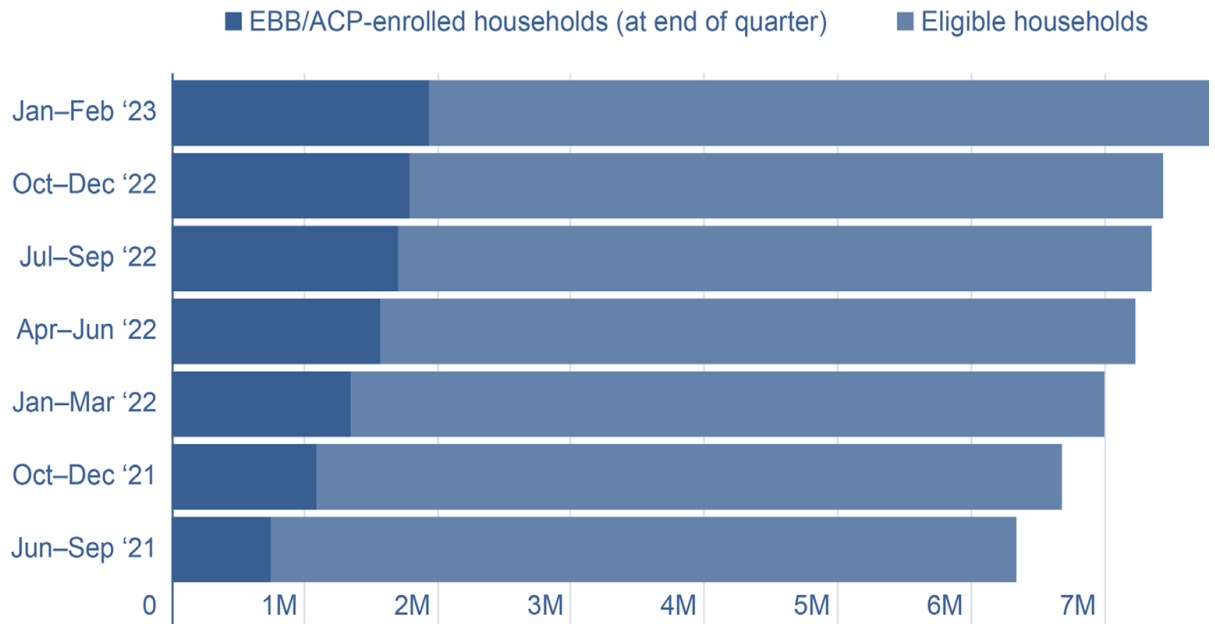
- In rural areas with low population density, private ISPs typically have a difficult time recouping the cost of network deployment. This lack of return on investment, or ROI, can limit private ISPs' desire and ability to invest in such areas. Additionally, if a network is constructed, the ISP may be forced to charge customers higher subscription rates to offset these higher deployment costs. Local funding, state grants, and federal grants can help provide the additional resources needed for private ISPs to enter these low-density markets, which then reduces the need to charge higher prices to recoup the full cost of the deployment. As a result, these deployment subsidies can help to keep service offerings more affordable.[57]
- Communities with a low median income typically subscribe to broadband service at lower frequency than their higher-income counterparts. This can impact an ISP's willingness to invest in an area due to concern about take rate (the number of customers who will subscribe to their services). Even in areas where adequate service is available, it may not be priced at rates affordable to low-income residents.[58] Enrollment in internet subsidy programs can help offset this burden. However, even though enrollment increased in such programs during the acute phase of the COVID-19 pandemic, only one third of eligible households in California receive(d) federally subsidized internet through either the Emergency Broadband Benefit (EBB) program or the Affordable Connectivity Program (ACP).

[56] California Office of Historic Preservation, (website homepage), https://ohp.parks.ca.gov/, accessed September 2023.

[57] CA Broadband for All Action Plan.

[58] Botts and Cano, "The Wires May Be There but the Dollars Aren't: Analysis Shows Why Millions of California Students Lack Broadband."

**Figure 9: California Households Enrolled in ACP[59]**




- Another barrier to utilizing the internet and broadband access is digital literacy.[60] The American Library Association defines digital literacy as "the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills."[61] This ability depends not only on possessing skills, but also having the confidence to go online drawn from one's understanding of how the digital world works. Much of this comes from simply working with digital technologies to develop the knowledge and skills to navigate the vast world online, and people on the other side of the digital divide often lack digital skills from the lack of opportunity to have enjoyed online access for so long. There are many factors that may affect an individual's confidence in their ability to use the internet, including:
    - English language fluency
    - Age
    - Concerns about safety and cybersecurity
    - Prior online access opportunities
    - Access to family and friends with high digital skills

[59] Darriya Starr, Joseph Hayes, and Niu Gao, "California's Digital Divide," Public Policy Institute of California, June 2023, https://www.ppic.org/publication/californias-digital-divide/.

[60] State of California, "State of California - State Digital Equity - Planning Application," (draft submitted to the NTIA), July 19, 2022, https://broadbandforall.cdt.ca.gov/wp-content/uploads/sites/19/2022/07/DRAFT-Project-Narrative-and-Eligibility.pdf.

[61] American Library Association, "Digital Literacy," https://literacy.ala.org/digital-literacy/, accesses October 2023. For a further exploration of the digital literacy concept and related concepts like technological literacy and internet literacy, see Etem Yeşilyurt and Rabia Vezne, "Digital Literacy, Technological Literacy, and Internet Literacy as Predictors of Attitude toward Applying Computer-Supported Education," *Education and Information Technologies*, 28, 9885–9911 (2023).

As with other forms of literacy, digital literacy can be positively impacted through culturally appropriate skills development, training, and support. Through these community-based programs, individuals can have the knowledge to safely utilize broadband resources to fully participate in modern life.

## Technologies, Benefits, and Barriers Conclusion

High-speed broadband access plays a pivotal role in enabling productivity, competitiveness, and innovation. Broadband needs are dynamic, evolving in response to escalating user demands, an ever-growing range of uses, and the impact of events such as the recent pandemic. County stakeholders must be cognizant of this evolving landscape and the opportunities and challenges it presents. The federal government's substantial investments in broadband infrastructure provide a window of opportunity for municipalities to leverage improved technology and higher service speeds. These initiatives require a keen understanding of compliance and eligibility for accessing funding that can support high-speed broadband expansion.

For Inyo County, Senate Bill 156 is a significant opportunity. The allocation of approximately $6 billion towards broadband efforts, coupled with the restructuring of program requirements, opens avenues for groups to participate in the development of a statewide, open access middle mile networks, reducing the cost of last mile connectivity in remote areas. This improved middle mile access will present better opportunities for residents to not only benefit from enhanced connectivity but also for leaders to actively contribute to bridging the digital divide.

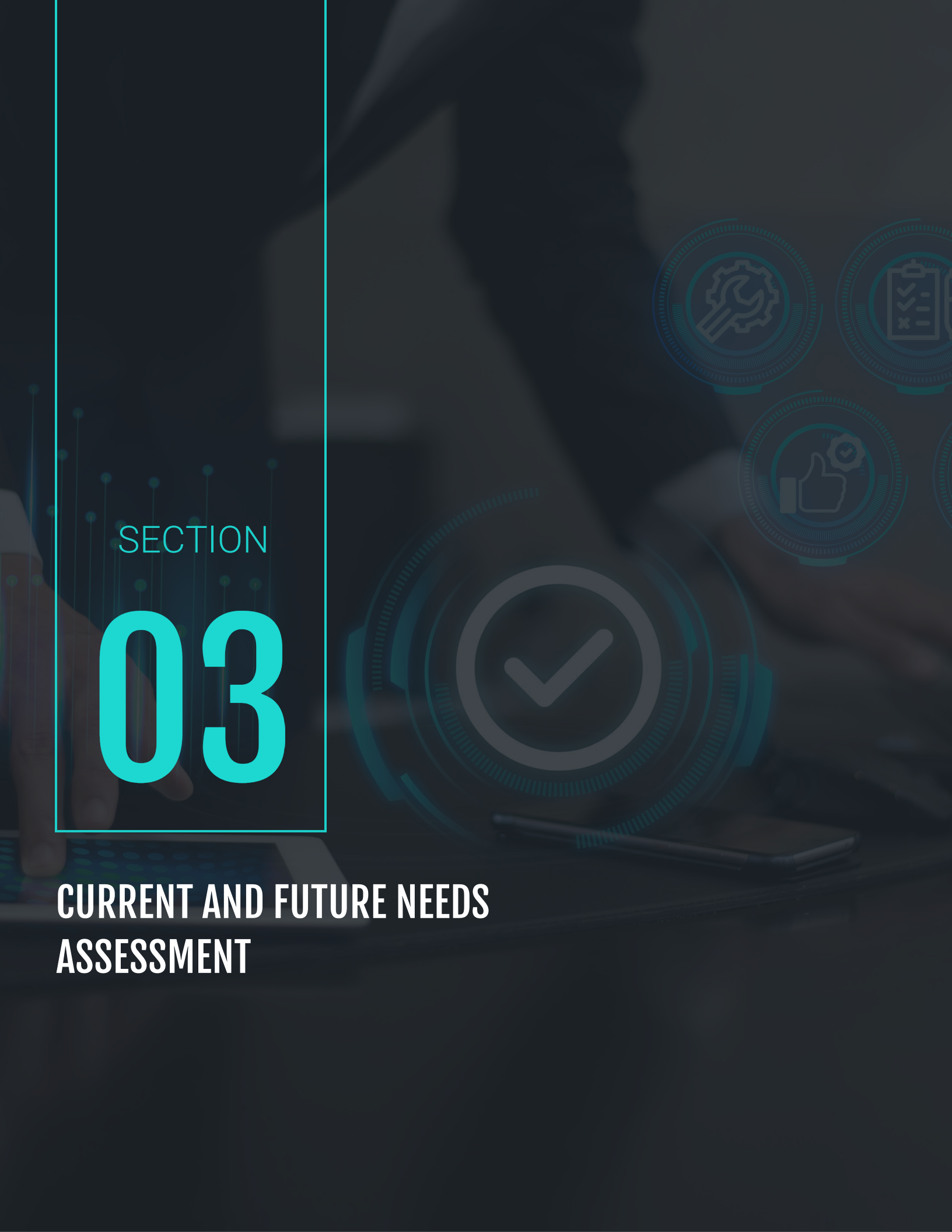
Understanding the diversity of wired and wireless options is vital to optimize connectivity strategies. This section highlighted key aspects of these technologies and the implications they have for business operations and development. Ultimately, the transition to fiber is crucial as the demand for bandwidth increases, driven by the proliferation of smart devices and data-hungry applications.

Broadband benefits span various domains and have never been more critical in a pandemic-changed world. From local governmental functions and public safety enhancements to increased civic engagement, high-speed broadband brings efficiency, coordination, and participation. Broadband is instrumental in smart transportation applications, supporting transit, electric charging, and traffic management. Utilities benefit from operational efficiency through real-time monitoring, cost reduction, and compliance assurance. Broadband provides opportunities for local businesses to connect with customers online and is crucial for attracting and retaining larger employers in industries such as manufacturing and logistics, and crucial for attracting remote workers.

In a residential context, broadband is a lifeline for the community. It enables access to online education resources, which have seen exponential growth since the pandemic. Broadband also fuels economic development by increasing income potential and supporting local circular economies. Healthcare is revolutionized with telemedicine, a necessity in remote areas with fewer healthcare facilities.

Governments must not only embrace the advantages of broadband but also be aware of the barriers and actively engage in initiatives to overcome them. Some of the multi-faceted obstacles include physical barriers posed by terrain and environmental regulations, as well as social and economic barriers that impact service affordability and digital literacy. Low-income and rural areas often face underinvestment from private ISPs, necessitating government and grant support. Communities with low median incomes may struggle to access affordable broadband, and digital literacy remains a key concern. Fortunately, there are opportunities for policies and initiatives to help mitigate these challenges.

The current broadband funding landscape presents a unique strategic opportunity. By seizing it, the county can harness the power of broadband to drive productivity, competitiveness, and long-term growth in an increasingly digital world.

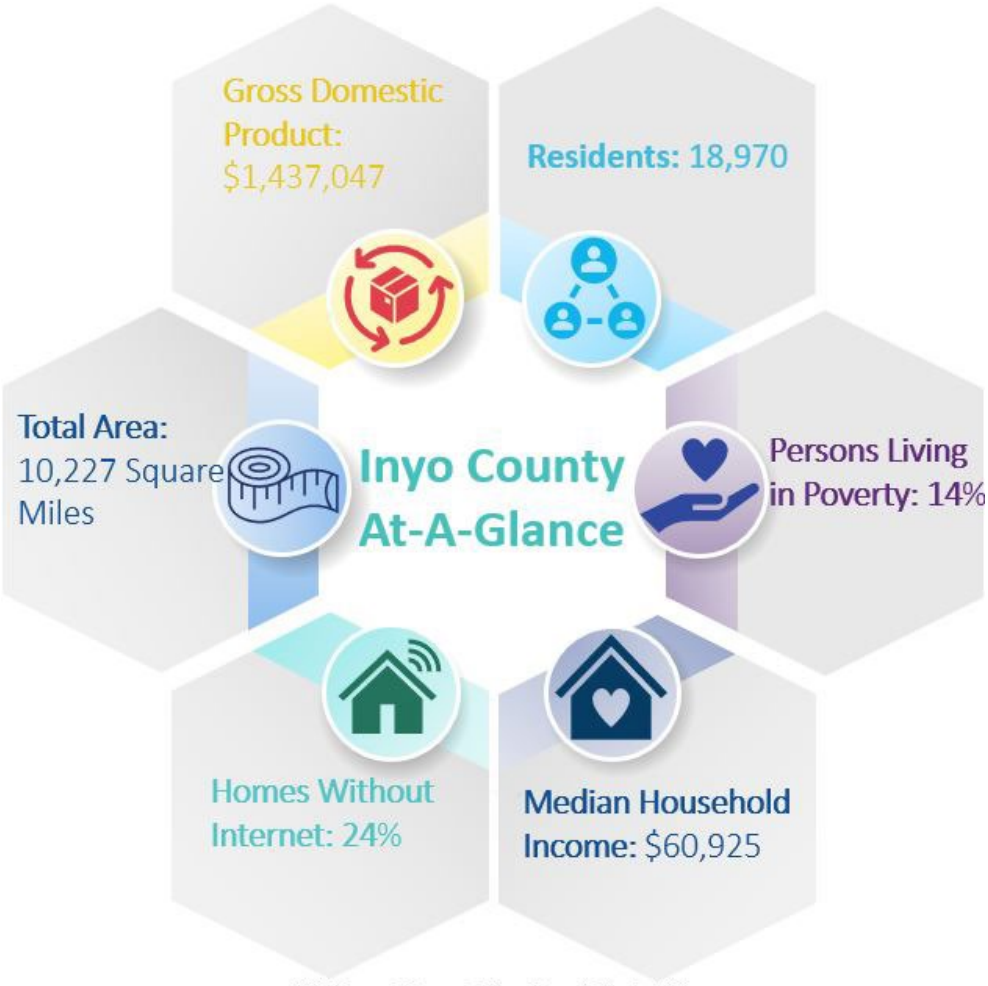


SECTION

# 03

# CURRENT AND FUTURE NEEDS ASSESSMENT

**Figure 10: Inyo County At-A-Glance**[62]




FRED Economic Research. "Gross Domestic Product: All Industries in Inyo County, CA." Federal Reserve Economic Data | FRED | St. Louis Fed. Last modified December 8, 2022. https://fred.stlouisfed.org/series/GDPALL06091.
US Census Bureau. "Census.gov." Census.gov. Last modified October 17, 2023. https://www.census.gov/en.html.

County leadership faces an ongoing challenge of assessing the requirements and impacts of facilitating broadband infrastructure deployment, involving not only technological change but social change as well. This section is intended to identify the need to bridge the digital divide and describe the potential short-term benefits, intermediate outcomes and long-term impacts of doing so. Here we will address the current broadband ecosystem in Inyo County, initiatives planned and currently underway, and provide a summary of required resources and an analysis of gaps and barriers to broadband deployment in the county.

[62] Note that household internet access, as defined broadly by the Census Bureau, includes any dial-up, cellular data-based connectivity, satellite-based service, and all fixed wireline and wireless services. U.S. Census Bureau, 2021 American Community Survey 1-Year Estimates. The number of residents, poverty information, and household income were determined from 2021 ACS data. Ibid. GDP is for the 2021 calendar year. St. Louis Federal Reserve, "Gross Domestic Product: All Industries in Inyo County, CA –2017 to 2022," https://fred.stlouisfed.org/series/GDPALL06027.

Bringing broadband to rural counties is challenged by incomplete or inaccurate broadband availability mapping and the reluctance of ISPs to provide accurate information on service availability, cost, and service speeds.

Until the COVID-19 pandemic highlighted connectivity and affordability challenges for millions of Americans, broadband expansion was expected to be solved by a patchwork of programs and providers. The pandemic exposed what rural communities already knew—the digital divide is a reality for many and will only get more pronounced without local intervention.

# 3.1 Broadband Needs Assessment

## 3.1.1 Economic Development and the Role of Broadband

Broadband can be a powerful tool for meeting the economic goals of the county. Densely populated areas have significantly higher rates of broadband availability than rural areas. Closing this gap in connectivity offers future economic growth opportunities for the county's unincorporated areas.

The business of farming and ranching benefits from broadband by the development of new markets, ability to communicate with customers, precision agriculture (technology that improves crop yields and increases production, reduces labor time, manages water, fertilizer, and pest management), etc. which aid improvements in efficiency and profitability. Additionally, internet access supports agriculture workers by improving access to education, healthcare, and other quality-of-life services. For smart technology recommendations specific to the County, refer to Section 3.3: Overview of Smart Communities, and Section 9: What is a Smart Community?

**Figure 11: Inyo County Priorities**

> **"To expand the use of information technology in order to improve personal convenience, reduce dependency on nonrenewable resources, take advantage of the ecological and financial efficiencies of new technologies, maintain the County's economic competitiveness, and develop a better-informed citizenry."**
>
> ***– Inyo County General Plan, Communication Infrastructure Goal PSU-7***

As the county looks forward to not only recovery but also COVID-19 post-pandemic impacts, the need to support a robust information core to maximize social and economic resiliency has never been more important.

Robust broadband is a critical element to economic sustainability. In their article, Broadband Adoption and Availability: Impacts on Rural Employment During COVID-19, authors Catherine Isley and Sarah A. Low note "[ ] a causal relationships with the employment rate in low-population rural counties. Specifically, a one percentage point increase in the rate of broadband availability would have led to a 0.37 percentage point increase in the employment rate. A one percentage point increase in the

rate of wired broadband adoption would have led to a 0.87 percentage point increase in the employment rate."[63] In simple terms, increasing broadband access is projected to produce favorable increases in the employment rate.

Employers looking for locations to establish businesses often require areas with robust broadband. Even more so for employers embracing remote work policies, even if they require employees to be in the office only part of the time. In this case, employers find it imperative that their community have broadband infrastructure for their employees not only at their office, but at their homes as well. Rural areas with robust broadband infrastructure available at most homes, the essential tool necessary to participate in the digital workplace, can be very attractive for fully remote workers who can live wherever they choose. The ability of residents to live and work in the communities of their choice and spend their paychecks in the communities of their choice, provides economic benefits to small communities and businesses and reduces the effects of over-population on the environment in urban and suburban areas. On an individual basis, remote work can improve the well-being of individuals by connecting them to the communities of their choice.

### 3.1.2 Unserved and Underserved

For practical purposes, unserved locations are those lacking access to internet access of 25/3 Mbps from any service provider other than satellite, unlicensed fixed wireless or mobile wireless. Underserved locations are those that do have access to 25/3 Mbps service but lack access to 100/20 Mbps from any service provider other than satellite, unlicensed fixed wireless or mobile wireless.

Due to many factors including population density, unincorporated areas and areas of low density per mile of the county often have the greatest number of un- and underserved households. In addition to population density, there are other factors impacting deployment to rural areas, including median incomes.

**Table 8: Population Statistics for Inyo County**

| Area | Population (2022 Estimated) | Population Density per Square Mile (2020) | Land Area in Square Miles |
|---|---|---|---|
| Inyo County as a whole | 18,718 | 1.9 | 10,197.26 |
| **Incorporated Cities** | | | |
| Bishop | 3,822 | 2,001.0 | 1.91 |

The differences between incorporated and unincorporated areas and the density of population are further defined by the availability and/or absence of wireline service and provider competition as detailed in Section 4.

Section 4 describes that wireline service is sufficient in incorporated areas of the county. Whereas the rural areas, characterized by lower population density, are often served by only fixed wireless technology offered by one provider.

Fixed wireless service is distinct from wireline by its line-of-sight requirements and its sensitivity to adverse weather conditions. The total available bandwidth of fixed wireless is also limited by the spectrum range it uses, so more users during peak times divide the bandwidth available to each user. Researchers testing the reliability of fixed wireless systems have

[63] Catherine Isley and Sarah A. Low, "Broadband Adoption and Availability: Impacts on Rural Employment during COVID-19," *Telecommunications Policy*, 46(7) (2022): 102310, https://doi.org/10.1016/j.telpol.2022.102310.

found them to often lag behind cable and fiber systems, with more variations in what speeds are available at any given time.[64] This research team also explained that "[] anecdotally, fixed wireless does appear to face more frequent downtime or dropouts than fiber or cable wireline broadband products."[65] For these reasons, fixed wireless may not be as reliable as fiber or cable, but its flexibility and lower cost of deployment, particularly in rural areas, may nevertheless justify the performance tradeoffs.[66]

For many functions in a digital world, a reliable connection is critical. Business, education, healthcare, and government services rely on stable network connections.

An evaluation of un- and underserved connections in the county (census block level) demonstrates the difficulty in making deployment decisions. For additional information and funding strategies, see Section 6.

### ■ Who are the Unserved and Underserved?

Access to service by the current definitions of broadband is the prevailing factor in assessing who is un- and underserved in a county, especially in relation to planning for funding opportunities. However, this study will be using the FCC's 'broadband serviceable location' fabric as the basis for determining if a residence is eligible for service, as this is the standard for most major funding opportunities going forward. More information on the uses, limitations, and eventual challenge process considerations for this data can be seen in Sections 4-7.

In rural-agricultural defined counties, the demographics of the area also present a picture of those who do not have access to internet connectivity. The return on investment for deploying service to widely dispersed households and communities with low population densities is generally longer than 5–10-year average Return on Investment (ROI). Combined with a lower than average income base and the ability of an ISP to recoup investment in these areas may be negatively impacted.

The costs of both service and devices are well known barriers to adoption and play a critical role in determining what and who can afford broadband service. They also play a role in the decision-making of private entities as they plan deployment projects in rural areas.

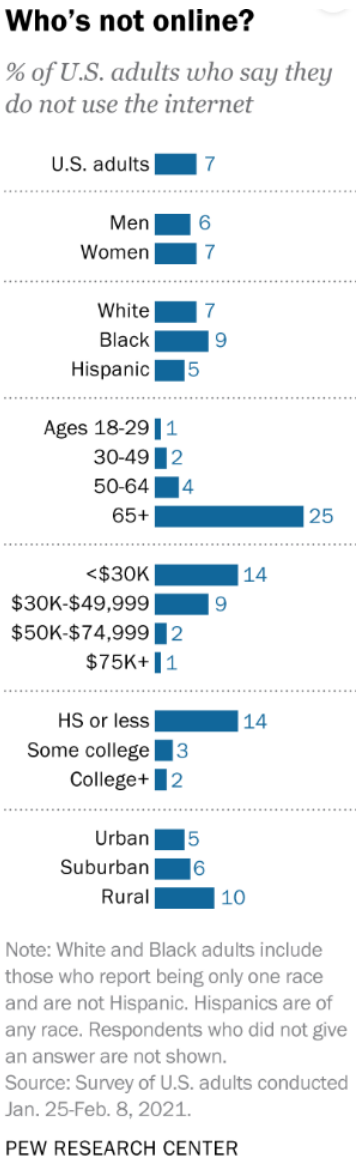
A 2021 survey conducted by the Pew Research Center reported the following:

[64] Linda Hardesty, "Fixed Wireless Service Quality Lags Wired Broadband Says Evercore," *Fierce Wireless*, February 15, 2022, https://www.fiercewireless.com/wireless/fixed-wireless-service-quality-lags-wired-broadband-says-evercore.

[65] Ibid.

[66] See Ibid.

**Figure 12: Who's Not Online?** [67]




Respondents earning less than $30,000 a year, those with only a high school education, those living in rural areas, and those over the age of 65 reported to use the internet at lower rates than their higher-income, more educated, younger urban and suburban counterparts.

### 3.1.3 Broadband Speed and Bandwidth

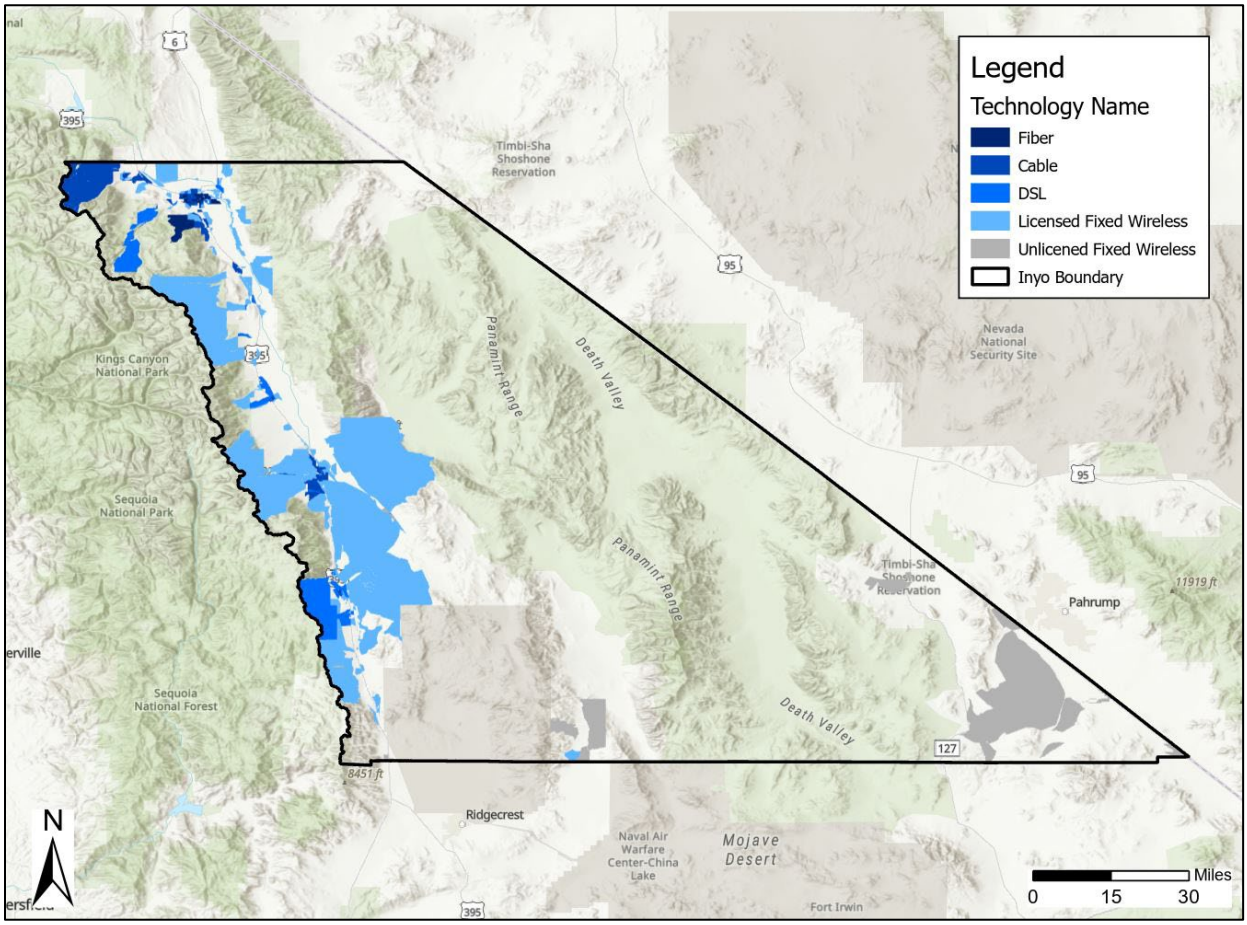
In its rules for the American Rescue Plan Act's broadband funding programs, the U.S. Treasury Department identifies that a family of five who telecommute and use remote education simultaneously require at least 100 Mbps of download capacity

[67] Andrew Perrin and Sara Atske, "7% Of Americans Don't Use the Internet. Who Are They?," Pew Research Center, April 2, 2021, https://www.pewresearch.org/short-reads/2021/04/02/7-of-americans-dont-use-the-internet-who-are-they/.

to meet their needs.[68] The FCC also acknowledges that a single student or telecommuter can easily overwhelm a broadband connection capable of only 25/3 Mbps.[69] The current definition of broadband's minimum speed requirements described in Section 2 does not adequately consider today's requirement for full digital participation. The proliferation of connected devices, i.e., printers, cellphones, security, laptops, tablets, etc. makes lower-tier services almost unusable. To close the digital divide, broadband plans should be developed to provide ample bandwidth growth so that rural areas will not continue to lag behind urban areas.

The below examination of technology in the county portrays a distinct lack of high-speed options, detailing how existing services may not meet current needs.

**Figure 13: Inyo County Current Internet Service by Fastest Technology Type**




The latest data identifies the un- and underserved households at the census block-level. Note: Broadband Service locations will alter the number likely representing a different view of un- and underserved households:

[68] Department of the Treasury, "Coronavirus State and Local Fiscal Recovery Funds," Interim Final Rule, 31 CFR Part 35, p. 72.

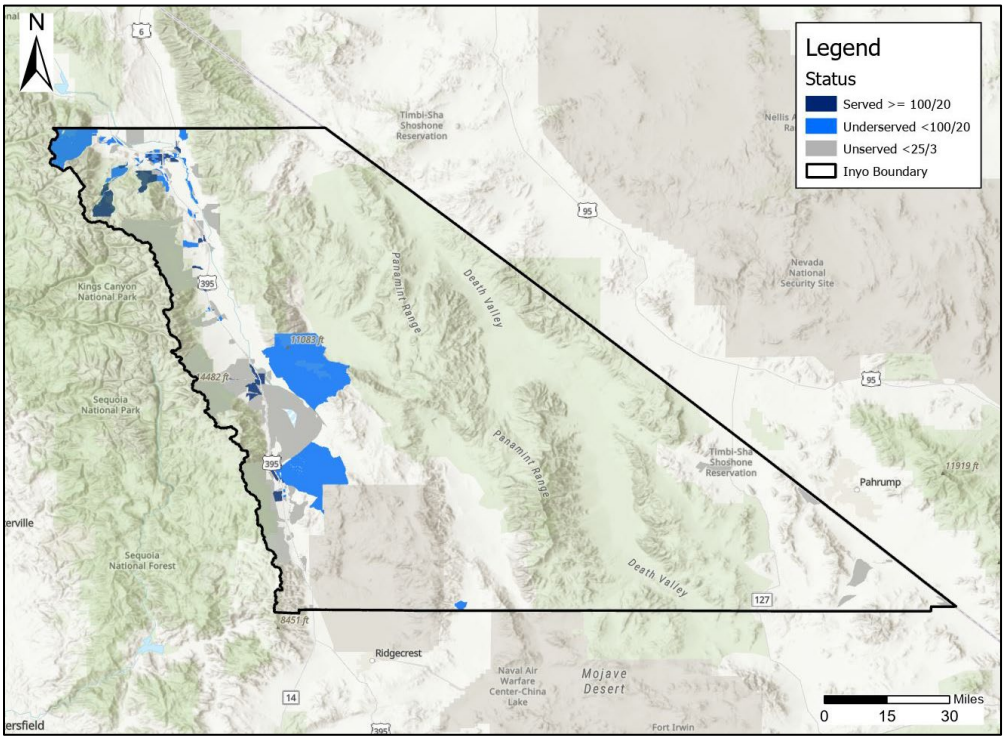
[69] The FCC has identified that a single student or telecommuter can need up to 25 Mbps alone, with combined use requiring "Advanced Service" with downloads above 25 Mbps. FCC, "Broadband Speed Guide," https://www.fcc.gov/consumers/guides/broadband-speed-guide, accessed September 2023; FCC, "Household Broadband Guide," https://www.fcc.gov/sites/default/files/household_broadband_guide.pdf, accessed September 2023.

**Table 9: Households Lacking Broadband Service across Inyo County[70]**

| Broadband-Serviceable Households | Amount | Percent | Notes |
|---|---|---|---|
| **Total number of Households (HHs)** | 9,468 | 100% | Defined by FCC address fabric |
| | | | |
| **HHs lacking 25/3 Mbps wireline service** | 3,504 | 37.0% | May still receive fixed wireless service |
| **HHs lacking any 25/3 Mbps service** | 3,035 | 32.1% | BEAD-defined "unserved"** |
| **HHs with 25/3 but not 100/20 Mbps service** | 4,579 | 48.4% | BEAD-defined "underserved"** |

*Note that the FCC reports comprehensive, technology-based availability information on the "household" level, rather than by count of locations. This distinction is discussed more in Section 4. **When evaluating the internet service levels available at a broadband-serviceable location (BSL), the BEAD program does not consider satellite, unlicensed fixed wireless, or mobile services. The BEAD program defines an "unserved" location as any BSL that cannot receive reliable internet services providing speeds of at least 25/3 Mbps, and an "underserved" location as any BSL that cannot receive reliable internet services providing speeds of at least 100/20 Mbps but can receive reliable internet services providing speeds of 25/3 Mbps.

**Figure 14: Inyo County Service Status**




Note: Broadband Service locations will alter the number likely representing a different view of un- and underserved households.

[70] This data is available on the FCC's National Broadband Map platform, under the option to download the "Broadband Summary by Geography Type." FCC, "Data Download," National Broadband Map, https://broadbandmap.fcc.gov/data-download/nationwide-data?version=jun2023, accessed November 2023. CostQuest also provides more detailed information about the distribution of residential and non-residential units by county. CostQuest, "About the Units in the Broadband Serviceable Location Fabric Data," September 19, 2022, https://www.costquest.com/resources/articles/about-the-units-in-broadband-serviceable-location-fabric-data/.

### 3.1.4 Affordability and Adoption

The development of broadband infrastructure to households across Inyo County is the first step in creating access to broadband, but affordability should be a parallel step and affordability requirements are often part of broadband infrastructure grant programs. Both the state and the federal government address affordability, understanding it is a critical step to broadband adoption.

The state's 2020 Broadband for All Plan identifies affordability as the second challenge to achieving broadband for all. In 2019, prior to the pandemic and the growth of federal and state funding, the California Emerging Technology Fund Survey found that over half of the Californians without a home broadband connection either cannot afford it or do not have a computer.[71]

The federal government has long sought to make broadband affordable. However, many programs prior to the pandemic were challenging to use and therefore underutilized. As a result of the pandemic, federal funding was allocated to create the first wide-ranging broadband affordability program.

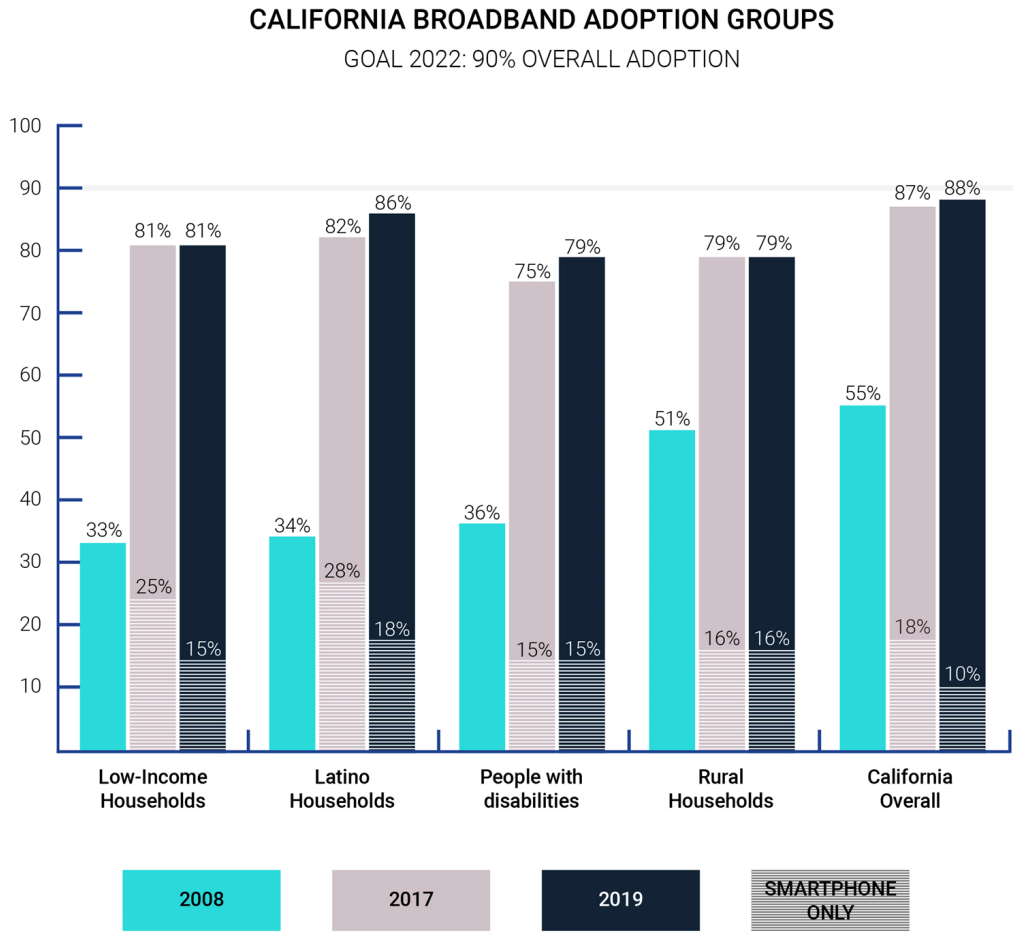
- December 2020, the federal government recognized affordability as a barrier and created the Emergency Broadband Benefit (EBB) fund to help households pay for connectivity by providing $3.2 billion in funding.[72]
- November 2021, the EBB was replaced with a longer-term program with more available funding, the Affordable Connectivity Program (ACP). The ACP was allocated $14.2 billion from the IIJA.
- October 2023, the White House requested an additional $6 billion to support the ACP program, which will run out of money in 2024 if new funds are not allocated to the program.[73]

[71] CA BEAD Five-Year Plan.

[72] Federal Communications Commission, "Emergency Broadband Benefit Program," https://www.fcc.gov/emergency-broadband-benefit-program, accessed August 2023.

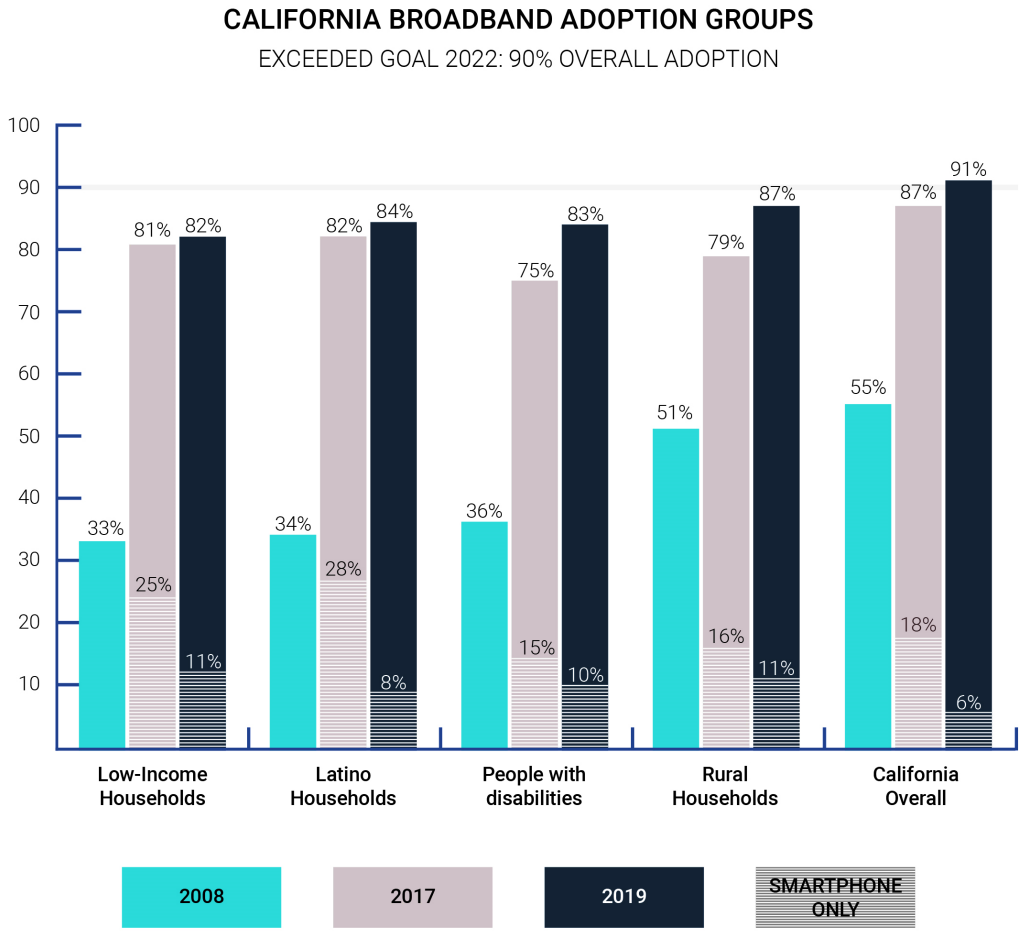
[73] Joan Engebretson, "Biden Asks Congress to Fund ACP Low-Income Broadband Through 2024," Telecompetitor, October 25, 2023, https://www.telecompetitor.com/biden-asks-congress-to-fund-acp-low-income-broadband-through-2024/.

**Figure 15: 2019 California Adoption Rates**[74]




[74] California Emerging Technology Fund, *Statewide Survey on Broadband Adoption*, 2019, accessed July 2023, https://www.cetfund.org/action-and-results/statewide-surveys/2019-statewide-surveys/

**Figure 16: 2021 California Adoption Rates**[75]



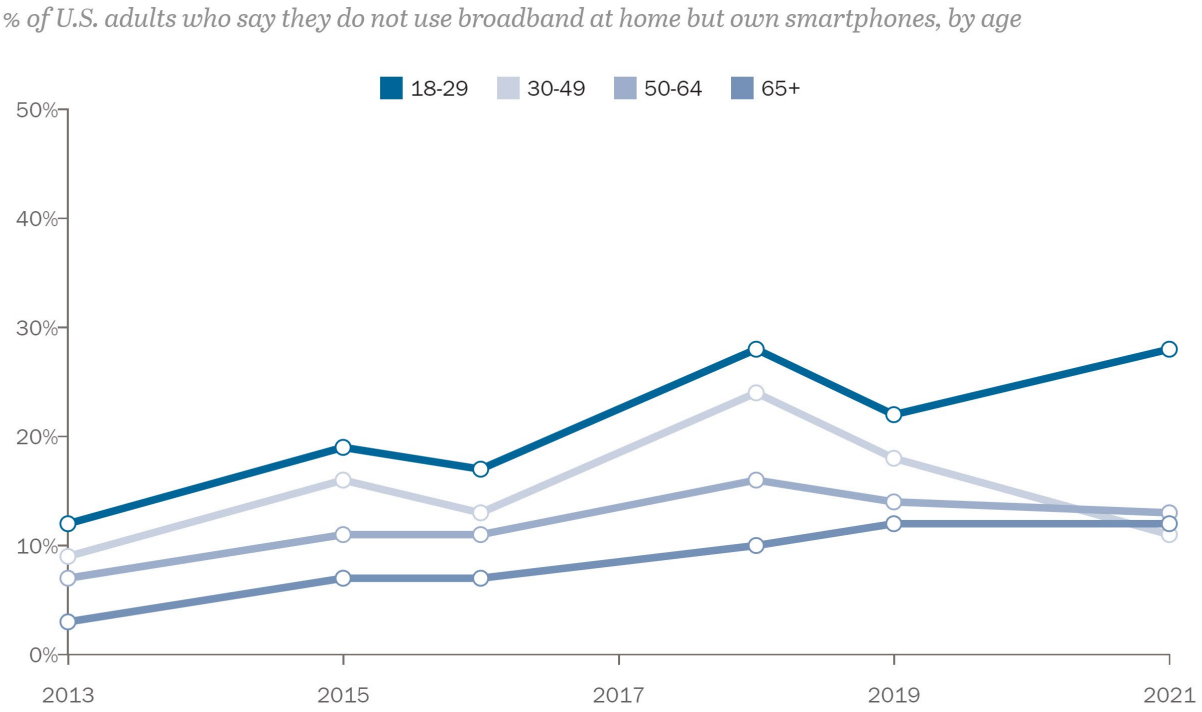

The State Broadband for All plan uses 2019 data. California Emerging Technology Fund released a survey in 2021, which incorporates the EBB and ACP subsidies for a significant number of households across the state and Inyo County. Through making broadband more affordable, along with investment in broadband infrastructure, more people are able to adopt broadband. After the EBB and ACP subsidies were put in place, there was a noticeable increase in broadband adoption for all recorded demographics, except for people identifying as Latinos. Through making broadband more affordable, along with investment in broadband infrastructure, more people were motivated and able to adopt broadband.

The two graphics above displaying California Broadband Adoption Groups from 2019 and 2021 demonstrate marginal 1-2 percent growth in adoption for low-income households while smartphone-only use has declined. Pew Research shows that a "substantial majority of Americans are cellphone owners across a wide range of demographic groups. By contrast, smartphone ownership exhibits greater variation based on age, household income and educational attainment.[76]

[75] California Emerging Technology Fund, "Statewide Survey on Broadband Adoption, 2021," https://www.cetfund.org/action-and-results/statewide-surveys/, accessed July 2023.

[76] Pew Research Center, "Mobile Fact Sheet," April 7, 2021, https://www.pewresearch.org/internet/fact-sheet/mobile/?tabId=tab-011fca0d-9756-4f48-b352-d58f343696bf.

**Figure 17: Smartphone dependency by age[77]**




As discussed in the subsection 'Who are the Unserved and Underserved," lower-income households are often the ones with no or limited access to the internet. They are also the most likely to subscribe to budget-friendly services that may not adequately meet household needs.

While significant federal funding initiatives have been developed to address barriers to universal broadband as discussed below, careful attention needs to be paid to developing pre-funding requirements and post-award compliance monitoring to ensure that the public's investment is serving the intended need for the long-term.

[77] Pew Research Center, "Mobile Fact Sheet," April 7, 2021, https://www.pewresearch.org/internet/fact-sheet/mobile/.

**Table 10: Major Policy Initiatives to Address Barriers to Universal Broadband Access**

| Availability | Amount |
|---|---|
| ➢ **NTIA Broadband Equity, Access, and Deployment Program** | $42 billion |
| ➢ **FCC Rural Digital Opportunity Fund** | $20 billion |
| ➢ **California Senate Bill 156** | $6 billion |
| ➢ **NTIA Tribal Broadband Connectivity Program** | $2 billion |
| ➢ **USDA ReConnect Program and Rural Development Broadband Program** | $2 billion |
| **Affordability** | |
| ➢ **FCC's Affordable Connectivity Program** | $14 billion |
| ➢ **NTIA Digital Equity Programs** | $2.75 billion |
| **Adoption** | |
| ➢ **CPUC Broadband Adoption Programs (multiple)*** | not established |
| ➢ **NTIA Digital Equity Programs** | $2.75 billion |

Notes: NTIA = National Telecommunications and Information Administration. USDA = US Department of Agriculture. FCC = Federal Communications Commission. CPUC = California Public Utilities Commission. * California program/initiatives only. Federal amounts are for the US as a whole.

The lure of a fast broadband connection and new internet-enabled devices are likely to be squashed by the cost of essentials such as housing. California ranked as the state with the highest median monthly housing expense, totaling $2,111. Not only did California rank highest for this metric, but California is also among the states with the most expensive square footage; the $2,111 median monthly housing expense will pay for less space when compared to other states.[78] The cost of housing has a demonstratable relationship with broadband adoption rates. To address the cost of internet service, the IIJA included $14.2 billion in funding for the Affordable Connectivity Program (ACP), a broadband affordability program to be administered by the FCC. The ACP began accepting applications on December 31, 2021.

The ACP program provides up to $30 a month toward the cost of internet service for eligible households and $75 for qualifying households in some high-cost areas and tribal households. Eligible households can also receive $100 to purchase an internet-enabled device such as a laptop, desktop, or tablet (with a minimum household contribution of $10). Both benefits are limited to one service and one device discount per household.

Eligibility is based on income or participation in another government assistance program.[79]

### ■ Income

Federal broadband subsidy programs frequently define low-income households as having income at or below 200% of the Federal Poverty Guidelines:

[78] Robin Rothstein, "Examining The Cost Of Living By State In 2023," *Forbes Advisor*, August 24, 2023, https://www.forbes.com/advisor/mortgages/cost-of-living-by-state/.

[79] More information about the ACP and other subsidy programs is found below in Section 8.

**Table 11: FCC ACP Federal Poverty Guidelines**

| 2023 POVERTY GUIDELINES FOR THE 48 CONTIGUOUS STATES AND THE DISTRICT OF COLUMBIA | |
|---|---|
| **Persons in family/household** | **Poverty guideline** |
| 1 | $14,580 |
| 2 | $19,720 |
| 3 | $24,860 |
| 4 | $30,000 |
| 5 | $35,140 |
| 6 | $40,280 |
| 7 | $45,420 |
| 8 | $50,560 |

*For families/households with more than 8 persons add $5,140 for each additional person.*

- **Government Assistance Programs:**

Households may also qualify for ACP based on at least one household member's participation in one or more of the following government assistance programs:

- Received a Federal Pell Grant during the current award year
- Meets the eligibility criteria for a participating provider's existing low-income internet program
- Participates in one of these assistance programs:
    - Free and Reduced-Price School Lunch Program or School Breakfast Program, including at U.S. Department of Agriculture (USDA) Community Eligibility Provision schools.
    - SNAP
    - Medicaid
    - Federal Housing Assistance, including:
        - Housing Choice Voucher (HCV) Program (Section 8 Vouchers)
        - Project-Based Rental Assistance (PBRA)/Section 202/ Section 811
        - Public Housing
        - Affordable Housing Programs for American Indians, Alaska Natives or Native Hawaiians
    - Supplemental Security Income (SSI)
    - WIC
    - Veterans Pension or Survivor Benefits

- or Lifeline[80]

- Participates in one of these assistance programs and lives on Qualifying Tribal lands::
  - Bureau of Indian Affairs General Assistance
  - Tribal TANF
  - Food Distribution Program on Indian Reservations
  - Head Start (income based)[81]

In Inyo County, 42% of households qualify for the ACP program; however only 17% of eligible household are currently enrolled.[82]

**Table 12: Inyo County ACP Participation**

| Name of county | Total households | Eligible households | Eligible households' percentage | Enrolled households | Enrolled households' percentage |
|---|---|---|---|---|---|
| **Inyo** | 7,253 | 3,052 | 42% | 534 | 17% |

It is important to note that ACP will terminate when the $14.2 billion in funding is exhausted. In October 2023 the White House requested an additional $6 billion to fund the ACP program through 2024 but the funding request has not yet been considered by congress. Both California's Last Mile Federal Funding Account (FFA) and the BEAD Act both require that ISPs participate in the ACP. Analysts predict ACP will run out of money sometime in 2024.[83]

Depletion of ACP funding will further exacerbate the issue of access and device affordability for low-income and other participating households. To narrow the gap, funders and funded projects should consider alternate methods for ensuring affordability.

# 3.2 Stakeholder Asset Inventory

## 3.2.1 Community Anchor Institutions (CAIs)

Community Anchor Institutions (CAIs) play a critical role in maintaining community. CAIs provide quality-of-life services such as healthcare and education, serve as resiliency centers during emergencies and natural disasters, drive growth in

[80] Federal Communications Commission, "Helping Households Connect," https://www.fcc.gov/acp, accessed August 29, 2023

[81] Federal Communications Commission, "Helping Households Connect," https://www.fcc.gov/acp, accessed August 29, 2023

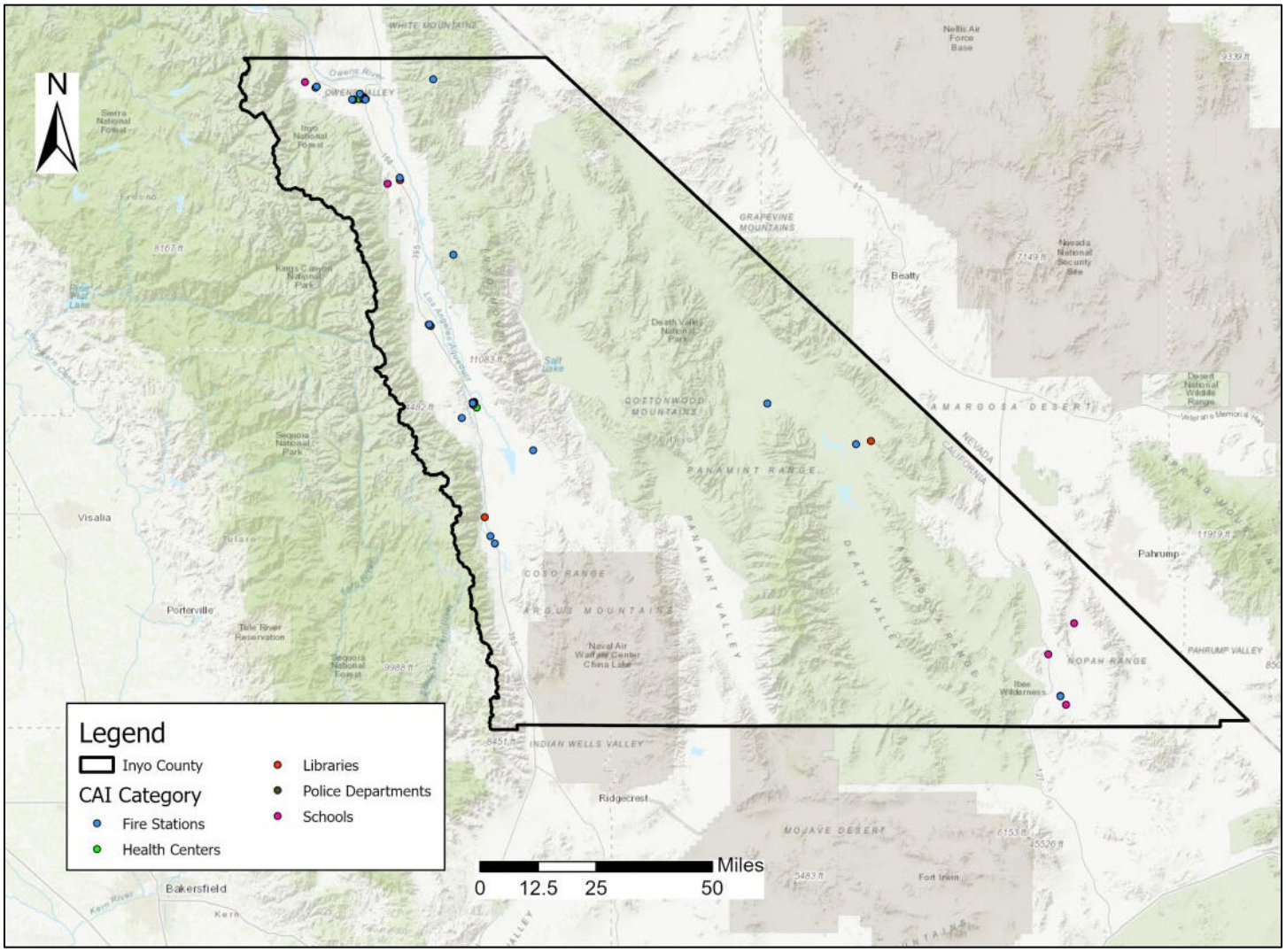
[82] California All| Broadband for All, "Affordable Connectivity Program Enrollment Tracker," https://broadbandforall.cdt.ca.gov/affordable-connectivity-program/acp-enrollment/#, accessed August 28, 2023

[83] See, e.g., Kathryn de Wit, "Closing the Digital Divide With the Affordable Connectivity Program," Pew Research Center, June 1, 2023, https://www.pewtrusts.org/en/research-and-analysis/articles/2023/06/01/closing-the-digital-divide-with-the-affordable-connectivity-program; Nicole Ferraro, "Bipartisan Group of Congress Members Calls for ACP Funding," *Light Reading*, August 18, 2023, https://www.lightreading.com/digital-divide/bipartisan-group-of-congress-members-calls-for-acp-funding; Ry Marcattilio-McCracken, "A New Tool to Track Federal Funding for Affordable Broadband," Institute for Local Self-Reliance, August 31, 2022, https://ilsr.org/new-resource-tracking-the-affordable-connectivity-program/. The latter link provides an enrollment tracker that enables users to analyze when the funding will run out under a range of different assumptions.

economically depressed areas, and offer safe gathering places to foster a sense of connection to neighborhood. CAIs must have reliable, high-speed access to broadband internet to provide maximum benefit to the community.

An analysis of CAIs demonstrates that a majority of those locations are clustered in the urban, heavily populated areas of Inyo County.

**Figure 18: Inyo County Community Anchor Institution (CAI) Locations**




## 3.2.2 Community Anchor and Business Needs Survey Results

The needs of businesses and CAIs for economic development and sustainability cannot be overstated. This section provides detailed information from the survey activities pertaining to these entities conducted by Tilson. Separately, Tilson conducted an Internet Service Provider (ISP) outreach survey that can be seen in Section 4. The findings suggest that access to high-speed broadband to support business growth and critical county functions, as well as innovation in rural and farming communities, is crucial to positive economic outcomes.

These surveys were disseminated using the ESRI Survey123 platform. More specifically, these were sent to CAIs, business owners, and ISPs who serve the counties included in this study. A separate outreach survey was provided to Rural County Representatives of California (RCRC) "Point-of-contacts" at the beginning of this program, which was not collected through this platform.

The following section will detail general insights learned from these surveys. Further analysis of the business survey results are included in Appendix A.

**Community Anchor Institution Survey Findings – Summary**

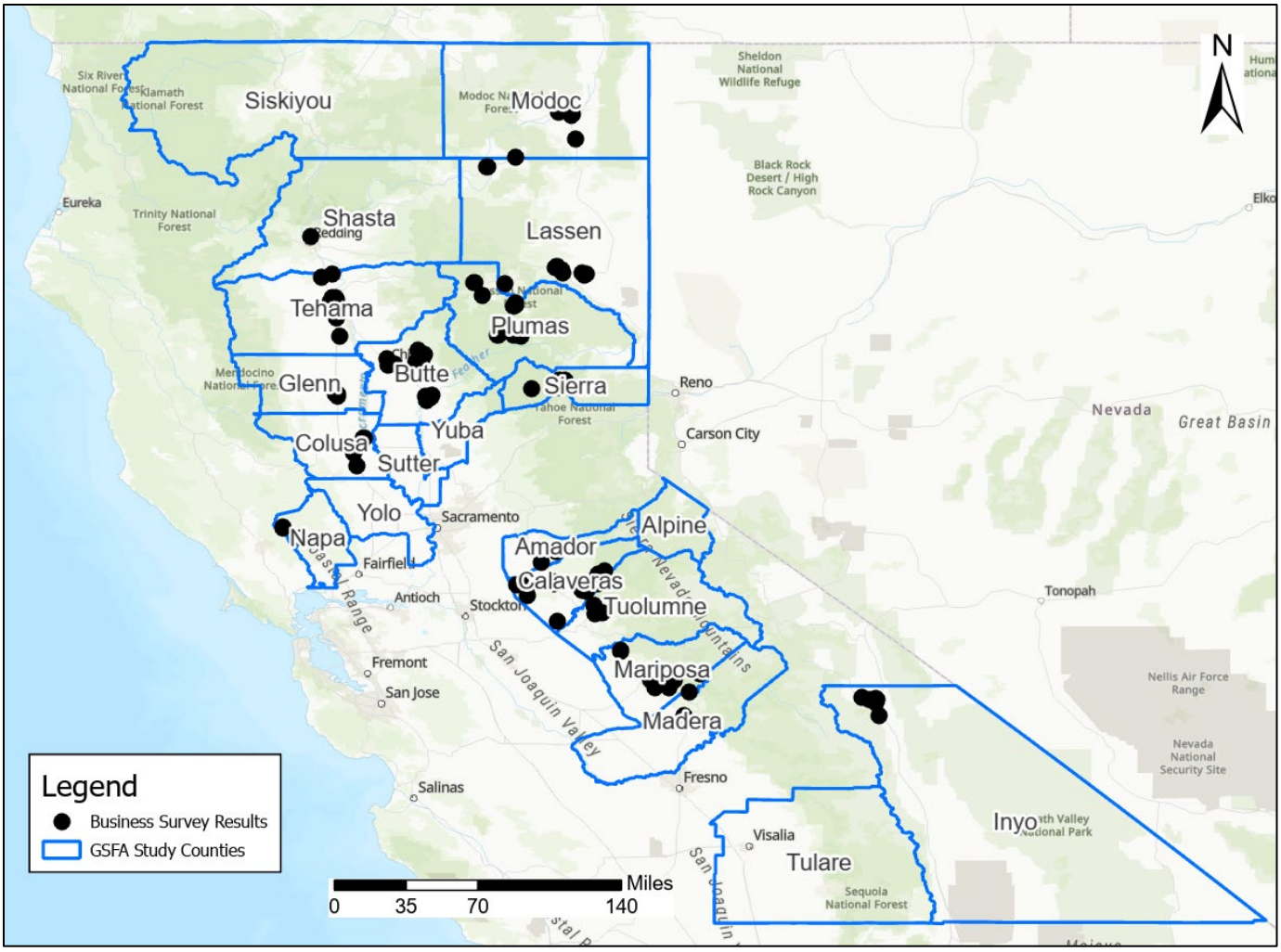
The survey collected information from various CAIs in California, including schools, libraries, and fire protection districts, though there were only 11 responses out of the more than 500 that were engaged. While that does not constitute a statistically significant sample, some of the responses decry universal challenges facilities face with access to inadequate broadband. These institutions serve multiple counties and rely on different ISPs, with AT&T, Comcast, and Frontier among the prominent choices. The methods of internet delivery varied, spanning DSL, fiber optics, and wireless connections. Most organizations procured internet services, while some also acquired phone and television services, and the associated monthly costs ranged from $85 to $1,208.

These responses underscored the need for better awareness and access to federal programs to bolster internet connectivity and infrastructure. The small population of data also highlighted the complexity of challenges faced by these institutions, with some seeking to change ISPs due to concerns related to service quality and speed. Some institutions have benefitted from programs such as E-Rate and CalREN subsidies provided by the Corporation for Education Network Initiatives in California (CENIC). A notable interest in broadband planning efforts was evident, indicating a desire to access potential funding opportunities. However, a significant portion of institutions remained unfamiliar with the upcoming federal BEAD program and the consequential challenge process that could affect their eligibility for crucial funding.

**Business Survey Findings – Summary**

The aim of the business survey was to ask businesses in the study area (at all scales) about their current connectivity, possible options available in the area, and gauge demand for higher bandwidth and applications that would improve their existing or anticipated processes. Notably, Alpine, Madera, Siskiyou, Sutter, Tulare, Yolo, and Yuba received no responses. Below are the locations of all businesses that have responded to the survey:

**Figure 19: Locations of Business Survey Results**

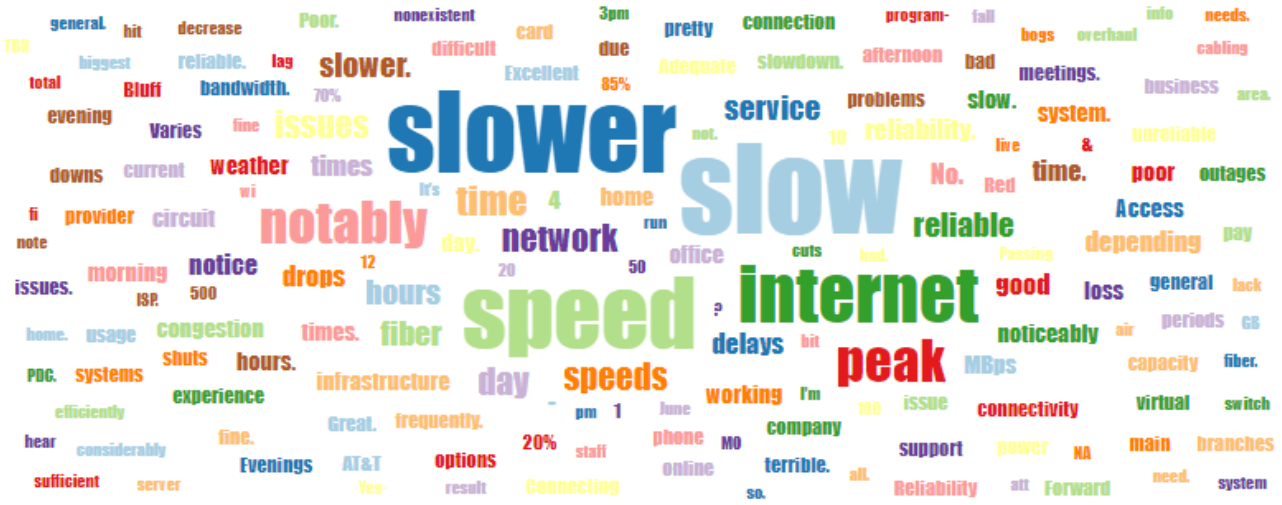



In asking about current internet speeds, a notable 31 percent of respondents claimed that they were operating at less than 10 Mbps. In total, 50 percent of respondents were operating with a connection less than 50 Mbps, and 63 percent under 100 Mbps. Only 6.5 percent had a connection of greater than 500 Mbps. Of these respondents, 41 percent said that their current speeds were not sufficient for their business needs (with 14 percent with non-response to this query).

When asked about future bandwidth requirements, 15 percent responded that they would not need anything more than 10 Mbps. Most businesses falling into this category were small retail stores, campgrounds, and farms, whose main critical function requiring internet is their Point-of-Sale system. Some of these can be supplemented by cell service, which lowers the immediate demand or need to upgrade. However, some other respondents of this category mentioned that they were realtor offices, sheriff offices, chamber of commerce departments, or other entities that would require a more robust connection, justified by their use cases such as security cameras, web development, and even video conferencing. Because of the disparity in these responses, it is assumed that more digital literacy outreach would be required to inform these businesses of the actual speeds necessary to run their critical day-to-day functions more effectively.

When asked about their infrastructure, 59 percent of businesses stated that they had modern or fairly modern (0-10 years old) wiring and networking equipment. 23 percent stated that they had a fiber optic connection, while 19 percent had a copper based connection. The following is a word cloud describing the most common responses received when asked about network congestion during peak hours.

**Figure 20: Word Cloud of Responses from ESRI Survey 123 Regarding Current Internet Speeds**




Half of the respondents have Comcast, AT&T, Frontier, or Spectrum as providers (50 percent). The average satisfaction with their current provider was an average of 3.1 out of 5 stars. Surprisingly, 32 percent of businesses were aware that they had some type of fiber in the area, even though 22 of them reported having speeds of 50 Mbps or less. The most common budget for a monthly connection was around $100 or less, which could be a factor. Only 22 businesses had a budget greater than $200 a month.

Finally, there was a varying degree of demand for connection-based security, where most of the businesses already had that component figured out to the level of their current needs, but some needed a VPN tunnel, email encryption, separation of employee and guest access, or cheaper managed IT services. In most cases, medium- to large-scale businesses had a professional on staff or a contractor handle their security needs. Further, battery backups and redundant satellite connections are the main mechanisms for disaster recovery, if available.

### 3.2.3 Needs of Tribal Communities

When evaluating the overall broadband ecosystem of the county, it is important to understand how the needs of the overall county and the needs of tribe(s) intersect. The case for broadband on tribal lands is not divergent from the overall goals of the county. A cooperative partnership can provide opportunities for efficiency of both design and funding.

The NTIA Tribal Broadband Connectivity Program (TBCP) is providing $3 billion in funding to eligible applicants for broadband service and programs that promote the use of broadband to access remote learning, telework, or telehealth resources. Rounds One and Two each provide $980 million in grants funds. Round One closed September 1, 2021, and awarded $164+ million to 36 California tribes (see table below). Round Two, which is open as of the publication of this document, closes January 23, 2024, and also provides $980 million to qualified applicants.

**Table 13: Tribal Broadband Connectivity Program Round One California Awardees[84]**

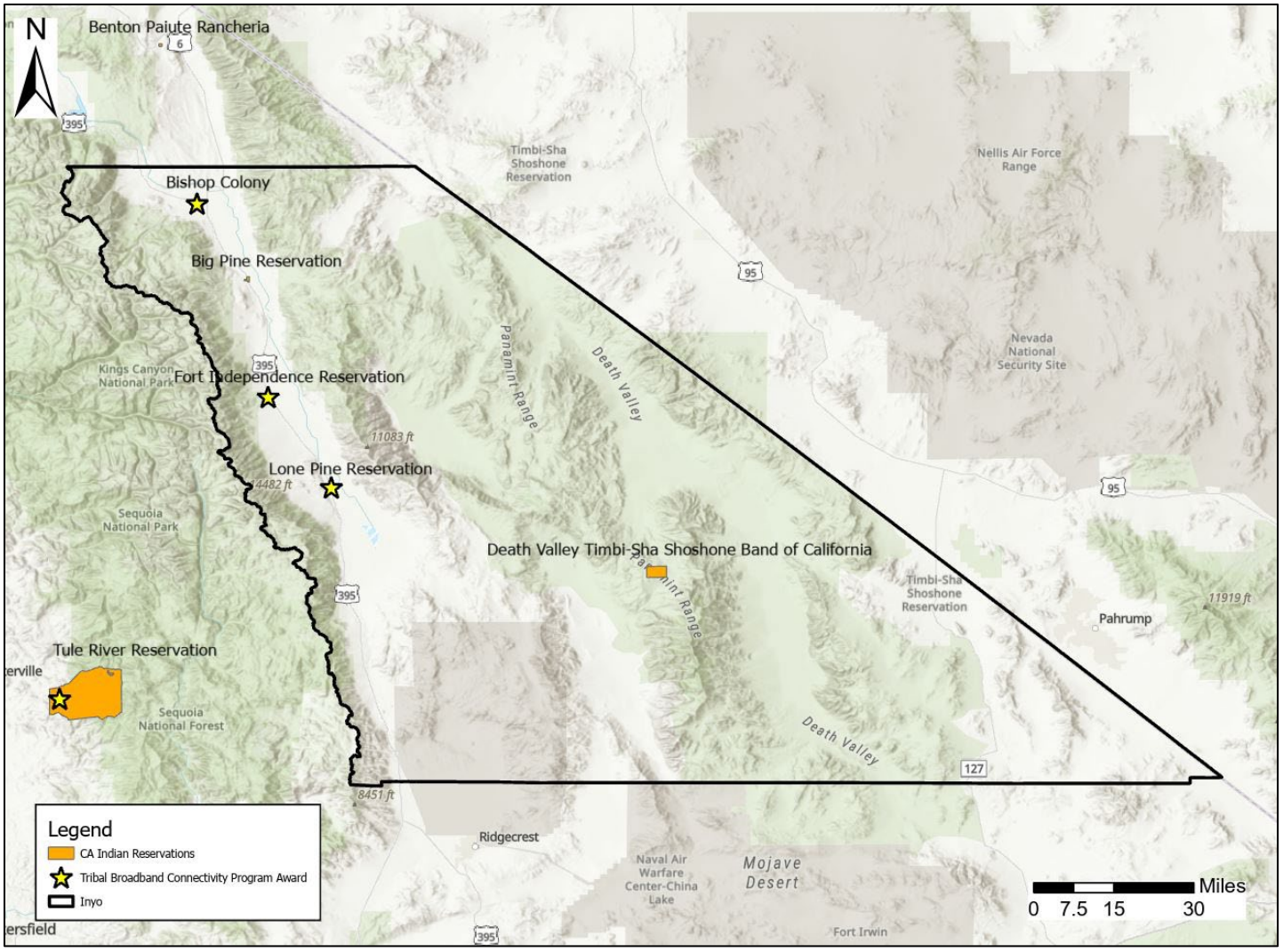
| Awardee | Project | Award |
|---|---|---|
| Big Sandy Rancheria Band of Western Mono Indians | Infrastructure Deployment | $1,125,675.59 |
| Big Valley Band of Pomo Indians | Infrastructure Deployment | $951,684.00 |
| Bishop Paiute Tribe | Planning, Engineering, Feasibility, and Sustainability | $499,935.50 |
| Blue Lake Rancheria, California | Infrastructure Deployment & and Planning, Engineering, Feasibility, and Sustainability | $493,400.48 |
| Bridgeport Indian Colony | Planning, Engineering, Feasibility, and Sustainability | $355,153.32 |
| Cabazon Band of Mission Indians | Infrastructure Deployment | $320,346.40 |
| California Rural Indian Health Board, Inc. | Planning, Engineering, Feasibility, and Sustainability Studies | $500,000.00 |
| Inyo Indian Community Council | Broadband Infrastructure Deployment | $481,533.85 |
| Coyote Valley Band of Pomo Indians | Use and Adoption | $596,796.00 |
| Ewiiaapaayp of Kumeyaay Indians | Planning, Engineering, Feasibility, and Sustainability | $500,000.00 |
| Fort Independence Indian Reservation | Infrastructure Deployment | $1,510,610.82 |
| Guidiville Indian Rancheria | Broadband Use and Adoption & Planning, Engineering, Feasibility, and Sustainability | $500,000.00 |
| Habematolel Pomo of Upper Lake | Broadband Infrastructure Deployment Planning, Engineering, Feasibility, and Sustainability | $500,000.00 |
| Hoopa Valley Tribal Council | Infrastructure Deployment | $65,140,407.72 |
| Ione Band of Miwok Indians | Planning, Feasibility, and Sustainability Studies | $459,000.00 |
| Karuk Tribe | Planning, Engineering, Feasibility, and Sustainability | $500,000.00 |
| Kashia Band of Pomo Indians of the Stewarts Point Rancheria | Broadband Use and Adoption | $495,477.00 |

[84] National Telecommunications and Information Administration, "Tribal Broadband Connectivity Program," Broadband USA, https://broadbandusa.ntia.doc.gov/funding-programs/tribal-broadband-connectivity, accessed October 2023; National Telecommunications and Information Administration, "TBCP Awards," https://nbam.maps.arcgis.com/apps/dashboards/8285506482b941ae8f9de43f8acf3746, accessed October 2023.

| | | |
|---|---|---|
| La Jolla Band of Luiseno Indians | Planning, Feasibility, and Sustainability Studies | $829,239.00 |
| Lone Pine Paiute-Shoshone Reservation | Infrastructure Deployment | $1,866,081.00 |
| Pauma Band of Luiseno Indians | Use and Adoption | $498,380.00 |
| Pinoleville Pomo Nation | Use and Adoption | $496,977.00 |
| Resighini Rancheria | Planning, Engineering, Feasibility, and Sustainability | $499,953.00 |
| Rincon Band of Luiseno Mission Indians of Rincon Reservation | Use and Adoption \| Planning, Feasibility, and Sustainability Studies | $1,230,457.05 |
| Round Valley Indian Tribes | Infrastructure Deployment | $13,514,977.00 |
| Santa Ynez Band of Mission Indians (aka Chumash Indians) | Planning, Engineering, Feasibility, and Sustainability | $500,000.00 |
| Scotts Valley Band of Pomo Indians | Use and Adoption | $584,000.00 |
| Shingle Springs Band of Miwok Indians | Infrastructure Deployment | $2,710,067.25 |
| Soboba Band of Luiseno Indians | Broadband Use and Adoption | $500,000.00 |
| Southern California Tribal Chairman's Association | Broadband Infrastructure Deployment; Broadband Use and Adoption | $4,500,000.00 |
| Susanville Indian Rancheria | Infrastructure Deployment | $612,604.00 |
| Table Mountain Rancheria | Planning, Engineering, Feasibility, and Sustainability | $500,000.00 |
| The Wiyot Tribe | Broadband Use and Adoption | $499,997.16 |
| Tolowa Dee-ni' Nation | Planning, Engineering, Feasibility, and Sustainability | $500,000.00 |
| Tule River Indian Tribe of the Tule River Reservation, California | Broadband Infrastructure Deployment & Planning, Engineering, Feasibility, and Sustainability | $500,000.00 |
| Viejas Band of Kumeyaay Indians | Use and Adoption | $592,110.00 |
| Yurok Telecommunications Corp. | Infrastructure Deployment | $61,661,365.50 |

| | |
|---|---|
| | Denotes use and adoption initiatives |
| | Denotes Infrastructure deployment projects |
| | Denotes planning and feasibility Studies |

**Figure 21: Inyo County Tribal Communities Location**




# 3.3 Overview of Smart Community Technologies

As broadband becomes more universally deployed, opportunities to use internet access to transform and improve the efficiency of government services increases. Smart community technologies have the potential to drive advancement in sustainability, resilience, and equity. Smart community technologies can be adopted to meet the individual needs of each community and the stakeholders it includes.

- **Connecting to Government**

For instance, smart communities offering public Wi-Fi might develop a landing page for users that provides critical updates, assesses users for specific needs such as emergency housing or substance abuse treatment, and provides easy ways to make use of existing government programs.

- **Infrastructure optimization**

Smart technologies can provide opportunities to optimize the performance and control of existing infrastructure, managing the energy grid, water and waste systems, and traffic flow.

- **Agriculture**

Smart agriculture technologies, such as soil and irrigation sensors, can help the county reach its economic goal to increase production by helping to monitor plant health.

- **Public Safety**

Smart communities offer the ability to connect body-worn, traffic, and security camera footage, as well as traffic flow information, social media activity and other real time data sources. This "single-pane of glass" approach allows real-time situational awareness for emergency managers by tracking all available emergency resources and assisting with decision-making about the deployment of resources—thereby reducing property loss and saving lives.

In addition to using a broadband availability-based approach to identify crucial and high priority areas for expanding high-speed access, VHB have identified issues in the county that could be addressed through connectivity-enabled smart community deployments, which will be detailed in Section 9.

The next map depicts census tracts in the county that fall under the designation of disadvantaged by the Justice40 initiative under the U.S. Department of Transportation. Enabled by Executive Order 14008, with this program the federal government has made it a goal that "40 percent of the overall benefits of certain Federal investments flow to disadvantaged communities that are marginalized, underserved, and overburdened by pollution."[85]

The categories of investment include "climate change, clean energy and energy efficiency, clean transit, affordable and sustainable housing, training and workforce development, remediation and reduction of legacy pollution, and the development of critical clean water and wastewater infrastructure."[86]

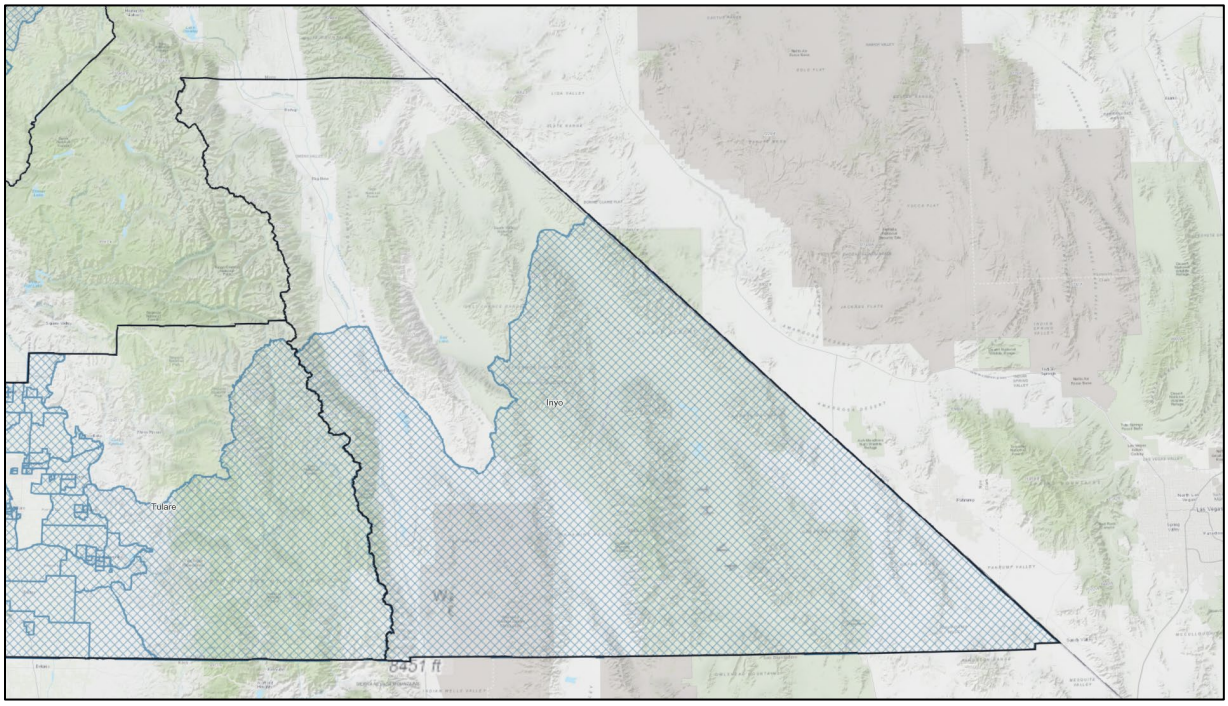
This data set looks at multiple different factors such as environmental dangers, income, and resource availability based on the most recent census data and other factors to create aggregate need levels and list the top threats a community might be vulnerable to.[87]

[85] https://www.whitehouse.gov/environmentaljustice/justice40/

[86] Ibid

[87] More info about the methodology and ethos of the program are available at https://www.transportation.gov/equity-Justice40.

**Figure 22: Map of Justice40 Disadvantaged Tracts (Hatched)**




The Justice40 map identified that at least some Inyo County census tracts were classified as disadvantaged in 3 of its 12 categories. To meet the threshold, a census tract must be among the lowest 35 percent of annual household income and satisfy the category's additional requirements:

- **Climate Change**

Areas are identified as disadvantaged if they are at or above the 90th percentile for any of the following:

- Expected agriculture loss rate
- Expected building loss rate
- Expected population loss rate
- Projected flood risk
- Projected wildfire risk

- **Housing**

Areas are identified as disadvantaged if they have experienced historic underinvestment or are at or above the 90th percentile for any of the following:

- Housing cost
- Lack of green space
- Lack of indoor plumbing
- Lead paint

### Legacy Pollution

Areas are identified as disadvantaged if they have at least one abandoned mine land or formerly used defense sites or are at or above the 90th percentile for any of the following:

- Proximity to hazardous waste facilities
- Proximity to Superfund sites (National Priorities List (NPL))
- Proximity to Risk Management Plan (RMP) facilities

These factors, as well as the economic benefits of bringing broadband to these specific locations, should be weighed when planning and prioritizing future deployments. For additional information and recommendations for smart community technology, refer to Section 9. VHB's Smart Community Web Experience webmap depicting the full layers and data provided by VHB can be accessed here:

https://experience.arcgis.com/experience/a5845d235e1749f38374f325cfad53eb/

SECTION

# 04

# ANALYSIS OF CURRENT BROADBAND MARKET AND EXPANSION STRATEGIES

# 4.1 Introduction and Expansion Strategy Roadmap

This section reviews the current residential broadband market in Inyo County, identifying each significant ISP's current service areas. The ISPs' service area maps will develop an understanding of where broadband services with different performance characteristics are and, more importantly, are *not* available. At a high level, the BEAD grant program will focus on the following two location eligibility criteria.

- ***Unserved* households lacking 25/3 Mbps service:** 3,035 households (32.1 percent)[88]
- ***Underserved* households lacking 100/20, but not 25/3 Mbps service:** 4,579 households (48.4 percent)

Inyo County has a *very high* proportion of unserved households, creating significant challenges for the 3,035 households on the other side of the digital divide. These households will benefit greatly from the BEAD program, but there are only a few major clusters of unserved locations that lend themselves to significant project areas. Most others are distributed throughout the county and will likely require different deployment projects to reach scattered unserved addresses.

Inyo County also has a *very high* proportion of underserved households. These areas are less likely to receive BEAD funding, because the CPUC does not believe it has enough funding to cover all unserved and underserved locations across the state.[89] These households nevertheless should remain a priority for county and local policymakers interested in bridging the digital divide, but require a more detailed understanding of the current technologies offered nearby.

These two criteria do not tell the full story either. To explore other aspects of the digital divide, the table below provides a snapshot of the availability of different technologies across the county, based on the FCC's most recent 2023 household data. We note that this information is presented by household, and not by location, because it is the best FCC data available at this level of detail and allows for a better understanding of the impact of the digital divide on the population.

[88] This data is derived from the FCC's National Broadband Map Area Summaries, which detail these percentages by "units." Residential Broadband Serviceable Locations (BSLs) may represent single-family homes or buildings like apartments that contain multiple distinct dwellings. "Units" represent individual dwellings or households, so a BSL with an individual FCC Location ID can contain multiple units. We note that apartment buildings tend to be constructed in more densely populated areas, which also tend to be more likely to receive high-speed broadband service. As a result, the percentage of units connected will tend to be higher than the percentage of locations connected. This issue is an inherent limitation of the FCC's publicly available data.

[89] CPUC, State of California Five-Year Action Plan: Broadband Equity, Access, and Deployment (BEAD) Program, Final Initial Draft, July 13, 2023, p. 87, ("CA BEAD Five-Year Plan"), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M513/K977/513977116.PDF.

**Table 14: Households Receiving Each Level of Service across Inyo County[90]**

| Households (HHs) – 9,468 Total | 25/3 Mbps | 100/20 Mbps | 250/25 Mbps |
|---|---|---|---|
| **Served by any wireline or fixed wireless** | 67.9% (6,433) | 19.6% (1,854) | 14.6% (1,380) |
| **Served by any wireline technology** | 63.0% (5,964) | 16.0% (1,515) | 14.6% (1,380) |
| **Wireline Technologies:** | | | |
| ➢ **High-speed option (Fiber and/or Cable)** | 59.9% (5,667) | 14.6% (1,380) | 14.6% (1,380) |
| ➢ **DSL** | 8.0% (757) | 1.6% (148) | 0% |
| ➢ **DSL as only wireline option at speed** | 3.1% (297) | 1.4% (134) | 0% |
| **Fixed Wireless Technologies:** | | | |
| ➢ **Fixed wireless** | 11.9% (1,125) | 5.1% (479) | 0% |
| ➢ **Only fixed wireless at speed** | 5.0% (469) | 3.6% (339) | 0% |

Of the 9,468 households across the county, a reported 1,380 households (14.6 percent) can receive high-speed broadband services of at least 250/25 Mbps from technologies that can be upgraded to meet needs well into the future. The remaining households do not yet have access to such relatively future-proof technology. The information above highlights the following top broadband availability issues:

- **Many locations are still critically unserved:** Inyo County has a reported 2,676 locations (28.3 percent) that do not yet receive any wireline or wireless service meeting the 10/1 Mbps standard, according to FCC data.
- **Moderate dependence on fixed wireless:** An estimated 469 households (5.0 percent) can receive only basic broadband service via fixed wireless technologies across Inyo County, while 339 households (3.6 percent) depend upon it for access to 100/20 Mbps services. This connectivity has been vital for these households, but in the long term, they should remain a priority to receive high-speed wireline services.
- **Available DSL is inadequate:** A claimed 2,723 households (28.8 percent) in Inyo County have access to DSL services offering at least 10/1 Mbps. However, only 757 households (8.0 percent) in Inyo can receive DSL service offering the minimum broadband speed of 25/3 Mbps set by the FCC in 2016. ISPs providing inadequate DSL service may not have an incentive to upgrade these networks if the projected return on investment is insufficient. However, if provided financial support, these providers may be best positioned to deploy fiber through their DSL service areas using existing access to telephone poles and rights-of-way to install fiber at a lower cost than competitors.
- **High-speed broadband availability gap:** A reported 40.1 percent of households cannot receive high-speed broadband service. This level of availability is low compared to the rest of California and the nation.
- **Available cable services are generally not upgraded:** While a reported 5,615 households (59.3 percent) can receive cable services offering speeds of at least 25/3 Mbps, only 355 households (3.8 percent) can receive cable services offering 100/20 Mbps or more. Where available, cable networks in other markets have generally been upgraded to offer high-speed services of at least 250/25 Mbps, and cable providers in Inyo County should follow suit.
- **Insufficient fiber-to-the-home availability:** Only 10.8 percent of homes in Inyo County can receive fiber services.

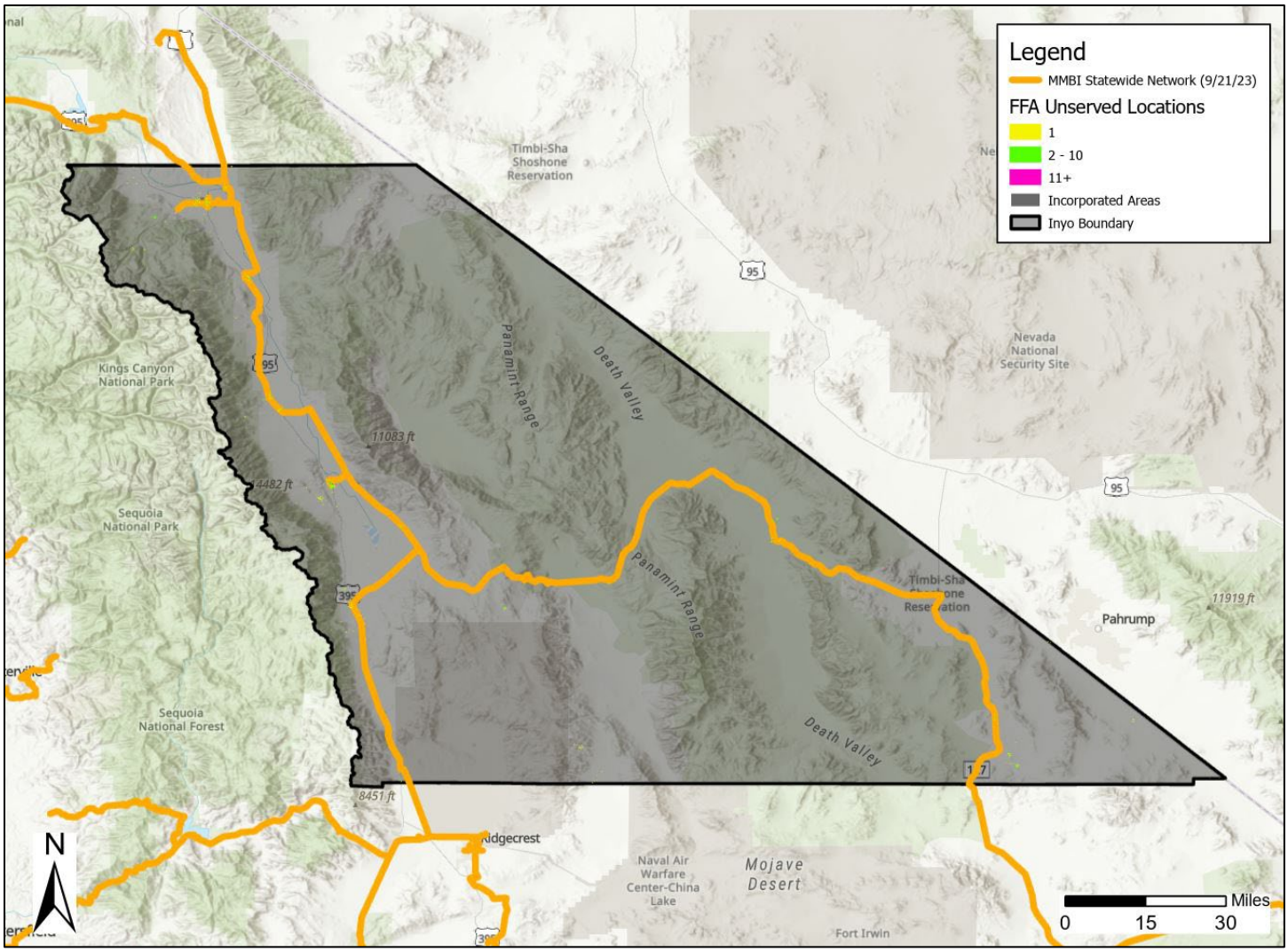
[90] Federal Communications Commission, "FCC National Broadband Map," updated May 30, 2023, https://broadbandmap.fcc.gov/data-download/nationwide-data?version=dec2022; CostQuest Solutions & Technology Team, "About the Units in the Broadband Serviceable Location Fabric Data," CostQuest Associates, September 19, 2022, https://www.costquest.com/resources/articles/about-the-units-in-broadband-serviceable-location-fabric-data/.

- **Large areas do not have adequate wireline broadband:** Aspendell, Laws, Keeler, Cartago, Tecopa, Death Valley Indian Village, and several areas in the eastern portion of the county all have large collections of unserved and underserved locations that should be among the highest priorities to be connected. The state middle mile network will come within 5 miles of most of these locations, but ISPs will need to construct approximately 25 miles of fiber down Trona Wildrose Road to reach some of the most remote locations. This effort may require collaboration between Kern and Inyo Counties.

The map below shows locations across the region that do not yet have access to fiber or high-speed cable services offering speeds of at least 25/3 Mbps. California's Federal Funding Account grant program essentially used this eligibility standard to identify locations it would accept in the application process, providing a map of them in clustered areas.[91] By excluding fixed wireless, DSL, and older cable system services, this program adopted a standard of service that should service as the long-term goal for all locations. Locations not yet receiving 25/3 Mbps service are generally eligible for most funding opportunities, so municipalities and Inyo County's leadership can facilitate projects to these locations more easily. However, locations receiving wireless but not wireline services capable of 100/20 Mbps will not be eligible for BEAD funding, so ISPs and local governments will need to identify other ways of improving the business case to connect these locations to a high-speed wireline network.

[91] The FFA defined "unserved" locations as all locations that did not receive reliable wireline services capable of 25/3 Mbps, while classifying DSL services and older cable services as presumptively unreliable. The Federal Funding Account's eligibility criteria are reviewed in more detail in Section 6. The program did not provide individual location information but did provide a mesh of small hexagonal areas and identified how many eligible locations were in each "hexbin." In the following figure, these have been converted to dots centered on the Hexbin locations.

**Figure 23: Planned California Middle Mile Network Routes and Locations Unserved by Modern Cable or Fiber at Speeds of at Least 25/3 Mbps in Inyo County**




**Market Summary:** Inyo County has three primary residential wireline ISPs Optimum, Lone Pine Communications, and Frontier.[92] Optimum's cable network has the greatest reach, connecting a reported 5,077 locations to its cable service in the most populous portions of the county. However, the network seldom can offer speeds of 100/20 Mbps, so locations served by this older cable network are mostly classified as "underserved" under the BEAD program. Frontier has the next greatest reach, connecting 2,314 locations with its DSL network and now offering fiber services to another 1,167 locations. Frontier has expressed interest in upgrading their existing areas in Aspendell, Alabama Hills, Lone Pine, and Kern County to fiber through multiple submitted FFA projects. Lone Pine Communications focuses on the Lone Pine area, connecting 370 locations with cable services. While AT&T is reported to provide telephone service primarily in the southeastern part of the County, including in Tecopa, Shoshone, and Furnace Creek, its self-reported broadband service area in the county is limited to a few census blocks in Bishop, in northwestern Inyo County.

[92] We note that a few other providers claim to offer services to a very small number of residential locations. TPx Communications offer DSL to a single location. AT&T offers DSL to 11 locations, and fiber services to a reported 6 locations.

An estimated 469 households (5.0 percent) rely on fixed wireless services to obtain basic broadband speeds of 25/3 Mbps in Inyo County. There is only one primary fixed wireless provider in the county. T-Mobile reaches a claimed 7,218 locations. Verizon reports to serve 22 locations as well, but this service area is so small that it is not likely to have a significant impact on the market unless it is expanded significantly. A major portion of these locations served by T-Mobile do not receive speeds necessary to be considered broadband. In another FCC data set, a reported 6,605 households (69.8 percent) in Inyo County can receive some form of fixed wireless service, but 5,480 of those households (57.9 percent) cannot even reliably receive speeds of 10/1 Mbps.

This section's review of individual ISP service areas can be used to explore the most likely expansion and service upgrade opportunities throughout the county. Combined with insights in Section 3's analysis of broadband needs, county and local leadership can use this understanding of each ISP's expansion opportunities to identify the ISPs most likely to deploy or upgrade service to un- and underserved locations in their jurisdictions that have been identified in the map above.

**Improvement Opportunities Summary:**

- Frontier's fiber presence in Bishop and West Bishop can be extended along US 395 to areas with existing DSL service, such as the Big Pine, Fish Springs, Independence, Lone Pine, Olancha, and Haiwee areas, though state or other available middle mile with their existing right-of-way and pole agreements. Their FFA applications in Aspendell, Alabama Hills, and Lone Pine have signaled their intent to adopt this approach.
- Lone Pine Communications and Optimum, the cable providers in Inyo, will need to modernize their existing service offerings to offer services capable of at least 100/20 Mbps and preferably offer download speed of up to 1 Gbps, then expand into other nearby areas.
- The state middle mile network can soon be leveraged by any provider willing to establish services in some of the most remote areas of the county, or a new entrant, to connect areas such as Tecopa, Park Village, Furnace Creek, and Death Valley Indian Village along State Route 190.
- AT&T's existing presence may be very small, but it remains a possible entrant to connect unserved areas if the primary wireline providers in the county do not connect all of the BEAD-eligible unserved locations over the next couple of years. They could also expand deeper into Bishop or along any available state middle mile routes, these expansion possibilities are not very likely.
- Other improvement opportunities are covered in more detail in Section 6's review of Broadband Infrastructure Account and BEAD suggested areas for consideration.

Some of these potential efforts to improve broadband availability will be eligible for broadband funding grants, a topic reviewed in Section 6 below, while other areas may receive new or upgraded networks as a result of local efforts to encourage ISP action, a topic discussed in Section 7. Still, other areas may receive improved service options gradually as a result of last mile construction catalyzed by new middle mile networks such as the State of California's open access middle mile network.

To better understand how to interpret this broadband market assessment, we will first review key factors influencing the three basic ways that improved broadband services can reach more people: expansions, upgrades, and new market entry. Next, this section will review a list of ISPs in Inyo County, along with their service areas, technologies they offer, and the service pricing ranges they charge for residential services. Municipalities looking to encourage deployments should focus on working with fiber service providers, while considering cable providers if they are willing to deploy their most current network technologies.[93] Areas served above 25/3 Mbps by only DSL should be included in the list of priorities, but as Section 6 will

[93] Section 2 discusses the distinction between DOCSIS 3.1 and DOCSIS 4.0, the latter able to offer significantly faster upload speeds that can compete directly with fiber systems in nearly all consumer applications.

discuss, several key grant programs may not provide funding to such areas, requiring that county and local leadership encourage new expansions or upgrades through other strategies.

### ■ Key Factors Influencing Service Availability Improvements

**Traditional expansion:** ISPs in the region will generally expand their current service footprints when the costs to expand to nearby areas will generate a reasonable long-term return on investment. This traditional expansion process is often incremental, requiring each ISP to consider the entire range of adjacent areas across its regional or even national network and focus its limited investment resources on the least risky location choices. As a result, this expansion process can be slow and tedious, particularly in rural areas.

The incredible amount of funding available over the next few years is changing how ISPs think about this expansion process. As last mile grant programs have gradually reduced matching funds requirements over the past decade, locations that were once less appealing investments have become significantly more attractive. Major middle mile projects, such as California's upcoming open access network, have also reduced the total costs to reach many un- and underserved areas, creating many new deployment opportunities for ISPs that had remained out of reach from lack of adequate backhaul. With so many funded deployments and upgrades soon to change the broadband availability landscape, the threat of new competition will also encourage existing ISPs to plan their own expansions or potentially cede nearby un- and underserved areas to competitors.

Not all new deployments need to be major expansions either. Across Inyo County, there are pockets of un- or underserved locations that are partially surrounded by served areas. The last mile funding programs have recognized this trend across the nation and adapted accordingly, allowing project submissions with smaller areas. In some cases, the FFA's data depicts only 1-2 unserved locations contained in each biddable area (represented as hexbins). The best approach to connect these scattered unserved locations is for the incumbent to be encouraged to serve these addresses. The funding programs also generally allow applicants to include several noncontiguous deployment areas, so these pockets of unserved areas can be combined together or included with a larger nearby expansion plan, preferably by the incumbent for the most efficient use of funding.

**Upgrading existing networks:** Some ISPs have already begun to upgrade older technologies such as DSL that generally cannot achieve the higher broadband speeds demanded by modern households.[94] These upgrades to existing networks are often substantially less costly than new construction by other ISPs. An existing ISP already has a physical presence and infrastructure, has secured many essential rights-of-way, and is familiar with the area's permitting requirements. An upgrading ISP also has an existing customer base and customer support coverage in the area. As grant funding has become more plentiful, ISPs offering older technologies are facing the threat of competitive entry by other ISPs offering fiber. As a result, these ISPs are very interested in obtaining funding and local support to upgrade their networks to maintain their customer bases. This market assessment identifies each ISP offering multiple wireline technologies to encourage discussions that may facilitate these updates and improve services.

**New regional market entry:** While rarer in rural areas, ISPs without a nearby service area can deploy an entirely new network and begin to offer new services in a region. Generally, market entry is based on the perceived return-on-investment (ROI) from the proposed area. An ISP must serve a certain number of households in an area to cover the costs of on-going support efforts. Combined with the other economic challenges of unserved and underserved areas and the competition present in served areas, there are few opportunities for new ISPs to find areas large enough to support new deployments.

[94] See discussions of the performance limitations of DSL and older fixed wireless systems and of the broadband usage demands of modern households in Section 2.

However, GSCA, in partnership with UTOPIA Fiber, has developed plans for its entry into [xxx] County. This open-access, last mile network will offer choices between different service providers to each connected household and business, introducing high-speed broadband service competition in areas that often have none. This possible entrant could change the region's broadband services market significantly, putting more competitive pressure on existing providers to expand or upgrade their networks before UTOPIA can expand into their areas. Networks owned by public entities like GSCA operate in a non-profit manner, so many of their business decisions can be made with different goals in mind, such as expanded connectivity to areas in need. Public entities also have access to different financing options, such as municipal bonds, and can develop projects in areas where the expected return on investment occurs after twenty years or more, broadening their range of potential service areas. With this example, policymakers should not assume new regional entrants are impossible to attract and should consider this new entrant when developing plans to work with ISPs to improve services in their jurisdictions.

### ■ Mapping Considerations

To identify each ISP's service areas and develop deployment plans utilizing upcoming funding opportunities discussed in Section 6, this broadband market assessment analyzes the most current available broadband data provided by the FCC's Broadband Data Collection (BDC) program and National Broadband Map.[95] Initially released in November 2022, the FCC's National Broadband Map presents BDC availability data that corresponds to location information defined in the National Broadband Location Fabric, ascribing a service status to each individual address considered a Broadband Serviceable Location (BSL).[96] Unfortunately, the address-level information is available via license only, and at the time of this writing, neither Tilson Technology, nor GSFA have been able to obtain a license to use this proprietary data. As a result, many parts of the analysis must then occur on the census block-level, which hinders the identification of unserved locations in partially served census blocks in general maps, a problem that has become more pronounced over the last decade. To alleviate this issue for grant applicants, the NTIA have recently announced that a new tier of license is available to certain entities that must gain access to the address fabric data used by the FCC's BDC program to apply to a grant program.[97]

The CPUC also requests data from service providers for its own mapping program, and the results are also generalized to the census block level, similar to the FCC's previous Form 477 reporting. Of the two maps, the FCC's map was selected as the primary basis for analysis over CPUC's,[98] because it serves as the basis for California's BEAD program planning documents and upcoming grant program and is used as a supplement to the CPUC's own California broadband map. However, conflicts between the two do exist. The CPUC's coverage areas generally overlap with the FCC's BDC data, but the BDC data identifies more census blocks as partially or fully served by fixed wireless and/or wireline services offering at least 25/3 Mbps. As part of the BEAD planning process, the CPUC must reconcile these two data sets and manage a challenge process (discussed more in Section 6.4) to identify where self-reported ISP service claims may not be accurate. As a result, county and local governments reviewing these maps should look closely and identify areas where these service claims are suspect, then challenge them to ensure un- and underserved areas are eligible for grant funding. It's worth noting that county and local governments are among the limited eligible entities allowed to participate in the BEAD challenge process soon to be conducted by the CPUC.

---

[95] Federal Communications Commission, "FCC National Broadband Map," updated May 30, 2023, https://broadbandmap.fcc.gov/data-download/nationwide-data?version=dec2022.

[96] A broadband serviceable location is a residential or business location where fixed broadband internet access service is or can be installed, as determined by the FCC. https://www.costquest.com/resources/articles/clarity-on-bdc-challenge-process-and-definition-of-broadband-serviceable-locations/; see also https://www.fcc.gov/sites/default/files/bdc-challenge-overview.pdf.

[97] NTIA, "NTIA Tier D License Request," https://apps.costquest.com/NTIArequest/, accessed September 2023.

[98] CPUC, "CPUC Annual Collected Broadband Data," updated April 2023, https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-mapping-program/cpuc-annual-collected-broadband-data.

When availability information is presented on the census block-level, partially served census blocks cannot be distinguished from fully served ones. There are few sources that can be used to identify unserved locations in more detail to correct this issue. One such source, the CPUC's Federal Funding Account (FFA) program, used a series of very small hexbins to identify areas containing locations that were eligible for funding under its program rules.[99] This data was included in the map above to identify priority areas.

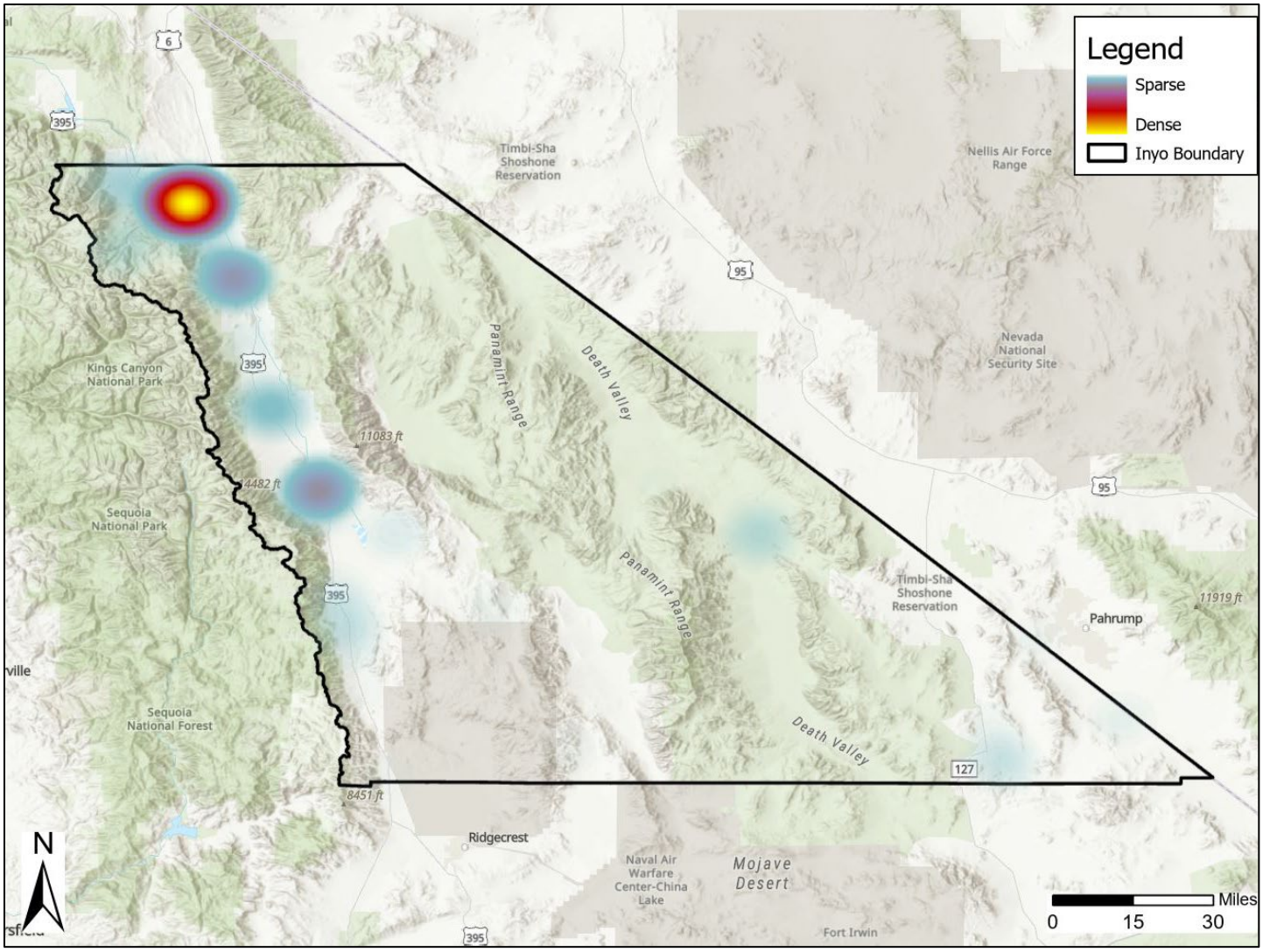
## 4.2 Residential Providers and Service Breakdown

Inyo County, situated in Eastern California, is characterized by its diverse geography, encompassing both deserts and mountains. The county includes a significant portion of Death Valley, one of the hottest and lowest points in North America. To the west, the Sierra Nevada mountain range, including the iconic Mount Whitney, provides a contrast with alpine landscapes and forests. Due to these factors, the population layout of Inyo County is predominantly rural, with small towns and communities scattered along the main valley in the west. Independence, the county seat, is a central point for government activities. Other notable communities include Bishop, Lone Pine, and Big Pine.

In terms of transportation, US 395 is a major north-south highway that runs through the county, connecting it to other parts of California and providing access to the towns along the eastern Sierra. State Route 190 traverses Death Valley, while State Route 168 provides access to Deep Springs Valley in the northeast.

[99] Hexbins are used in mapping to divide an area into hexagons which join together to completely cover the area in question.

**Figure 24: Inyo County Relative Population Density**




The following table presents the internet service providers in Inyo County with their available speed offerings and corresponding price ranges (agnostic of technology deployed), as of August 2023:

**Table 15: Inyo County Providers by Technology**

| Provider | Dominant Technology | Speed Range | Monthly Recurring Cost | Notes |
|---|---|---|---|---|
| **AT&T Inc** | Fiber | 300 Mbps - 1Gbps Synch | $55-80 | |
| **FRONTIER** | DSL | 0.4/0.4Mbps - 115/7Mbps | $65 | |
| **FRONTIER** | Fiber | 500/500 Mbps - 1/1 Gbps | $40 - $60 | |
| **Lone Pine Communications** | Cable | 10/1 Mbps - 500/40 Mbps | $28 - $168 | |
| **Lone Pine Communications** | Fixed Wireless | 25/25 Mbps - 75/50 Mbps | $51 - $88 | |
| **LV.Net** | Fixed Wireless | 15/2 Mbps - 25/5 Mbps | $80 - $125 | |
| **Optimum** | Cable | 300 Mbps - 1 Gbps+ | $35 - $265 | |
| **SBC-Wireless** | Fixed Wireless | 45/15 Mbps - 85/30 Mbps | $70 - $160 | |
| **T-Mobile US** | Fixed Wireless | 245 Mbps | $50 | |
| **Valley Communications** | Fixed Wireless | 40/10 Mbps | $55 - $75 | Price Depends on Service Area |
| **VERIZON** | Fixed Wireless | 300 Mbps - 1 Gbps | $25 - $65 | |

## ■ Wireline Broadband Availability

Broadband service over fiber or cable offers a significantly greater maximum bandwidth capacity for users throughout an area than competing technologies. Without the spectrum limitations of wireless systems, more users can access the internet simultaneously, without much concern for peak demand hours or the need to meter the amount of data used per month. Wireline services also are more resilient to environmental conditions and weather, making them more reliable, and they tend to be substantially less expensive to maintain once installed. Fiber, and to a lesser extent, cable systems (hybrid fiber-coaxial cable, with the cable portion moved deeper into neighborhoods) can also be upgraded to handle even higher speeds and more overall capacity as the electronics enabling each technology continue to improve.

In the table below, the availability of each wireline technology is presented at three key speeds: 25/3 Mbps, 100/20 Mbps, and 250/25 Mbps. The first two speeds are based on the FCC's 2016 definition of broadband and the more modern understanding of what households now need to enjoy the current range of telecommuting, remote learning, telehealth, and online communications activities. The highest speed presented, 250/25 Mbps, offers an adequate glimpse into the availability of services that can meet the higher demands of e-commerce, video-based content creators and editors, heavy online database users, or simply households with several online-savvy family members. Wireline technologies that can achieve these speeds generally offer downloads of up to 1 Gbps and either currently offer or may be upgraded to upload speeds of 500 Mbps or

more. By presenting the availability of these technologies across these three key speed points, the data also reflects the extent to which cable and fiber systems have been adequately upgraded, while contrasting them against the level of performance upgrades that competing DSL technologies have received as well.

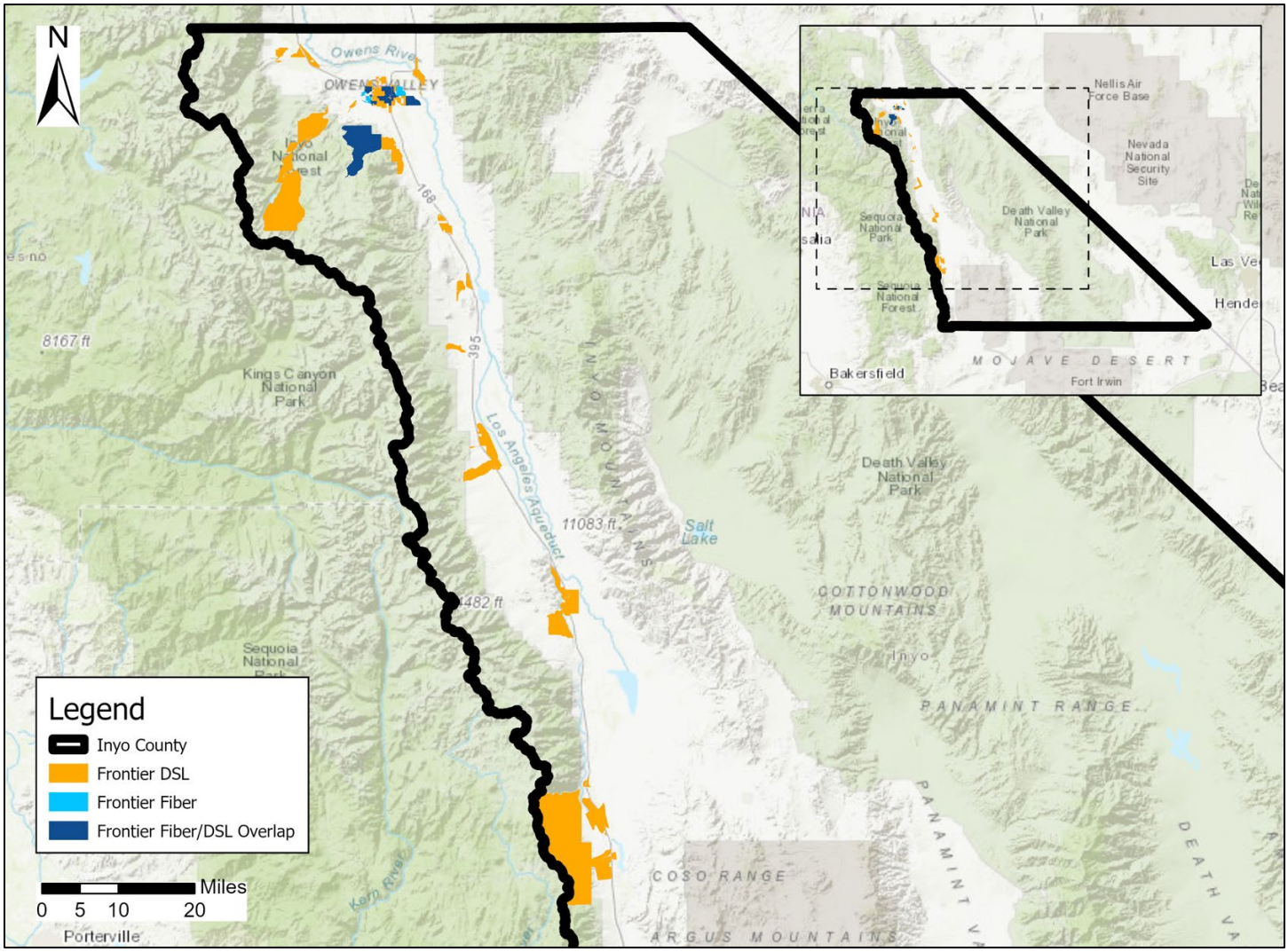
**Table 16: Wireline Service Availability in Inyo County**

| Households (HHs) – 9,468 Total | 25/3 Mbps | 100/20 Mbps | 250/25 Mbps |
|---|---|---|---|
| **HHs served by any technology** | 67.9% (6,433) | 19.6% (1,854) | 14.6% (1,380) |
| **HHs served by any wireline technology** | 63.0% (5,964) | 16.0% (1,515) | 14.6% (1,380) |
| **HHs served by only fixed wireless at speed** | 5.0% (469) | 3.6% (339) | 0% |
| ➢ **Fiber** | 10.8% (1,024) | 10.8% (1,024) | 10.8% (1,024) |
| ➢ **Cable** | 59.3% (5,615) | 3.8% (355) | 3.8% (355) |
| ➢ **DSL** | 8.0% (757) | 1.6% (148) | 0% |
| ➢ **High-speed option (Fiber and/or Cable)** | 59.9% (5,667) | 14.6% (1,380) | 14.6% (1,380) |
| ➢ **DSL as only wireline option** | 3.1% (297) | 1.4% (134) | 0% |

All of the fiber of ISPs in this region have been fully upgraded to offer at least 250/25 Mbps. In contrast, most cable is not capable of delivering even 100/20 Mbps, and most DSL cannot deliver even 25/3 Mbps, despite reaching 2,723 (or 28.8 percent) of households.

The map below shows Frontier's service availability by census block. Frontier offers fiber services to 1,167 locations in Bishop, in northwestern Inyo County, and DSL to 2,314 locations near the western border and along US 395 in the Big Pine, Fish Springs, Independence, Lone Pine, Olancha, and Haiwee areas. Frontier is the dominant wireline provider in this part of the county. Frontier competes with AT&T, Optimum, and Lone Pine Communications in different portions of its service area. Frontier is also the only wireline provider with a presence in Fish Springs, Aberdeen, and Olancha.

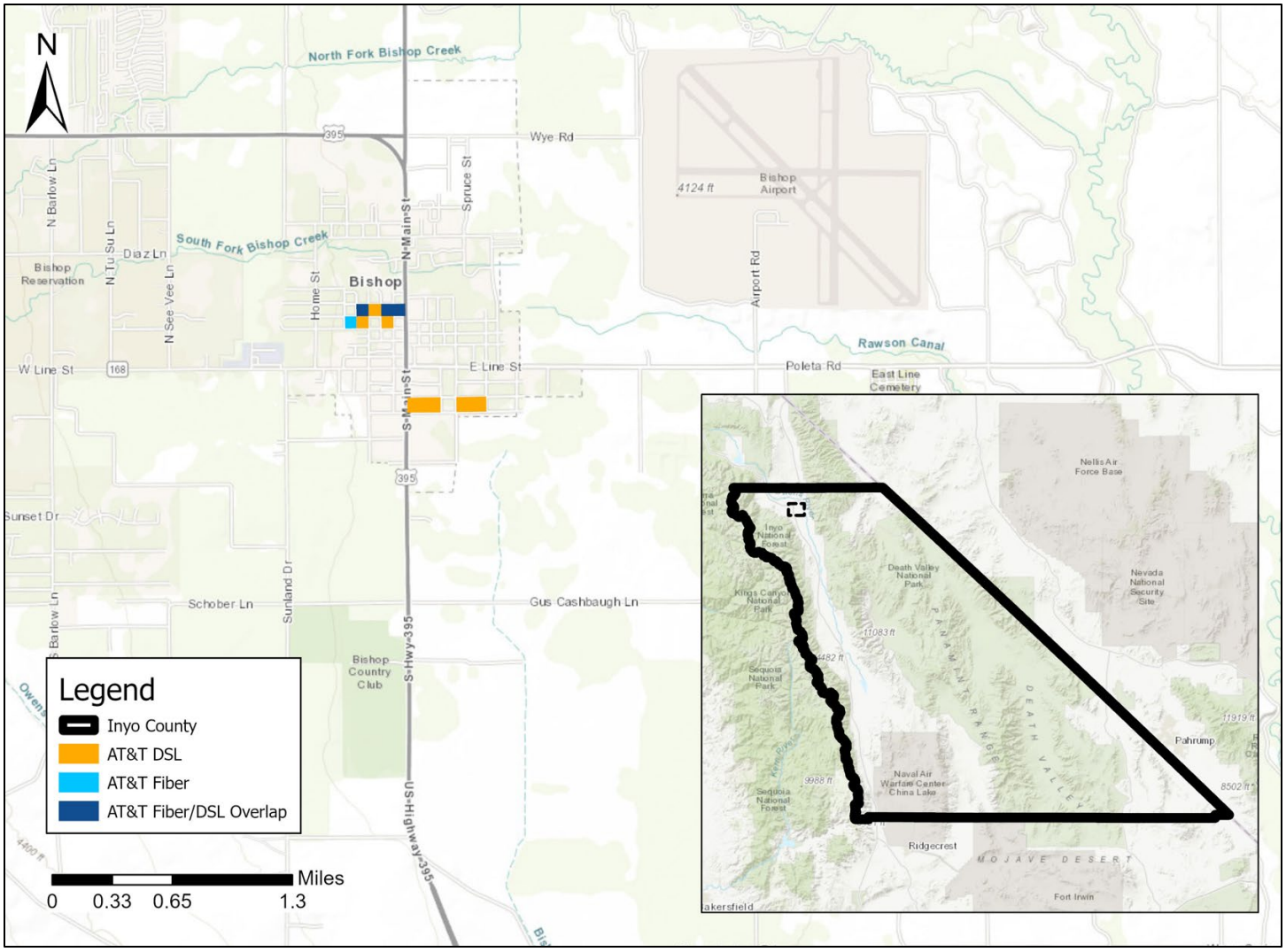
**Figure 25: Frontier Service Availability by Technology**




Frontier is pursuing funding opportunities more aggressively than other providers that serve Inyo County, submitting three applications to the most recent FFA funding cycle for projects within the county. These project areas propose to serve Aspendell in the northwestern corner of the county, west of Lone Pine, and through Lone Pine itself. If Frontier's Inyo-exclusive projects are awarded, an additional 706 locations in these areas will have access to the provider's fiber service.

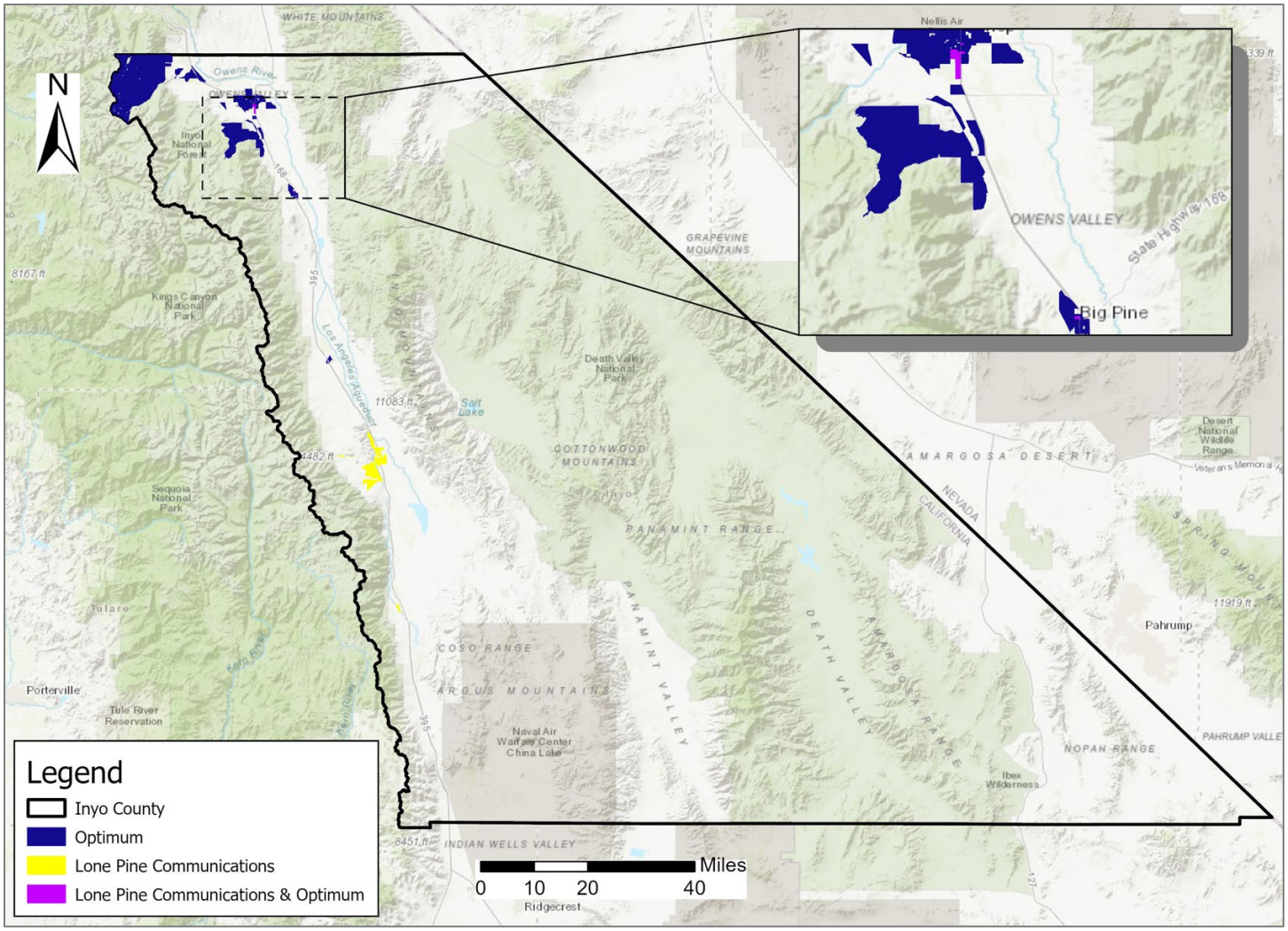
Frontier is also in one of the best positions to reach areas in the western portion of the county that appear eligible for the BEAD program, such as in and around Olancha, Alabama Hills, Lone Pine. Additionally, if Frontier's FFA application to serve Aspendell or Lone Pine are not selected for award, this area will remain eligible for the BEAD program.

**Figure 26: AT&T Service Availability by Technology**




While AT&T is said to provide telephone service in the southeastern part of the County, including in Tecopa, Shoshone, and Furnace Creek, their reported broadband service area is much smaller. Both AT&T's fiber and DSL service areas are limited to a few census blocks in Bishop, in northwestern Inyo County. AT&T's fiber is available to just six locations in Bishop, while the provider's DSL network reaches 11. In most other counties included in this study, AT&T applied to the FFA program to install fiber in and beyond the provider's existing service areas. Inyo County is a notable exception to this trend, with only Frontier applying to this funding opportunity. While AT&T is not currently proposing projects in Inyo County, the provider is typically engaged, appears to stay abreast of relevant funding opportunities, and may be developing projects for future applications to the upcoming BEAD program. AT&T could consider reaching locations near Aspendell in the northwestern corner of the county that appear eligible for BEAD funding if Frontier's application to the FFA program to serve this area is not selected for award. While not directly adjacent to AT&T's existing service area, such a project could serve as AT&T's main entry into Inyo's residential internet market.

**Figure 27: Cable Service Availability by Technology**




Both Optimum and Lone Pine Communications offer cable service in some areas of Inyo County. Optimum claims to reach 5,077 locations in north Inyo, including Big Pine, Independence, Bishop, Rovana, and Mount Morgan. Lone Pine Communications, on the other hand, offers cable services to just 370 households in Lone Pine, the provider's namesake, and once census block in south Bishop.

Both providers could consider upgrading the speeds their networks deliver to end-users by purchasing more bandwidth from transport service providers introduced through the state's planned middle mile network along US 395. These services will likely be less costly than the transport options currently available, as the state's middle mile network introduces greater competition into the market. However, the speeds each provider is able to deliver are also limited by the cable technology each uses. Upgrading to DOCSIS 3.1, or 4.0, where feasible, should be encouraged if not already in use. The state middle mile network will also bring substantially more backhaul capacity into their service areas, so if backhaul limitations were one of the reasons the networks had not yet been upgraded, these ISPs will finally have the opportunity to bring high-speed broadband services to their customers.

While the BEAD program heavily favors projects that will deploy fiber, Optimum or Frontier could consider pivoting to this technology in the county.[100] If the providers pursue this opportunity, Lone Pine Communications' existing service footprint contains BEAD-eligible areas, suggesting that the provider's cable may not serve all addresses within these census blocks. Lone Pine Communications could consider applying to the BEAD program for support to reach these locations, though the provider may have to cultivate internal capacity to deploy and offer fiber services if it is to pursue this route. Similarly, Optimum could consider applying to BEAD to reach locations near Aspendell in the northwestern corner of the county. However, both areas will only remain eligible for the program if Frontier's applications to the FFA do not receive an award.

### ■ Fixed Wireless Availability

In those areas not covered by fiber, cable, or DSL, fixed wireless services have offered a vital source of connectivity to a reported 469 households and a competitive option to even more. Indeed, with wireless speeds of at least 100/20 Mbps offered to 5.1 percent of the county, fixed wireless services are currently reported to be the only source of broadband at those speeds for 339 households. The table below identifies the portion of households across Inyo County receiving fixed wireless services at three key speeds.[101]

**Table 17: Fixed Wireless Service Availability in Inyo County**

| Households (HHs) – 9,468 Total | 25/3 Mbps | 50/5 Mbps | 100/20 Mbps |
|---|---|---|---|
| **HHs served by any tech** | 67.9% (6,433) | 65.1% (6,167) | 19.6% (1,854) |
| **HHs served by fixed wireless** | 11.9% (1,125) | 5.1% (482) | 5.1% (479) |
| **HHs served by only fixed wireless at speed** | 5.0% (469) | 2.8% (264) | 3.6% (339) |

While this coverage has likely been a vital lifeline for those who use it, it does mean that locations served by wireless services at speeds of 100/20 Mbps are not eligible for BEAD funding. Similarly, areas served by only fixed wireless at speeds between 25/3 Mbps and 100/20 Mbps will be considered underserved, placing them after the unserved areas in terms of the program's priorities. As a result, locations served by only fixed wireless at these speeds will likely remain in need of wireline solutions to achieve higher service speeds now available to a vast majority of Californians.[102]

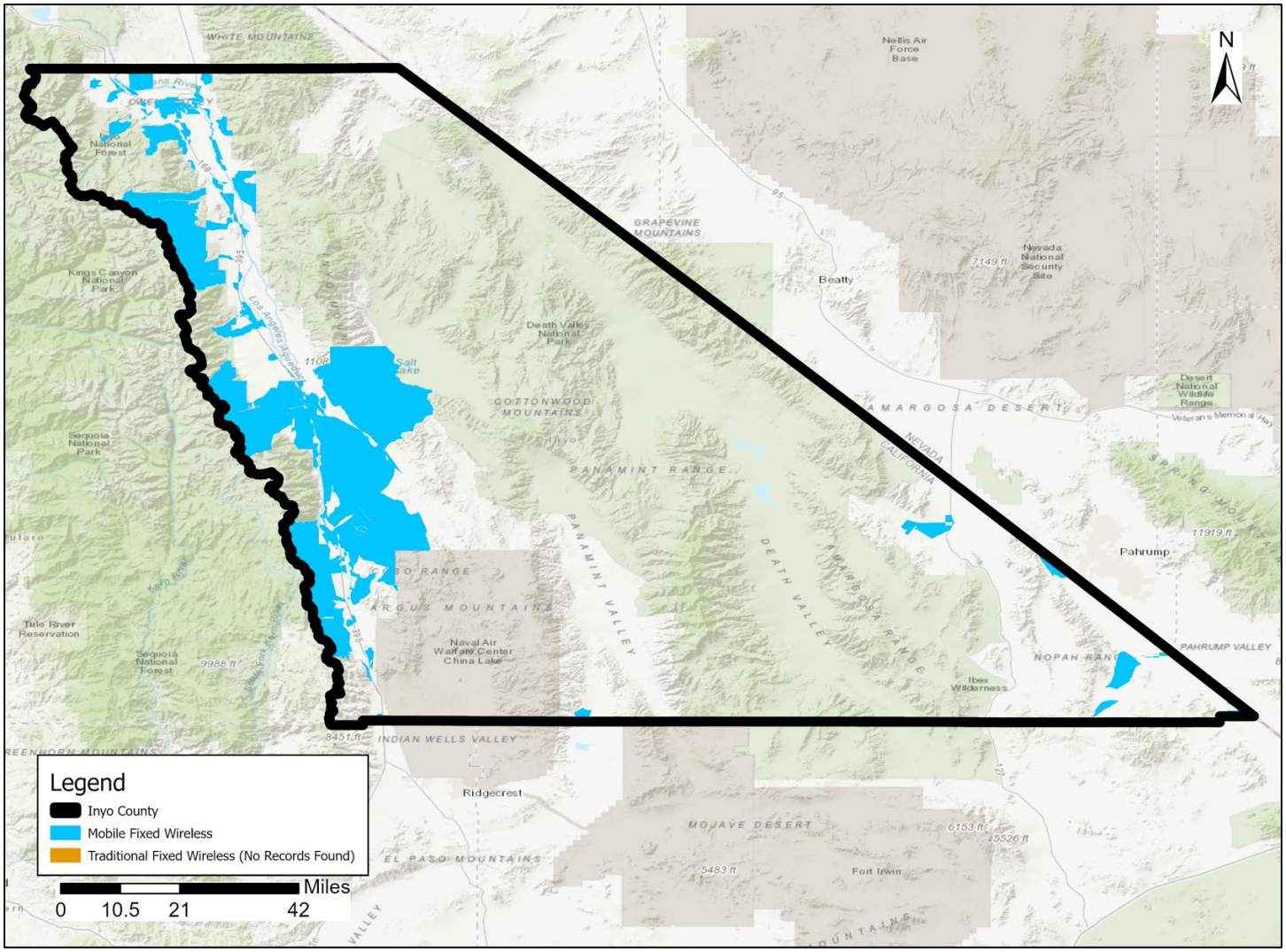
The map below shows census blocks that fixed wireless providers claim to cover. If locations are not in fact served by these fixed wireless services, they should be among the most important places to participate in the various challenge processes discussed in subsection 6.4. Fixed wireless service areas are somewhat difficult to predict and model with certainty, so wireless ISPs can sometimes report that services are available to locations when the local geography hinders connectivity. These errors can prevent locations in need of broadband funding from being eligible for it, so the challenge processes play an important role to ensure that fixed wireless service areas are correctly understood by the CPUC and FCC.

[100] Optimum claims to provide fiber in certain areas, but Lone Pine exclusively offers cable. Procedurally, the BEAD program does allow a non-fiber project to be funded if the location in need does not receive any fiber deployment proposals, so they may participate in later BEAD application rounds in some instances.

[101] Note that the FCC data and some service maps will express service coverage at lower speeds than the FCC's current minimum definition of broadband. For example, the FCC reports that 69.8 percent of households can receive at least some fixed wireless signal, and 11.9 percent can receive services achieving at least 10/1 Mbps.

[102] The FCC data contains nearly no claims of fixed wireless services offering speeds of 250/25 Mbps, which is the next speed tier tracked by their data.

**Figure 28: Fixed and Mobile Wireless Deployments**




The above map reflects the reporting that 69.8 percent or 6,605 households are served by some form of fixed wireless. As the information in the table above shows, there are pockets of the county where fixed wireless service can achieve speeds over 100/20 Mbps as well. However, similar to DSL, these technologies struggle to offer any faster speeds in a cost-effective manner, generally either requiring 5G transmitters connected to fiber routes to be placed close to home users or significant spectrum allocations per user that limit the number of possible users.

Mobile service providers such as AT&T, Verizon, and T-Mobile can now use their wireless facilities to offer dedicated home broadband services that compete with the traditional fixed wireless companies, a strategy now reflected in the FCC data. Unfortunately, just like the traditional wireless service areas, these mobile fixed service areas can be considered "served" under the rules of some of the grant programs, so they may not be eligible for BEAD and other wireline network deployment funding opportunities.

# 4.3 ISP Survey Review

*For context about the methodology of the survey, see Section 3. For a full list of the survey results, see Appendix A.*

**Internet Service Provider Survey Findings - Summary**

Out of all 88 providers contacted, there were only 12 responses in total. The majority (10) were fixed wireless providers, with 4 fiber, 2 cable, 1 copper. Many of these companies provide additional services, such as Voice-over-IP phone services, colocation, IP video, and many other managed connectivity-based services. Many seek to expand their service area, but most notably, 3 fixed wireless providers aim to expand their offerings into the fiber market.

The majority of these respondents have not been awarded grant funding, and do not expect to receive any. There are 2 companies that have active applications in for California Advanced Services Fund (CASF) areas and a USDA Community Connect grant, but those are still in progress. All but one have stated that they are willing to work with local, state, and federal entities to develop more infrastructure. The most common barriers to expansion that they have identified are the lack of middle mile fiber available, funding, difficulties permitting new towers or obtaining space on existing towers, and geographic barriers. Build cost and supply chain issues were stated to be additional difficulties faced by these respondents, with a common thread being prohibitive ROI for rural deployments.

When asked about current partnerships, there were varying degrees of activity, with some having unofficial, working relationships with school boards, housing authorities, and other government utility organizations, but the remaining claiming that they have not had a suitable opportunity, have not been approached, or prefer not to because it allows them to deploy faster without having to provide a cost share model. Regardless, all have answered yes to being interested in partnering financially with state, county, and federal organizations.

**Internet Service Provider Survey Findings – County Specific**

For Inyo County, in total there were four active ISP respondents to our ESRI 123 ISP survey.

1. **Lone Pine Communications**

1. **LV.Net**

2. **Succeed.Net**

3. **Valley Internet**

**Table 18: ISP Survey Results (Toughest aspects of rural deployment)**

| Response | Count | Percentage |
|---|---|---|
| **Permitting-Municipal** | 1 | 25% |
| **Permitting-County** | 3 | 75% |
| **Permitting-State** | 0 | 0% |
| **Prohibitive build cost** | 3 | 75% |
| **Lack of access to middle mile infrastructure** | 1 | 25% |
| **Supply chain issues** | 1 | 25% |
| **Skilled labor** | 1 | 25% |
| **Maintaining affordability to the consumers** | 2 | 50% |
| **Other** | 0 | 0% |

SECTION

# 05

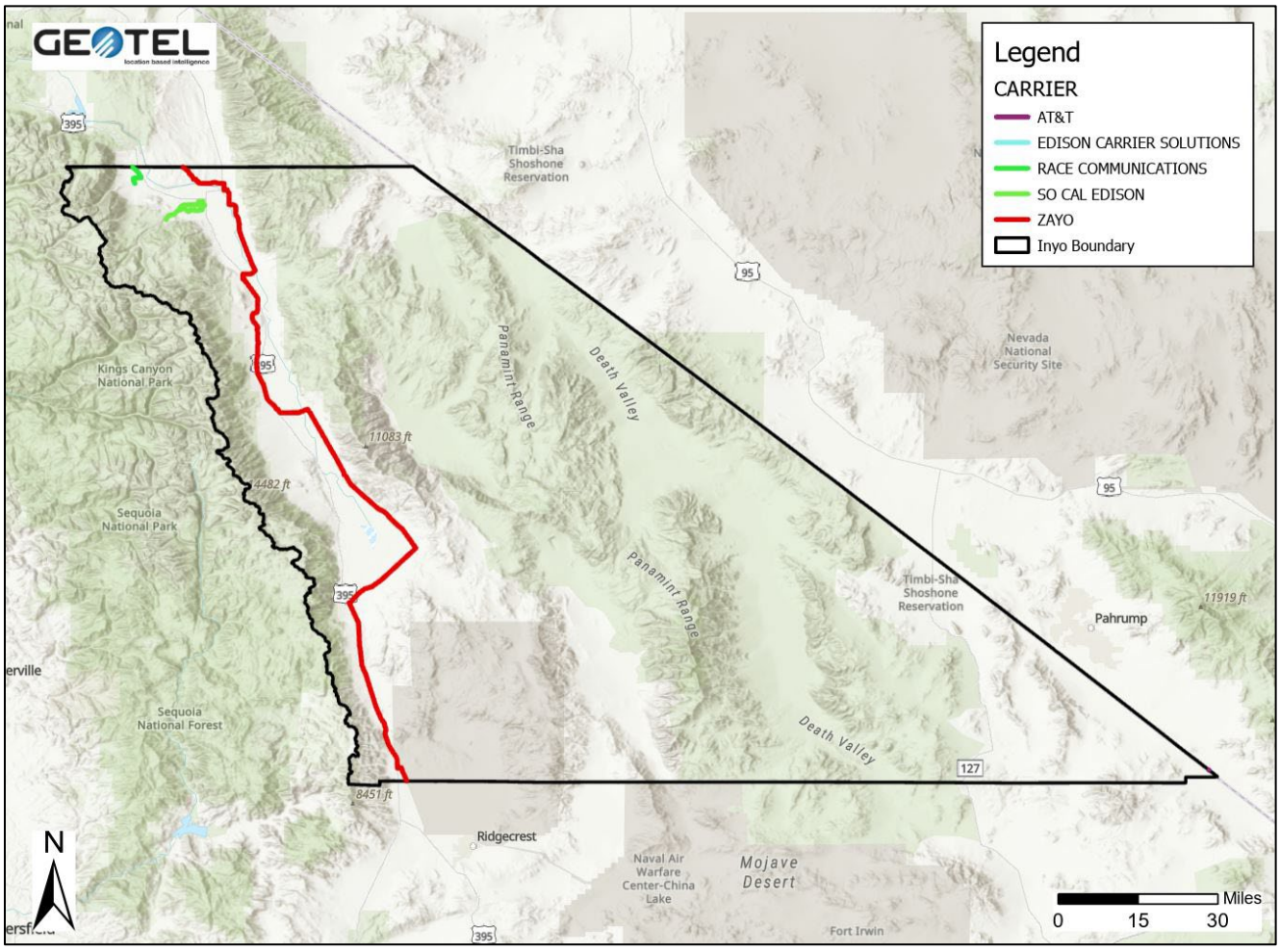
# ASSET INVENTORY AND GAP ANALYSIS

This section explores the currently available broadband infrastructure within Inyo County, including public assets that could potentially be leveraged for expansion. It also provides a gap analysis to highlight areas of need currently lacking sufficient connectivity. This inventory of existing infrastructure assets serves as the foundation upon which any broadband expansion initiatives can be built. In turn, the gap analysis will help identify the disparities between current infrastructure and the broadband connectivity goals recommended here, providing valuable insights into the steps required to bridge these gaps and pave the way for enhanced digital connectivity and economic growth. GIS layers depicted in this section are packaged as an additional deliverable together with this document, in order to empower the county with data that can be used for decision making when prioritizing areas for grant-funded deployments through cooperation or partnerships with ISPs.

# 5.1 Middle-Mile Fiber Route Inventory

Middle mile fiber infrastructure provides high-capacity bandwidth and data communications from an aggregation point, such as a central office or cable headend, to a fiber point-of-presence (PoP). Access to adequate middle mile infrastructure is a major determinant of the feasibility of last mile broadband infrastructure projects and the basis from which wireline and fixed wireless services are offered to customers.

**Figure 29: County Middle-Mile Carriers**



This preceding map depicts the carriers who have middle-mile infrastructure in Inyo County. The listed carriers are as follows: Allstream, AT&T, Edison Carrier Solutions, Race Communications and Zayo. These fiber-optic carriers do not publish, report, or make their routes available publicly, so information about the routes was acquired from GeoTel, a geospatial data provider that continually updates its database of middle mile carrier routes. The data provides a limited number of details, such as whether the fiber is "off-road", "on-road", or running concurrently with a "railroad." These designations roughly approximate which routes are aerial or in rights-of-way but are not conclusive in some cases.

Middle mile fiber deployments run through main city centers, towns, and unincorporated communities. Overlaid on the population density heatmap, the routes hit every noticeable pocket. Rural last mile networks deployed to reach unserved broadband-serviceable locations (BSLs) may be able to interconnect with these middle mile fiber routes, providing the ability to scale up service offerings over time as household bandwidth demands continue to increase. However, existing middle mile fiber is not always accessible for interconnection at a location convenient for a last mile network.

The following table shows the middle mile carriers that provide dark fiber and datacenter/colocation services, which will allow for providers to weigh their backbone connectivity options when expanding into un- and underserved areas.

**Table 19: Middle-Mile Carrier Service Offerings**

| Carrier | Dark Fiber | Data Center and Colocation |
|---|---|---|
| **AT&T** | NO | YES |
| **Edison Carrier Solutions** | YES | YES |
| **Race Communications** | NO | YES |
| **Zayo** | YES | YES |

Dark fiber allows carriers to light and manage their own infrastructure at a fixed cost, being responsible for the equipment cost themselves. Dark fiber allows the carrier to scale up with their demand requirements through their own upgrades, compared with having to buy more bandwidth from their provider. This option might be more expensive for smaller businesses but is a better choice for carriers who need full control of their own network, have operation and management capabilities, and foresee that they will be using the infrastructure for the long-term, allowing them to lock into an Indefeasible Right of Use (IRU) contract to secure access to that dark fiber for 5, 10, or 20 years or more.

Data center connectivity, and by extension, collocation, can also provide advantages to providers and business alike. Carriers can lease space in data centers to house their electronics connecting this leased dark fiber, avoiding the need to have their own real estate to host servers and ensure reliability through backup power and redundancy. This type of connection also can provide the ability to collocate with other providers in an Internet Exchange Point (IXP), which allows for 'peering' with other networks, reducing latency by keeping internet originating traffic as local and redundant as geographically possible.[103] This geographical redundancy enhances the resilience of the network, ensuring that users experience consistent and reliable internet services. Moreover, data center colocation extends additional advantages to businesses, enabling them to leverage data center facilities to host their critical infrastructure, benefiting from the same secure, scalable, and well-connected

[103] Netrality, "Internet Exchanges: The Glue That Holds the Internet Together," https://netrality.com/data-centers/internet-exchanges-the-glue-that-holds-the-internet-together/, accessed September 2023.

environment. As a result, they can focus their resources on core operations, while the data center experts handle the complexities of infrastructure management, security, and compliance.

In essence, data center connectivity and colocation services create a symbiotic relationship that bolsters the performance and reach of carriers while providing a solid foundation for businesses to thrive and scale up as required. Together, they form a critical part of the strategy required for both carriers and business to expand their enterprises.

## 5.2 Additional Inventory of County Assets

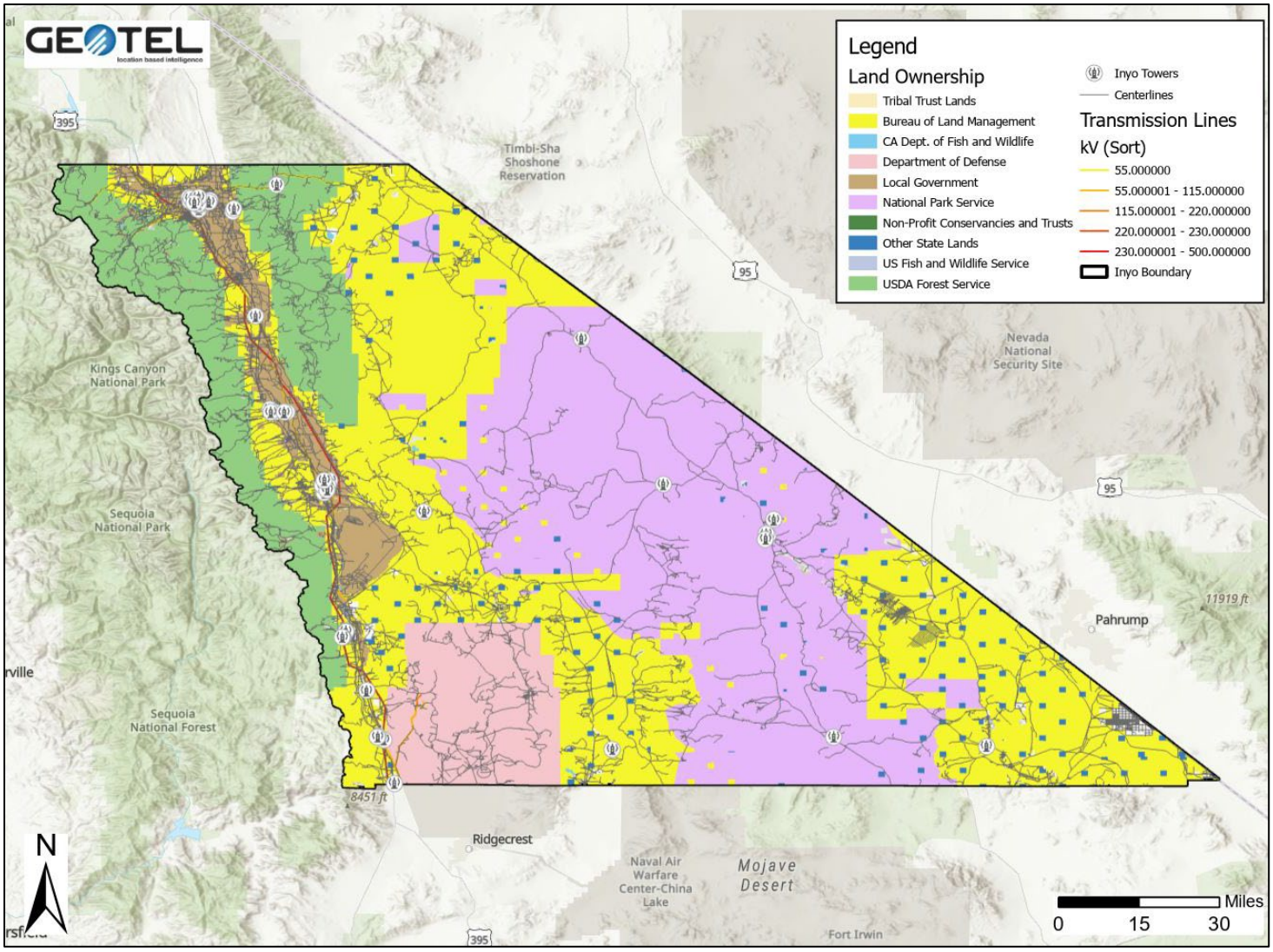
To expand broadband services efficiently, ISPs must collaborate with local authorities to access and utilize publicly owned resources that may either be essential to the deployment or significantly reduce deployment costs. Local governments can use their assets to encourage interested ISPs to work with them, serving as a basis to develop coordination agreements or partnerships that will allow the municipality to influence the deployment area and other factors.

The following map is a starting point for municipalities to create inventories of available assets, establish processes to lease them to ISPs, and develop asset access agreements. ISPs can lease assets used for co-locating or installing various broadband-related infrastructure components such as antennas, towers, buildings, and substations, underground conduits, fiber optics, spectrum resources and land and space resources such as public rights-of-way and land parcels. ISPs that would benefit from access to several of these asset categories may also be very interested in a partnership, which will improve coordination further and enhance the availability of cutting-edge broadband infrastructure and services across the region, benefiting households, enterprises, agriculture, and industry.

To plan deployments in areas of need, ISPs and municipalities must consider land ownership, registered towers, and electric transmission lines. Utilizing existing towers can facilitate cost-effective co-location of fixed and mobile broadband equipment, enabling last mile wireless service or providing backhaul to remote locations and facilitating nearby wireline deployments. In cases where no nearby towers are available, ISPs can consider constructing a new tower on publicly owned city or county land, preferably within the footprint of an energy utility. Locations near transmission lines and substations can make more appealing development locations, offering a clear party to contract with and often power for broadband huts or nodes.

An inventory of towers and available space can also assist fixed wireless partnerships, which will be crucial to serve the most remote locations in the county. Free tools, such as Cambium LinkPlanner, can show tower path quality by using LiDAR data depicting potential obstructions between two points or modeling non-line-of-sight (LoS) deployments using the CBRS spectrum. These materials are made available in the additional GIS deliverables, with key details presented below.

**Figure 30: Assets to Leverage for Infrastructure Deployments (Depiction of contents of GIS Package)**




New broadband infrastructure must be designed with a forward-looking approach, capable of accommodating the expected growth in demand in the targeted areas. Shared infrastructure solutions should be explored to reduce costs and better leverage resources. For example, Section 7 explores the 'dig-once' coordination efforts Caltrans introduced with traffic projects that can enable opportunities to lay conduit concurrently, saving time and resources in the case of future expansion.

## 5.2.1 CALTRANS Alignment and Golden State Net Middle Mile Project

As mandated by California Assembly Bill 1549 (2016)[104] the California Department of Transportation (Caltrans) was tasked to inform broadband deployment organizations about transportation projects suitable for broadband installation through its website. This notification occurs during the planning phase of specific highway construction projects led by Caltrans, who

[104]"California Assembly Bill AB-1549," California State Legislature, http://www.leginfo.ca.gov/pub/15-16/bill/asm/ab_1501-1550/ab_1549_bill_20160630_amended_sen_v93.htm, Section 1, subsec. C (accessed September 2023).

regularly update their website with GIS layers of active, planned, and completed road projects of all types. Upon receiving notification from Caltrans, broadband deployment organizations can partner with Caltrans to incorporate the installation of broadband conduit into the project, if the project type aligns with this type of work.

Since this legislation was initially passed, Caltrans has made great strides working in conjunction with Golden State Net (GSN) to use these priority corridors in the deployment of a state-wide middle mile network.[105] In July of 2021, the California State Legislature passed Senate Bill 156, which allocated $3.25 billion toward the construction of an open access middle mile network that would provide many areas without adequate access to essential middle mile with the connectivity they need to build or expand networks to unserved and underserved communities.[106] California has a robust state-wide research and education middle mile network known as CalREN, provided by the Corporation for Education Network Initiatives in California (CENIC). This organization formed GSN, which California Department of Technology (CDT) approved to be the third-party administrator for the open access middle mile network created by SB 156.[107] On June 30, 2023, NTIA announced that CDT and, by extension, GSN, were awarded a further $73 million from the NTIA's middle mile grant program to fund construction activities for the proposed state-wide network and run 288-count fiber across California.[108]

The middle mile network comes together from a patchwork of different approaches. Many of the routes through the Sacramento Valley are leased from existing providers, while the portion of I-5 from Alpine to Los Angeles was purchased outright. The remaining routes are categorized as joint builds, and many of the spokes placed to provide service to un- and underserved communities will be new construction from GSN. The open access nature of this infrastructure can make it appealing for new providers, facilitating entry into existing markets to directly compete with or outperform incumbents.

For any routes not captured by this project, or even small laterals that would be required in Inyo County to reach remote locations, AB 1549 also addresses guidelines to streamline the process of installing broadband conduit through these proposed project ROWs. According to these guidelines, broadband stakeholders have two approaches:[109]

- **Stand-alone Encroachment Permit Project:** This option is suitable for broadband deployment entities that prefer to independently manage the planning, design, and installation of their conduit, utilizing contractors of their choice.
- **Planned Transportation Partnering Project:** For broadband deployment entities desiring closer cooperation with Caltrans throughout the planning, design, and installation phases of the conduit, they can opt for a planned transportation partnering project.

In both scenarios, broadband stakeholders must obtain encroachment permits before proceeding with the installation of broadband conduits. This strategy can be used by providers to expand their service into available parts of the county.

To keep up with Caltrans project progress updates, follow this link to the CA.gov website: https://dot.ca.gov/programs/asset-management/caltrans-project-portal.

For updates on the Middle Mile Broadband Initiative, visit this link: https://site-cammbi.hub.arcgis.com/pages/statewide-middle mile-network-map

---

[105] "GSN Statewide System Level Design," California Department of Technology, https://cdt.ca.gov/wp-content/uploads/2022/04/GSN-Statewide-System-Level-Design-04222022.pdf (accessed September 2023).

[106] California SB 156 (2021-2022 Regular Session), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB156.

[107] Golden State Net, "About CENIC California Middle Mile Broadband Initiative, LLC dba GOLDENSTATENET," https://goldenstatenet.org/about, accessed October 2023.

[108] California Department of Technology, "California Department of Technology Secures $73 Million Grant for Middle mile Broadband Initiative," June 30, 2023, https://techblog.cdt.ca.gov/2023/06/california-department-of-technology-secures-73-million-grant-for-middle mile-broadband-initiative/.

[109] California Department of Transportation, "Encroachment Permits Application Guide Utility Booklet," section 603.2A-1 (Wired Broadband Facility Installation Processes), revised July 2022, https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/encroachment-permits/chapter-6-ada-a11y.pdf.

# 5.3 Broadband Gap Analysis

The purpose of this section is to detail the areas of Inyo County in need of strategies to address lack of high-speed broadband access.

## 5.3.1 Discussion of County Network Design Process and Expansion Considerations

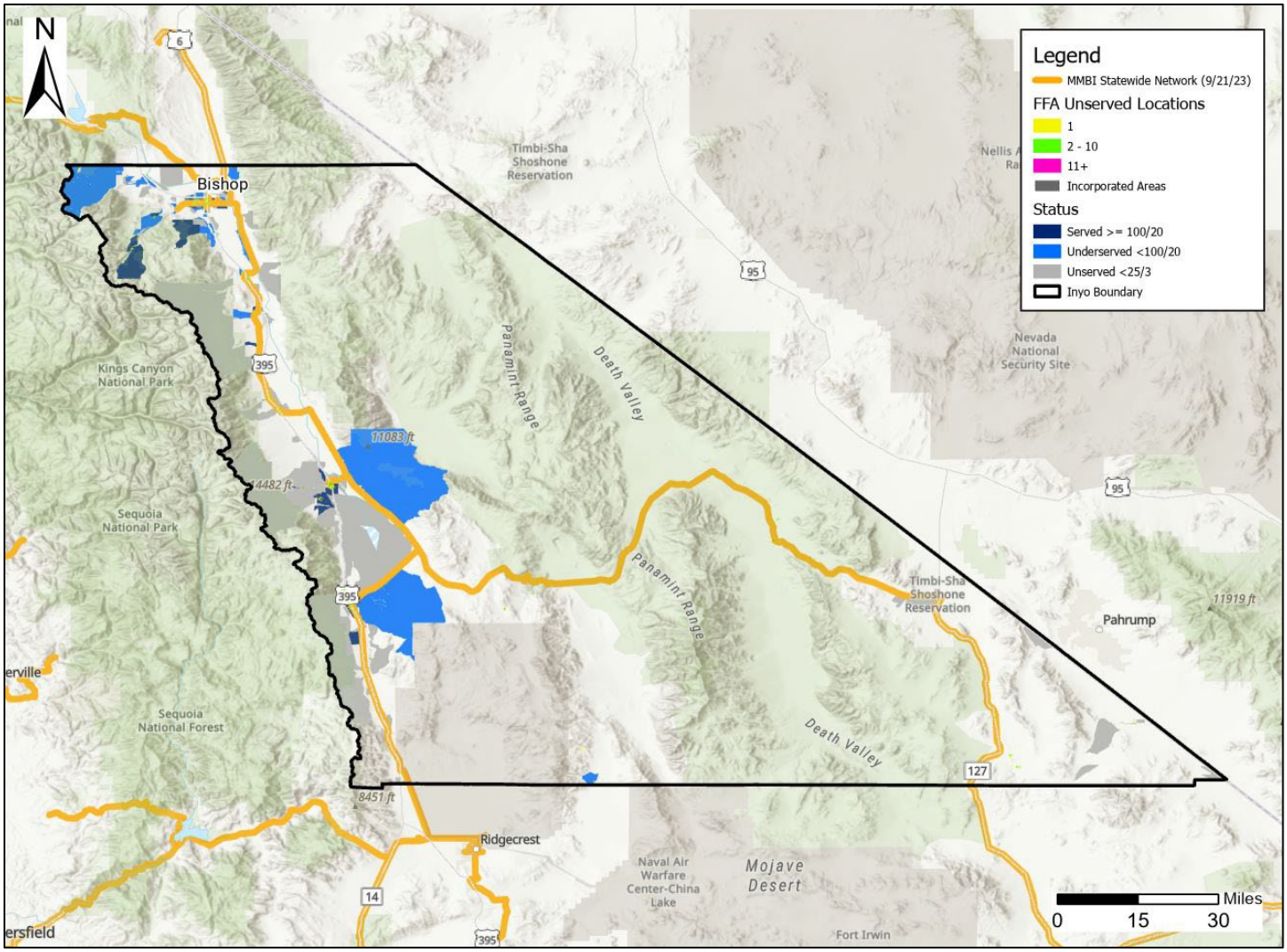
This study was requested by the Golden State Financing Authority (GSFA) and is accompanied by a parallel effort by Tilson with the Golden State Connect Authority (GSCA), both under the umbrella of the Rural County Representatives of California (RCRC). Under this initiative, a number of RCRC counties received strategic plans and high-level designs for robust fiber networks for various jurisdictions under RCRC that were awarded a LATA (Local Agency Technical Assistance) grant. Tilson was directed to collaborate with UTOPIA (Utah Telecommunication Open Infrastructure Agency), acting as the engineering manager, to guide Tilson with engineering standards and cost estimate assumptions. Tilson was provided various engineering deliverables, such as a conceptual network design, a subsequent refined high-level design, and a limited low-level design, with the end goal of creating shovel-ready network designs. These three key deliverables are intended to identify and estimate constructable project areas that maximize various funding opportunities available now and in the future.

- **Conceptual Network Design**

The conceptual design (CD) is an all-encompassing network design that provides connectivity to every household within the LATA awardee's unincorporated jurisdiction, with the exclusion of incorporated cities (unless otherwise specified). Using publicly available address and road databases, Tilson created serviceable address lists for all counties to use as inputs for the automated fiber design software, Biarri FOND. This program enables Tilson's engineering team to customize and optimize wireline broadband network designs by using the centerline layer and address point layer to run a network analysis and generate complete fiber designs using a set of parameters and requirements. For this specific program, UTOPIA dictated that the designs would be based on an Active Ethernet deployment that terminates a fiber cable to the end premise, offering a 'best-case scenario' in terms of deployable speed compared to a PON architecture. Tilson designed around this parameter as specified by UTOPIA and developed a bill of materials (BOM) from FOND's proposed designs and engineers' reviews and manual adjustments. After producing these designs, Tilson engineers perform a high-level quality check (QC) of the network design as well. Following design completion, the engineers passed along the BOM to a financial analyst who integrates it into a financial model to produce build cost projections. The build cost projections include a breakdown of the entire network infrastructure build and key evaluation metrics, such as the cost per mile and cost per passing. The results of this work product are a conceptual network design and high-level build cost projections to every unincorporated serviceable location across the county.

The design documents have been made available to the GSFA, and municipalities are encouraged to work with it and the GSCA to develop additional deployment plans and partnerships.

**Figure 31: FFA-Eligible Locations and GSN/CDT State Middle Mile**




Unserved areas are color-coded to reflect the number of eligible locations in that area. Points containing two to ten FFA eligible unserved locations are green; areas with more than 11 are magenta, and areas with only one FFA unserved passing are yellow. The former illustrates clusters for more concentrated areas that can be appealing to ISPs for completely new expansion, while the latter shows both remote passings that require long drops, low density passings, or potentially BDC mapping errors.

Additionally, because two serviceability datasets are presented here, different information can be gleaned from their combinations. Primarily, the FFA points may highlight partially unserved census blocks, illustrating the tendency for census block-level reporting to obfuscate these individual locations. When high density FFA-eligible clusters are found in areas in lighter blue shade (designated “Served < 100/20”), the area is likely to rely primarily on fixed wireless service or legacy cable infrastructure. In the dark blue, ”Served >= 100/20” areas can also be subject to these technologies but at a higher service standard, due to their proximity to PoPs, suffering from overstating of speeds from wireless providers, or cherry picking from cable operators. The latter is well poised for incumbent expansion, especially with access to the new state middle mile routes. The limitations of both of these technologies, discussed in Section 2, make these dense clusters into prime targets for modern wireline infrastructure deployments.

Priority areas should have high middle mile traffic and close proximity to central offices, lit equipment, and in most cases, adequate service offerings such as fiber access, so the strategy to reach dense unserved pockets in these cases revolves

around addressing *islanding*, where unserved locations are surrounded by otherwise served locations. In most of these instances, partnerships and subsidies should typically be sought to alleviate these issues via the incumbents' service. Frontier is the prime candidate to adopt this approach due to their fiber presence and DSL network that is near planned state middle mile, especially in the areas of Big Pine, Lone Pine, Fish Springs, and Olancha. Additionally, middle mile fiber will have to be run to Aspendell in the West, being the densest area in Inyo in need of any modern wireline. The cable providers Lone Pine Communications and Optimum should also consider leveraging these new facilities and looking for subsidies to expand their network to the areas in and around Bishop that still need service. Frontier is the prime candidate for this expansion with the biggest reach in Inyo, and active FFA applications to accomplish just that.

The middle mile can enable existing companies to expand, as well as enabling new market entrants to introduce infrastructure in these markets much more cheaply. Areas close to this planned middle mile such as Park Village and Indian Village in Death Valley, or Tecopa, are well poised for this style of expansion.

Fixed wireless is the remaining technology in the county and can be used to address any areas that are low-density outliers. Thanks to the state middle mile, these existing systems can benefit from a fiber PoP at the tower site to enable much greater speeds than previously seen. To serve the pocket of unserved in Homewood Canyon, an ISP will have to construct approximately 25 miles of fiber down Trona Wildrose Road. This effort may require collaboration between Kern and Inyo Counties. Otherwise, a fixed wireless deployment would create significant cost-avoidance to this approach.

Through looking at the asset inventory layer, there does seem to be potential opportunity in the availability of land publicly owned by the Bureau of Land Management (BLM), who have expressed interest in making their managed lands available for the purposes of broadband expansion. Through the use of repeater sites that are close to the middle mile, fixed wireless service could be modernized through the use of clever repeater site deployments by way of navigating the elevation changes.

Ultimately, expansions will be strategic decisions based on the identified needs of Inyo County, the funding opportunities for unserved and underserved locations, improved access to middle mile infrastructure, and each ISP's willingness to build in these areas. However, there is a fundamental tension at the core of this decision-making. Should the expansion strategy focus on achieving fiber connectivity to even the most remote locations, essentially focusing on near universal high-speed wireline connectivity as the region's long-term "endgame," or should developers simply focus on the "low-hanging fruit," performing the least costly upgrades and expansions to the most locations as quickly as possible?

This tension is reflected in several questions of priority. Should remote areas with the greatest need be targeted, or should clusters near new middle mile routes be prioritized because they will be less costly to connect? Does fixed wireless sufficiently solve remote locations' connectivity problems enough to shift focus toward upgrading more underserved locations to fiber, or should more costly wireline expansions to remote locations unserved by wireline still be prioritized, despite having access to fixed wireless services exceeding minimum broadband speed standards? All of these options have their merit. However, when examining the tradeoffs between these different strategies, funding opportunities will largely determine where providers, both new and existing, will focus their efforts.

And with each opportunity having their own guidelines, standards, limitations, and considerations, a firm understanding of the nuances of each is required to plan accordingly. Section 6 dives into these existing and upcoming funding programs in detail.

SECTION

# 06

# BROADBAND FUNDING STRATEGIES

California's broadband funding landscape has improved dramatically since 2020, providing an unprecedented amount of funding to finally connect California's most remote or challenging unserved and underserved areas. Over the next few years, the California Public Utilities Commission (CPUC) will award approximately $4 billion to support broadband projects to connect households and businesses that lack access to reliable services offering speeds of at least 25/3 Mbps.[110] Combined with additional federal broadband funding opportunities, California counties and municipalities now have access to a wide range of funding options to address the digital divide.

With this abundance of deployment funding options, regional, county, and local governments now face two broadband planning challenges. First, these public entities may need to work with ISPs or qualified public partners to **develop grant-eligible broadband deployment projects** that will make the best use of funding opportunities to meet the specific connectivity needs of their communities. Second, as historically unserved areas are finally connected to high-speed broadband networks, these communities will face new digital equity challenges. Some people are unable to adopt broadband services for financial reasons, while others lack the digital devices or skills necessary to take full advantage of the internet. Public entities should **develop or support funding-eligible broadband adoption and digital skills programs** using new funding opportunities designed to help everyone experience the economic and quality-of-life benefits of modern broadband. The county and municipalities must work with local community anchor institutions (CAIs) to understand how they already have been addressing these connectivity challenges and how the range of funding programs can be used to improve these efforts.

While Section 8 will examine funding opportunities that support digital equity, this section will focus on programs that will shape future network deployments. The aim of this overview is to empower Inyo County and its municipalities to become involved in the planning and deployment process by working with interested ISPs and qualified public partners to facilitate better connectivity in their own communities. Critical considerations for public sector entities participating in these processes include:

1. An understanding of the level of effort required to submit a grant application to a broadband infrastructure funding program,
2. An understanding of coordination and partnership opportunities between public entities and ISPs or qualified public partners,
3. The range of available funding options, and how they relate to connectivity needs within Inyo County, as well as each program's eligible location criteria and requirements for matching funds,
4. The methods to ensure that unserved locations are eligible for funding by challenging broadband map inaccuracies,
5. The implementation of broadband deployment-friendly local permitting and policy environments that will reduce deployment costs and encourage ISP investment.

Subsection 6.1 ("Applying to a network deployment funding opportunity") provides an overview of the standard submission requirements for network deployment programs that prospective applicants should consider before preparing a proposal. This section also reviews the roles and responsibilities associated with network construction and operation to help public entities assess when coordination or a partnership between qualified local partners and either private or public Internet Service Providers (ISPs) may be in the project's best interest.

Subsection 6.2 ("Broadband deployment grant programs") then reviews the current, most applicable broadband deployment funding options available to Inyo County administered by either the CPUC or the federal government. Relevant CPUC

[110] The Last Mile Federal Funding Account, Broadband Infrastructure Account, and upcoming California Broadband Equity, Access, and Deployment (BEAD) program each consider different groups of technologies when defining "reliable" broadband at this speed. See Section 6.1 below.

opportunities include the Last Mile Federal Funding Account (FFA), Broadband Infrastructure Grant Account (BIA), and the upcoming Broadband Equity, Access, and Deployment (BEAD) Program.[111] As these three programs present the most logical future opportunities for Inyo County and its municipalities, this section explores approaches for maximizing each opportunity's impact. Discussion of additional federal funding programs, such as the United States Department of Agriculture (USDA) Rural Utility Service's (RUS) **ReConnect** program and the Universal Service Administrative Company's (USAC) **E-Rate Special Constructions Projects** program are included, as these opportunities may also play a role in a comprehensive solution to connect Inyo County.

However, as noted above, a grant award supporting network construction through an unconnected area is often only the first step to bringing an entire community online, and construction itself is not without its own challenges. Though a grant can help to make a project economically feasible, awardees may still need to issue debt in order to fulfill a program's matching funds requirement or, in the case of programs with a receipt reimbursement structure, supply necessary cash on-hand to support construction between award payments. As a network is constructed, individual houses may be too far from the street to be served by standard installation practices. Apartment complexes may not have sufficient in-building wiring to deliver suitable speeds to residents even if a high-speed network serves their building. Additionally, residents with limited experience online could need support learning to use the internet safely and to their benefit. Fortunately, programs offering funds to address these additional needs are increasingly common. Subsection 6.3 provides an overview of these deployment-based opportunities, while Section 8 discusses programs supporting achievement of digital equity goals.

Subsection 6.4 ("Mapping and challenge processes") will review how counties and municipalities can work to ensure that unserved locations are eligible for grant funding. Each of these last-mile funding programs requires that applicants rely upon broadband service availability information and maps from either the FCC or the State of California to demonstrate a given project falls within a grant program's criteria for eligible locations. However, not all locations are accurately classified as served on these maps. The county or a municipality may attempt to reclassify locations to make them eligible for funding if it is able to gather sufficient evidence that those locations are not served. These challenge processes can be used to combat self-reported and overly optimistic ISP claims of service availability, reliability, or performance, particularly for service provided over aging DSL systems and wireless systems. The county or municipality can implement a number of strategies that can gather this information to ensure residents connected by these subpar systems can be included in deployment planning during this unique and brief funding window.

Section 7 ("Fostering a healthy broadband deployment environment") will review how counties and municipalities can encourage ISPs to deploy networks to their historically underserved areas. Communities can choose to work closely with private ISPs to develop and support grant-eligible deployment projects by developing partnerships, or they may simply prefer to facilitate private investment by streamlining permitting, access to public rights-of-way, and other local administrative processes. Other states and municipalities across the nation have developed and adopted "Broadband-Ready Communities" policies and best practices to address local deployment policy issues, foster improved cooperation with ISPs, and potentially reduce local administrative costs as well.[112] This section will review policies and strategies that municipalities can adopt to improve cooperation and reduce the cost of network deployments.

[111] While NTIA administers the BEAD program at the national level, California and other states are responsible for developing and implementing programs to select subawards, who then construct networks conforming to the Infrastructure and Investment Jobs Act's statutory priorities.

[112] See, e.g., Next Century Cities, "Becoming Broadband Ready Toolkit," https://nextcenturycities.org/broadband-toolkit/, accessed September 19, 2023; Indiana Broadband Office, "Broadband Ready Communities," https://www.in.gov/indianabroadband/broadband-ready-communities-program/, accessed September 19, 2023; Georgia Department of Community Affairs, "Broadband Ready Community Designation," https://broadband.georgia.gov/general-information, accessed September 19, 2023.

# 6.1 Applying to a Network Deployment Funding Opportunity

Network deployment funding opportunities have become increasingly sophisticated over the past few years. Many require that applicants already have a project plan in place, with sufficient detail regarding how the network will be constructed, operated, and maintained with relevant partnership agreements already or near executed. This section provides prospective public-sector applicants an overview of necessary considerations to guide a network concept to a submission-ready project, such as:

- Developing an understanding of one's organizational capacity for network construction and operation
- Reviewing cooperation opportunities and partnership structures compatible with this capacity
- Creating and executing project plan and companion application submission plan

While preparing an application does require significant planning and effort, many programs request near-identical or similar materials. This similarity creates an advantage for well-organized applicants, who can develop a core set of materials relevant to most opportunities, reducing effort required to submit a particular application. The Appendix contains a review of the common elements of the most important funding programs, and other programs share many of these details.

While these planning requirements may occasionally seem daunting, qualified ISPs should have no problem developing these materials. Public entities should simply be aware of these requirements to ensure they can be involved when needed and help to shape certain decisions, particularly if they are contributing their own efforts and resources to project planning and deployment.

Additionally, in the event a project is not selected for funding, plans and materials can often be revised to meet another opportunities' requirements. Preparing grant applications should therefore be understood as an iterative process. Planning efforts and any coordination agreements or partnerships should be created with this flexibility in mind to minimize the burden of pivoting to future project iterations if needed.

### 6.1.1 Common Considerations for Deployment-Focused Funding Opportunities

Grant programs to fund network construction aim to maximize the number of households that will receive new or improved internet service. Typically, programs will limit locations eligible for funding to locations that do not receive a certain level of service, such as 25/3 Mbps or 100/20 Mbps in some instances. Many restrict the types of entities that can apply for funding or include certain ownership requirements and service obligations for the resulting network.

To improve the chances that an awarded project fulfills its intended purpose, grant programs typically require applicants to provide extensive materials demonstrating that a proposed network is well thought out, financially sustainable, and executable within a specified timeframe. Materials often include, but are not limited to, a network's high-level engineering and designs, financial projections, construction timelines, anticipated permits, and proof substantiating that an applicant has funds available to meet the program's matching funds requirement. Many opportunities also require proof that an applicant has resources to support activities between funding reimbursements, as is the case for the three California programs discussed later in this section. Funding programs also assess the financial standing of applicants and any partners to understand the risks that may come with an award, often by requesting historical and projected financial statements and

organization charts. Prospective applicants should expect to provide the following materials, at a minimum, when submitting proposals to grant programs funding network deployment:

**Table 20: Standard last-mile application areas and materials**

| | | |
|---|---|---|
| **Applicant and/or partnership information** | Organization charts | Historical financial statements |
| | Organization-wide financial projections | Partnership structure and supporting documentation (as applicable) |
| **Proof of project necessity** | Proof of project area level of service | Stakeholder letters of support |
| **Project Budget** | Detailed budgets aligned with network design | Proof of matching funds |
| **Network Construction Plan** | Network diagrams | Construction timeline |
| | Network routes and service area (.kmz or shapefiles) | Project and workforce plans |
| **Network Operation** | Project pro forma projections demonstrating sustainability | End customer service pricing |
| | Operations plan | Marketing plan |

In addition to these materials, many programs require narrative descriptions of key items justifying the proposal. The majority of opportunities also require an affidavit or certification by an authorized signatory of the lead applicant to prevent frivolous applications or inaccurate claims. Further discussion of these standard application materials can be found in Appendix B.

### 6.1.2 Organizational Capacity and Partnership Considerations

It is no small endeavor to execute a project plan to build, own, and operate a network. Aside from the effort required to prepare an application with detailed mapping, network designs, and financial projections, the role of constructing and operating the network requires significant and ongoing commitment and resources. While public entities may be attracted to the idea of serving their communities, many may not have the organizational capacity to handle the broad range of responsibilities that come with these roles. Responsibilities commonly associated with last-mile network deployment include:

- Management of contractors and project implementation,
- Securing funds to meet program match requirements,
- Maintaining cash reserves to fund project implementation,
- Performing ongoing operations, maintenance, and upgrades,
- Attracting and retaining customers

Partnerships and cooperation strategies with the private sector and qualified public partners can help projects be realized without placing undue burden on public entities committed to serving their constituents. While such partnerships can take

any form depending on each party's expertise, an increasingly common structure is that of public asset ownership with private operation. This structure can allow public entities the benefit of using the network for their internal operations, realizing revenue through leasing dark fiber stands, and the opportunity to influence end-user bandwidth and services in some circumstances through agreements with the ISP partner. On the other hand, the private partner gains new or improved access to a customer base and can easily scale up existing operations to support service provision to new end-users. Note that various elements of this model can be customized significantly and that other models that do not involve public ownership of any assets nevertheless share many considerations, making this model an excellent starting point to understand the range of possible public-private and public-public models.

### ■ Deployment Considerations for Public Ownership, Private Operation Partnership Model

Under this model, either the public entity or the ISP may produce high-level engineering and design and lead network construction, though ISPs typically fill this role, as most already have established relationships with contractors and vendors to purchase necessary materials and services. Either party may also hire a third-party contractor to perform some of these steps, overseeing this subcontractor's work and integrating it into the overall project. If the ISP partner oversees the design and manages construction, the public entity can still participate through asset contributions or processes that facilitate network deployment, such as access to poles, underground conduit, rights-of-way, and expedited permit approvals.[113] This arrangement places the risk of managing contractors and executing deployment within the project timeline on the ISP partner, who may be more experienced in this role.

Providing funds to meet a grant program's match requirement can fall to the private partner, the public entity, or both parties. However, these contributions can impact the relative influence each party has on project outcomes. For instance, if a public entity is providing a larger proportion of the match, it may use this leverage to influence which deployment routes and roads are chosen to be included in the project. For example, the public entity may require that the network reach additional locations that benefit the community if it provides a larger portion of matching funds. In contrast, if a private partner provides a larger portion of this match, it may not allow the public entity to retain ownership of the constructed assets. This latter option can be considered a distinct public-private partnership model, the **Public Investment in Private Infrastructure**, and still provides significant opportunity to shape the project but with less control over the infrastructure and services offered over it in the long-term.

Maintaining cash reserves on-hand to cover project implementation costs can be handled either by the private partner or public entity, though this is typically the responsibility of the party managing construction. As with the match, both parties may contribute, and the relative proportion of this contribution may give greater leverage over the project's service area and outcomes. However, risk associated with issuing debt or opportunity cost of the committing funds should be considered against the benefit this increased leverage may provide on other decisions and project design.

### ■ Ownership and Operations Considerations for Public Ownership, Private Operation Partnership Model

Under this model, public entities typically own underlying network assets, such as fiber and conduit, while private entities own network electronics and provide services to customers over the network. This approach is often beneficial because fiber and conduit require little upkeep and can be leased or shared with other organizations that serve the public's interest, such as fire stations, police stations, local utilities, or community centers.[114] In contrast to fiber and conduit, network electronics are

[113] For further discussion of broadband deployment-friendly policies municipalities can adopt to make their jurisdictions more attractive to private providers, see Section 7: Fostering a Healthy Broadband Deployment Environment.

[114] Public entities interested in this approach should consider whether they have the capacity to perform ongoing maintenance for fiber and conduit. If not, there should be consideration for shifting this responsibility to the ISP partner depending on the terms of the contractual agreement. Maintenance can also be performed by another third party.

typically upgraded every five to seven years to serve growing capacity demands, which ISPs are accustomed to anticipating. Additionally, ISPs may be more experienced in the areas of customer acquisition and retention, customer support, marketing, and billing.

### ■ Opportunities for Partnership Customization

While the roles described above are a common form of the public ownership, private operation partnership model, this arrangement can always be customized to fit the partners' abilities and goals. Public entities with experience managing their own utility systems may consider filling the role of customer-facing services, such as billing, service calls, and marketing. Public entities with network operations experience may feel comfortable augmenting current staff to maintain network electronics and provision end-user services themselves. Those with experience managing public works projects may consider leading project construction with existing offices and staff. Public organizations that adopt the responsibilities of ultimately owning and operating their own networks are simply referred to as public ISPs.

Conversely, some public entities may not feel suited to even own the underlying fiber and conduit and may prefer to limit their involvement in a project by not entering into any formal partnerships. Entities in this position can still have an impact on project outcomes by providing matching funds, letters of support, access to rights-of-way, or existing conduit along project routes. ISPs will be eager to collaborate with public entities, as demonstrating public support can increase a project's score for many funding opportunities, and access to public assets can reduce project costs. For example, right-of-way fees can sometimes be waived or donated, and a project can often count this contribution towards a project's matching funds requirement. Strategies and policies that contribute to this **Public Facilitation of Private Infrastructure** are discussed more at length in Section 7 and still play an important role in other partnership and coordination models as well.

### ■ Public-Public Partnership Strategies

Collaboration between two or more public entities can also result in successful network deployments. If another public entity (or entities) has demonstrated experience in some or all of the areas described above, then a formal partnership between the two could instead serve as the mechanism for securing the necessary resources, expertise, and capacity to carry out network deployment projects. These partnerships can form between two municipalities that share the goal of serving a continuous area within both jurisdictions, between a municipality and a larger entity such as a county or regional economic development authority, or between a county or local government and a multi-region development initiative with network deployment goals, such as GSCA. Additionally, public entities who do not feel they have suitable expertise to manage a partnership with an ISP could instead seek to collaborate with a public partner with more experience in this area, who can manage this relationship on behalf of the public (or group of public) entities.

The GSCA's approach exemplifies this flexibility. This public entity has developed a relationship with UTOPIA Fiber, a successful publicly owned broadband network provider throughout many parts of Utah, to build, construct, and manage an open-access, last mile network throughout parts of GSCA's 40 member counties, as funding and financing are acquired. GSCA's governance is conducted by a group of elected supervisors from member counties, ensuring that the partnerships between it and the elected leadership of each county remain at the core of the organization. GSCA also assists member counties with acquiring technical assistance and broadband planning support, facilitating improved connectivity even before construction begins. GSCA is willing to work with municipalities within each county as well, offering a flexible approach to developing project plans and financing that can meet the needs of local communities.

### ■ Navigating Application Submissions with a Partner

Preparing an application to a network deployment grant program requires effort, careful planning, and close collaboration between involved groups. The expertise required to perform high-level engineering and design, companion network designs

and maps, detailed budgets, financial pro formas, and other materials often requires that project routes, partnerships, and operation details already be near-finalized at least a month before the submission deadline to leave time for preparing narratives, collecting letters of support from stakeholders, or conducting any challenges to levels of service reported in the target project area that are believed to be overstated.

It is worthwhile to have a common understanding among partners as to the roles, responsibilities, and ownership structure for the resulting network before application preparation begins in earnest. A coordination agreement for the project (or a general agreement applicable across multiple future projects) is a common method to establish this understanding. Preparing this agreement can take significant time, as it involves legal teams from all parties working through terms and conditions related to the project. Beginning this process early is highly encouraged, as it reduces the risk that the parties will not reach an agreement before a program's submission deadline.

Another approach to allocating responsibilities between partners is to issue a Request for Proposal (RFP), dictating the respondents' obligations in the project scope itself. This method is often required to satisfy a municipality's procurement rules and ensure that the best partner is chosen through a competitive process. The agreement resulting from this process can specify each partner's involvement in network deployment, ownership, and operations. While time consuming, the RFP approach will, under good conditions, provide the public entity with a range of private partners to evaluate, allowing for selection of the partner that best suits the public entity's goals.

Finally, preparing a grant application between partners, as with the network plan itself, must have clearly defined responsibilities for each party, department, or contractor involved. Close coordination is essential, as the specific requirements of each opportunity may warrant multiple iterations of materials and plans, particularly if the proposed project area is not yet finalized before the drafting of application materials begins.

# 6.2 Broadband Deployment Grant Programs

The range of broadband deployment funding options available over the next few years likely represents the greatest amount of public support for broadband funding that will ever be offered in California. With a developed understanding of the level of effort and expertise needed to produce a grant application for a broadband infrastructure project, municipalities within Inyo County interested in such opportunities should aim to stay informed of upcoming funding programs, their eligibility requirements, and target uses to plan projects and supporting activities accordingly.

### 6.2.1 California funding opportunities overview

Combined with California's middle mile network, the three major California grant programs will finally allow counties and municipalities, working in cooperation with ISPs or public partners, to address the most pressing broadband connectivity needs in their communities.

1. The **Federal Funding Account** program is providing $2 billion for broadband infrastructure, with approximately $13,200,000 allocated specifically to projects in Inyo County. In September of 2023, the CPUC received three applications for Inyo County, all from Frontier. One project will span both Inyo and Kern Counties and requested $6,629,936, only a small portion of which will come from Inyo County's allocation. The other two projects located exclusively in Inyo County requested $3,568,487. There is likely to be some funding remaining for another FFA application round, with application rounds expected to open every six months.

2. The **Broadband Infrastructure Account** program has been revised to complement this program, drawing from an annual funding pool of up to $150 million per year, based on annual fees collected from a surcharge on telecommunications bills.[115] This program's application window is expected to open once a year in the spring, with the actual amount available varying based on demand.
3. The **California Broadband Equity, Access, and Deployment** (BEAD) program is expected to begin offering $1.86 billion in deployment support as early as the summer of 2024.[116] While this program's rules have not been finalized, the NTIA has placed a number of requirements on the program, including a rule that mandates all unserved locations across the state be prioritized for funding before the program can accept applications for primarily underserved locations.[117] As a result, this funding will be available to unserved locations (those without access to 25/3 Mbps service), but is unlikely to be available for underserved locations (those with access to 25/3 Mbps service but not 100/20 Mbps service).[118]

This incredible amount of funding is likely to be available only over the next few years, so counties and municipalities must be strategic about how they work with partners to take advantage of each of these rare opportunities. The three programs' location eligibility considerations and application timing differ enough to require strategic planning. The funding programs also limit the overall grant amounts that can be requested, so no one funding program will meet all the connectivity needs of the county. As a result, each deployment project submitted to one of the grant programs should be carefully designed to:

- Comply with that grant's location eligibility requirements,
- Limit the size and cost of the project area to comply with the grant request limit, and
- Design the network's eligible service area to facilitate future expansions covered by other grants.

Generally, programs with more restrictive eligibility criteria should be used to focus on locations that can meet those restrictions, while more flexible projects should focus on areas otherwise ineligible or unlikely to be covered by more restrictive programs. The county or municipality then can encourage or design each distinct project to take advantage of the strengths of the specific grant opportunity available at the time in order to best utilize the overall range of funding opportunities available to it over the next few years.

---

[115] Note that this amount is to be distributed across the CASF account programs. CPUC, "Broadband Infrastructure Grant Account Program Requirements, Guidelines and Application Materials," Decision 22-11-023, Attachment 1, Updated May 25, 2023, p. A-3, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-infrastructure-and-market-analysis/broadband-infrastructure-grant-account---landing-page/decision-docs/d2211023attachment-1casf-guidelinesw-coverheader-lef-052523.pdf. In 2023, the CPUC is expected to award $24.9 million to 2022 Broadband Infrastructure Account grant awardees and has explained that future allocations will be based on each year's applications and funding trends from other application programs. CPUC, Decision Adopting Modifications to Broadband Public Housing Account, Broadband Adoption Account, and Rural and Urban Regional Broadband Consortia Account Program Rules; and Fiscal Year 2022-2023 Allocation of California Advanced Services Fund Budget," Rulemaking 20-08-021, Decision 22-05-029, pp. 67-68, May 19, 2022, https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M479/K637/479637749.PDF.

[116] NTIA, "Biden-Harris Administration Announces More Than $1.8 Billion to California to Deploy High-Speed Internet Infrastructure," June 26, 2023, https://www.internetforall.gov/news-media/biden-harris-administration-announces-more-18-billion-california-deploy-high-speed; CPUC, "California Broadband Equity, Access, and Deployment (BEAD) Program," https://www.cpuc.ca.gov/beadprogram, accessed September 2023.

[117] The BEAD program defines an "unserved location" as any broadband-serviceable location that lacks access to reliable broadband service with a speed of at least 25/3 Mbps and latency of less than 100 milliseconds from any wireline or licensed fixed wireless provider. BEAD NOFO, p. 17. An "underserved location" is similarly defined but identifies locations with a maximum available service speed of at least 25/3 Mbps but less than 100/20 Mbps. Ibid., at 16.

[118] CPUC, State of California Five-Year Action Plan: Broadband Equity, Access, and Deployment (BEAD) Program, Final Initial Draft, July 13, 2023, p. 87, ("CA BEAD Five-Year Plan"), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M513/K977/513977116.PDF.

**Table 21: Key Eligibility Considerations of California's Three Primary Last-Mile Grant Programs**

| Grant Program | Grant Availability Timing | Eligible Areas | Additional Location Considerations |
|---|---|---|---|
| **Last-Mile Federal Funding Account (FFA)** | First application cycle ended Sept. 29, 2023; each cycle expected to occur 6 months | Must lack access to 25/3 Mbps service from "reliable" wireline source | DSL and cable using DOCSIS 2.0 or below are presumed not "reliable."[119] |
| **CASF Broadband Infrastructure Account (BIA)** | Recent application cycle ended June 1, 2023[120]; expected to occur annually | Must lack access to 25/3 Mbps service from wireline or fixed wireless sources | Strong focus on low-income areas.[121] |
| **Broadband Equity, Access, and Deployment Program (BEAD)** | First application cycle expected to begin mid-2024 at the earliest; at least two application cycles expected | Likely restricted to locations that lack access to 25/3 Mbps service from "reliable" wireline or licensed fixed wireless | "Reliable" defined as "available with a high degree of certainty."[122] |

## ■ California Federal Funding Account Program

The State of California allocated $13,221,784 to Inyo County to be distributed through the FFA program. In September of 2023, the CPUC received three applications for Inyo County, all from Frontier. One project will span both Inyo and Kern Counties and requested $6,629,936, only a small portion of which will come from Inyo County's allocation. The other two projects located exclusively in Inyo County requested $3,568,487 to connect 706 FFA-eligible locations at an average cost of $5,055 per location. These funding requests are presented in the table below.

**Table 22: Applications for Inyo County Submitted to the Federal Funding Account by September 29, 2023**

| Organization | Project Name | Amount Requested | Unserved Locations |
|---|---|---|---|
| Frontier | Inyo 1 | $1,413,619 | 441 |
| Frontier | Inyo 2 | $2,154,868 | 265 |
| Frontier | Kern* | $6,629,936 | 523 |

**Denotes a project that spans multiple counties*

[119] CPUC, Federal Funding Account Program Rules and Guidelines, Order Instituting Rulemaking Regarding Broadband Infrastructure Deployment and to Support Service Providers in the State of California, Rulemaking 20-09-001, Decision 22-04-055, Appendix, April 21, 2022, pp. A-8, A-16, ("FFA Guidelines"), https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M470/K481/470481278.PDF; CPUC, "Frequently Asked Questions(FAQs) – Federal Funding Account, Last Mile," April 2023, p. 3, https://www.cpuc.ca.gov/-/media/CPUC%20Website/Files/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Communications_-_Telecommunications_and_Broadband/FFA%20Webpage%202023-04/FFA%20FAQs%20V2.pdf.

[120] CPUC, "Second Postponement of the 2023 CASF Infrastructure Application Deadlines," April 18, 2023, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-infrastructure-and-market-analysis/2023-letters/20230418-exec-dir-casf-infra-extension-deadline-letter.pdf.

[121] CASF, Broadband Infrastructure Grant Account Program Requirements, Guidelines and Application Materials, Order Instituting Rulemaking Regarding Revisions to the California Advanced Services Fund, Rulemaking 20-08-021, Decision 22-11-023, Attachment 1, p. A-10, updated May 31, 2023, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-infrastructure-and-market-analysis/broadband-infrastructure-grant-account---landing-page/decision-docs/d2211023attachment-1casf-guidelinesw-coverheader053123.pdf.

[122] NTIA, Broadband Equity, Access, and Deployment Program Notice of Funding Opportunity, 15, May 12, 2022, ("BEAD NOFO"), https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf.

The FFA Program does not require a matching funds commitment and is allocated at the county level, so applicants do not compete with other projects across the state.[123] This program is the only one of the three to classify locations served by either DSL or fixed wireless services at speeds at or above 25/3 Mbps as funding-eligible in the proposed deployment areas.[124] If an area is shown as served, but community testimonials, speed tests, and other network performance data collected suggest otherwise, CPUC may still consider the project area eligible for funding.[125] Additionally, the FFA awards additional points to projects that will serve disadvantaged communities, using demographic information provided by the CPUC and its own additional information sources.[126] As a result, this program offers the best opportunity to connect locations that would be less likely or outright ineligible to receive funding from the other programs due to levels of service reported in the area.[127]

The FFA program also puts certain location and cost limits on projects to be reviewed and approved without additional formal resolutions.[128] To receive the standard review, a project's grant request must not exceed $25 million, and the average cost per location cannot exceed $9,300 per location.[129] If the project exceeds either of these criteria, requests a waiver of one of the program requirements, or includes any locations also present in a competing FFA application, then a more detailed review and formal CPUC resolution will be required. Notably, the applicant may also include a limited number of served households in its proposed deployment area if necessary to make the project financially viable, but the CPUC has not provided a clear standard about how it will evaluate this request.[130]

At the time of this writing, applications are still being reviewed, and winners have not yet been announced. Detailed information about each application, including maps of proposed funded service areas, can be found here:

https://broadbandportal.cpuc.ca.gov/s/objection-page

Given the impact each project award would have on future network deployment efforts in the county, ISPs and municipalities must be flexible when planning for projects that can best utilize the other funding opportunities available over the next two years. The map below shows the locations that were eligible for the FFA program. We note that the eligibility criteria is broader than the BEAD program's definitions of "unserved" locations.

[123] The Federal Funding Account program does not require a match. The program does award applicants with up to 10 points for providing up to a 50 percent match, but with applicants only competing against other project proposals within the same county, applicants do not have a strong incentive to offer matching funding for these scoring rewards.

[124] FFA FAQ, pp. 3, 5.

[125] FFA Guidelines, p. A-16.

[126] FFA Guidelines, p. A-7.

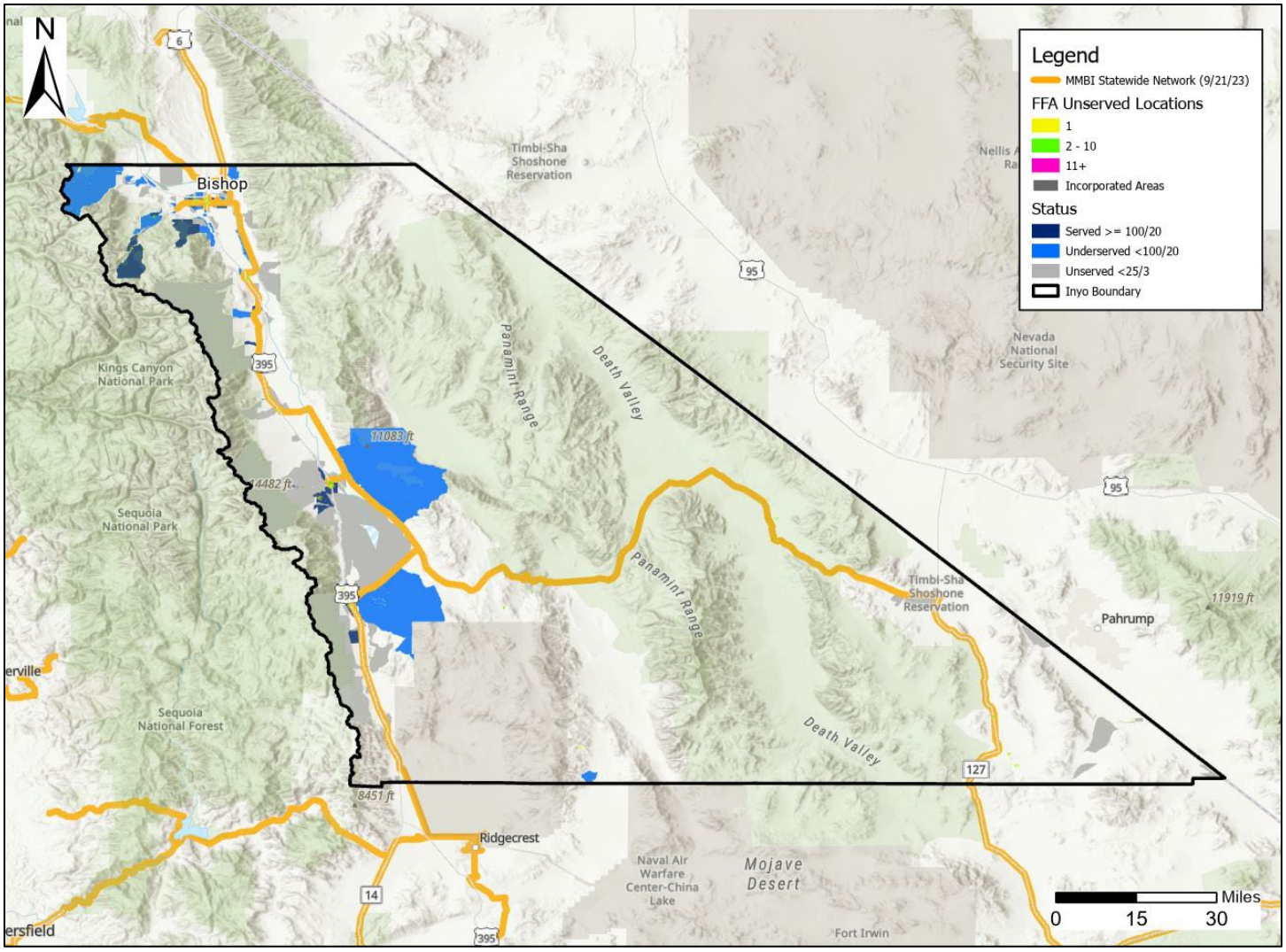
[127] However, a private ISP, without coordinating with the county or municipality, can propose a relatively conservative extension of its network within the county and potentially beat out a more expansive project co-developed by another ISP and local governments.

[128] FFA Guidelines, p. A-23.

[129] FFA Guidelines, pp. A-23 to A-24.

[130] See FFA Guidelines, p. A-5, A-16. The FFA Rules reference the Treasury's Final Rule for the Coronavirus State and Local Fiscal Recovery Funds program: "Households and businesses with an identified need for additional broadband infrastructure investment do not have to be the only ones in the service area served by an eligible broadband infrastructure project. Indeed, serving these households and businesses may require a holistic approach that provides service to a wider area, for example, in order to make ongoing service of certain households or businesses within the service area economical." Ibid; 3 Department of the Treasury, Final Rule, Coronavirus State and Local Fiscal Recovery Funds, 31 C.F.R. Part 35, 87 FR 4338-4454 (January 27, 2022), https://www.federalregister.gov/documents/2022/01/27/2022-00292/coronavirus-state-and-local-fiscal-recovery-funds.

**Figure 32: FFA-Eligible Locations and BEAD-Defined Unserved and Underserved Census Blocks**




Considering Frontier's proposed projects during the first round of the FFA program, several areas could be covered with any remaining FFA funding. We suggest considering the following:

- Lone Pine Communications could consider extending its wireline service area to reach Olancha, expanding to eligible for the FFA-eligible addresses to the south, or expanding eastward to reach eligible areas in Keeler, to the east of Owen's Lake. The state's middle mile network will be constructed along US 395 and could serve as the basis for another provider's deployment through Olancha, but Lone Pine Communication's existing unlicensed fixed wireless service in the area could provide a competitive advantage with this areas' customers, as the Lone Pine likely a recognized brand within the community and could transition them to fiber wireline service more easily.
- In the west-central Inyo County, many locations that are already served by Frontier's DSL network are eligible for the FFA program. Frontier could consider pursuing additional support from the FFA to upgrade these networks to fiber in Independence and locations directly to the north of this community. As Frontier has already secured access to poles and rights-of-way in these areas, the provider will likely be able to deploy fiber at lower cost than a new market entrant could.

- Big Pine, in northwest-central Inyo, contains locations eligible for the FFA program that are within both Frontier and Optimum's existing service areas. As the state's planned middle mile network will extend down US 395, both providers could consider using the transport services introduced to the area by this network to facilitate this deployment. If ambitious, this project could include FFA-eligible locations in the very southwestern edge of Big Pine, just off of Sugar Loaf Road.
- Lastly, many locations through Bishop, in north-central Inyo County, are eligible under the FFA program, despite the many providers that serve this population center. In fact, every wireline provider with a presence in Inyo County could consider applying to the FFA to serve these locations, as AT&T, Frontier, Optimum, and Lone Pine Communications all maintain networks somewhere in the city.

### CPUC's Broadband Infrastructure Account Program

While the California Advanced Services Fund (CASF) Broadband Infrastructure Account (BIA) is the next available funding opportunity, projects applying for this grant should be narrowly tailored to meet its more specific location eligibility and prioritization rules. Perhaps the most restrictive of the three primary last-mile funding programs, the BIA does not allow the inclusion of any location that receives at least 25/3 Mbps service from either a wireline or licensed fixed wireless ISP and does not permit any overbuilding. As with all three programs, service from satellite internet service providers, including low earth orbit providers such as Starlink, does not affect program eligibility. Compared to FFA's $2 billion in overall funding, the BIA offers substantially less funding, drawing from a funding pool of that in 2023 had $150 million shared with other CPUC programs. The location considerations are also more complex, impacting not only the eligible deployment area but the minimum match required along with the project's application score.

The program does not perform competitive scoring in the same way that most other grant programs do. Instead, it heavily prioritizes projects that will be used to connect areas with no service at all, followed by those unserved by speeds of even just 10/1 Mbps. After considering projects for these priority areas, remaining funds will be distributed according to the project area's median household income, with lower-income areas receiving preference.[131] To maximize chances of an award under BIA, projects should prioritize entirely unserved locations, followed by those without service of at least 10/1 Mbps. Project should also aim to include as many of the following match-reduction considerations as possible.

The CASF BIA program's match requirement varies between 0 and 40 percent, based on proposed project area's characteristics and current service level. Areas that are not served by a single facilities-based internet provider do not need to provide a match.[132] Otherwise, the project must provide up to 40 percent match, reduced by the income and other area considerations. Projects in low-income areas may reduce the match requirement by 40 percent.[133] Otherwise, each of the following criteria reduces the match amount required by 10 percent:

- Project will primarily rely on upgrading existing infrastructure to meet requirements,
- Project is in a "Broadband Consortium region" where more than 2 percent of locations do not yet have access to services offering at least 25/3 Mbps,

---

[131] CPUC, "Decision Adopting Modifications to California Advanced Services Fund Broadband Infrastructure Account, Attachment 1: Broadband Infrastructure Grant Account Program Requirements, Guidelines and Application Materials," R.20-08-021, p. A-6, November 17, 2022, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-infrastructure-and-market-analysis/broadband-infrastructure-grant-account---landing-page/decision-docs/d2211023attachment-1casf-guidelinesw-coverheader053123.pdf accessed Oct 18, 2023.

[132] Ibid., p. A-7.

[133] Low-income areas under this program are defined as any area where the American Community Survey (ACS) 5-year median household income is less than or equal to 80 percent of the statewide median income or Department of Housing and Community Development's list of state income limits. CASF BIA Guidelines, p. A-5. Participation in the Affordable Connectivity Plan (ACP), California LifeLine, or federal Lifeline is required to receive the full 40 percent reduction. Ibid.

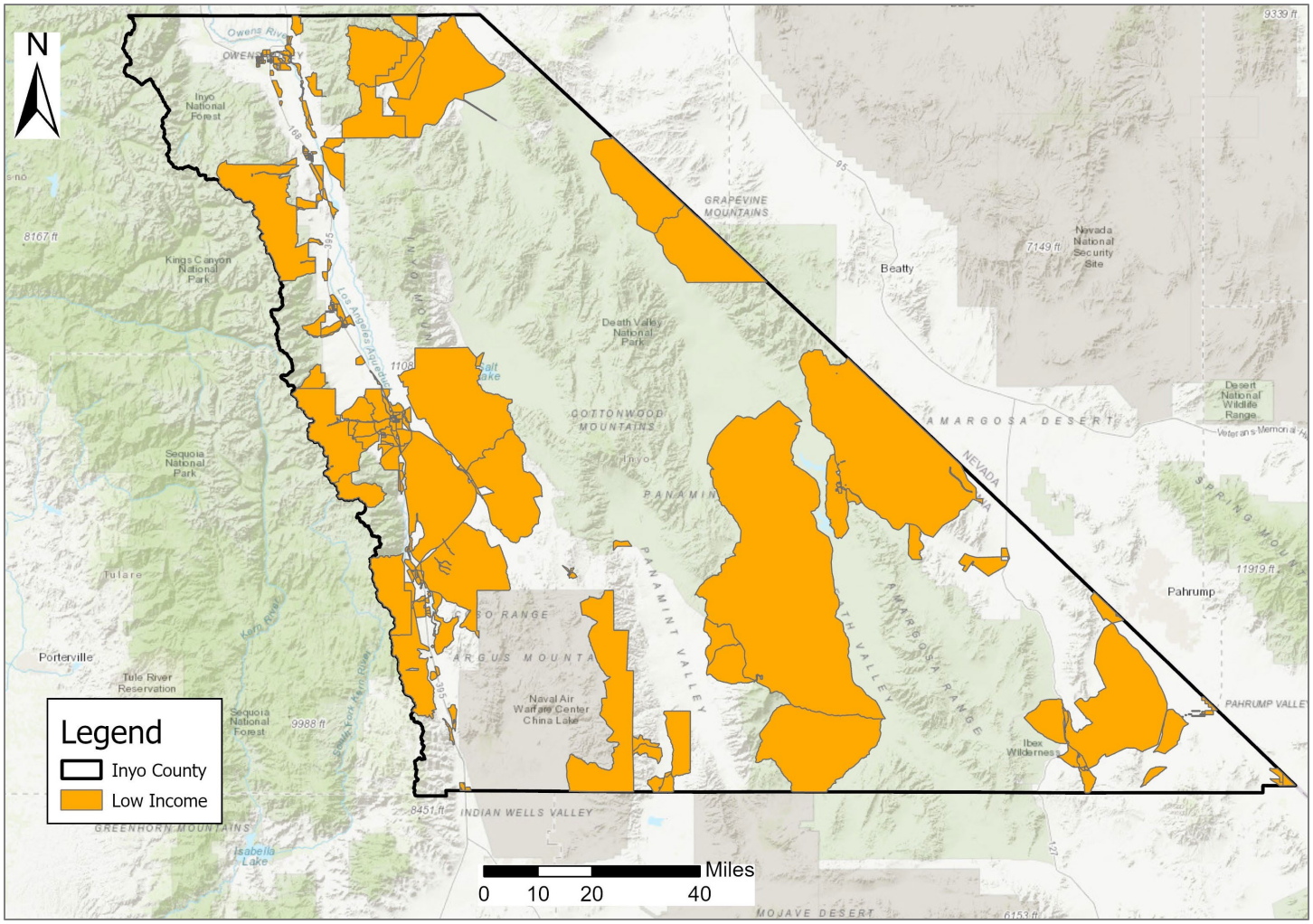
- Project's area satisfies at least three of the following criteria:
  - Is rural (as defined by U.S. Census Bureau),
  - Is an unincorporated community,
  - Is an extreme or elevated fire threat area (as defined by the CPUC Fire-Threat Map),
  - Is more than 10 miles away from nearest hospital,
  - Is more than 10 miles away from nearest state or federal highway,
  - Contains rugged or difficult terrain.

Despite available funding, BIA allows for a maximum average cost per location of up to $24,700 for projects seeking approval without a formal resolution, significantly higher than the FFA's per location maximum of $9,300.[134] These factors suggest BIA is intended to support projects in extremely unserved, hard-to-reach areas that do not anticipate network deployments under normal conditions. Given the program's emphasis on areas with extremely poor service, unique match requirement structure, and comparably high anticipated cost per location served, projects seeking funds from BIA should be designed to complement other network deployments by serving the most costly, rural, hard-to-reach locations other opportunities do not similarly prioritize.

To use this funding program effectively, a BIA-oriented project should focus on unserved locations in Census Block Groups with the lowest median incomes. These locations do not need to be contiguous; the project can identify areas as small as individual properties and combine them in one application, so long as the residents of each property are low-income households.[135] As a result, this program is a unique option for smaller project proposals that focus on expanding or upgrading existing networks to reach these economically disadvantaged areas. Low-income areas in Inyo County are shown below.

[134] CASF BIA Guidelines, p. A-31.
[135] CASF BIA Guidelines, pp. A-9 to A-10.

**Figure 33: Low-income Areas for Consideration Under the Broadband Infrastructure Account Program**




Inyo County has a reported 2,676 locations (28.3 percent) that do not yet receive any service meeting the 10/1 Mbps standard, 1,358 locations (14.3 percent) of which are reported to not receive any form of internet service. This latter group is prioritized by the BIA program, regardless of the income characteristics of the area, but to identify these locations, the municipality will need to license access to the CostQuest address fabric. With a significant portion of unserved locations also located in low-income census blocks, ISPs looking to expand their current service areas should consider using the BIA to expand beyond their current service areas or to upgrade services to low-income households currently receiving DSL services offering less than 10/1 Mbps. Nearly all of the project area suggestions made for the BEAD program below should be considered for the BIA program as well, once the ISP or municipality obtains access to the address fabric and can evaluate the current service characteristics (or more importantly, lack thereof) to each location in those suggested areas.

BIA projects can identify areas as small as individual properties and combine them in one application, so long as the residents of each property are low-income households or lack current service entirely. As a result, this program is a unique option for project proposals across the county that focus on expanding or upgrading existing networks to reach a number of small, non-contiguous areas. Including areas that may already receive 10/1 Mbps service but not 25/3 Mbps service, there are a few clusters in low-income census blocks that are worth highlighting to be considered for the BIA program:

- In the northwestern portion of the county, along a bend in US Highway 6, the Laws area contains low-income census blocks that have been marked unserved. Frontier and Optimum both have nearby infrastructure and can easily connect these locations.
- Near the western edge of the center of the county, there are a scattered number of unserved homes in low-income census blocks near Fort Independence Reservation and the Seven Pines campground area. Optimum may be encouraged to expand its cable reach into these areas by connecting to the state middle mile route along US 395, but Frontier's DSL network could be upgraded and expanded to these locations as well.
- Lone Pine Communications could upgrade their cable network in Lone Pine and extend it into the eligible low-income neighborhoods to the west, particularly along W Whitney Portal Road and Granite View Drive.
- Along US 395 near Haiwee, there appear to be scattered unserved locations in low-income census blocks. Portions of these unserved areas extent to the western boundary of the county from the communities of Coso Junction to Grant. There is another small cluster surrounding the South Haiwee Reservoir. Frontier DSL network could be partially replaced with fiber and extended to these unserved locations.
- The Timbi-Sha Shoshone Reservation, near Death Valley Junction, is largely unserved and at least partially classified as low-income. The state middle mile route will pass through the junction, making this area a potential opportunity to interested ISPs. By deploying in this area, the ISP could extend to the southeast corner, including the town of Charleston View, and locations along Old Spanish Trail Highway, just east of South Nopah Range Wilderness Area.

## The Broadband Equity, Access, and Deployment Program

The BEAD program will not be available until mid-2024 at the earliest.[136] The state's program rules have not been finalized yet, but the NTIA has required that states comply with a number of requirements that enable counties, municipalities, and ISPs to integrate the funding opportunity into their overall deployment strategies. The CPUC must ensure that BEAD funding is prioritized to cover all locations lacking 25/3 Mbps service from either a wireline or licensed fixed wireless ISPs (the BEAD program's definition of an "unserved" location) before funds can be used to connect "underserved" locations (locations that lack access to 100/20 Mbps service but receive 25/3 Mbps service). Unfortunately, the CPUC does not expect the amount of available funding to connect all unserved locations,[137] so Inyo County and interested partners should use BEAD funding to connect locations unserved by 25/3 Mbps that are not included in FFA-funded projects. The program is also likely to allow applicants to include a portion of served locations within their project applications, so long as these account for fewer than 20 percent of the project's total proposed locations.[138]

However, BEAD program's more lenient project area considerations come with a tradeoff. Applicants are generally expected to cover at least 25 percent of the project's total costs, and the program's scoring system is likely to favor both higher match amounts and lower average proposed costs per passing.[139] The NTIA has allowed for the possibility that projects in high-cost areas may be allowed to submit a lower matching amount or no matching amount at all. These areas are shown further below. The NTIA has also invited the CPUC to request a match reduction or waiver from the NTIA if a particular project demonstrates that "a match requirement could deter participation in the BEAD Program by small and non-traditional providers,

[136] CPUC, "California Broadband Equity, Access, and Deployment (BEAD) Program," https://www.cpuc.ca.gov/beadprogram, accessed September 2023.

[137] CPUC, State of California Five-Year Action Plan: Broadband Equity, Access, and Deployment (BEAD) Program, Final Initial Draft, July 13, 2023, p. 87, ("CA BEAD Five-Year Plan"), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M513/K977/513977116.PDF.

[138] BEAD NOFO.

[139] NTIA and U.S. Department of Commerce, "Broadband Equity, Access, and Deployment (BEAD) Program: Initial Proposal Guidance," pp. 40-41, July 2023, ("BEAD Initial Proposal Guidance"), https://broadbandusa.ntia.doc.gov/sites/default/files/2023-07/BEAD_Initial_Proposal_Guidance_Volumes_I_II.pdf; BEAD NOFO, pp. 20-21, 42-43.

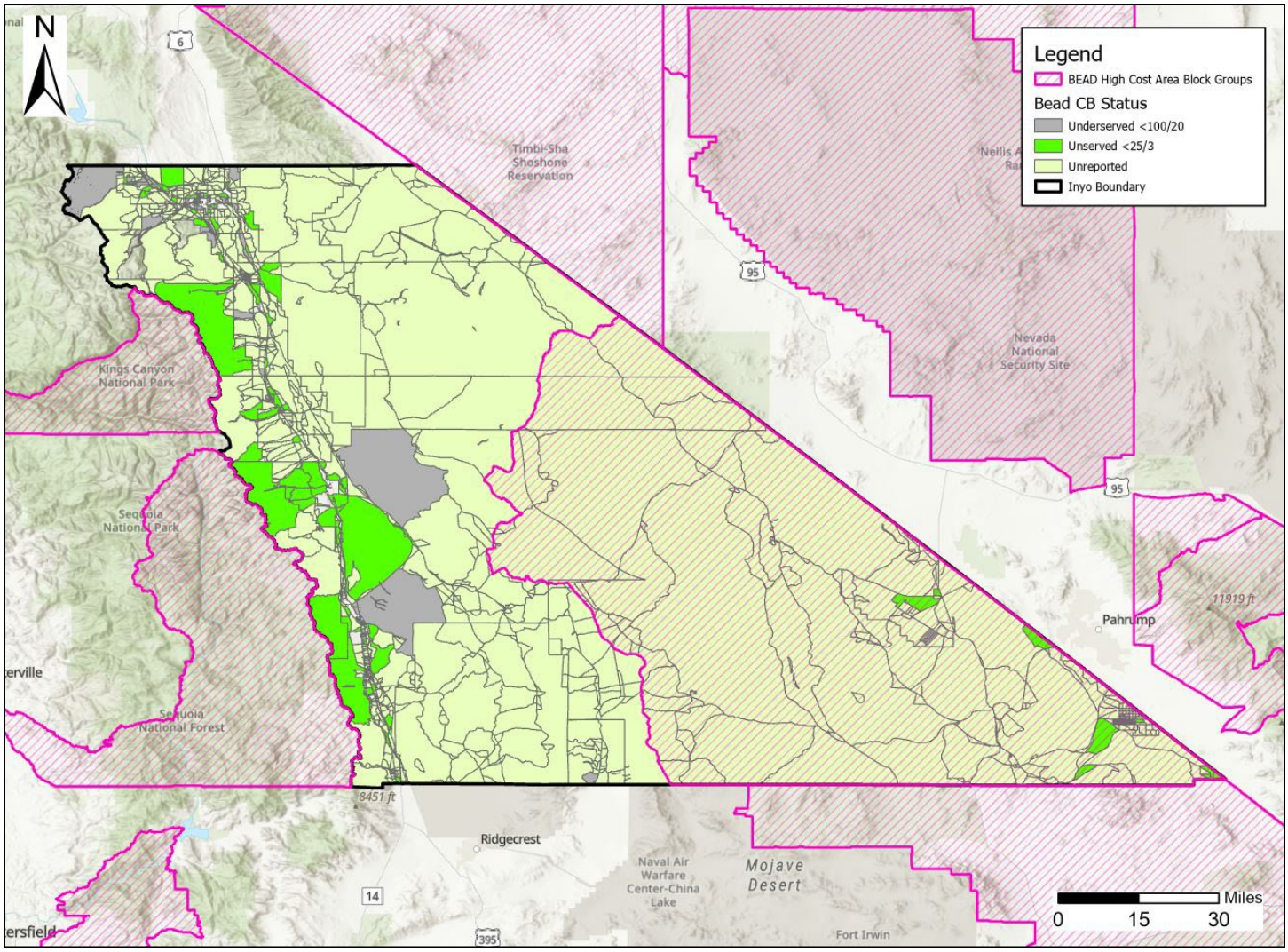
in marginalized or low-income communities, or could threaten affordability (i.e., if an applicant must offset the cost of a substantial match through higher end user prices)."[140]

Fortunately, the BEAD program does provide some flexible ways to satisfy the match requirement. Funding from a number of other federal funding programs can be used as a matching contribution if the applicant is able to obtain them,[141] and California's Loan Loss Reserve Fund (discussed below) can be used by eligible organizations to help to obtain loans or other financing that could cover the matching requirement. NTIA's rules would allow applicants to offer in-kind contributions as match, such as employee service contributions, equipment, computer hardware and software, and waived fees or other valuable access rights related to rights-of-way, pole attachments, conduits, easements, or access to other types of infrastructure, if the CPUC chooses to allow that in the state's BEAD program.[142]

The BEAD Program's first application round will not begin until mid-2024 at the earliest.[143] By this time, the first and likely second rounds of the FFA program will have already established deployment commitments to a significant portion of unserved locations close to existing networks. As a result, project plans designed for the BEAD program should consider how these earlier funding opportunities are likely to extend the reach of FFA- and BIA-funded networks deeper into unserved areas and provide deployment opportunities to more remote locations. Maximizing funding under these programs will require careful planning, as many areas eligible for BEAD funding are also eligible for FFA and BIA. The figure below shows the areas in Inyo County that are currently eligible for BEAD funding, before additional deployment commitments are likely to revise this map.

[140] BEAD NOFO, p. 20.
[141] BEAD NOFO, pp. 20-21.
[142] BEAD NOFO, p. 22.
[143] CPUC, "California Broadband Equity, Access, and Deployment (BEAD) Program," https://www.cpuc.ca.gov/beadprogram, accessed September 2023.

**Figure 34: Areas in Inyo County Likely Eligible under the BEAD Program**




Fewer locations are anticipated to be eligible under BEAD than are eligible under FFA, which considers locations receiving 25/3 Mbps or above to be eligible if service is provided over DSL or fixed wireless. The BEAD program will not likely consider locations receiving 25/3 Mbps or above as unserved, regardless of the technology providing this service (aside from unlicensed fixed wireless or satellite). There are also blocks depicted that do not have BEAD data reported but could possibly contain eligible BSLs.

A portion of BEAD-defined unserved locations are likely to be scattered in partially served census blocks, but there are a few clusters worth highlighting:

- All of the areas suggested for BIA consideration above should also be considered for the BEAD program. The Laws area in the northwestern portion of the county, the Lone Pine area, and a number of scattered unserved locations found within a few miles of US 395 throughout the county should all be considered for BEAD-funded projects. The state open-access middle mile network is planned to run near a majority of these areas as well, so while Frontier, Lone Pine Communications, and even AT&T may not be near each area, any one of the three could decide to use BEAD funding to establish itself along different portions of US 395.

- The unserved areas in the southeastern portion of the county, such as locations in and near Charleston View, Death Valley Junction, Shoeshone, Tecopa, and Sandy Valley, have been designated as BEAD high-cost areas, so projects to connect these areas will have a much lower matching requirement, if any. The CPUC may designate this area as an "extremely high cost," which would allow fixed wireless ISPs to submit plans for high speed wireless networks capable of providing services of at least 100/20 Mbps if wireline networks to this area are not economically viable. However, the state middle mile network is planned to run along State Route 127, so many locations in this area may be able to receive fiber service to their homes.
- There are a few clusters of unserved locations west of West Bishop, particularly in the outskirts of Round Valley, Starlight, and further southwest in Aspendell. The state middle mile network will run to the intersection of W Highway 168 and Ed Powers Road. If Frontier elects to use the state middle mile network it could extend its existing fiber network to these clusters in West Bishop.

While the CPUC does not expect to have enough funding to support connectivity to all unserved locations,[144] there is a small chance that underserved locations may become available in a later funding round. The NTIA has recently released information about the areas that are considered "high cost," allowing projects covering them to offer a lower matching amount than the typical 25 percent requirement. The CPUC is yet to define the program's "Extremely High Cost Per Location Threshold," which requires the CPUC to identify the amount of subsidy needed per location that is so high, fiber deployments to that location should not be required.[145] Instead, areas with a funding need above this threshold become eligible for certain fixed wireless or satellite-based projects, provided they meet certain performance standards.[146] If the CPUC sets this value at a sufficiently low amount, a larger number of the California's most expensive unserved locations could be connected by these significantly less expensive technologies, which may free up enough funding to consider underserved locations.[147] CostQuest, the CPUC's mapping partner, estimated the following relationship between the number locations per square mile and the average cost per location.

[144] CA BEAD Five-Year Plan, p. 87.

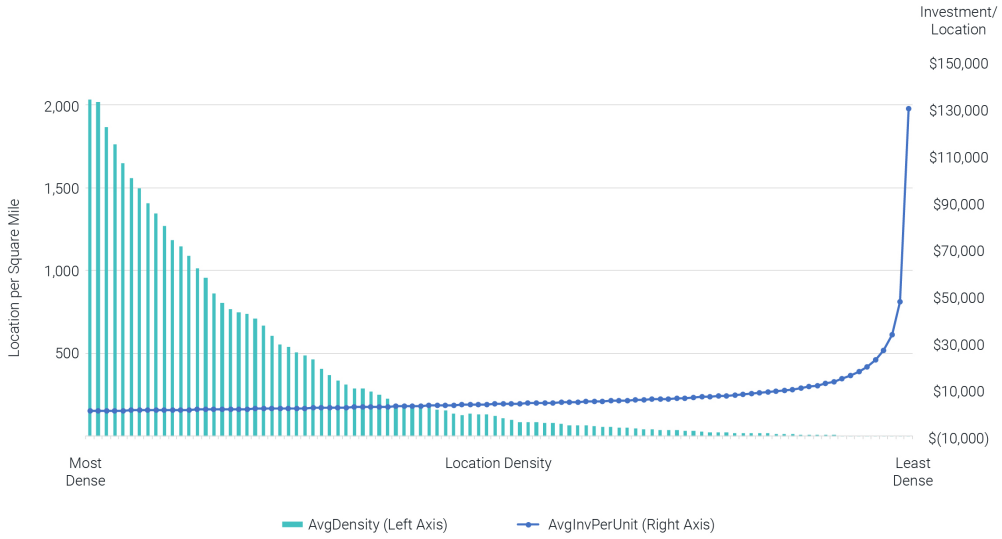
[145] BEAD NOFO

, p. 13. Notably, the CPUC has set the upper limit for the Broadband Infrastructure Account's average cost per location at $24,500, may hint at the eventual threshold it will choose. See CPUC, California Advanced Services Fund, Order Instituting Rulemaking Regarding Revisions, Decision 22-11-023, November 17, 2022, p. 38.

[146] See BEAD NOFO, pp. 13, 38-39.

[147] For example, in the 5-Year Action Plan, the CPUC expects the most expensive 12 percent of unserved and underserved locations across the state to cost an average of $40,000 per location, representing roughly half of the $9 billion in estimated total investment needed to connect the state. If the CPUC were to identify the Extremely High Cost Per Location Threshold as the cost per location that would separate the top 12 percent of locations from the other 88 percent, then the total cost for all location below this threshold would be $4.84 billion. If those 12 percent of locations could be connected via wireless systems for a fraction of the cost, the combined $3.86 billion between the FFA and the BEAD programs would likely be enough to connect all unserved locations, leaving some funding for underserved locations.

**Figure 35: CostQuest Estimate of Investment Required Per Unserved Location by Location Density[148]**




The CPUC estimates that the average cost to connect all but the 12 percent most costly locations to fiber-to-the-premises services to be approximately $5,700 per location,[149] requiring an estimated $4.84 billion in combined grant funding and industry investment.[150] In contrast, the most expensive 12 percent of locations would cost an average of $42,600 per location. This relationship between location density and cost per location is useful to understand which locations are likely to receive special consideration for fixed wireless deployments as well.

## 6.2.2 Federal Programs with Broadband Deployment Funding Options

Though the CPUC's Federal Funding Account, Broadband Infrastructure Account, and the California Broadband, Equity, Access, and Deployment program may offer the most compelling opportunities for network expansion in Inyo County, additional federal funding programs administered by the United States Department of Agriculture (USDA) and Universal Services Administrative Company (USAC) may also contribute to a comprehensive solution for local communities.

In 2021, the Infrastructure Investment and Jobs Act (IIJA) allocated $635 million to the USDA Rural Utility Service's (RUS) **ReConnect Program,** which offers several grant and/or loan-based funding options to support broadband deployments capable of at least 100/100 Mbps in rural areas.[151] The program is very competitive, so potential applicants should be very selective about how they choose their proposed deployment areas to achieve higher competitive application scores. The

[148] CostQuest Associates, California Broadband Investment Model Last Mile Funding Analysis, p. 15, April 2023, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/broadband-implementation-for-california/ffa-webpages/ca-broadband-investment-model_04212023.pdf.

[149] CA BEAD Five-Year Plan, p. 87.

[150] CA BEAD Five-Year Plan, p. 87.

[151] Rural areas under this program are defined as areas that are "not located within:

a city, town, or incorporated area with a population of more 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 as defined in the Agency Mapping Tool."

USDA Rural Utilities Service (RUS), "Rural E-Connectivity Program Application Guide for Fiscal Year 2022," pp. 6, 12-13, September 6, 2022, ("ReConnect Application Guide"), https://www.rd.usda.gov/files/ReConnect_Program_Application_Guide.pdf.

application process awards points for the proposed area's level of rurality, economic needs of the community, and the relative affordability of their low-cost broadband service options.[152] Additional scoring priority is given to local governments, non-profits and cooperatives, and Tribal Organizations.[153]

The program also adjusts the matching requirements and maximum allowed funding request to fit the proposed service location's characteristics.[154] If at least 90 percent of households in the proposed deployment area do not receive services at speeds of at least 25/3 Mbps, then the applicant can request the "90% unserved" option, which will avoid the standard 25 percent minimum matching requirement.

Otherwise, only 50 percent of the households in the proposed area need to be unserved at this speed, allowing applicants to construct a significant portion of their funded networks in already served areas.[155] Some areas meeting this criteria may nevertheless qualify to avoid the matching requirement as well. Special Area Grants are available for projects in persistent poverty areas, socially vulnerable communities, and Tribal Lands and do not require matching funds.[156] Table 24 provides a summary of these variations of the ReConnect program.

**Table 23: USDA RUS ReConnect Program Funding Options**

| Funding Category* | Funding Type | Match | Maximum Request | Total Available*** |
|---|---|---|---|---|
| **More than 90% unserved** | Grant | 0% | $25,000,000 | $200,000,000 |
| **Special Area Grant** | Grant | 0% | $25,000,000** | $350,000,000 |
| **Normal Area Grant** | Grant | 25% | $25,000,000** | $150,000,000 |
| **50%/50% Grant and Loan** | Mixed | 0% | $50,000,000 | $150,000,000 |
| **100% Loan** | Loan | 0% | $50,000,000 | $50,000,000 |

*The ReConnect program refers to the normal area grant as the "100% Grant" category, but this description is somewhat misleading, because it suggests there is no match element. **This amount increases to $35,000,000 if the entire proposed deployment area is FAR Level 4. ***These amounts reflect the total amount available before the ReConnect – Round 4 funding cycle and are suggestive of the likely amounts and distribution of funding for future ReConnect funding cycles.[157]

[152] Projects proposing PFSAs with population densities of 6 persons or less, or PFSAs located 100 miles from a city or town that has a population greater than 50,000 inhabitants will be awarded 25 points. ReConnect Application Guide, p. 23. Economic need is determined by evaluating the proposed area's county poverty percentage, using the United States Census Small Area Income and Poverty Estimates (SAIPE) integrated into the program's application mapping tool. Ibid.

[153] ReConnect Application Guide, pp. 24-25.

[154] The matching funds must be secured before the award can be fully accepted. ReConnect Application Guide, pp. 12, 26.

[155] ReConnect Application Guide, p. 13. Locations receiving service at or above 25/3 Mbps that were already supported by the RUS are not eligible. Ibid, at 13-14.

[156] To qualify for this funding category, a California project can qualify in three relevant ways: At least 75 percent of the deployment area covers Persistent Poverty Counties, "defined as any county with 20 percent or more of its population living in poverty over the past 30 years" according to the ACS and the 1990 and 2000 decennial censuses; The deployment area is a Socially Vulnerable Community, with a score of 0.75 or higher on the Center for Disease Control's Social Vulnerability Index; The deployment area is on Tribal Lands, lands held in trust for Native Americans, protected Indiana Lands, or lands owned by a Tribal Government, and the Tribal Government is proposing to provide services. ReConnect Application Guide, p. 8.

[157] "FAR Level 4 areas consist of rural areas that are—15 minutes or more from an urban area of 2,500-9,999 people; 30 minutes or more from an urban area of 10,000-24,999 people; 45 minutes or more from an urban area of 25,000-49,999 people; and 60 minutes or more from an urban area of 50,000 or more people." ReConnect Application Guide, p. 7.

Normal area grants are available for all other areas that do not meet the special area or 90 percent unserved requirements and require at least a 25 percent matching contribution. An applicant may also apply for the 50%/50% Loan and Grant or 100% Loan options, which offer a very low interest rates and a substantially larger maximum request.[158] The 100% Loan option can be used to acquire matching funding to most of the grant funding options offered by California. These options are less competitive, with the latter also reducing or removing several application requirements to encourage its use. Unlike the ReConnect grant programs, the 100% loan option is a "first come, first served" program, so applicants that act early in the cycle stand a better chance at success.

The ReConnect grant application process is among the most challenging, with a complex portal that requires manual entry of most GIS, budget, and financial information. Applicants must demonstrate the project's financial feasibility and sustainability by submitting detailed information about the services available in the area, the menu of ISP service offerings, expected adoption patterns, and all balance sheet information for the past five and next five years.[159] Thankfully, some pre-application costs, including expenses necessary to develop the project's network design, financial projections, and other application preparation efforts, are eligible for reimbursement if the applicant is successful.[160] Note that the ReConnect program has tended to update its rules for each funding round, so some of these details may change for ReConnect Round 5, which is expected to open in the fall of 2023.[161]

The USDA's **Community Connect Grant Program** offers up to $5 million to deploy broadband networks capable of at least 100/20 Mbps to a single, contiguous rural area that currently lacks access to fixed 25/3 Mbps service, provided that the project also include the improvement, expansion, construction, or acquisition of at least one community center that provide broadband accessibility to the public.[162] The cash matching requirement is only 15 percent, which makes it an appealing option for applicants without substantial financing resources.[163] The program's most recent funding cycle ended on June 20, 2023,[164] but the program is expected to be offered again in the future.

The program requires that the proposed project include at least 2 new computer access points and wireless access at the community center, which also must receive at least 2 years of free broadband service.[165] The program is more likely to select projects that demonstrate strong local community support, public safety connectivity needs, and the area's educational and health care challenges, particularly as they relate to distance learning and telehealth. The application also considers the proposed deployment area's economic challenges, including low household income, unemployment data, and employment by sector, to better understand the deployment's potential economic impact.[166]

**E-Rate Special Construction Projects:** USAC allows eligible entities, such as schools and libraries to request funding from the E-Rate program to develop special construction projects that will deploy fiber connecting them to middle mile networks.[167] Eligible E-Rate entities can use the standard E-Rate procurement process (an RFP along with a form 470 posting) to choose

[158] The loan program's interest rate is set at 2 percent, while the 50/50 Grant and Loan option's interest rate is set at the equivalent interest rate for U.S. Treasury securities. ReConnect Application Guide, pp. 8, 10.

[159] ReConnect Application Guide, p. 12.

[160] ReConnect Application Guide, pp. 14-15.

[161] See ReConnect Application Guide, p. 28.

[162] USDA RUS, "Community Connect Grant Program Application Guide-FY 2023," pp. 5, 7, 12, Match 20, 2023, ("Community Connect Application Guide"), https://www.rd.usda.gov/media/file/download/ccapplicationguidefy23.pdf.

[163] Community Connect Application Guide, pp. 12-13.

[164] Community Connect Application Guide, p. 4.

[165] Community Connect Application Guide, p. 10.

[166] Community Connect Application Guide, p. 23.

[167] Universal Service Administrative Company, "Fiber – Summary Overview," https://www.usac.org/e-rate/applicant-process/before-you-begin/fiber-summary-overview/, accessed September 2023.

a provider of Leased Lit Fiber, Leased Dark Fiber or Purchased "Self-Provisioning Fiber.[168] If an E-Rate-eligible entity positions the procurement correctly, an E-Rate-eligible service provider (a service provider with a SPIN/498 ID)[169] can also utilize additional fiber installed during the construction process to provide service to the community or communities in the vicinity.[170]

These projects can be combined with other deployments to reduce the overall cost of construction by taking advantage of "dig once" opportunities, reducing the cost of trenching incurred by the ISP or other parties. Eligible CAIs that do not yet receive symmetrical 1 Gbps services should strongly consider this option. Potential projects must show that the chosen special construction strategy will cost less over the life cycle of the proposed infrastructure than other options.

**Figure 36: E-Rate special construction options and eligible costs**[171]

| Leased Lit Fiber | Leased Dark Fiber | Self-Provisioned Networks |
|---|---|---|
| ■ Monthly recurring charges<br>■ Basic installation charges<br>■ Special construction charges<br>■ Network equipment | ■ Recurring dark fiber lease or indefensible rights of use (IRU) payments<br>■ Maintenance and operations (M&O) charges<br>■ Basic installation charges<br>■ Special construction charges<br>■ Network equipment | ■ Maintenance and operations (M&O) charges<br>■ Special construction charges<br>■ Network equipment |

[168] "Dark Fiber, Self-Provisioning Fiber and Special Construction," USAC, included in Pennsylvania E-rate Coordinator's cultivated ListServ, October 4, 2021, http://e-ratepa.org/wp-content/uploads/2020/10/4-4-Fiber-Eligibility-2021.pdf, accessed November 2023.

[169] USCA, "Obtain a Service Provider Identification Number (SPIN)," https://www.usac.org/e-rate/service-providers/step-1-obtain-a-spin/, accessed November 2023.

[170] FCC, Modernizing the E-rate Program for Schools and Libraries, WC Docket No. 13-184, Second Report and Order and Order on Reconsideration, December 19, 2014,

https://docs.fcc.gov/public/attachments/FCC-14-189A1.pdf

[171] Ibid.

# 6.3 Funding Opportunities that Complement Deployment Projects

A grant award supporting network construction is often one of many necessary steps to connecting a community. As deployment programs become increasingly common, companion programs that help awardees secure necessary financing or extend a network to individual, hard-to-reach locations have become available to remedy these potential hurdles.

## 6.3.1 Financing Programs

A few programs expand the range of financing strategies available to applicants of other projects, helping them to satisfy match requirements or reduce interest-related costs. The CPUC's **California Loan Loss Reserve Fund** will provide eligible organizations, including non-profits, electrical cooperatives, local and county governments, joint powers authorities, and other local or regional public entities, with the ability to obtain credit rating enhancements and provide support for timely debt payments.[172] This program has a total of $750 million to enable local governments and nonprofits to secure financing for broadband infrastructure.

The program prioritizes projects that will construct last-mile service that have received an award from another state or federal funding program. To assess the credit enhancement needed, the CPUC will rely on financial projections produced by either a third-party accredited municipal advisor or assessments from a credit rating agency.[173] To be eligible for this credit enhancement, projects must be completed in 36 months, and the resulting network must also be capable of delivering 100/100 Mbps to end-users, or 100/20 Mbps where the prior requirement is not feasible due to physical limitations, as is consistent with other last-mile funding opportunities administered by the CPUC.[174] While projects executed by public-private partnerships can receive support under the Loan Loss Reserve Fund, the resulting network must be owned by the public or non-profit partner to be eligible.[175]

A few federal programs, such as the USDA's **ReConnect** program (discussed above), offer loans with very low interest rates to construct broadband in eligible areas.[176] These loans can sometimes be used as matching funding in conjunction with another last-mile program, such as the upcoming BEAD program.[177] Under another program, the **OneRD Guarantee Loan Initiative** (formerly the "Business and Industry (B&I) Guaranteed Loan Program), the USDA can guarantee loans to a variety of organizational types to support broadband deployments in USDA-defined rural areas.[178] This program accepts applications year-round.[179] Additionally, the Treasury Department's **New Market Tax Credit** program encourages the creation of

[172] CPUC, "Broadband Loan Loss Reserve Fund Program Guidelines – Revised Staff Proposal," p. 10, June 21, 2023, ("Loan Loss Reserve Fund Guidelines Proposal"), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M511/K719/511719252.PDF; https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-implementation-for-california/loan-loss-reserve-fund.

[173] CPUC, "Broadband Loan Loss Reserve Fund Program Guidelines," p. 4, September 28, 2023, ("Loan Loss Reserve Fund Guidelines"), https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M520/K495/520495866.PDF.

[174] Ibid., p. 6.

[175] Ibid., p. 11.

[176] CPUC, "Loan Loss Reserve Fund," https://www.usda.gov/reconnect/program-overview, accessed September 2023.

[177] BEAD NOFO, p. 21.

[178] This program defines a rural area as "Rural areas not in a city or town with a population of more than 50,000 inhabitants." USDA RUS, "Business & Industry Loan Guarantees," https://www.rd.usda.gov/programs-services/business-programs/business-industry-loan-guarantees#overview, accessed September 2023.

[179] Ibid.

Community Development Entities that can offer investors to receive tax credits in exchange for capital necessary for local projects operating in low-income communities.[180]

### 6.3.2 Wiring to/through Buildings

A majority of locations still unserved by fiber or cable technologies tend to be located several blocks or even miles away from the nearest fiber infrastructure. To become served, these locations need new fiber networks to be constructed along their roads, connecting the households that run along these streets. However, in some instances, these street-level "passings" are not enough. Some buildings remain unserved because they are far away from the wireline infrastructure that runs along the nearest street. To solve this "long drop" problem, the ISP or the building owner would have to spend thousands of dollars to deploy a line connecting the building to the network.

The State of California has developed the innovative **CASF Line Extension Program** to deal with this problem for low-income Californians. The program will provide up to $9,300 per qualified unserved household to connect the location to a nearby wireline network, and up to $500 for fixed wireless equipment and installation.[181] Households must demonstrate that they are enrolled in the California LifeLine or CARE Programs or may demonstrate that they otherwise meet the qualifying low-income threshold.[182] Notably, residents themselves can apply for this funding, or an ISP can apply on behalf of the household. Applications are accepted on an ongoing basis, allowing Californians to seek funding to connect their homes as soon as the need and presence of a nearby network are identified.

Publicly supported housing that suffers from poor, unreliable, or outdated wiring inside buildings will be eligible for the **CASF Broadband Public Housing Account Program**, which provides funding for the network engineering and designs, networking equipment, and labor necessary to install modern broadband equipment capable of supporting all units in the building.[183] This opportunity will reimburse up to 100 percent of costs associated with eligible rewiring projects.[184] As an added benefit, the ISP receiving the funding must offer free broadband service to residents.

## 6.4 Mapping and Challenge Processes

California's last-mile deployment grant programs discussed above rely on a combination of the FCC's new National Broadband Map and their own broadband mapping efforts to determine which locations are eligible for their programs. Both of these mapping programs have improved upon the earlier broadband availability mapping methods used throughout the 2010s. The FCC's prior mapping effort, the Form 477 broadband information program, identified only the speed ranges of advertised internet services available on each census block. An ISP could claim that an entire census block was served if it

[180] U.S. Department of the Treasury –Community Development Financial Institutions Fund, "New Market Tax Credits Program," https://www.cdfifund.gov/programs-training/programs/new-markets-tax-credit, accessed September 2023.

[181] CPUC, "CASF Broadband Infrastructure Grant Account –Line Extension Program Pilot Application Requirements and Guidelines," p. 2, April 2019, ("CPUC Line Extension Program Guidelines"), https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-infrastructure-and-market-analysis/line-extension-program/lep-rules-appendix-extracted-from-d1904022.pdf.

[182] Ibid.

[183] CPUC, "Broadband Public Housing Account Revised Application Requirements and Guidelines," pp. 1-5, May 24, 2022, ("Broadband Public Housing Account Guidelines"), https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-adoption-and-access/bpha/bpha-guidelines.pdf.

[184] Ibid.

could provide service to a single location within that block,[185] so unserved locations in partially served census blocks could not be identified for inclusion in grant programs.

Since mid-2022, the FCC's new Broadband Data Collection program has required ISPs to provide address-by-address service availability information twice a year. For each "broadband serviceable location" (BSL), ISPs provide information about the type of internet technology offered, the maximum advertised download and upload speeds available, and whether residential or business services are offered at the location.[186] California has aligned its service reporting requirements with this program, requesting that facilities-based ISPs submit this information to the CPUC directly.[187] The CPUC also requires that ISPs submit subscriber data as well,[188] which is used to provide additional validation that service is available at a location.

While the location-based information is a significant improvement over prior efforts, these two updated map programs still rely on ISP self-reports, which can be problematic. ISPs sometimes mischaracterize the services they provide to a location or even an entire area,[189] with a few ISP mischaracterizations even being explicitly attributed to restricting competitors' grant-based deployment efforts.[190] As a result, the two mapping programs have created opportunities to allow ISPs, municipalities, and sometimes other interested parties to submit mapping "challenges." Once filed, the ISP whose service claim is challenged is able to submit additional evidence to validate its original submission. The map's administrator, either the CPUC or the FCC, will then evaluate the competing claims, sometimes send out engineers to inspect the situation directly, and make a determination about the actual level of service.

While at least a few instances of mischaracterized services seem to result from anticompetitive intent, other mischaracterizations are more benign and harder to identify systematically. DSL-based service mischaracterizations are often the result of assuming that older copper-based telephone networks can still deliver consistent performance over aging infrastructure. Some ISPs have begun to remedy this issue by beginning to phase out their DSL services,[191] while others leave existing DSL customers with potentially unreliable service.

Fixed wireless services are similarly problematic. FCC requires that fixed wireless companies use wireless propagation modelling to ensure that their coverage claims reasonably match the potential reach of the technologies and frequencies used, but these methods do not necessarily account for all obstructions and issues that can hinder service availability or

---

[185] ISPs could report connectivity to a census block if they could provide services to at least one household within that census tract "without an extraordinary commitment of resources" "within a service interval that is typical for that type of connection." FCC, "FCC Form 477 Local Telephone Competition and Broadband Reporting," December 6, 2016, p. 17, https://transition.fcc.gov/form477/477inst.pdf.

[186] FCC, "Data Specifications for Biannual Submission of Subscription, Availability, and Supporting Data," November 10, 2022, pp. 20-22.

[187] CPUC, "Broadband Data Submission Guidelines and Templates," https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-mapping-program/broadband-data-submission-guidelines-and-templates, accessed September 2023; CPUC, "Data Format for Fixed Broadband Deployment by Address," revised January 2023, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/casf-infrastructure-and-market-analysis/broadband-data-collection-documents-and-templates/data-format-for-fixed-broadband-deployment-by-address-2023.pdf.

[188] CPUC, "Data Format for Fixed Broadband Deployment by Address."

[189] E.g., Jon Brodkin, "AT&T Gave FCC False Broadband-Coverage Data in Parts of 20 States," *Ars Technica*, April 17, 2020, https://arstechnica.com/tech-policy/2020/04/att-gave-fcc-false-broadband-coverage-data-in-parts-of-20-states/; Jon Brodkin, "After Defending False Data, Comcast Admits Another FCC Broadband Map Mistake," *Ars Technica*, February 23, 2023, https://arstechnica.com/tech-policy/2023/02/comcast-could-have-avoided-giving-false-map-data-to-fcc-by-checking-its-own-website/; Federal Trade Commission, "FTC Takes Action Against Frontier for Lying about Internet Speeds and Ripping Off Customers Who Paid High-Speed Prices for Slow Service," May 5, 2022, https://www.ftc.gov/news-events/news/press-releases/2022/05/ftc-takes-action-against-frontier-lying-about-internet-speeds-ripping-customers-who-paid-high-speed.

[190] Jon Brodkin, "ISP Admits Lying to FCC about Size of Network to Block Funding to Rivals," *Ars Technica*, February 2, 2023, https://arstechnica.com/tech-policy/2023/02/cable-company-tries-to-block-grants-to-rivals-by-lying-about-coverage-area/; Jon Brodkin, "Cable Company's Accidental Email to Rival Discusses Plan to Block Competition," *Ars Technica*, November 17, 2022, https://arstechnica.com/tech-policy/2022/11/cable-companys-accidental-email-to-rival-discusses-plan-to-block-competition/.

[191] E.g., Rob Pegoraro, "AT&T Shelving DSL May Leave Hundreds of Thousands Hanging by a Phone Line," *USA Today*, October 3, 2020, https://www.usatoday.com/story/tech/columnist/2020/10/03/att-dsl-internet-digital-subscriber-line-outdated/5880219002/; Farah Javed, "Verizon's Aging Copper Lines Leave Customers Hung Up With Frustration," *The City*, February 4, 2022, https://www.thecity.nyc/2022/2/3/22915176/verizon-copper-lines-customers-frustration.

reliability. In many otherwise unserved areas, mobile internet service providers can now claim that 5G and 4G-LTE-based fixed wireless services can provide reliable broadband with speeds of at least 25/3 Mbps, further complicating matters. Fixed wireless services are often even more difficult to challenge, because there is no physical infrastructure outside of each location for engineers to evaluate, removing one of the most effective challenge strategies available against wireline ISPs.

County and local governments must work with members of their communities and interested ISPs to understand the patterns of ISP service mischaracterizations and develop challenges to ensure that unserved and underserved locations in Inyo County can be identified and reclassified as eligible for the major influx of broadband funding over the next few years. This section will review the types of challenges, how they relate to the main funding programs, and what counties and municipalities can do to develop crowd-sourced information that can be used to submit challenges.

### 6.4.1 Overview of Challenge Processes

The FFA, BEAD program, and federal programs each have their own challenge processes, so potential applicants should be aware of which mapping source is used by each program and how service availability can be challenged. There are four general types of challenges:[192]

- **Service availability errors:** At least one service option detail, such as the advertised speed, technology (DSL, cable, fiber, etc.), or service type (residential or business), offered at the location does not match the service information presented on the map.
- **Service performance errors:** The actual speed or latency of the service does not reliably match the subscriber's service plan and conflicts with the service information presented on the map.
- **Location information error**: The information about the location, such as its address, position on the map, number of households at the location, or its status as a residence, business, or community anchor institution, does not match the location information presented on the map.
- **Enforceable commitment status error**: The location is either classified as included within a deployment project that is subject to an enforceable commitment, such as a grant agreement or reverse auction award, but is not, or the location is classified as not part of such an agreement but is marked as ineligible for this reason.

Not all of these challenge types are available under each program. For example, the FCC challenge process has not been adequately designed to handle actual service performance errors, while the BEAD program cannot consider location information errors. The NTIA required that state BEAD administrators have their own state-administered challenge processes to ensure that the states could provide additional challenge options not necessarily present in the FCC process.

Of the three main challenge processes, the FFA challenge process may be the most applicant-friendly, because a wider range of challenge information can be submitted as part of the application itself, and by default, challenged ISPs have a more limited time to respond.[193] The BEAD challenge process is more robust, with definite evidentiary requirements, and will occur during a specific time during the first half of 2024.[194] While the FCC's National Broadband Map challenge process still does not allow individuals to challenge actual service performance errors, this map is still used as the primary source to identify eligible deployment areas for federal agency programs, such as the USDA's ReConnect program and the BEAD program.

[192] See, e.g., NTIA and U.S. Department of Commerce, "BEAD Model Challenge Process," pp. 13-17, 2023, https://www.ntia.gov/sites/default/files/2023-09/bead-model-challenge-process.zip.

[193] FFA Guidelines, pp. A-15 to A-16, A-21 to A-23.

[194] NTIA and U.S. Department of Commerce, "BEAD Model Challenge Process."

### 6.4.2 Local Challenge Strategies

Municipalities have an important role to play to help ensure that all un- and underserved areas within their jurisdictions are eligible for grant funding. With two separate maps and at least three challenge processes, municipalities can sort through this complexity and serve as vital coordinators of community action, encouraging people within their jurisdictions to participate in the right efforts to fix erroneous service claims at their homes. Municipalities interested in identifying mischaracterized locations can adopt three core strategies.

**Review the broadband maps closely:** Municipalities should review the CPUC's map and FCC's National Broadband Map closely to check whether the ISPs' self-reported service areas seem to match with the experiences of their communities. Section 4 uses information from the FCC map, so close review of the materials in that section will help to guide this process. There are five distinct error patterns that this review may identify.

- **Missing locations:** While it is hard to discover individual missing locations, larger missing clusters, such as new residential communities, may not yet have been integrated into the National Broadband Fabric. ISPs have a strong incentive to add these areas to the fabric themselves, but municipalities should note the issue and consider submitting a bulk location challenge to the FCC, using their permitting information to verify the existence of new households.
- **Broadband signal-based issues**: While the areas served by each technology should be scrutinized, municipalities should look more closely at DSL and fixed wireless coverage to identify whether there are service issues related to weak or unreliable signals. DSL networks in some areas still use older infrastructure and wiring installed in the prior century. Without replacement, smaller sections of these networks can become unreliable somewhat sporadically, introducing reliability issues that are hard for the ISP to identify, track, and report to the FCC and CPUC. As a result, the ISP may reasonably believe that all locations are served, but consumers may have different experiences. Similarly, fixed wireless companies rely upon wireless propagation models to justify their service area claims, but some obstructions, such as trees, hills, and other buildings may hinder the signal from reaching all locations within the area predicted by the model.
- **Erroneous network location claims:** ISPs have a difficult task of interpreting a massive amount of network infrastructure and customer service information. When this information is converted to GIS data, errors may sometimes occur, and the ISP may claim that certain locations are or can be connected within 10 business days when they cannot. These errors may result in certain side streets or sections of longer rural roads being misclassified as served when the network may not actually be close enough to many locations.
- **"Long drops" – locations far from the nearest road:** As discussed in Section 6.2.3 above, some buildings remain unserved because they are far away from the wireline infrastructure that runs along the nearest street. Their driveways may be long, or they may be placed along dirt road easements onto which the ISP did not install infrastructure. In these situations, the ISP will often request several hundred or even thousands of dollars to perform the initial installation. The ISP may generate its service area claims by identifying the roads containing its infrastructure and assuming all passed addresses are serviceable. In many rural communities, this assumption will classify locations with long drops as served when they are not.
- **Wiring problems in apartments:** Older apartment buildings and other multi-tenant environments (MTEs)/Multiple Dwelling Units (MDUs) often rely on older wiring that may have originally been installed to provide basic telephone service. Service to some units may suffer from older cables. In many of these buildings, new wiring to connect the outside cables to each unit can be expensive to install, a problem that generally increases with each additional floor. ISPs that claim service to each building passed by their networks may claim these buildings are served when the internal wiring has not been installed or may not be aware of the condition of the internal wiring.

**Encourage the right community actions:** The municipality should generally encourage everyone to look at the broadband maps if they are not happy with their broadband service options. However, depending upon the patterns of errors identified in the map, the municipality may want to encourage members of its community to focus on specific efforts.

- **Promote participation in the FCC and CPUC challenge processes:** On their websites and at appropriate public events, municipalities can provide the public with information about the FCC and CPUC online map portals and encourage them to see what services are claimed to be available at their households. The municipality can also explain the importance of these consumer challenges and how easy it is to submit information on those websites directly.
- **Listen to community issues:** The initial review of the broadband maps should be complemented by conversations with community broadband leaders and CAIs who may have more details about some of the ISPs' service claims and can promote participation in the FCC's and CPUC's consumer challenge processes. These discussions may identify some of the error patterns discussed above, which should guide any collective action.
- **Develop outreach strategies to participate in coordinated efforts:** Once the municipality has identified an error pattern, it can reach out to households likely to be suffering from the same type of service mischaracterization. This more targeted participation strategy will provide the FCC or CPUC with multiple instances of the same problem within an area, which may encourage them to investigate the situation further and discover the extent of the mischaracterization beyond the individual challenges submitted to them.

**Develop "bulk challenge" submissions:** In some cases, the error pattern may encourage the municipality to work with the community to develop a "bulk challenge" submission, which would contain information about the misclassification of many different locations across an area. These bulk challenges have a few added benefits. First, they implicitly allege that a pattern of mischaracterization is occurring, which may encourage additional investigations. Second, they allow the municipality to create a more consistent data set identifying a reoccurring problem. Third, they serve as an additional opportunity for quality control, with crowdsourced information able to be requested with greater specificity and reviewed before submission to identify opportunities to improve the clarity of the data. While these bulk challenges are available to address most challenge claims, they are particularly useful in the following three contexts.

- **Speed testing efforts:** ISPs facing poor speed test results can often claim that the tests were performed over weak or slow Wi-Fi networks or were otherwise influenced by factors that muddle the results. A municipality or other organization developing a bulk challenge filing can request that participants explain additional details about their testing circumstances, submit multiple testing outcomes across different times and days, or even require that some testing be performed over a direct wireline connection to the modem. These strategies reinforce the impact of bad speed test outcomes and foreclose some of the counterarguments that ISPs may make about their services.
- **Areas where ISP does not actually offer service on its website:** Once the municipality has information about an ISP claiming to serve an area on the maps but not actually offering services to addresses in that area on its own website, it can develop data to demonstrate the pattern. It can request that residents send in screen captures the ISP's website showing both the address being checked and the services offered at that location, then have staff perform a similar check for services at neighboring addresses.
- **Areas without an ISP's claimed infrastructure:** Some service claims can best be refuted by sending a qualified broadband technician into an area and taking photos of the infrastructure available. In many cases, entire side streets marked as served can be demonstrated to be unserved if the technician can demonstrate there is no corresponding infrastructure.

More information about the types of challenges is provided below, along with additional information about how municipalities, and in some cases, other organizations can develop these bulk challenges.

### 6.4.3 FFA Challenges

Within the California Federal Funding Account application itself, the program allows applicants to revise location eligibility classifications by providing additional evidence that demonstrates the location has been misclassified as ineligible on the FFA's eligibility map. While applicants can challenge service availability errors, the program's list of suggested evidence primarily focuses on service performance errors, allowing applicants to submit[195]:

- Speed test data from the CalSPEED test or other platforms, such as Ookla
- Data contesting reliability of service
- Interviews and testimonial from the impacted community and other qualitative information
- Other available data, including federal or state-collected data

The program suggests that this data can be gathered in a crowdsourced manner, with individual users running speed tests and providing testimonials of their service experiences to a single organization to be organized and analyzed as a group.[196] The program also encourages individuals to submit their conflicting service information as feedback on the California Interactive Broadband Map directly.[197] The CPUC's official Federal Funding Account map includes a "Search and Give Feedback" tab on the top-left of the screen and the ability to provide feedback on individual location hexes, which allows individuals to provide information that contradicts the map's current service claims.[198] These comments "will be considered with any applications that include areas for which a comment was submitted. Comments will also be evaluated on an ongoing basis."[199]

Once the FFA applications are submitted and the proposed service areas are made public, ISPs may respond to these challenges and issue their response within 14 days.[200] Interestingly, the program's challenge response requirements are among the most vigorous and specific, requiring that the ISP submit documented evidence of the service area, such as permits, easements, pole attachments, and/or pictures of the infrastructure and may submit billing statements of customers in the area.[201] The ISP may also submit challenges identifying "a policy or statutory requirement that the application has contravened,"[202] which adds risk to application strategies that appeal to the CPUC for special consideration against its default rules.

### 6.4.4 BEAD Challenges

While the CPUC's BEAD challenge process has not been finalized, there is enough information about its likely design to allow municipalities to begin to plan their challenge strategies. As part of the CPUC's required BEAD Initial Proposal Submission, it must describe to the NTIA the process it intends to use to conduct its own challenge process to the FCC's mapping

[195] FFA Guidelines, pp. A-15 to A-16.

[196] See ibid.

[197] CPUC, "Broadband Public Feedback," https://www.cpuc.ca.gov/industries-and-topics/internet-and-phone/broadband-mapping-program/broadband-public-feedback, accessed September 2023.

[198] CPUC, "Federal Funding Account Public Map," https://federalfundingaccountmap.vetro.io/, accessed September 2023.

[199] FFA FAQ, p. 4; CPUC, "Federal Funding Account Public Map User Guide," p. 5, June 2023, https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/communications-division/documents/broadband-implementation-for-california/priority-areas-webpage/public-map-user-guide.pdf.

[200] FFA Guidelines, p. A-21. The CPUC may extend this deadline as well. Ibid.

[201] FFA Guidelines, p. A-22.

[202] FFA Guidelines, pp. A-21 to A-22.

information.[203] The NTIA has provided states, such as California, with a "Model Challenge Process," which is designed to help them to comply with the long list of process requirements that NTIA has placed on it.

The Model Challenge Process identifies who may submit challenges and what challenges may be submitted, while suggesting submission timelines. As soon as the CPUC publishes the list of all unserved and underserved locations that it must provide to the NTIA, nonprofit organizations, units of local and tribal governments, and broadband service providers will have 30 days to submit their challenges.[204] Once submitted, the challenged ISPs will have 30 days to respond to the challenge, after which the CPUC has 30 days to evaluate the challenge and make a final determination. To request that a location's status be changed to "unserved" or "underserved," Challengers may submit the following challenge types:[205]

**Table 24: BEAD Challenge Process Types**

| Challenge Type | Description | Evidence Examples |
|---|---|---|
| **Availability** | Service identified in data is not offered at the location | Website service offering screenshots; ISP message denying service, demonstrating failure to install service within 10 business days, or requesting excessive installation fee; pictures demonstrating no corresponding infrastructure |
| **Technology** | Technology identified in data is not offered or available | Manufacturer and model number of residential gateway (CPE) that demonstrates the service is delivered via a specific technology |
| **Speed** | Actual speed of the service tier falls below the unserved or underserved speed | Speed test performed by subscriber demonstrating performance below 25/3 or 100/20 Mbps; evidence of subscription to faster service plan |
| **Latency** | Round-trip latency of the service exceeds 100 ms | Speed test performed by subscriber demonstrating latency above 100 ms |
| **Data cap** | ISP mandates data cap of 600 GB per month or less | Screenshot or billing statement of ISP establishing impermissible data cap |
| **Business service** | Location is residential but is only offered business service | Website service offering screenshots |
| **No enforceable commitment** | Location is marked as covered by an enforceable commitment but is not | Evidence demonstrating that location is not included in corresponding funding program or otherwise rebutting the claim of deployment obligation |

The Model Challenge Process also offers two optional sets of rules that states may adopt. The first provides a more detailed set of speed test requirements and a list of the different methods to perform a speed test, varying from a measurement made directly from the customer premises equipment to a typical consumer speed test conducted online near a Wi-Fi router.[206] This optional set of rules requires that failing speed test outcomes occur on three separate days, which will hinder the ability

[203] NTIA, "Bead Challenge Process Policy, https://internet4all.gov/bead-challenge-process-policy, accessed September 2023.

[204] U.S. Department of Commerce and NTIA, "BEAD Model Challenge Process," 2023, p. 12, https://www.ntia.gov/sites/default/files/2023-09/bead-model-challenge-process.zip.

[205] Ibid, at pp. 13-17.

[206] Ibid, at pp. 18-20.

for municipalities to use crowd-sourced data from their residents. These speed test outcomes also cannot occur more than 60 days before the start of the challenge period, requiring that crowd-sourced efforts occur within a very specific timeframe.

The second optional set of rules allows challengers to develop "Area Challenges," which will encourage them to use coordinated crowd-sourcing of data to submit the same challenge type from at least 6 locations within a census block group to obligate the ISP to demonstrate it actually does offer services meeting that claim across that area.[207] If the CPUC adopts this option, it will be a potent tool that will magnify the efforts of local coordination efforts, potentially allowing a municipality and its community members to challenge entire areas of unreliable services instead of challenging only the statuses of individual locations. This option also provides apartments and other multiple dwelling units (MDUs) with the ability to challenge services across the building by gathering evidence demonstrating the challenge from at least 10 percent of units or 3 units, whichever is greater.

### 6.4.5 FCC Challenges

While the FFA and BEAD challenge processes will help ensure the eligibility of un- and underserved locations mischaracterized by ISPs for those programs, the FCC challenge process will be ongoing and will play a role in determining location eligibility in future federal broadband infrastructure grant programs. The challenge submission process is also available to individual consumers and provides a well-designed web interface that allows them to submit screengrabs, pictures, and other evidence directly. The FCC's process is the only way to challenge the location fabric as well, making it the essential route to correct location information. Individuals or organizations can submit information demonstrating that a broadband serviceable location (BSL):

- Has been omitted from the fabric
- Is not a BSL
- Features errors about the corresponding address, building type, and/or number of units
- Has the wrong location coordinates information

Individuals or organizations can also challenge availability claims under the following options:

- Provider does not offer the speed(s) reported to be available at this location
- The actual speeds of this service do not match its advertised speed
- Provider does not offer the technology reported to be available at this location
- Provider denied a request for service
- Provider failed to schedule a service installation within 10 business days of request
- Provider did not install the service at the agreed-upon time
- Provider requested more than the standard installation fee to connect service

Individual applicants are invited to upload evidence of these claims, such as screengrabs of the ISP's website containing both the resident's address and the services offered at the location or copies of messages sent by the ISP denying requests for services. Consumers are also invited to describe the situation and explain their evidence in an accompanying text box.

[207] Ibid, at pp. 17-18.

The FCC provides organizations with the opportunity to submit *bulk challenges* as well. There are several submission options, with the FCC inviting organizations to develop engineering evidence that evaluates the infrastructure in a given region or collect crowdsourced information about consumers' service issues.[208] The crowdsourced information option generally requires that individuals provide the organization with much of the same information that is required by the FCC, so it may not be a particularly attractive option unless the organization has collected the information for another reason, such as to file a BEAD challenge.

Unfortunately, the FCC does not currently offer a way to challenge actual service speeds, making the BEAD challenge process's speed test option more important in this regard. Residents can submit customer complaints identifying that "[t]he actual speeds of this service does not match its advertised speed." Users submitting these actual performance claims are taken to a separate consumer complaints page that falls outside of the actual National Broadband Map challenge process page. Similarly, bulk challenges submitting speed test data to demonstrate that "performance of the fixed broadband service does not match its advertised speed" are categorized as a "Crowdsource Data" submission, not a formal challenge.[209] ISPs are under no obligation to respond, but the FCC explains that this speed test information "may be used by the FCC to identify instances or patterns of potentially inaccurate or incomplete data that warrant further investigation or review" by the FCC,[210] a process that has not been described in detail.

[208] See FFC, "Broadband Data Collection: Data Specifications for Bulk Fixed Availability Challenge and Crowdsource Data," pp. 1, 6-9, November 17, 2022, https://us-fcc.app.box.com/v/bdc-bulk-fixed-challenge-spec.

[209] FCC, "Broadband Data Collection: Data Specifications for Bulk Fixed Availability Challenge and Crowdsource Data," November 17, 2022, https://m.box.com/shared_item/https%3A%2F%2Fus-fcc.app.box.com%2Fv%2Fbdc-bulk-fixed-challenge-spec.

[210] FCC, "Differences between Bulk Fixed Availability Challenge Data and Crowdsource Data," November 17, 2022, https://help.bdc.fcc.gov/hc/en-us/articles/10390788241307-Differences-between-Bulk-Fixed-Availability-Challenge-Data-and-Crowdsource-Data.

SECTION

# 07

# FOSTERING A HEALTHY BROADBAND DEPLOYMENT ENVIRONMENT: PERMITTING, COORDINATION, AND OTHER LOCAL POLICIES

Historically unserved and underserved areas tend to pose economic challenges that discourage ISPs from entering the market.[211] Last mile broadband funding programs help to improve the ISP's business case to deploy new infrastructure to these areas. However, with this support funding still limited, local governments can work toward improving the economic appeal of serving these areas as much as possible.

Local governments cannot reduce higher deployment costs related to low population density or remote, problematic terrain. Still, they can adopt strategies to minimize other project costs and reduce the amount of ISP investment needed to offer new services. Some of these strategies require significant local effort or formal commitments between an ISP and the municipality, with the latter contributing financial resources and access to its existing infrastructure. In exchange, the municipality will be better positioned to ensure the ISP's network reaches unserved areas, offers more affordable pricing to customers, and better meets the community's needs.

In addition to these contributions, local governments can implement process improvements, policies, and best practices that do not require direct financial commitments or formal partnerships. These *Broadband Ready Community* strategies can often be done with little or no additional cost to the municipality while reducing ISP deployment costs, fostering better coordination between ISPs and municipalities. These strategies can also reduce the administrative efforts of the municipality itself. A few states, such as Colorado, Indiana, and Georgia, have analyzed these Broadband Ready Community strategies and created certification programs to help municipalities adopt them more easily.[212] Developed from local experimentation and experiences across the nation, these state certification programs use Broadband Readiness checklists to highlight the most important steps that municipalities can take to encourage new ISP investments. Accompanied by model ordinances, these clear requirements help communities determine whether they are poised to seek partners to design, deploy, and maintain broadband networks. The State of California has also developed advisory resources encouraging municipalities to improve their local permitting processes to facilitate network deployments by private ISPs.[213]

Overall, these policies can be classified into three categories[214]:

- **Improving access to information:** Local governments should make key broadband-related information about local infrastructure and public assets, permitting processes, projects, and related local strategies available online in an accessible, easy-to-use manner.
- **Improving local governmental coordination**: Local governments should establish clear, efficient lines of communication with ISPs and between different local governmental subdivisions. Broadband issues appear in several departments, so local governments should strive toward interdepartmental coordination to handle deployment-related decision-making effectively. Local governmental organizations should also coordinate with their county, other municipalities, and among each other to implement strategies that facilitate regional network deployment.

---

[211] NTIA, "Economics of Broadband Networks: An Overview," p. 1, March 2022, https://broadbandusa.ntia.doc.gov/sites/default/files/2022-03/Economics%20of%20Broadband%20Networks%20PDF.pdf.

[212] Colorado Broadband Office, "Announcing the Broadband Ready Community Program," January 26, 2023, https://www.in.gov/indianabroadband/broadband-ready-communities-program/broadband-ready-certification/; Georgia Department of Community Affairs, "Broadband Community Application Information," https://broadband.georgia.gov/broadband-community-application-information, accessed September 2023.

[213] E.g., California Governor's Office of Business and Economic Development, California Department of Technology, California Public Utilities Commission, and California Emerging Technology Fund, "State of California Local Permitting Playbook," August 2022, ("State of California Local Permitting Playbook"), https://broadbandforall.cdt.ca.gov/wp-content/uploads/sites/19/2022/09/California-Local-Jurisdiction-Permitting-Playbook-1.pdf.

[214] These three general categories are non-exclusive. For example, one of the most common strategies, designating a single point of contact for all matters related to broadband development projects, improves all three categories. Local governmental organizations with a single point of contact will centralize information requests and coordination efforts while improving the municipality's understanding about how permitting efforts are impacting the municipality's overall deployment efforts.

- **Improving permitting and asset access processes**: Local governments should streamline permit application filing, permit review processes, and encourage coordination between different stakeholders using dig-once policies, one-touch make-ready policies, and improved leasing opportunities for fiber, conduit, facility space, and real estate.

After further discussion of the Broadband Ready Community strategies described above, this section will explore additional ways that municipalities can work with ISPs to encourage them to invest in unserved areas. From joint planning efforts to formal partnerships, municipalities can make significant contributions to deployment efforts. These contributions also allow the municipality to encourage, or in some cases, require that an ISP adopt digital equity strategies or include specific areas in their deployment plans.

However, this list of specific strategies and best practices should not be viewed as a set of requirements. Instead, municipalities should view this section as a review of top issues municipalities face when handling broadband issues and a series of suggestions about how they can work toward minimizing them. Not all issues are significant in each area either, so municipalities can direct their efforts toward the most prevalent issues and identify which suggestions can be implemented when considering local resources. It is important to note that not all municipalities have the resources to devote to broadband-oriented policy revisions. Some may not even have formal policies addressing some of the construction factors discussed in this section or the staff necessary to facilitate deployments with ISPs in an active manner. After reviewing these strategies, staff from smaller municipalities will be better able to identify a few potential opportunities to make a significant impact on an as-needed basis, without creating formal policies beforehand.

# 7.1 Improving Access to Information

To plan and complete network deployment projects, ISPs need access to a large amount of information about local broadband needs, current infrastructure, other deployment efforts, construction policies, and permitting processes. County and local governments often have access to much of this information but may not have made it easily accessible to interested ISPs. Some of this information may not have been collected or organized yet either, which would require interested ISPs to collect it themselves. Local governments are often in a better position to organize this information more efficiently and at a lower cost than an interested ISP. As a result, municipalities that adopt "access to information strategies" will help ISPs to better analyze location details, such as permitting and access rights, and can reduce an ISP's ultimate deployment planning costs.

**Establish a dedicated broadband issues webpage on the local government's website:** Depending upon how the municipality handles permitting, mapping, and infrastructure development efforts, essential broadband deployment information can span many different local departments. An ISP may need to search throughout the municipality's website to find the information it needs, and some information may not even be available online. A centralized broadband webpage can provide direct links to this information, documents, and online submission forms from multiple departments.

Other local governments with broadband issues webpages often dedicate the top section to consumer issues. This section is an opportunity to encourage residents to sign up for broadband service subsidy programs, such as the Affordable Connectivity Program (ACP) and Lifeline, and to provide information about local service providers' low-cost internet plans. The page can also be used to collect broadband service challenges as well, a process discussed in subsection 6.3.

**Establish Geographic Information Systems (GIS) policies to support planning and construction efforts:** Municipalities often have detailed mapping information about building addresses and locations, parcel designations, zoning, neighborhood boundaries, and other details. Municipalities typically also have mapping data about their own assets, including public real estate, facilities, rights-of-way, and any existing broadband assets, as well as access to information about light and utility

poles, manholes and handholes, existing conduit, and underground utilities even if these assets are owned by a utility company. Through their permitting roles, municipalities may have access to information about private rights-of-way and easements, which can be substantially more costly for ISPs to discover themselves. Through its planning efforts, the municipality may also have developed details about unserved and underserved areas and related demographic information that can be invaluable when designing proposed service areas or applying to funding opportunities that require these details.

These GIS information sets can be essential for ISPs, allowing them to develop more detailed construction plans about their routes that can take into account more cost factors and funding considerations. A municipality with well curated asset information can even encourage ISPs to consider leasing arrangements that will leverage current public assets to reduce project costs. Local governmental organizations should work to ensure that these information sets are available online in an accessible, easy-to-use manner.

Through its role handling local infrastructure issues, the municipality may also be aware of certain challenges that could create problems or additional costs for ISPs entering the market. For example, some rights-of-way can become overly congested or are simply very costly to include in project construction. Many avoidable network design issues arise from a lack of knowledge of rights-of-way conditions, which can jeopardize project implementation. Municipalities can develop a congested rights-of-way policy, which can help to prioritize corridors in order of highest to lowest congestion to facilitate more efficient design decisions by guiding construction away from packed utility corridors whenever possible. Combined with GIS policies such as frequent maps updates for all public and utility rights-of-way, municipalities can aid ISP planning and coordination efforts significantly.

**Revise internal record-keeping processes to facilitate information-sharing:** Considering the range of issues involved, a municipality's broadband strategy planning and project coordination benefits significantly from input from several departments. Increasingly, a number of different local departments, including those that handle local economic development, community engagement, education, and local services, face significant broadband-related issues as well. These local services often depend upon reliable connectivity to ensure that their staff can provide public support.

> Local government-owned fiber is often documented on paper maps, in computer-aided design (CAD) drawings, and with ad-hoc spreadsheets. First, when there are only a few routes and no real complexity, these techniques appear to suffice. However, after a few changes, re-routings, and additions, the de facto documentation is only in the memories of the fiber team. The result may be re-work, fiber damage, accidental service outages, wasted time and money, and lack in confidence in the community's own infrastructure. Lack of documentation has led some communities to doubt their own fiber assets to the point that they decline to use it for public safety purposes because of concerns regarding failure rate and reliability. These same communities decline to lease their fiber because of concerns that they could not meet contract terms for managing it or for uptime. [215]

A better asset management system that tracks information about fiber, conduit, and other local assets would avoid problems resulting from this record-keeping approach and would ensure that such assets could be better utilized by both the municipality and interested parties looking to lease access to them. While this strategy may be costly upfront to implement, it is likely to reduce record-keeping costs in the long run and provide greater efficiency when these assets need to be repaired, upgraded, replaced, or utilized in new ways. Indeed, without a better asset management system, some future fiber uses may simply not be possible.

[215] State of California Local Permitting Playbook, p. 47.

**Establish efficient infrastructure information request policies:** In many cases, such as the public fiber assets documentation problem identified above, the municipality may not have the time or resources necessary to revise existing information into a more usable format. In these instances, the municipality should use its broadband issues webpage to encourage interested ISPs to reach out for more information about these deployment factors, then prioritize working with the ISP to analyze and refine the information into a more usable form needed by the ISP to create better deployment plans.

**Develop a permitting manual:** The municipality's broadband webpage should include information about a number of broadband consumer and ISP issues, but it may not be able to provide all details necessary to understand the permitting processes required by the municipality. In these cases, the webpage can instead provide a link to a telecommunications permitting manual that reviews the rules, regulations, and permitting processes that ISPs must follow to conduct broadband constriction projects in the municipality's jurisdiction. This manual should include permit cost and timeline expectations as well. If the municipality has few rules and required permits or does not have the time and resources to create a manual, it may want to organize information about these requirements in a single place for easy reference.

# 7.2 Improving Local Governmental Coordination

Once developed, the county or local government's broadband webpage should serve as a central point of passive information-sharing between interested ISPs and the municipality. However, this website certainly cannot replace all the conversations needed between the ISP and local staff. ISPs must interact with staff from different departments, including the municipality's attorneys, planning departments, public works and engineering, information technology, and GIS teams. When so many staff are involved, each person may not have the context of the overall broadband project and how each contributes to the municipality's overall decision-making. As a result, municipalities without well-designed communication and coordination plans may quickly lose track of important information, provide inconsistent answers, and ultimately work against themselves.

To make matters more complex, representatives from the municipality may also need to coordinate with other organizations that are outside of its control, such as local utilities. The municipality must often serve as a point of contact between these organizations, particularly when all parties must submit permitting, attachments, or rights-of-way information to the municipality. The municipality should also coordinate with other local governmental organizations to understand how coordination between county and local governments can create broadband opportunities that would not otherwise be available to each individual organization.

In summary, the municipality faces three on-going coordination challenges:

- Between the ISP and the municipality's staff
- Among the municipality's staff in different departments
- Between the municipality's staff and other organizations

To streamline coordination as much as possible, municipalities should adopt the following three strategies.

**Revise the municipality's internal coordination strategy to address broadband issues:** Considering the range of issues involved, a municipality's broadband strategy planning and project coordination must involve input from several departments. Increasingly, a number of different local departments, including those that handle local economic development, community

engagement, education, and local services, face significant broadband-related issues as well. These local services often depend upon reliable connectivity to ensure that their staff can provide public support.

To help all departments adequately address their broadband issues, municipalities should:

- Recognize how broadband issues impact each department
- Address broadband issues at top-level meetings among department heads
- Develop interdepartmental broadband plans that address:
    - The municipality's overall broadband development and digital equity strategic plan
    - The municipality's coordination strategies with other municipalities and essential third parties, such as utilities
    - Project coordination strategies between the municipality and ISPs active in the area
- Design and empower a *broadband coordinator* role to execute these strategies

By integrating the needs and insights of each department, these strategies will better represent the municipality's overall needs, ensuring that different departments are working together towards common goals.

**Designate a single point of contact for coordination with outside organizations:** Rather than requiring ISPs to reach out to multiple departments, municipalities should identify a single point of contact charged with quickly providing ISPs with information and other staff resources. Once initial contact is established, this broadband coordinator may allocate certain ongoing coordination responsibilities, such as permitting applications and GIS requests, to other staff as needed, while remaining responsible for overall staff utilization for broadband projects.

When the municipality is more closely engaged with a particular ISP, this single point of contact should also oversee how deployment plans with the ISP are progressing and coordinate the municipality's efforts to minimize planning and construction delays. This broadband coordinator should be empowered to work with ISPs to develop mutually agreeable approaches to design, planning, and construction that comply with local construction and permitting requirements as well.

This broadband coordinator will be more effective if she or he is also designated to represent the municipality's interests with other organizations, such as utilities and state government, and to advocate proactively for the municipality's broadband deployment and digital equity strategies. By placing this coordinator at the center of the municipality's broadband efforts with other organizations, the municipality can ensure that outside messaging and the municipality's overall deployment plan will remain consistent and well informed across discussions with these external groups. This person can also establish relationships with ISPs in the region, which is a critical step toward forming partnerships that can significantly benefit the ISP and municipality alike.

**Develop and implement customized coordination strategies with ISPs committed to construction in the area:** When a project is formally proposed, the municipality should dedicate an official project coordinator to manage the municipality's responsibilities for the duration of construction activities. Whether this project coordinator is the same person as the single point of contact described above, or merely reports to that designated point of contact, she or he can work closely with the ISP's project manager to review proposed plans and technical specifications, process permits, coordinate inspections, and identify and resolve unexpected issues. By working more directly with an ISP, this coordinator can also safeguard the municipality's interests in both achieving improvements in broadband service and minimizing unnecessary impacts on other infrastructure and the neighborhoods themselves.

Companies undertaking major broadband infrastructure projects in the area should also be encouraged to create a general coordination agreement with the municipality. This agreement has two basic goals. First, it should detail the municipality's construction and permitting requirements, along with an explanation of the municipality's responsibilities in administering them. Depending on what aspects are overseen by the municipality, this list should identify any rules related to placement of facilities within the right-of-way, typical depths, permissible construction methods, restoration requirements, inspections, encroachment into streets, sidewalks, or other public property, traffic disruption and control, notification procedures, and mitigation measures.

Second, the agreement should allow the ISP and municipality to identify any opportunities to modify submission and coordination processes to reduce the project's overall coordination costs and expedite deployment. Using the municipality's default permitting processes as a starting point, ISPs may suggest alternative ways that it can submit certain elements of its overall construction plans to comply with the municipality's review in a more efficient manner. If the municipality and ISP can come to an agreement about how the municipality's review can occur, this more project-focused review process can reduce the amount of time and effort needed to fill out permitting documents.

## 7.3 Improving Permitting Processes, Local Deployment Policies, and Asset Access Practices

Municipalities have a vital role to play to ensure that all local construction meets reliability, safety, and accessibility standards while addressing the needs of the community.[216] Several types of broadband deployment locations, from utility poles to train crossings and highway junctions, involve the property interests of several different parties. Through its regulatory and permitting roles, the municipality often helps coordinate and manage the rights and responsibilities of each involved party. They have five primary methods to accomplish these goals:

- **Construction rules and regulations:** These methods establish limitations and requirements that ISPs' projects must satisfy to ensure the community's interests are not harmed by construction. Most are not optional, though the municipality may allow different approaches to satisfy the underlying policy purpose of certain requirements. These rules generally function without requiring that the municipality provide notice to or communicate with construction companies, although the municipality should make regulations as transparent and easily available as possible. Examples include a municipality's rules about microtrenching, conduit installation, and the other project specifications verified through permitting processes.
- **Permitting processes:** These methods establish steps that an ISP must follow for authorization to perform certain construction activities, such as digging up roads, sidewalks, and other land, or to secure the right to place infrastructure on other property. Permit processes generally require that an ISP provide a specific set of information to the municipality, who in turn reviews this information to verify that the proposed project complies with applicable construction rules and regulations. While a municipality's permitting processes serve as the default method for submitting information, the municipality may also consider allowing the ISP to work with staff directly if a project requires many permits that must be processed quickly. This close coordination approach can also reduce the burden permit submission and review places on both the ISP and the municipality.

[216] See State of California Local Permitting Playbook, p. 1.

- **Coordination rules and policies:** These methods dictate the submission, communication, and coordination requirements an ISP's deployment plans must comply with to allow other parties the opportunity to place their own facilities alongside a network deployment, if reasonable. For example, a "dig once" policy will give other parties the chance to install their own infrastructure while the ground is open. Under this policy, an ISP must provide other parties with notice of the upcoming construction activities to facilitate this coordination. The goal of such policies is to minimize disruptions caused by construction.
- **Coordination agreements:** These methods allow the ISP and the municipality to work together to streamline permitting, project planning, and other construction processes, adapting each of their default internal processes in a way that reduces time and effort for both parties. By committing to more customized coordination efforts, the municipality can reduce the ISP's cost of expanding in the area.
- **Partnership agreements:**[217] The municipality and ISP may develop agreements to exchange financial resources, ownership of assets, and/or service obligations with one another. The municipality may agree to provide financing support and utility infrastructure to the ISP to encourage its market entry, or the municipality may even decide that it wants to own the broadband network itself, with the ISP agreeing to manage the infrastructure and offer services to consumers.[218] The discussions leading up to a public-private partnership can give the municipality the opportunity to negotiate additional commitments, such as the obligation to build out to all unserved locations in an area, offer low-cost broadband service plans to eligible households, or propose a discounted bulk service agreements to low-income housing in the area.

### 7.3.1 Construction Rules and Regulations

Depending upon the extent of the municipality's authority over local construction, the scope of the municipality's rules and regulations can differ dramatically. Larger municipalities with extensive regulations functionally require that construction experts analyze local rules and integrate compliance activities into an ISP's overall deployment plans. Smaller municipalities that do not fall into this category should instead focus on three factors:

**Strive for regional consistency around construction rules and regulations:** ISPs looking to expand into new areas are generally familiar with many of the construction rules and permitting practices of communities they already serve. In many cases, those communities have already worked with ISPs and gained insights into how their regulatory environment has impacted deployments, possibly modifying some rules to ease ISP entry. A municipality can look to its neighbors to gain insights into how construction rules can be revised and can work with other municipalities to promote regional alignment around these policies and permitting practices, creating a more straightforward permitting process that may allow the ISP to use one set of filing methods to satisfy other local, regional, or state requirements.[219] This comparison may also highlight policies that could hinder market entry. Legacy policies and ordinances can inadvertently interfere with efficient construction and permitting or may even deter partnership formation.

[217] These partnerships may also be between different public entities, such as a county or municipality and a California Joint Powers Authority.

[218] Note that this topic can be very complex, so this report will focus on the coordination and cost-reduction aspects of these partnerships. For more information about their business structuring aspects, see US Ignite and Altman Solon, "Broadband Models for Unserved and Underserved Communities," July 2020, https://www.us-ignite.org/wp-content/uploads/2020/07/USIgnite_Altman-Solon_Whitepaper-on-Broadband-Models_FINAL_7-9-2020.pdf, and a series of three public-private partnership whitepapers published by the Benton Institute for Broadband & Society, available at: https://www.benton.org/publications.

[219] See State of California Local Permitting Playbook, p. 12.

**Ensure that all construction rules and regulations are clear, reasonable, understandable, and available online:** ISPs must spend time interpreting and incorporating local variations to construction rules into their deployment plans. Construction rules should be designed to establish clear standards while being sufficiently flexible to accommodate different build options. A rule should aim to "provide a person of ordinary intelligence fair notice of what is prohibited" while not being "so standardless that it authorizes or encourages seriously discriminatory enforcement."[220] The language used in regulatory and permitting practices should therefore provide clear guidance to ISPs and facilitate easy, consistent enforcement and permitting reviews by the municipality.

**Determine the municipality's policies about underground construction methods and microtrenching:** ISPs must make a number of decisions about where to use aerial placement of cabling on poles and where to perform underground construction. Aerial deployments are cheaper to construct, but they depend on the availability of suitable utility or light poles and may require that the ISP pay to use this space. Pole attachment fees are generally annual, adding to a network's ongoing costs as well. In contrast, underground installations are substantially more expensive, requiring that the ISP dig a trench deep enough to place its conduit and fiber and install access points at regular intervals. However, underground construction is often necessary to ensure that the installed infrastructure is well protected against the elements, wildfires, and tampering. If fiber optic assets must be buried for protection and network preservation, the municipality should create placement policies that ensure the fiber will be protected underground.

Microtrenching is the practice of cutting narrow channels into rights-of-way. These channels are typically a few inches wide and vary in depth but are seldom as deep as trenching for other infrastructure, such as electrical or water networks. This method is a much more cost-effective way to install conduit and fiber optics compared to the traditional methods of excavation and road restoration, because these much smaller cuts into road surfaces or other land require less effort and cost to remediate the work site. Locations that adopt microtrenching policies will encourage ISPs to build fiber optic infrastructure at lower costs and faster time frames. However, this practice is not without its disadvantages. Microtrenching may not bury infrastructure deep enough to insulate it against fires or some forms of accidental tampering, making it a poor fit to fire-prone areas or areas where rights-of-way are regularly dug up or experience other stresses. Municipalities should consider these factors when designing rules about what areas could be eligible for this cost-saving technique.

### 7.3.2 Permitting Processes

Municipalities generally oversee permitting processes related to construction, rights-of-way and access. Most permitting regulations specify a set of circumstances under which permits must be granted or denied, while the process used to ensure compliance with these regulations establishes the way that the ISP must submit information for review by the municipality. Both the process and the regulations themselves are opportunities for transparency; municipalities should create clear, documented pathways through the process and explanations about how the evaluator will decide whether requirements are met. If the municipality does not present this level of clarity or if the process itself seems to be a logistical burden, ISPs could be deterred from considering expanding in the area. Municipalities can improve their permitting processes by adopting the following strategies:

- Ensure that each permitting process has been properly updated to consider broadband deployment issues and reviewed by staff who understand telecommunications factors,

[220] Institute for Constitutional Advocacy and Protection at Georgetown Law School, "Local Authorities," *Protests & Public Safety: A Guide for Cities & Citizens*, Fall 2017, https://constitutionalprotestguide.org/local-authorities/.

- Allow applicants to submit required permitting documentation digitally,
- Provide permitting process timelines and update applicants about their permit requests when the review reaches any milestones,
- Provide examples of permit planning and design standards, such as right-of-way diagrams, trench construction and pavement restoration, and pole attachments to improve ISPs' submission quality and better demonstrate standards,[221]
- Regularly revisit permitting rules and processes to improve alignment with federal, state, and other local requirements.[222]

### 7.3.3 Coordination Rules and Policies Best Practices

**Establish a "Dig Once" policy to promote conduit and fiber optic cable construction:** Underground construction is often necessary to ensure that the installed infrastructure is well protected against the elements, wildfires, and tampering. However, trench digging is very costly, so whenever digging occurs, the municipality should encourage as many parties as possible to take advantage of the opportunity to install infrastructure underground. Depending upon the specific rules adopted by the municipality, a "dig once" policy requires that any organization conducting certain types of underground construction provide opportunities for:

- Additional conduit and/or facilities to be included to ensure that other organizations can benefit from better underground access, or
- Other organizations to install infrastructure in the trench while it is available (also known as a "joint trench" policy[223]).

"Dig once" policies reduce costs and minimize construction impacts on pedestrian and auto traffic by reducing the number and scale of excavations needed to install telecommunication infrastructure in rights-of-way. This coordination requirement also opens up a number of additional opportunities for the municipality and other telecommunications and utility companies. For example, the municipality may decide to add additional conduit or its own fiber during the build, paying for the additional costs involved. It may then lease access or offer indefeasible rights of use (IRU) agreements, serving as both a means to encourage additional entry and a revenue-generating opportunity to cover the upkeep of other local telecommunications systems. Conduit placement should be considered even if the municipality does not necessarily have a current use for it. This way, when the conduit is needed for telecommunication infrastructure in the future, it is already in place and available for use or lease. Excess conduit reduces future installation costs by eliminating the need for additional trenching.

Municipalities should implement open trench notification processes as well. When a civil works project within the jurisdiction opens a trench, a list of pre-approved entities are notified of the opportunity to install conduit and cabling in that trench. Generally, this process will provide ISPs with the ability to install conduit and cabling at a significantly reduced cost if the trench is dug for other reasons, such as underground water, wastewater, gas, or other utility repairs and maintenance or new utility and municipal infrastructure projects. The municipality should maintain a public list of all broadband providers that

[221] State of California Local Permitting Playbook, p. 2.

[222] For examples of rights-of-way rules, see FCC Broadband Deployment Advisory Committee Model Code for Municipalities Working Group, "Rights-of-Way Model Code for Municipalities," https://www.fcc.gov/sites/default/files/bdac-07-2627-2018-model-code-for-municipalities-approved-rec.pdf, accessed September 2023.

[223] E.g., City of South San Francisco, "Ordinance amending Section 13.04 of the South San Francisco Municipal Code, adding Section adding Chapter 13.40 of the South San Francisco Municipal Code pertaining to open trench notification and telecommunication infrastructure improvements," January 9, 2019, https://www.ssf.net/home/showpublisheddocument/15880/636951776359530000; https://www.ssf.net/departments/public-works/engineering-division/dig-once-policy.

would like to receive notice of other trenching projects. To be eligible to receive an open trench notification, a provider must request that the municipality include them on this list. The municipality should provide notification of an upcoming open trench project on a non-exclusive, competitively neutral basis to broadband providers.

**Provide Early Notification of Trenching Moratoriums:** Trenching moratoriums are often used to protect newly paved roads or other recently completed infrastructure projects from trenching that would significantly undermine the quality and longevity of these improvements. Five-year trenching moratoriums can be particularly burdensome to ISPs planning gradual expansions or that are relatively new entrants to the market. If provided notice of a possible moratorium, providers may choose to install underground infrastructure that they might not immediately utilize in certain areas where a paving moratorium is about to go into effect. A provider may not need the infrastructure in place for some time, but the moratorium would foreclose the opportunity to perform installations and upgrades later. Providing regional ISPs with notice of a possible trench moratorium will encourage them to consider making a cheaper investment in conduit deployment if they anticipate eventual network expansion in the area.

**Establish a One-Touch Make-Ready Policy:** Typically, when a provider requests permission to attach new cabling to utility poles, it begins the "make-ready" process. Providers requesting such permission should already have a pole attachment agreement in place with the pole owner(s), but each new attachment triggers a process that requires utility poles be inspected to determine what work is needed to make each pole ready to receive a new attachment. Often, other cables may need to be physically moved to create sufficient vertical clearances necessary to comply with national safety standards.[224] Each owner of existing attached cabling is typically required to assess their infrastructure on the poles and move their own cabling infrastructure. Numerous owners mean numerous separate visits to the same utility poles to perform essentially the same task.

A one-touch make-ready replaces this process with a more streamlined one, where a single contractor (or small group of contractors) pre-approved by the pole owner(s) and the attachment owners can perform all the work necessary to complete the make-ready work needed for new attachments.[225] This approach reduces costs and time necessary to complete the process.

**Leverage Municipal Assets:** Municipalities should encourage interested ISPs to leverage their public assets. A municipality's existing conduit, fiber, rights-of-way, and facilities all present opportunities for broadband network developers to reduce their deployment costs, while potentially offering additional benefits to the municipality itself. If the municipality has an intragovernmental network running between local buildings, the conduit can be used to expand services quickly in areas passed by it, often into smaller town centers. A town's light and utility poles also may provide opportunities to run aerial cable or even install 5G small cell transmitters.[226] Key electronics facilities can be placed on or in municipality properties, and the municipality can offer its rights-of-way at reduced or no cost to encourage deployment without providing additional investment.

To facilitate ISP use of municipality assets, the municipality can create a template lease agreement. The template should include lease rates that prioritize broadband deployment over revenue generation and should allow for modifications to accommodate specific needs. By negotiating specific terms with the ISP, the municipality can also ensure that the ISP will

[224] State of California Local Permitting Playbook, p. VI.

[225] This practice generally applies only to make-ready work performed in the communications space on utility poles and not on any make ready-work that may be required in the upper, high-voltage power space.

[226] Even if the municipality does not own the utility poles, it may own the land on which the poles are located, potentially giving it the ability to develop some policies governing its use, such as a One Touch Make Ready policy.

protect the municipality's interests in these assets, potentially including ISP maintenance and additional operations requirements that can reduce the municipality's costs in managing these assets.

However, to fully leverage municipal assets, the municipality should first evaluate what assets it has and be able to provide that information to interested ISPs. Not having this understanding and inventory can lead to less than full utilization, because the assets and potential uses would be too unclear to facilitate this type of mutually beneficial coordination.

**Ensure Competition in Multiple Tenant Environments:** In February of 2022, the Federal Communications Commission (FCC) issued a Report and Order and Declaratory Ruling in the matter of improving competitive broadband access to residential and commercial multiple tenant environments (MTE).[227] The Order contains several provisions, but it specifically prohibits certain revenue-sharing agreements and exclusive marketing arrangements between landlords and two types of companies: telecommunications carriers and covered multichannel video programming distributors (MVPD), which are cable and satellite television providers. In the Order, the FCC declined to extend these prohibitions to providers that solely offer internet service.

In the Order, the FCC specifically prohibits telecom providers and property owners from entering into agreements for exclusive or graduated revenue sharing. The FCC stated that these types of revenue-share agreements are particularly harmful to competition and amount to de facto exclusive access agreements.[228]

While the FCC did not prohibit exclusive marketing arrangements in the Order, it did require the disclosure of such arrangements. In the Order, the FCC requires providers to disclose the existence of exclusive marketing arrangements they have with MTE owners, requiring that such disclosure "must be included on all written marketing material directed at tenants or prospective tenants of an MTE subject to the arrangement and must explain in clear, conspicuous, legible, and visible language that the provider has the right to exclusively market its communications services to tenants in the MTE, that such a right does not suggest that the provider is the only entity that can provide communications services to tenants in the MTE, and that service from an alternative provider may be available."[229]

While the FCC's ruling in the Order is in effect, the issue of de facto exclusive access arrangements, including access to existing inside wiring within MTEs, has been problematic even in the presence of FCC rulemaking. Municipalities should:

- Extend the prohibition on revenue-share agreements and graduated revenue-share agreements to providers that solely offer internet service,
- Prohibit exclusive marketing agreements between MTE owners and providers,
- Introduce MTE access requirements that will ensure other ISPs can access MTE facilities and install competitive networks for residents who want them.

### 7.3.4 Encourage Coordination Agreements

Municipalities should provide ISPs proposing major broadband infrastructure projects with the option of entering into a more comprehensive development agreement that would streamline the permitting process once a project is underway. Existing franchisees who are undertaking major projects to extend or upgrade infrastructure that involves work in the right-of-way should also have the option of entering into such agreements. Construction permitting should be consolidated and streamlined by allowing the developer to submit plans and receive permits for larger, multi-block areas as the designs become

[227] FCC, Report and Order and Declaratory Ruling, Improving Competitive Broadband Access to Multiple Tenant Environments, GN Docket No. 17-142, February 15, 2022, https://docs.fcc.gov/public/attachments/FCC-22-12A1.pdf.

[228] Ibid.

[229] Ibid.

available. The typical size of the areas submitted for review should be established in the development agreement, but areas containing up to 800-1000 premises would not be unreasonable. Required plans should be limited to one-dimensional (overhead) plans that indicate the placement of the proposed facility within the right-of-way and the method of construction.

Where local conditions require deviation from approved installation methods, municipalities should consider exceptions on a case-by-case basis, but may require greater supporting documentation before approval of needed permits.

While municipalities should identify expected construction methods, these should not be the exclusive methods permitted. Other methods may be appropriate due to local conditions, such as local underground obstructions or a lack of space in the right-of-way corridor or utility easement. As a matter of overall policy, the municipality should state its willingness to work with developers to identify appropriate and cost-effective methods to allow access to any serviceable premises, based on a balance of the following factors:

- Minimizing the cost to install facilities serving premises within the municipality to the extent practical,
- Minimizing the duration and disruption of work carried out within the right-of-way by using construction techniques less disruptive than traditional trenching,
- Minimizing accelerated depreciation of the right-of-way (deterioration of the roadway), considering the effectiveness of proposed restoration methods.

Such an agreement would include more information about the method(s) of construction that broadband providers intend to use in their project. The agreement should include, for example, cross-section plans for these methods and descriptions of situations in which they may be used, as well as allowable deviations from the norm. These agreements should describe the typical requirements for site restoration, traffic management, notification, and protection. They should also establish procedures for submitting final designs and as-built documentation, both as detailed drawings and GIS files.

SECTION

# 08

# DIGITAL INCLUSION CONSIDERATIONS AND STRATEGIES

As near universal broadband access is steadily being achieved through last mile funding programs, other aspects of the digital divide are becoming more pronounced. To ensure that all members of the community benefit from the opportunities provided by broadband, services must not only be available, but also affordable. The affordability of the service itself is not the only financial barrier that low-income non-adopters face either. Many families struggle to afford quality digital devices for each member, and instead are often forced to share a couple of decent devices or rely on outdated ones. To make matters more challenging, households that have long been on the other side of the digital divide have had fewer opportunities to develop digital skills. With these issues in mind, municipalities developing their overall digital equity strategies should focus on three main areas:

- Broadband adoption
- Device adoption
- Digital skills development

Addressing each of these issues can be a challenge because it is often difficult to reach out to the people most in need of assistance. Municipalities must work to understand who in their communities needs this support, which community anchor institutions (CAIs) have been working to help them already, and what they can do to support and expand upon these existing digital equity efforts.

Section 3 analyzed many aspects of the digital divide in Inyo County. This information plays a vital part in understanding the county's needs. Building upon that analysis, this section will first briefly present some affordability and adoption research to identify baseline adoption and pricing trends in the United States. The provided metrics can be used to develop more reasonable estimates for the sizes of different groups in need, which can play a role in designing digital equity program funding applications in the future.

Next, broadband service subsidy programs, including the Affordable Connectivity Program (ACP), the federal Lifeline program and California Lifeline, will be reviewed. Combined, these valuable programs make broadband service both at home and on mobile devices more affordable, but most people who are eligible for them are not enrolled. Municipalities should support CAIs that facilitate enrollment in these programs by promoting awareness and providing sign-up assistance.

Finally, this section will discuss what municipalities can do to prepare for the next wave of major digital equity program support funding. Recent federal legislation has made available significant funding for affordability and digital equity programs, funding that will largely flow through the National Telecommunications and Information Administration (NTIA) and California Department of Technology (CDoT). The NTIA has required digital equity funding recipients to submit their State Digital Equity Plans by no later than November 30, 2023,[230] so while digital equity planners are aware of the NTIA's general rules regarding how California can disburse this funding, the State's plan has not been submitted at this time. Nevertheless, the general rules suggest what range of programs that municipalities, CAIs, and non-profit organizations should consider developing or expanding to help everyone to experience the economic and quality-of-life benefits of modern broadband.

[230] Gabriel Petek, *The 2023-24 Budget: Broadband Infrastructure*, March 2023, p. 10, https://lao.ca.gov/reports/2023/4747/Broadband-Infrastructure-032023.pdf.

# 8.1 Affordability and Adoption

Home broadband services have become essential for nearly all American households. When broadband is available, nearly all households will purchase it if they can afford to do so. Pew Research Center's 2021 survey found that 93 percent of adults nationwide say they use the internet.[231] However, only 77 percent of adults nationwide said they have broadband service at home.[232] In other words, nearly one in five people who use the internet did not have high-speed home internet service at the time the survey was conducted. This gap between internet usage and high-speed service adoption has gradually continued to shrink, thanks to major federal and state funding efforts and the hard work of digital equity advocates across the nation, but the journey toward universal adoption is far from over. Digital equity advocates cannot take their progress for granted either. One recent survey found that approximately half of all households with annual incomes of $50,000 or less "live near the precipice of disconnection."[233]

This subsection will review and provide quantitative estimates of this gap, including the portion of the population that struggles to adopt service for financial reasons, those that have broadband access through only their mobile devices, and those that would struggle to pay for home broadband service unless it was free. These figures can be used to estimate the portions of home broadband non-adopters that could be reached with additional digital equity efforts, such as Affordable Connectivity Program (ACP) outreach and digital device handout and discount programs.

There are many reasons people may not purchase home internet services. Some simply do not have access to good broadband options. When research firm MoffettNathanson considered the impact of wired internet availability on service adoption, it found that that 87.4 percent of households with an available wired broadband connection actively subscribe to such service.[234] Among those without home broadband service, 25 percent "say they do not have a home subscription because broadband service is not available where they live or not available at an acceptable speed."[235] Pew found that only 72 percent of adults in rural communities subscribe to home broadband service, 7 percentage points less than adults in suburban areas.[236] This rural adoption gap is largely the result of differences in the availability of adequate service, but it also suggests that un-and underserved rural areas may be facing a larger digital skills gap as well, because households without home broadband have long lacked the same opportunities to develop online skills as the rest of the country.

In areas where broadband service is available and plentiful, household income levels explain a significant portion of the gap between internet use and home subscribership. Pew found that 92 percent of adults in households earning $75,000 or more

[231] Pew, "Internet/Broadband Fact Sheet," April 7, 2021, https://www.pewresearch.org/internet/fact-sheet/internet-broadband/.

[232] Pew, "Internet/Broadband Fact Sheet," April 7, 2021, https://www.pewresearch.org/internet/fact-sheet/internet-broadband/. The 2020 ACS found that 83 percent of households subscribe to wireline internet services, such as cable, fiber, and DSL. FCC, "2022 Communications Marketplace Report," GN Docket No. 22-203, December 30, 2022, p. 118, citing U.S. Census Bureau, American Community Survey, 2020 ACS 1-Year Estimates—Public Use Microdata Sample.

[233] John B. Horrigan and EveryoneOn, "Affordability and the Digital Divide: A National Survey of Low- and Lower-Income Households," December 2021, p. 5, https://tinyurl.com/HorriganAffordabilityReport.

[234] MoffettNathanson also found that an estimated 81.5 percent of households subscribe to wired broadband, which is noticeably higher than Pew's estimate. Alan Weissberger, "Broadband Access Subscriber Growth," *IEEE Communications Society Technology Blog*, January 4, 2023, https://techblog.comsoc.org/category/broadband-access-subscriber-growth/. MoffettNathanson's method differed; it analyzed households from the perspective of occupied housing.

[235] Andrew Perrin, "Mobile Technology and Home Broadband 2021," Pew Research Center, June 3, 2021, https://pewresearch-org-preprod.go-vip.co/internet/2021/06/03/mobile-technology-and-home-broadband-2021/.

[236] Emily A. Vogels, "Some Digital Divides Persist Between Rural, Urban and Suburban America," Pew Research Center, August 19, 2021, https://www.pewresearch.org/fact-tank/2021/08/19/some-digital-divides-persist-between-rural-urban-and-suburban-america/.

per year have broadband internet at home, but only 57 percent of households with an annual household income below $30,000 purchase the service.[237]

Digital device ownership is key to service adoption as well; researchers have identified a high correlation between owning a computer and obtaining home broadband services. One survey found that 90 percent of households have a laptop or desktop at home, and 96 percent of those households subscribe to home internet service.[238] Households without a laptop or desktop account for 58 percent of households that do not subscribe to home internet services.[239] When households can afford only a home connection or mobile service, most choose the latter. An estimated 27 percent of adults in households earning less than $30,000 annually are smartphone-only, while 13 percent in households with incomes of $30,000 to $74,999 and only 6 percent in households earning at least $75,000 rely exclusively on their smartphones.[240]

Simply put, many Americans are very sensitive to broadband pricing. In a nationally representative survey of 2,565 adult U.S. residents conducted by Consumer Reports in 2021, nearly a third of U.S. consumers who did not have broadband said the reason is because "it costs too much."[241] Another survey found that 45 percent of people without home broadband identify that the monthly cost of a subscription is too expensive.[242] Approximately 37 percent identified that the cost of a computer was a factor as well.[243]

Low-income households are particularly sensitive to home broadband service pricing. The Benton Institute for Broadband and Society's John Horrigan found that 40 percent of households with annual incomes of $50,000 or less say they cannot afford to pay anything for a home internet subscription.[244] Another 22 percent can afford to pay only about $25 per month.[245] Other research has concluded that prices above $10 to $15 per month are a challenge for low-income households to afford.[246] While many low-income households may choose smartphone service over home broadband service, not all households can afford smartphone service either. One survey found that about 24 percent of adults with household incomes below $30,000 a year say they don't own a smartphone.[247] Home computer costs play a role as well, with 41 percent of adults in the same income range reporting they don't have a desktop or laptop computer.[248]

---

[237] Andrew Perrin, "Mobile Technology and Home Broadband 2021," Pew Research Center, June 3, 2021, https://pewresearch-org-preprod.go-vip.co/internet/2021/06/03/mobile-technology-and-home-broadband-2021/.

[238] Sean Buckley, "Looking Forward to Broadband in 2023," *Broadband Communities Magazine*, January/February 2023, https://www.bbcmag.com/broadband-applications/looking-forward-to-broadband-in-2023, citing Leichtman Research Group (licensed research).

[239] Ibid.

[240] Andrew Perrin, "Mobile Technology and Home Broadband 2021," Pew Research Center, June 3, 2021, https://pewresearch-org-preprod.go-vip.co/internet/2021/06/03/mobile-technology-and-home-broadband-2021/.

[241] Jonathan Schwantes, "Broadband Pricing: What Consumer Reports Learned from 22,000 Internet Bills," *Consumer Reports*, p. 9, November 17, 2022, citing Survey Report, "BROADBAND: A Nationally Representative Multi-Mode Survey," *Consumer Reports*, p. 3, July 2021, https://article.images.consumerreports.org/prod/content/dam/surveys/Consumer_Reports_Broadband_June_2021.

[242] Andrew Perrin, "Mobile Technology and Home Broadband 2021," Pew Research Center, June 3, 2021, https://pewresearch-org-preprod.go-vip.co/internet/2021/06/03/mobile-technology-and-home-broadband-2021/.

[243] Ibid.

[244] John B. Horrigan and EveryoneOn, "Affordability and the Digital Divide: A National Survey of Low- and Lower-Income Households," December 2021, p. 5, https://tinyurl.com/HorriganAffordabilityReport.

[245] Ibid.

[246] Jonathan Sallet, "Broadband for America's Future: A Vision for the 2020s," Benton Institute for Broadband and Society, October 2019, 65-66, https://www.benton.org/publications/broadband-policy2020s; Colin Rhinesmith, Bianca Reisdorf, and Madison Bishop, (2019) "The Ability to Pay for Broadband," Communication Research and Practice 5, 2 (2019): 128; Colin Rhinesmith, "Digital Inclusion and Meaningful Broadband Adoption Initiatives," Benton Foundation, January 2016, 16, https://www.benton.org/sites/default/files/broadbandinclusion.pdf.

[247] Emily A. Vogels, "Digital divide persists even as Americans with lower incomes make gains in tech adoption," Pew Research Center, June 22, 2021, https://www.pewresearch.org/fact-tank/2021/06/22/digital-divide-persists-even-as-americans-with-lower-incomes-make-gains-in-tech-adoption/.

[248] Ibid.

These adoption patterns occur as a result of the specific range of home service prices available to each household. Overall, researchers have a sense of the range of prices consumers pay, but more detailed information is rare and often proprietary. A Consumer Reports study found that "among the 18,359 consumer bills on which an internet price could be identified, the median cost of high-speed internet service was $74.99 per month," with about half paying between $60 and $90 per month.[249]

Research into specific ISP pricing patterns is notoriously difficult. ISPs often use pricing strategies that differ by location, discount strategies that regularly change, and include occasional hidden fees. Each service pricing research effort must make simplifying assumptions to present the data, so the actual prices paid by consumers can differ significantly.

The Federal Communications Commission (FCC) analyzed the advertised rates for stand-alone internet plans in a limited number of markets on the websites of the top 11 fixed broadband providers in the United States, as shown in the chart below.[250] As the FCC noted, "in many cases these plans are not available throughout the provider's service area."[251] Additionally, the stated prices provided by ISPs do not necessarily reflect long-term pricing. The FCC study identified that, of the six providers offering discounts, the average discount was approximately 29 percent.[252] Consumers who are unable to switch to different ISPs may not be able to obtain new service discounts, so the real prices paid by consumers who have few ISP choices for adequate broadband services are often higher than prices paid by consumers in more competitive markets.

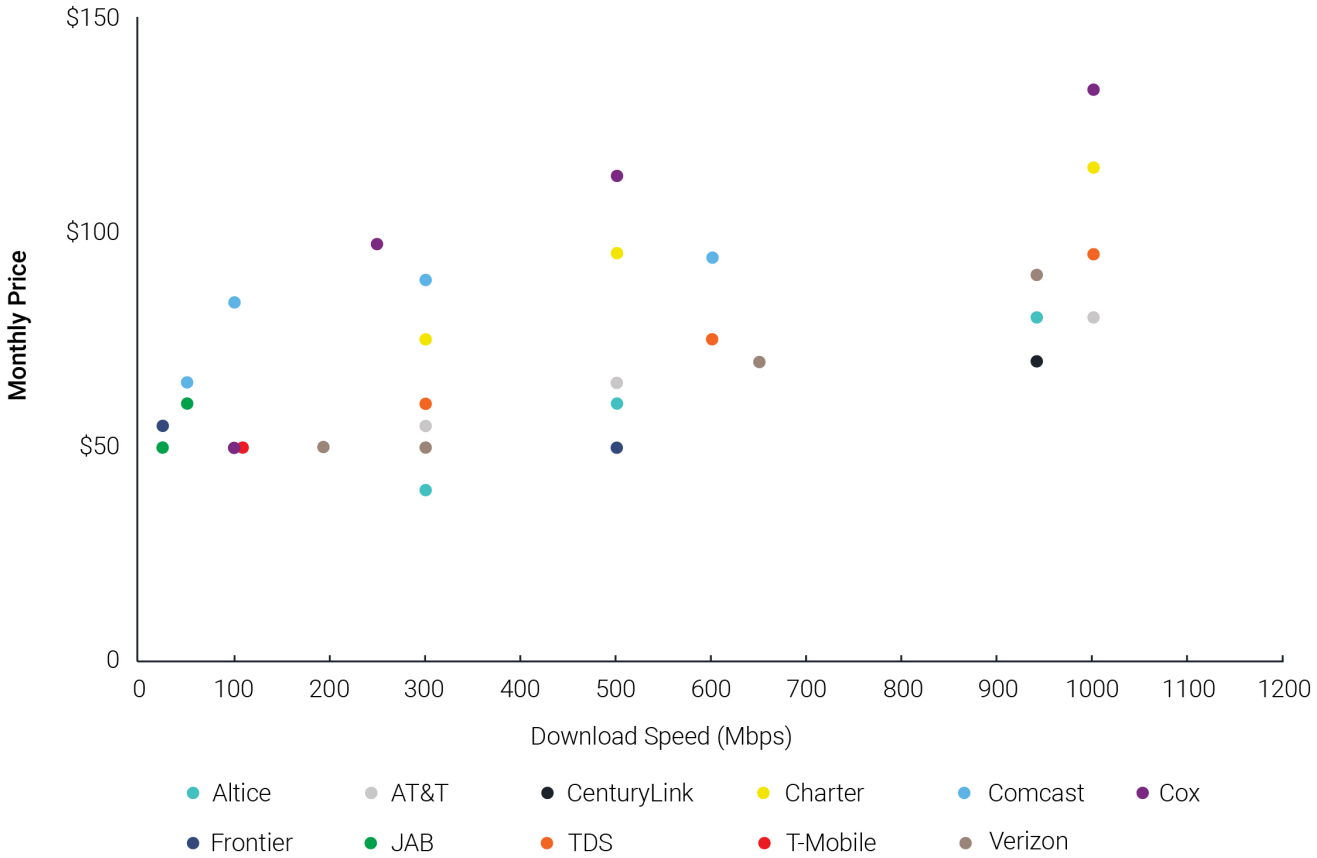
[249] Jonathan Schwantes, "Broadband Pricing: What Consumer Reports Learned from 22,000 Internet Bills, *Consumer Reports*, p. 3, November 17, 2022. Of the bills reviewed, 7,206 were bundled with other services but with internet service portions that couple be separated, while 2,827 bills were for bundled services that could not be used to identify the internet portion of the cost and were removed from the sample to reach this figure. Ibid, 16-17. This price range incorporated a number of additional costs on top of the stated price for the service and reflected the amount that consumers actually pay. Combined, short-term promotional discounts, paperless billing discounts, and credit card-based discounted in total typically ranged from $10 to $50 per month. Equipment charges were between $6 and $18 per month if they were included, and individual fees tied directly to internet service typically ranged from $2.49 to $9.95 per month. Ibid, at p. 4.

[250] FCC, "2022 Communications Marketplace Report," GN Docket No. 22-203, p. 29, December 30, 2022. The top 11 fixed broadband providers in the United States were Altice, AT&T, Lumen Technologies (CenturyLink), Charter, Comcast, Cox, Frontier, JAB Wireless, TDS, T-Mobile, and Verizon. Ibid. Using this method, the FCC's reported prices included the paperless billing or credit card-based payment discounts but not short-term promotional discounts, device fees, or additional company-imposed fees. Ibid.

[251] FCC, "2022 Communications Marketplace Report," GN Docket No. 22-203, p. 29, December 30, 2022.

[252] FCC, "2022 Communications Marketplace Report," GN Docket No. 22-203, p. 30, December 30, 2022.

**Figure 37: Monthly Price for Internet-Only Plans[253]**




While the FCC's research does not necessarily reflect the pricing in all markets, it does illustrate an important pattern. The price ranges offered by broadband service providers are somewhat similar, regardless of the technology providing the service or the actual service speeds. In other words, companies such as Frontier and AT&T may offer the same range of prices for DSL service in DSL-only areas as it does fiber service, despite the fiber service offering speeds significantly faster than what DSL can offer.

Focusing on the $50 price point, the chart above shows that the download speeds offered for $50 per month range from 25 Mbps to 500 Mbps. For example, Frontier offers both 25 Mbps and 500 Mbps service for $50, depending upon the availability of DSL or fiber technologies.[254] This pricing phenomenon has been referred to as "tier flattening," "in which consumers who have access only to the oldest and slowest internet infrastructure are forced to pay as much or nearly as much for inferior service as those served by newer, faster infrastructure."[255]

[253] FCC, "2022 Communications Marketplace Report," GN Docket No. 22-203, p. 30, December 30, 2022.
[254] FCC, "2022 Communications Marketplace Report," GN Docket No. 22-203, pp. 33-34, December 30, 2022.
[255] Jonathan Schwantes, "Broadband Pricing: What Consumer Reports Learned from 22,000 Internet Bills, Consumer Reports, p. 19, November 17, 2022.

**Table 25: AT&T Internet Costs**

| AT&T Internet Costs by Package Non-discounted prices of internet-only bills | | | |
|---|---|---|---|
| **Package** | **Bill Count** | **Mean Price** | **Median Price** |
| **Internet 10** | 12 | $51 | $55 |
| **Internet 12** | 23 | $58 | $63 |
| **Internet 18** | 43 | $64 | $65 |
| **Internet 24** | 56 | $68 | $70 |
| **Internet 25** | 73 | $60 | $60 |
| **Internet 45** | 25 | $74 | $80 |
| **Internet 50** | 109 | $66 | $68 |
| **Internet 100** | 89 | $63 | $60 |
| **Internet 300** | 124 | $67 | $65 |
| **Internet 1000** | 579 | $78 | $80 |

*Package names refer to the advertised download speed offered by the option. This is a convenience sample; no statistical inference can be drawn.*[256]

The above table demonstrates this tier-flatting phenomenon from a single provider offering DSL in some markets and fiber in others. This pricing research reflects that the cost of the lowest-tier DSL, cable, and fiber services packages in many markets all tend to start at between $50 and $65. The ACP provides a $30 per month subsidy, so unless an ISP offers a qualified low-income plan at a lower price point, the ACP can reduce the cost of this basic plan to between $20 and $35 per month, before any additional fees. Recalling that about a quarter of households with annual incomes of $50,000 or below say they can afford to pay only about $25 per month, the ACP subsidy helps these people adopt broadband when they would not have been able to otherwise. However, unless the ISP offers a special low-income plan for $30 per month (before the ACP subsidy), these services remain out of reach of an estimated 40 percent of households in this low-income category.

Affordability requirements and incentives have been integrated into some of the last mile funding programs to encourage adoption. In the application process, the California Public Utilities Commission's (CPUC) Federal Funding Account (FFA) requires that ISPs submit their menus of service options and corresponding pricing, while committing to not increase those prices for five years.[257] The program awards an additional 10 points to ISPs that commit to not increase prices for an additional five years and provides 20 points to ISPs that offer a low-cost broadband plan at 50/20 Mbps for $40 a month, with free installation and modem.[258] The program also obligates funding recipients to participate in the ACP, so this optional but highly encouraged service cost of $40 per month could drop to $10, making it affordable for nearly all residents in an FFA project's service area.[259]

The Broadband Equity, Access, and Deployment (BEAD) program also strongly prioritizes affordability considerations, requiring that states treat the applicant's stated cost of symmetrical 1 Gbps services as one of the grant program's primary scoring criteria.[260] Funding recipients must also offer at least one low-cost broadband service option to low-income

[256] Jonathan Schwantes, "Broadband Pricing: What Consumer Reports Learned from 22,000 Internet Bills, Consumer Reports, p. 19, November 17, 2022.
[257] FFA Guidelines, p. A-18.
[258] FFA Guidelines, p. A-7.
[259] FFA Guidelines, p. A-7.
[260] BEAD NOFO, p. 43.

families.[261] With the provided example, the NTIA suggests that states require this plan to cost $30 per month, "inclusive of all taxes, fees, and charges."[262] With funding recipients also required to participate in ACP, this qualified service option for low-income families would be free, subject to each eligible household's willingness to sign up for the ACP.

# 8.2 Service Subsidy Programs

### The Affordable Connectivity Program

The Affordable Connectivity Program (ACP) was authorized through the Infrastructure Investment and Jobs Act (IIJA) and is administered by the Federal Communications Commission (FCC) to continue the previously-funded Emergency Broadband Benefit (EBB) program. The ACP provides a monthly internet access discount of up to $30 to eligible households and up to $75 per month on tribal lands.[263] In addition, these same households can receive a one-time discount of up to $100 to purchase a laptop, desktop computer, or tablet from participating providers if they contribute more than $10 and less than $50 toward the purchase price. Households that meet at least one of the following criteria are eligible for the ACP:

- Household income at or below 200 percent of the federal poverty line;
- Received a Federal Pell Grant during the current award year;
- Meets the eligibility criteria for a participating provider's existing low-income internet program;
- Participates in one of these assistance programs:
  - Free and Reduced-Price School Lunch Program or School Breakfast Program, including at U.S. Department of Agriculture (USDA) Community Eligibility Provision schools;
  - SNAP;
  - Medicaid;
  - Federal Housing Assistance, including:
    - Housing Choice Voucher (HCV) Program (Section 8 Vouchers).
    - Project-Based Rental Assistance (PBRA)/Section 202/ Section 811;
    - Public Housing;
    - Affordable Housing Programs for American Indians, Alaska Natives or Native Hawaiians.
  - Supplemental Security Income (SSI);
  - WIC;
  - Veterans Pension or Survivor Benefits.

The ACP's funding is set to run out in the next year or two without additional efforts by Congress, putting its long-term stability in doubt. The FCC offered the second round of the Affordable Connectivity Outreach Grant Program this past summer, providing a total of up to $10 million in funding support to programs designed to increase ACP adoption among eligible

[261] BEAD NOFO, p. 67.
[262] BEAD NOFO, p. 67.
[263] FCC, "Affordable Connectivity Program," https://www.fcc.gov/acp, accessed September 2023.

households.[264] Along with the ACP's inclusion in major last mile funding programs, these efforts strongly suggest that federal policymakers believe the ACP will receive more funding after the initial $14.2 billion allocation is exhausted.

In October 2023 the White House requested an additional $6 billion for the ACP, but at the time of this writing congress has yet to consider the request.

### ■ Federal Lifeline and California LifeLine Programs

The Universal Service Administrative Company (USAC) administers a program that offers up to $9.25 per month to reduce the cost of qualifying internet and phone services for eligible households.[265] In California, this program has been modified and supplemented with additional benefits provided by the state.[266] The program provides up to $17.90 per month for qualifying mobile or home phone services and relief from a number of additional service fees and taxes, but it does not allow the subsidy to be used for home wireline broadband service.[267] Nevertheless, it remains an important part of broadband adoption promotional strategies. More than a quarter of households with annual earnings at or less than $30,000 are estimated to be smartphone-only.[268] If those households can reduce their smartphone bills by more than $200 per year, these savings can be used to cover the cost of home internet services. When combined with the ACP, qualifying households can reduce their combined home and mobile internet costs by nearly $50 per month.

Similar to the ACP, households can qualify for this combined state and federal program in two primary ways. The income-based qualification method is presented in the table below. Applicants must submit evidence of their annual income to the California LifeLine Administrator through either an online or paper application and must renew their eligibility status by updating this information annually.

**Table 26: California LifeLine Income-Based Qualification Requirement**

| Household Size | Annual Income Limits |
|---|---|
| 1-2 | $32,500 |
| 3 | $37,700 |
| 4 | $45,900 |
| Each Additional Member | $8,200 |
| **Effective June 1, 2023 to May 31, 2024** | |

[264] FCC, "Affordable Connectivity Outreach Grant Program – Round 2 Notice of Funding Opportunity," p. 5, 2023, https://www.fcc.gov/sites/default/files/FY_2023_ACP_Outreach_Grant_Program_NCOP_NOFO_Round_2_vF.pdf. The deadline for submissions was June 30, 2023. Ibid. at p. 11.

[265] USAC, "Lifeline – Get Started," https://www.lifelinesupport.org/get-started/, accessed September 2023.

[266] CPUC, "Program Guidelines: Is California LifeLine Right for You?," https://www.californialifeline.com/en/eligibility_requirements, accessed September 2023.

[267] CPUC, "California LifeLine Eligibility, https://www.cpuc.ca.gov/consumer-support/financial-assistance-savings-and-discounts/lifeline/california-lifeline-eligibility#qualify, accessed September 2023.

[268] Andrew Perrin, "Mobile Technology and Home Broadband 2021," Pew Research Center, June 3, 2021, https://pewresearch-org-preprod.go-vip.co/internet/2021/06/03/mobile-technology-and-home-broadband-2021/.

Alternatively, applicants can provide evidence that they participate in any of the following programs to qualify for the subsidy:

- Medicaid/Medi-Cal
- Low Income Home Energy Assistance Program (LIHEAP)
- Supplemental Security Income (SSI)
- Federal Public Housing Assistance or Section 8
- CalFresh, Food Stamps or Supplemental Nutrition Assistance Program (SNAP)
- Women, Infants and Children Program (WIC)
- National School Lunch Program (NSL)
- Temporary Assistance for Needy Families (TANF)
    - California Work Opportunity and Responsibility to Kids (CalWORKs)
    - Stanislaus County Work Opportunity and Responsibility to Kids (StanWORKs)
    - Welfare-to-Work (WTW)
    - Greater Avenues for Independence (GAIN)
- Tribal TANF
- Bureau of Indian Affairs General Assistance
- Head Start Income Eligible (Tribal Only)
- Food Distribution Program on Indian Reservations
- Federal Veterans and Survivors Pension Benefit Program

# 8.3 Reviewing and Assisting with CAI Efforts

- **Conduct outreach with Community Anchor Institutions (CAIs) and community broadband leaders**

In many communities, the digital divide is among the most important issues that social service-oriented organizations must address, because most other social programs either depend on or strongly benefit from online connectivity among participants. Employment and workforce development programs must encourage those seeking work to acquire connectivity, because it is vital to search for and apply to job openings, use online skills development opportunities, and discover the other online resources provided by the programs themselves. Similarly, people receiving assistance from programs related to healthcare, continuing education, elder care, income assistance, and other social service areas benefit significantly from online connectivity and are often unable to utilize full support opportunities without it. As a result, governmental organizations and CAIs offering these programs tend to be very aware of the digital divide and how it impacts the efficacy of their own programs.

A municipality's digital inclusion efforts should begin by reaching out to these organizations to better understand local digital equity problems and how they impact these other social support areas. These outreach efforts should serve as a basis to develop more long-term relationships between social service organizations and the municipality itself, because a municipality can evaluate how efforts to improve adoption and digital skills can help other social programs and can support coordination between these organizations to create a more cohesive overall digital inclusion strategy.

Some of these organizations likely will be addressing the digital divide more directly. With their mission to connect people to information and learning opportunities, libraries play a significant role in helping people access the internet. Library leadership will typically have a good sense of the types of digital divide issues that their staff assist with every day and can provide information about the list of broadband accessibility and digital skills development opportunities offered at their local branches. Schools also typically have information about the portions of their students that struggle with home connectivity.

- **Develop or support ACP and California LifeLine adoption awareness programs**

Many municipalities, non-profits, and CAIs have created programs to help ensure qualified households sign up for the ACP. These outreach programs are often successful in enrolling qualified households in the ACP monthly subsidy program. While some CAIs have developed significant programs that provide eligible households with direct assistance throughout the enrollment process, others have focused primarily on spreading awareness and providing signup information. These campaigns can be large or small in scope, so organizations with few resources can still contribute to awareness if they are interested in doing so.

The FCC has provided a toolkit for CAIs, local governments, and trusted community organizations to raise awareness about the ACP.[269] This toolkit contains consumer handouts, flyers, explanations for newsletter distribution, audio PSAs, and even pre-designed social media posts that municipalities and CAIs can immediately use to spread awareness of the program. Community anchor institutions should be encouraged to look at these materials and include them in their communications strategies. A few organizations, such as EducationSuperHighway, will provide individuals with signup assistance directly without a fee.[270] Organizations promoting awareness should encourage people to use these additional resources.

[269] FCC, "ACP Consumer Outreach Toolkit," https://www.fcc.gov/acp-consumer-outreach-toolkit, accessed September 2023.

[270] EducationSuperHighway, "Affordable Home Internet. Made Easy." https://www.educationsuperhighway.org/acpbenefit/, accessed October 2023.

SECTION

# 09

# WHAT IS A SMART COMMUNITY?

# 9.1 Defining a Smart Community

Many rural counties, suburban areas, and towns and cities are on the cusp of rapid change precipitated by a demand for digital services and the new technologies, such as high-speed broadband internet, that enable them. How can a community make informed decisions about its future, improve the efficiency of local government services, and meet the actual needs of its residents and businesses? While there is no one-size-fits-all definition for Smart Communities, they're generally recognized as digitally connected communities that utilize technology and data to improve the quality of life for all residents. Each community must go through a thoughtful planning process, informed by stakeholder input, to create a vision for the future that's backed by policy guidance and implementation plans.

## 9.1.1 Foundational Elements of Smart Communities

When developing Smart Community plans, the following foundational elements guide the selection of technologies and strategies used to address a community's needs.

- **People Focused/Community Driven:** The needs and challenges of residents, businesses, and visitors are the primary focus for adopting new technology and innovation
- **Co-Created:** Residents, businesses, and government participate in the decision-making process, including the identification of challenges and opportunities
- **Healthy:** Smart Communities promote active lifestyles that improve physical and mental health
- **Equitable:** A Smart Community is a compassionate community that works to enhance vulnerable and disadvantaged populations, reducing gaps to access and opportunity
- **Sustainable:** A Smart Community seeks a balance between environmental protection, social equity, and economic development priorities
- **Resilient:** A Smart Community maintains continuity of governance and business during chronic and acute stressors, including climate and severe weather impacts
- **Data-Informed**: A Smart Community collects and analyzes data to provide better and more efficient digital and physical services for all
- **Solution Oriented:** A Smart Community matches the right technological and innovative solutions to identified and established community issues and challenges
- **Transparent:** A Smart Community discloses what data it collects and how it is used. The public understands how decisions are made.
- **Interconnected:** A Smart Community is connected digitally by information technology and physically through urban planning and mobility solutions.

### 9.1.2 Benefits of Smart Communities

The Smart Communities approach for Inyo County will identify technologies and innovation that address current issues and prepare for the future. By prioritizing sustainability, resiliency, and equity, Inyo County can leverage technology and data to improve the quality of life for all residents while minimizing its impact on the environment. This can include implementing renewable energy sources, green buildings, and efficient transportation systems as well as promoting equitable access to resources and services such as affordable housing, transportation, and healthcare. Additionally, a smart community can be prepared to respond to natural disasters and other challenges by implementing emergency preparedness plans and investing in resilient infrastructure. Overall, the Smart Community Application Plan can help Inyo County become a more livable, sustainable, and resilient place for all its residents.

## 9.2 Inyo County's Existing Conditions

Inyo County is a rural area located in eastern California. It covers approximately 10,192 square miles and has a population of around 18,718 people.[271] With a climate and soil conditions conducive to farming, agriculture is the primary economic driver in the county. In addition, Inyo County is also home to a growing solar power industry, which contributes to the economic growth of the region. Natural resources, such as Yosemite National Park, Death Valley National Park, and the Eastern Sierra region make Inyo County an attraction destination for tourism. Other natural attractions, such as the Ancient Bristlecone Pine Forest, Mono Lake, and the Alabama Hills, draw in thousands of visitors annually.

### 9.2.1 Climate, Natural Hazards, and Other Issues

VHB reviewed publicly available information, including the county website, strategic plan, data provided by Tilson, and surveys conducted during the Broadband study to identify existing community issues and challenges.

VHB reviewed the CalEnviroScreen[272] tool, a mapping tool created by the California Office of Environmental Health Hazard Assessment, to identify census tracts that are most affected by sources of pollution, and where people are often especially vulnerable to pollution's effects. CalEnviroScreen uses environmental, health, and socioeconomic information to produce scores for every census tract in the state. An area with a high score is one that experiences a much higher pollution burden than areas with low scores. The CalEnviroScreen[273] Score for Inyo County is 24.8/100; primary hazards to the community are exposure to pesticides, unsafe drinking water, and ozone— all resulting from solid waste hazards, cleanup sites, and impaired water bodies. Primary community health risks include vulnerability to asthma, cardiovascular disease, and low birth weight. The factors contributing to socioeconomic vulnerability are poverty, education attainment, and unemployment.

- **Digital Equity**

The county submitted a grant application for Local Agency Technical Assistance funding in August 2022. The application is designated for last-mile network construction engineering designs to connect the unserved and underserved remote and rural population centers and cities in Inyo County to symmetrical 100Mbps or better broadband Internet service. Approximately 7.4

[271] U.S. Census Bureau QuickFacts: Inyo County, California
[272] About CalEnviroScreen | OEHHA
[273] CalEnviroScreen 4.0 Data Dashboard (arcgis.com)

percent of residents in Inyo County do not have access to broadband Internet services at speeds of at least 25Mbps/3Mbps. However, this data is self-reported by internet service providers (ISPs) and may not accurately reflect the actual availability and quality of broadband service in the county. While 92.7 percent of households have access to broadband, the actual speeds may vary widely. Some areas may have access to high-speed fiberoptic internet, while others may only have access to slower DSL or satellite internet.

The cost of broadband service in Inyo County can be higher than in more urban areas due to the lack of competition and the higher cost of providing service in rural areas. However, some ISPs may offer discounted rates for low-income households or those who qualify for government assistance programs such as Lifeline. Inyo County has limited options when it comes to broadband providers, with most residents having only one or two choices for internet service. The primary broadband providers in the area include AT&T, Frontier Communications, and Viasat.

### ■ Transportation

The mean travel time to work in Inyo County is 15.5 minutes. Due to the area's rural setting and high elevation, the vehicle is the main form of mobility for both locals and visitors. Approximately 850 of the system's total miles are paved. Less than 425 of the 1,126 miles of County highways and 10 miles of municipal streets are paved. Inyo County's roads saw a total of 1.797 million vehicle miles (VMT) each day. According to the US Energy Information Administration's 2018 Annual Energy Outlook, national VMT is predicted to rise by 16.4 percent between 2018 and 2050.[274] Inyo County's roads saw a total of 1.797 million vehicle miles (VMT) each day. According to the US Energy Information Administration's 2018 Annual Energy Outlook, national VMT is predicted to rise by 16.4 percent between 2018 and 2050. There are several public transit operators in the county. A fixed subscription service called Inyo-Mono Dial-a-Ride provides transportation between Tecopa and Pahrump, Nevada. The Inyo-Mono Senior Program (IMSP), a division of the county of Inyo, is the recipient of a contract from the Inyo-Mono Area Agency on Aging to provide its bus service.

### ■ Agriculture

Both the economy of Inyo County and its culture and traditions depend heavily on agriculture. The main agricultural activity in the county is livestock production, which includes rearing cattle, packing animals (horses, mules, and burros for transporting people and supplies), and sheep. This is because the county has wide rangelands accessible for grazing. The county also has irrigated pasturelands and a minor amount of intensive agriculture.

There were several critical agricultural resources identified during the development of the Inyo General Plan,[275] including:

- Protection and preservation of agricultural lands within the county;
- Protection of water is needed for viable agricultural operations; and
- Support for continued use of Los Angeles Department of Water and Power (LADWP), state and federal lands for agricultural purposes.

### ■ Emergency Preparedness

According to the General Plan,[276] the following are threats to the county: air quality, flood hazards, avalanches, wildfires, geologic and seismic hazards, and noise.

[274] Final Inyo 2019 RTP.pdf (inyocounty.us)
[271] GP Goals and Policy Report 12.2001.pdf (inyocounty.us)
[272] GP Goals and Policy Report 12.2001.pdf (inyocounty.us)

**Air Quality**

Wind-raised dust from the dry Owens Lake bed is the main stationary source of air pollution in Inyo County. The Los Angeles Department of Water and Power (LADWP) has historically diverted water from the Owens Valley, leaving the formerly enormous but shallow lake empty. Currently, the biggest single source of $PM_{10}$ (particulate matter) in the country—which accounts for 99 percent of the emission inventory in Inyo County—is wind erosion of the Owens Lake bed. The following are critical air quality issues that were identified during the development of the county General Plan:

- $PM_{10}$ pollution from the Lake Owens lakebed; and
- Impacts to the county from air pollutants drifting in from the San Joaquin Valley.

**Flood Hazards**

Inyo County has three different types of landforms that are frequently prone to flooding: playas, dry lakes, and stream floodplains. Additionally, people in Lone Pine and Olancha have voiced worry that flooding threats might occur from a failure of the Los Angeles Aqueduct. Development inside these floodplains or hazard zones can worsen these dangers by increasing runoff, altering the floodplains, and endangering public safety. Future construction will have some effect on flood zones by increasing impervious surfaces and runoff. The following are critical flood hazard issues that were identified during the development of the county General Plan:

- Development in floodplains;
- Mudflows (mixes of water, saturated rock, soil, and other debris); and
- Flood hazard from rupture of Los Angeles Aqueduct upstream from populated areas.

**Avalanches**

Intense snow avalanche threat can be present in some areas of Inyo County due to the steep mountain ranges and the intense and frequently changing weather. The Sierra Nevada mountain range contains most of the avalanche-prone regions, which are deserted and unusable for development. Aspendell, Habegger's, and parts of Sage Flat are examples of established communities or areas now zoned for residential usage that are situated in hazard zones. Avalanche dangers can also affect tourists who utilize or stay in places that are avalanche prone. Avalanches could cause significant structure collapses, human harm, and even death. The following are critical avalanche hazard issues that were identified during the development of the county General Plan:

- Existing development within known avalanche hazard areas;
- Undeveloped land within avalanche hazard areas that are designated for residential uses; and
- Backcountry avalanches and hazards to recreationalists.

**Wildfires**

Inyo County's main public safety issue is wildfires. Extreme seasonal weather conditions of low humidity and high winds, along with the huge open area and flammable flora, provide the ideal environment for devastating wildfires that burn intensely, quickly, and out of control. Additionally, wooden buildings sited on wooded properties increase the risk of fire. In the county, lighting and human error are the main sources of wildfire. The following are critical wildfire hazard issues that were identified during the development of the county General Plan:

- Limits on development in areas of high fire danger;
- Reduction in fire hazards; and
- Access to fire areas by emergency personnel.

**Geologic and Seismic Hazards**

Extreme topographic characteristics define Inyo County. Deep intervening valleys contrast sharply with high mountain ranges that were created during tectonic mountain-building processes. Large chunks of earth that were surrounded by faults in the Earth's crust were elevated during times of tectonic activity, resulting in the formation of these ranges, also known as fault block ranges. Various areas of the county are known to currently experience volcanic activity. The Coso Mountains, the Saline and Aberdeen Volcanic Fields, Ubehebe Crater, the Green Water Range, and the Bishop Tuff all have volcanic activity. Despite the fact that these regions are active, none of them are known to pose a substantial risk. The following are critical geological and seismic hazard issues that were identified during the development of the county General Plan:

- Protection from risks posed by seismic events;
- Protection from risks associated with volcanic activity;
- Ensuring adequate emergency response capabilities for major seismic/volcanic events; and
- Proper coordination with outside agencies to ensure timely response to event.

**Noise**

Noise sources can be separated into two types, mobile and stationery. Mobile sources are those who generate noise while moving around the county. These include noise from general and commercial aviation, military aircraft activities, and traffic on highways and roads in Inyo County. The county's main stationary sources include land usage for mining, industry, commerce, and utilities. The following are critical noise hazard issues that were identified during the development of the county General Plan:

- Maintaining the rural atmosphere in County;
- Noise from aircraft overflight; and
- Noise from roadways.

## 9.2.2 Community Plans and Initiatives

Through a review of publicly available data, VHB has observed that the following smart community technologies are already in use within the county.

### Broadband

Inyo County has taken steps to improve broadband access and quality in the area. The county has formed a Broadband Working Group to identify and address broadband issues in the area.

Broadband infrastructure can provide numerous benefits to Inyo County. Here are some potential ways that broadband could impact the area:

- **Improved access to information**: With broadband, residents of Inyo County would have faster and more reliable access to the internet, which would allow them to access information, stay connected with others, and participate in online activities such as remote learning, telemedicine, and telecommuting more easily.
- **Economic development**: Broadband can attract new businesses and industries to Inyo County, as it provides faster and more reliable internet access for businesses to operate and innovate. In addition, it can create new opportunities for entrepreneurs and small businesses to thrive, especially in fields that require high-speed internet.

- **Improved quality of life**: Broadband can help improve the quality of life for residents by enabling access to online services such as telemedicine, e-government, and online education. It can also help bridge the digital divide between urban and rural areas and reduce social isolation.
- **Increased civic engagement**: Broadband can enhance civic engagement by enabling residents to participate in online activities such as e-voting, community forums, and virtual town hall meetings.

Overall, broadband infrastructure can be a critical component in the economic and social development of Inyo County, providing residents and businesses with the connectivity they need to succeed in today's digital world.

### Transportation

All new bus purchases with gross vehicle weight rating (GVWR) over 14,000 pounds must be zero-emissions starting on January 1, 2029. Over the course of the planned period, more expensive electric car purchases will also be necessary, as well as the infrastructure needed to sustain an electric vehicle fleet. As Eastern Sierra Transit Authority (ESTA) runs high-mileage routes, this will include charging stations at the yard as well as on the road. The reduction in maintenance costs will be one advantage of fleet electrification. Currently, the Film Museum in Lone Pine and the US 395 immediately north in Mono County both have Tesla public charging stations for electric cars.

### Energy

The abundance of mineral resources was a motivating element for most of the county's early settlement. Because nearly 60 percent of the land in the county is estimated to contain mineral potential, mining continues to play a substantial, albeit declining, role in the county. The extraction of aggregate materials (stone, sand, gravel, and clays) is the most common mining operation. Other important minerals, including silver and gold, are mined in the county as well. Borates and soda ash (obtained from Owens Lake) are also significant in the mining sector. Inyo County's potential for energy resource development and augmentation is rather restricted. The hydrology, environmental sensitivity, and accessibility of rivers, streams, and geothermal resources limit further development. Several hydroelectric and geothermal power plants are currently operational, producing up to 322 megawatts (MW) of electricity per day.

## 9.3 Initial Smart Community Strategies

The introduction of additional high-speed broadband connectivity will enhance the ability of Inyo County to deploy smart community technologies that provide more efficient public services and enhance sustainability, resilience, equity, and quality of life for residents and businesses.

The smart community technologies that are potentially applicable to rural California counties are organized into five Pillar focus areas:

- Digital Community Infrastructure
- Climate Adaptation, Hazard Monitoring and Resilience
- Connected Public Infrastructure
- Smart Transportation Operations
- Smart Agriculture and Food Systems

Pillar focus areas help guide the development and implementation of initiatives and projects that aim to improve various aspects of community life through the use of technology and innovation.

Each Pillar focus area contains several strategies to address community needs, such as sustainability, resilience, and equity, through the integration of smart community technologies and processes. A strategy is a broad plan or approach that outlines goals and objectives, as well as the actions and resources needed to achieve them. It's a high-level plan that provides direction and guidance for an organization or project.

### 9.3.1 Digital Community Infrastructure

Digital community infrastructure refers to the use of digital technologies and platforms to support community development and engagement. This includes the use of social media, online forums, and other digital tools to connect community members and facilitate communication and collaboration. Digital community infrastructure also includes the development of digital services and resources, such as online education and healthcare platforms, to improve access to essential services. The goal of digital community infrastructure is to create a more connected and inclusive community that can leverage digital technologies to improve quality of life and promote social and economic development.

Local government can improve digital services by investing in technology infrastructure, such as high-speed internet and digital devices, to ensure that all residents have access to digital services. They can also develop user-friendly digital platforms and applications that are accessible to all residents, including those with disabilities or limited digital literacy. Local government can also provide training and support to residents to help them navigate and use digital services effectively. Additionally, local government can engage with residents to gather feedback and input on digital services and use this information to continuously improve and update digital offerings. Finally, local government can collaborate with other organizations, such as nonprofits and private-sector companies, to improve digital services.

**Strategy**

- Improve Digital Access and Equity
- Promote Digital Governance to Improve Communication Between Government and Citizens
- Use GIS and Digital Twin Technologies for Geospatial Analysis and Modeling

### 9.3.2 Climate Adaptation, Hazard Monitoring, and Resilience

Climate adaptation and resilience refer to the ability of a system or community to withstand and recover from the impacts of climate change. This includes the development of strategies to mitigate the effects of extreme weather events, sea level rise, and other climate-related hazards. Climate adaptation and resilience also involve the integration of climate considerations into planning and decision-making processes, such as land use planning and infrastructure development. The goal of climate adaptation and resilience is to reduce vulnerability to climate change and ensure the long-term sustainability and well-being of communities and ecosystems.

Climate hazard monitoring refers to the ongoing monitoring and assessment of climate-related hazards, such as extreme weather events, sea level rise, and changes in temperature and precipitation patterns. This involves the collection and analysis of data on climate conditions and trends, as well as the identification of potential risks and vulnerabilities associated with these hazards. Climate hazard monitoring is important for informing climate adaptation and resilience strategies as well as for supporting disaster preparedness and response efforts. By monitoring climate hazards, communities and organizations

can better understand and prepare for the impacts of climate change and take proactive measures to reduce their vulnerability and increase their resilience.

The 22 counties in this study are some of the nation's most climate-vulnerable. Being primarily inland, the greatest climate risks are droughts, wildfires, inland flooding from cloudburst events, extreme heat, earthquakes, and landslides. These events impact communities in numerous ways, from droughts damaging regional agricultural economies to wildfires and landslides devastating homes. Many of these climate hazard events are now costing both the state and the nation billions of dollars each year.

**Strategy**

- Create Digital Model to Identify Climate Risks, Vulnerable Communities, and Critical Infrastructure
- Use Weather Monitoring & Analysis to Predict and Prepare for Climate Hazards
- Expand Wildfire Detection and Monitoring Systems to Improve Safety
- Expand Flood and Landslide Monitoring Systems to Improve Safety

### 9.3.3 Connected Public Infrastructure

Connected public infrastructure refers to the integration of various technologies and systems to create a network of interconnected infrastructure. This includes the use of sensors, cameras, and other devices to collect data on traffic patterns, energy usage, and other infrastructure-related information. This data is then analyzed and used to optimize performance, improve safety, and reduce costs. Connected infrastructure also includes the use of communication technologies to enable real-time monitoring and control of infrastructure systems, such as traffic lights and energy grids. The goal of connected infrastructure is to create a more efficient, sustainable, and resilient infrastructure system that can adapt to changing needs and challenges.

**Strategy**

- Use Smart Water Systems to Optimize Conservation Efforts
- Expand Use of Clean and Renewable Energy Systems to Reduce Carbon Emissions

### 9.3.4 Smart Transportation Operations

Smart transportation operations refers to the use of advanced technologies and data analytics to optimize existing transportation systems and increase efficiency. It involves the integration of various technologies such as sensors, GPS, and artificial intelligence to collect and analyze data on traffic patterns, vehicle performance, and passenger behavior. This data is then used to make informed decisions on route planning, traffic management, and vehicle maintenance. Smart transportation operations also include the use of connected vehicles and infrastructure to improve safety and reduce congestion. The goal of smart transportation operations is to improve mobility, reduce travel time, and minimize environmental impact while ensuring safe and reliable transportation for all.

Smart transportation operations include an emphasis on decarbonized mobility, or the transition from fossil fuel-based transportation to low-carbon or zero-emission modes of transportation. This includes the use of electric vehicles, hydrogen

fuel cell vehicles, and other forms of alternative fuels. Decarbonized mobility also involves the development of sustainable transportation infrastructure, including charging stations and hydrogen refueling stations, to support the widespread adoption of low-carbon transportation. The goal of decarbonized mobility is to reduce greenhouse gas emissions from the transportation sector, which is a major contributor to climate change, while ensuring sustainable and efficient transportation for all.

**Strategy**

- Use Intelligent Transportation Systems (ITS) to Optimize Operations of Existing Transportation Networks
- Provide On-Demand Mobility as a Service (MaaS) to Enhance Trip Planning and Mobility
- Provide Digital Wayfinding to Reduce Traffic Congestion and Provide Public Safety Alerts
- Provide Smart Parking Solutions to Optimize Availability and Increase Revenue
- Deploy Charging and Fueling Infrastructure to Support Zero Emissions Vehicles (ZEV) and Electric Vehicles (EV)
- Deploy Microtransit Solutions to Provide Increased Transportation Options and Reduce Traffic Congestion

### 9.3.5 Smart Agriculture & Food Systems

Smart agriculture is the use of advanced technologies and data analytics to optimize agricultural production and increase efficiency. It involves the integration of various technologies, such as sensors, drones, GPS, and artificial intelligence, to collect and analyze data on soil conditions, weather patterns, crop growth, and livestock health. This data is then used to make informed decisions on crop management, irrigation, fertilization, and pest control. Smart agriculture also includes precision farming techniques that reduce waste and improve yields by enabling farmers to apply inputs only where they are needed. The goal of smart agriculture is to increase productivity, reduce costs, and minimize environmental impact while ensuring sustainable food production.

**Strategy**

- Use Soil Sensors to Optimize Irrigation, Fertilization, and Tillage
- Use Smart Irrigation Systems to Provide the Optimal Amount of Water for each Crop
- Use Aerial Drones to Monitor Crop Health, Irrigation, Spraying, and Planting, Soil and Field, Plant Counting, and Yield
- Use Smart Greenhouses to Create a Self-Sustaining Microclimate for Crop Production.

## 9.4 Prioritized Strategies

VHB reviewed the Climate, Natural Hazards, and other Issues identified in Section 2 to evaluate which Smart Community strategies are most appropriate for the identified needs of Inyo County. This evaluation also considers the issues identified in County plan documents, survey results (where applicable), and technologies already in use by the county.

The Prioritized Strategies for Inyo County are as follows:

- Expand Flood and Landslide Monitoring Systems to Improve Safety;

- Expand Wildfire Detection and Monitoring systems to Improve Safety;
- Deploy Charging and Fueling Infrastructure to Support Zero Emissions Vehicles (ZEV) and Electric Vehicles (EV);
- Improve Digital Access and Equity;
- Expand use of Clean and Renewable Energy Systems to Reduce Carbon Emissions, Increase Community Equity, and Improve Resilience

### 9.4.1 Strategy: Expand Flood and Landslide Monitoring Systems to Improve Safety

#### Description

In the diverse terrains of rural California, the strategy for enhancing flood and landslide monitoring blends advanced technological tools and community engagement. Central to this initiative is detecting early signs of soil movement or rising water levels through the deployment of ground-based sensors along riverbanks, slopes, and other vulnerable areas. Satellite imaging, combined with real-time meteorological data, can track heavy rainfall events and their potential to trigger landslides or floods. Further enriching these data streams with AI-powered analytics allows for predictive modeling, which can identify high-risk zones before any visible signs emerge. Additionally, engaging local communities through training and digital platforms ensures swift dissemination of alerts and promotes community-led monitoring efforts.

The implementation of such a robust monitoring strategy is crucial for several reasons. Rural areas, often characterized by less dense infrastructure and vast open landscapes, can experience rapid and devastating impacts from flash floods and landslides—resulting in loss of life, property damage, and significant economic setbacks. Given the changing climate, with erratic rainfall patterns and increasing instances of extreme weather events, the unpredictability of these hazards is on the rise. Proactively monitoring and predicting these events can significantly reduce response times, allowing residents to evacuate or take necessary precautions. Flood and landslide monitoring systems ensure the safety of the communities and minimize economic losses, making it an indispensable investment for the future safety and sustainability of rural California.

#### Applications and Use Cases

- **Early Detection Systems**: Early detection systems seamlessly integrate a multitude of data sources—including real-time weather data, riverbed and stormwater infrastructure flood sensors, and soil saturation measurements—enabling early detection of impending floods or landslides. Analysis of these data can be used to precisely forecast and issue real-time alerts, allowing communities to take swift and informed action to protect lives and property. Early detection systems are instrumental in bolstering disaster resilience, minimizing damage, and ensuring the safety and preparedness of vulnerable regions in the face of increasingly unpredictable weather patterns and natural hazards.
- **Water Systems Monitoring**: Water systems monitoring employs an advanced sensor network to continuously track water levels and assess water quality in critical waterbodies and reservoirs. Using real-time data to provide invaluable insights into the health and integrity of aquatic ecosystems, water monitoring systems play a pivotal role in safeguarding water resources by ensuring a sustainable supply of clean water and proactively identifying and addressing issues such as contamination or overuse. Their ability to provide early warnings and inform decision-makers about critical changes in water systems make these monitoring systems are essential to preserving the ecological balance and meeting the water needs of communities and industries alike.
- **Preventative Detection Systems**: Preventative detection systems employ a sophisticated network of sensors capable of assessing environmental conditions and terrain stability in order to accurately gauge the likelihood of floods or landslides. Furthermore, they provide critical insights into identifying vulnerable populations who may be at risk. By leveraging real-time data and predictive analytics, these systems can save lives and minimize property damage by

empowering communities and authorities to proactively plan and execute targeted interventions. Their capacity to forecast natural disasters and pinpoint those in harm's way makes them an indispensable tool in modern disaster management and community safety.

- **Flood and Landslide Notification System:** A flood and landslide notification system is a pivotal component of disaster response and public safety. Designed to rapidly disseminate to both first responders and the general public real-time alerts that are tailored to the specific level of danger posed by floods and landslides, these systems utilize a combination of meteorological data, ground-based sensors, and predictive models to assess the severity of impending hazards. Whether it's issuing evacuation orders, road closures, or precautionary measures, these notifications play a critical role in minimizing risks associated with natural disasters. In doing so, they enhance overall disaster preparedness, ensure swift and informed responses, and safeguard property and lives in vulnerable communities.
- **Evacuation Planning:** Enhancing evacuation planning, in conjunction with the effective use of flood and landslide monitoring data, is pivotal to ensuring the safety and effectiveness of evacuation efforts. Real-time data on inundation areas and landslide paths allows authorities to plan evacuation routes that more precisely steer clear of high-risk zones and respond to the evolving conditions of a disaster event, ensuring the safety of evacuees and first responders. It also enables the efficient allocation of resources and the establishment of designated evacuation centers. Integrating flood and landslide monitoring data into evacuation planning is a proactive measure that saves lives and enhances the overall resilience of communities.
- **Climate Adaptive Water Resource Management:** Climate-adaptive water resource management provides a forward-looking approach to mitigating flood risks while efficiently managing water resources. Monitoring data from various sources, including real-time weather data and water level sensors, allows for dynamic and data-informed decision-making in reservoir management and ensures that water levels are carefully controlled to minimize flood risk during heavy rainfall events. This adaptive approach safeguards communities from flooding and promotes sustainable water resource use. By synchronizing water releases with climate patterns, it optimizes water supply for various needs while simultaneously reducing the vulnerability of downstream areas to flood hazards. Integrating monitoring data into water resource management is essential in the face of changing climate dynamics, offering both resilience and resource efficiency for the benefit of communities and ecosystems alike.
- **Ecological Impacts of Flooding and Landslides:** Utilizing monitoring systems to assess the ecological impacts of flooding and landslides is vital for the preservation of vulnerable species and habitats. These systems provide valuable insights into the immediate threats posed by natural disasters and the subsequent opportunities for protection and restoration. By analyzing data from ground-based sensors, satellite imagery, and post-disaster surveys, they can identify areas where ecosystems may be at risk or where habitat restoration is needed. This information enables conservationists and authorities to develop targeted plans for safeguarding vulnerable species, restoring damaged habitats, and implementing mitigation measures to reduce future risks. Integrating monitoring data into ecological impact assessments fosters a more comprehensive and proactive approach to preserving biodiversity and ecological resilience in the face of natural disasters.
- **Enhance Design and Deployment of Green Infrastructure:** Using monitoring system data to enhance the design and deployment of green infrastructure and low-impact development (LID) systems is a progressive approach to mitigating the impacts of extreme precipitation events. By leveraging location and frequency data from monitoring systems, planners and engineers can make informed decisions about where to strategically implement green infrastructure and LID systems. This approach can reduce the risk of flooding and erosion by ensuring that sustainable stormwater management solutions are deployed in areas most vulnerable to extreme precipitation. By optimizing the allocation of resources and investments in green infrastructure projects, this strategy promotes a more resilient and sustainable urban environment. The integration of monitoring system data into infrastructure planning enhances the capacity to adapt to changing weather patterns and minimize the negative impacts of heavy rainfall on communities and ecosystems.

## Benefits

- **Enhanced Public Safety:** Monitoring systems provide early detection—giving communities time to safely evacuate, take protective measures, and reduce risk of injury of loss of life.
- **Optimized Emergency Response Resource Allocation:** Authorities that are able to prioritize and deploy resources based on areas that are predicted to be the most affected can ensure timely and efficient responses.
- **Infrastructure Protection:** Local authorities and utility companies can take preventative measures, such as reinforcing structures or redirecting water flows, to protect key infrastructure from damage.
- **Economic Saving:** Early warning signs and preparations reduce the impact of disasters, saving in post-disaster recovery costs. This can result in reduced downtime for local businesses and greater economic stability.
- **Nature-Based Planning and Design:** Predictive data on flood and landslide-prone areas can allow for better land use decisions, ensuring safer and more resilient community design.
- **Holistic Water Management:** Real-time monitoring of river and rainfall patterns allows for better water resource management, potentially aiding in drought mitigation through ensuring appropriate reservoir levels.

## Metrics and Key Performance Indicators

- **Sensor Deployment Coverage:** Measuring the percentage of vulnerable areas covered by ground-based sensors ensures comprehensive monitoring.
- **Data Collection Frequency:** Tracking how often data is collected from monitoring sensors ensures real-time or near-real-time monitoring capabilities.
- **Early Warning Lead Time**: The average lead time the monitoring system provides for issuing flood or landslide warnings to authorities and the public.
- **Data Accuracy**: Assess the accuracy of data collected by monitoring sensors ensures the reliability of early warnings.
- **Response Time:** The time it takes for emergency responders to react to alerts generated by the monitoring system.
- **False Alarm Rate:** Calculating the frequency of false alarms generated by the monitoring system minimizes unnecessary panic and resource allocation.
- **Risk Zone Identification:** The percentage of high-risk zones accurately identified by the monitoring system.
- **Emergency Preparedness:** The preparedness level of local authorities and communities can be assessed and improved through drills, training, and readiness assessments.
- **Cost Efficiency:** The cost-effectiveness of the monitoring system in terms of its ability to prevent damages and save lives compared to its operational expenses.
- **Data Sharing and Integration:** The extent to which monitoring data is shared and integrated with other relevant agencies and systems, such as weather forecasts or emergency response systems.
- **Reduction in Casualties and Damages:** The actual reduction in casualties, property damages, and economic losses attributed to the early warning and monitoring system.
- **Infrastructure Resilience:** The resilience of critical infrastructure, such as bridges and roads, to floods and landslides, based on monitoring data.
- **Environmental Impact:** The impact of monitoring efforts on the preservation of ecosystems and vulnerable species affected by floods and landslides.

- **Public Awareness and Education:** The effectiveness of public awareness campaigns and educational programs related to flood and landslide risks.
- **Frequency of Monitoring System Updates:** How often the monitoring system is updated with new technologies and improved capabilities to stay current with evolving risks.

## Risks

- **Financial Constraints:** Funding for the installation, maintenance, and operation of monitoring systems can be limited. Budget constraints may hinder the expansion and sustainability of monitoring efforts.
- **Data Privacy and Security:** Collecting and sharing real-time data can raise concerns about data privacy and security. Unauthorized access and data breaches could compromise sensitive information.
- **Technical Failures:** Monitoring sensors and equipment may experience technical failures. Gaps in data collection or inaccurate information can be mitigated with regular maintenance and redundancy measures.
- **False Alarms:** Overly sensitive monitoring systems may generate frequent false alarms, which can strain emergency response resources and lead to complacency among the public.
- **Public Resistance:** Some communities may resist the installation of monitoring equipment due to concerns about property values, aesthetics, or perceived intrusiveness.
- **Limited Coverage:** Achieving complete coverage of all vulnerable areas can be challenging, especially in remote or geographically complex regions.
- **Data Interpretation:** Accurate interpretation of monitoring data, and the ability to distinguish between regular fluctuations and impending disasters, is essential to avoid unnecessary panic or evacuation.
- **Infrastructure Vulnerability:** The infrastructure supporting these monitoring systems may themselves be vulnerable to damage during extreme events, potentially disrupting data collection and communication.
- **Climate Change Uncertainty:** Climate change can alter precipitation patterns and increase the frequency and intensity of extreme weather events, making it challenging to accurately predict future risks.
- **Resource Allocation:** Allocating resources to wildfire detection and climate monitoring may divert funds from other important planning initiatives. Misallocation can impact the overall effectiveness of the system and potentially impact overall community development.
- **Data Integration Challenges:** Integrating data from various sources, such as weather forecasts, river gauges, and landslide sensors, can be technically complex and require ongoing coordination.
- **Operational Maintenance:** Regular maintenance and calibration of monitoring equipment are necessary to ensure the accuracy and reliability of data, which can be resource intensive.

## Potential Partnerships

Addressing the complex challenges associated with expanding flood and landslide monitoring systems often requires collaboration with various partners. The following includes potential partners for rural California communities:

- **State and Local Government Agencies:** In California, collaboration with state and federal agencies such as the California Department of Water Resources and FEMA has led to the development of comprehensive flood monitoring systems. For example, the California Data Exchange Center (CDEC) is a state-operated system that collects, manages, and disseminates hydrologic and meteorological data to support flood monitoring and emergency response.

- **Environmental Organizations:** Collaborations with NGOs such as The Nature Conservancy and the Sierra Club can integrate ecosystem protection into flood monitoring. Their involvement can help balance environmental conservation with disaster resilience efforts, such as the restoration of floodplains and wetlands.
- **Academic Institutions:** California's universities, including the University of California, Berkeley, and Stanford University, conduct research on flood monitoring technology and risk assessment. Their expertise can contribute to the development of advanced monitoring systems and data analysis techniques.
- **Technology Companies:** California-based tech companies such as IBM and startups such as IoT America have partnered with government agencies to provide the technical infrastructure and software solutions required for flood monitoring. These collaborations can bring cutting-edge technology to a community's disaster resilience efforts.
- **Community Groups:** Involving California's community-based organizations, such as the Red Cross and local grassroots groups, can engage residents in preparedness efforts. These efforts are crucial for enhancing public awareness and participation.
- **Weather Forecasting Agencies:** The National Weather Service (NWS) and its local offices collaborate with California's emergency management agencies to improve the accuracy of weather forecasts and warnings. This partnership can ensure that real-time weather data is integrated into flood monitoring systems.
- **Infrastructure and Utility Companies:** Utilities such as PG&E and Southern California Edison are key partners in ensuring the resilience of critical infrastructure during floods. Their cooperation includes monitoring power grids and addressing potential vulnerabilities.
- **Insurance Companies:** Insurance providers such as State Farm have an interest in reducing flood-related losses. They support initiatives that enhance flood monitoring and mitigation to minimize insurance claims and protect policyholders.
- **Nonprofit Organizations:** California-based nonprofits such as the California Disaster Airlift Response Team (CalDART) are deeply connected to their communities. They can assist in disaster communication, outreach, and logistics.
- **Emergency Responders:** California's emergency response agencies, including the California Office of Emergency Services and local fire departments, can collaborate with developing flood response plans, coordinating rescue efforts, and ensuring public safety.
- **Land Use and Urban Planning Departments:** Local planning departments can work with flood monitoring systems to integrate real-time data into land use and development plans, helping create resilient, flood-resistant urban environments.
- **Transportation Authorities:** Agencies such as Caltrans can manage transportation infrastructure during flood events. Monitoring these systems aids in making informed decisions regarding road closures and detours, ensuring public safety.
- **Regional and Local Authorities:** Collaboration with county and municipal governments is essential for aligning policies, sharing resources, and coordinating flood response efforts at the local level.
- **Data and GIS Experts:** California's data and GIS experts contribute their skills to integrate monitoring data and create informative visualizations, making complex data accessible for decision-makers.
- **Media and Communication Partners:** California's media outlets and communication experts play a crucial role in disseminating timely flood warnings and safety information to the public, contributing to effective disaster communication.

Effective partnerships can enhance the capacity to expand and maintain flood and landslide monitoring systems while promoting community engagement and resilience. The choice of partners will depend on the specific goals and needs of the monitoring initiative and the local context.

## ■ Case Studies

The following case studies from Colorado, Washington State, and Monterey County serve as an example to rural California communities interested in deploying wildfire detection and monitoring systems. These success stories offer adaptable strategies that can be tailored to meet local needs.

Colorado has a history of flash floods, particularly in areas affected by wildfires. To address this risk, the Colorado Hazard Mapping Program (CHAMP), led by the Colorado Water Conservation Board, focuses on mapping flood and landslide hazards. Using advanced technologies such as LiDAR, aerial imagery, and ground-based field surveys, this program identifies high-risk areas within the state. However, it goes beyond mapping to play a pivotal role in guiding land use planning and enhancing emergency preparedness measures. By providing actionable data and insights, it equips stakeholders with the tools to make informed decisions, safeguard communities, and reduce the impacts of natural disasters.[277]

In the Pacific Northwest, an area known for its steep terrain and susceptibility to landslides, various agencies in Washington state have developed a landslide warning system. This system utilizes monitoring data and GIS Models to assess slope stability and promptly issue alerts when landslide risks are elevated, particularly after heavy rainfall. In addition, the system monitors where landslides occur and are reported, making the data available through its Geographic Information Portal. This proactive approach to monitoring has proven invaluable to protecting communities in the region.[278]

Monterey County, California, has been prone to both wildfires and flooding, which has led its Water Resources Agency to implement an early warning system. The ALERT Flood Warning System utilizes a network of sensors to monitor real-time environmental conditions including rainfall, river levels, and the potential for debris flows. Data from the system is monitored by staff via both a desktop and mobile web-based interface. The system also ensures redundancy through using an ALERT radio backbone, providing access to reliable real-time hydrologic data in even the worst storm conditions. What sets this initiative apart is its ability to swiftly issue alerts to both residents and emergency responders when the threat of flooding or landslides escalates. These timely notifications empower communities to take decisive actions, including evacuations, and enable emergency responders to mobilize quickly. This bridging of technology and disaster response serves as a lifeline for safeguarding lives and minimizing the impact of natural disasters in a state frequently at risk.[279]

## ■ Estimated Costs

The estimated cost of a flood monitoring system is subject to various factors, including the system's scope and coverage area; the choice of technology and sensors; data communication infrastructure, processing, and analytics; integration with existing infrastructure, maintenance and operational expenses; alerting and communication systems; user interface development; environmental conditions; regulatory compliance; and scalability requirements. Costs can range from tens of thousands of dollars for small-scale local systems to millions of dollars or more for larger regional or national systems with advanced technology and extensive coverage. To determine an accurate estimate, organizations planning flood monitoring systems should conduct a thorough needs assessment and cost analysis tailored to their specific objectives and project parameters.

[277] https://bouldercounty.gov/transportation/floodplain-mapping/colorado-hazard-mapping-program-champ/
[278] https://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/landslides#find-mapped-landslides
[279] https://www.co.monterey.ca.us/government/government-links/water-resources-agency/programs/flood-warning-alert/alert-flood-warning-system

In California, state and federal grants are crucial funding sources for flood monitoring systems and related projects. The California state government, through agencies such as the California Department of Water Resources and the California Governor's Office of Emergency Services, provides grants and funding opportunities for flood monitoring and disaster resilience initiatives.[280] Additionally, federal agencies such as FEMA offer competitive grant programs for which municipalities, organizations, and communities in California can apply to support their flood monitoring efforts.[281] These grants play a vital role in financing the development and maintenance of flood monitoring systems in the state, contributing to enhanced disaster preparedness and response. Securing such grants typically requires a comprehensive application process—demonstrating the project's alignment with state and federal priorities, potential impact on public safety, and adherence to specific program requirements and guidelines.

### 9.4.2 Strategy: Expand Wildfire Detection and Monitoring Systems to Improve Safety

#### ■ Description

In the wake of increasing climatic changes and environmental challenges, the strategy for expanding wildfire detection and climate monitoring systems in rural California is aimed at proactively identifying and mitigating potential wildfire threats. Utilizing a fusion of advanced technologies such as satellite imaging, drones, ground sensors, AI predictive analytics, and robust communication infrastructures, this comprehensive approach offers real-time surveillance, accurate data collection, and swift response mechanisms for both wildfires and significant climatic shifts.

The importance of this strategy cannot be overstated. Rural California, with its expansive woodlands and dry terrains, has historically been vulnerable to devastating wildfires, which endanger lives, destroy homes, and decimate ecosystems. The economic and environmental repercussions of these events have ripple effects that are felt locally and nationally. Moreover, as climate change exacerbates weather extremes, monitoring shifts in the environment becomes crucial to predicting and preparing for these volatile events. Thus, by investing in and advancing these monitoring systems, we not only safeguard our communities and natural landscapes but also equip ourselves with the tools and knowledge necessary to combat the unpredictable challenges of a changing climate.

#### ■ Applications and Use Cases

- **Computer Vision based Wildfire Monitoring Systems**: A vital component in modern wildfire detection and monitoring systems, Wildfire lookout cameras offer continuous, real-time surveillance of vulnerable landscapes. Equipped with high-definition, pan-tilt-zoom capabilities, these cameras are strategically placed at elevated vantage points to maximize their field of view, often covering dozens of miles in all directions. Utilizing advanced image recognition algorithms, they can automatically detect signs of smoke or fire and alert relevant authorities within seconds, thereby significantly reducing the time between the onset of a wildfire and the initiation of emergency response measures and aiding in the protection of lives, property, and natural ecosystems.
- **Emissions Based Wildfire Monitoring System:** Wildfire emissions sensors are cutting-edge devices specifically engineered to monitor air quality and detect pollution levels associated with wildfires. Strategically deployed in fire-prone regions, these sensors are capable of measuring a range of pollutants, including particulate matter, carbon monoxide, and volatile organic compounds, and provide real-time data that is crucial for assessing the environmental and health impacts of wildfires. Integrated with advanced analytics and communication systems, these sensors not only alert emergency services and local communities to deteriorating air quality but also contribute valuable

[280] https://www.caloes.ca.gov/

[281] https://www.fema.gov/grants/mitigation/flood-mitigation-assistance

information for research and policy making. By continuously tracking and analyzing wildfire-induced emissions, these sensors offer an indispensable tool for mitigating both the immediate and long-term impacts of wildfires on air quality and public health.

- **Automated Wildfire Emergency Notification System**: The automated wildfire emergency notification system is a state-of-the-art alerting mechanism designed to provide immediate warnings to first responders and local communities when a potential wildfire threat is detected. Using real-time data from a network of cameras, sensors, and satellite imaging, this system employs advanced algorithms to accurately identify the early signs of wildfires. Upon detection, it automatically triggers a cascade of alerts via multiple platforms—such as text messages, emails, and dedicated apps—to ensure rapid dissemination of critical information. By significantly narrowing the time window between the onset of a fire and the initiation of emergency response actions, the automated wildfire emergency notification system plays a pivotal role in safeguarding lives, property, and natural resources, while allowing for more effective coordination among various agencies involved in wildfire management.
- **Drones and UAVs:** Unmanned aerial vehicle (UAV) deployment for investigating and monitoring potential and active wildfires represents a transformative approach to wildfire management. These UAVs can quickly and safely cover expansive and often rugged terrains that are difficult for human surveyors to access. Offering high-resolution imaging, thermal cameras, and smoke detection sensors, they provide real-time data that is invaluable for both the early identification of potential fire zones and the tracking of active wildfires. Integrated with predictive analytics and communication networks, the UAVs can instantly relay critical information to emergency services, facilitating timely and effective response strategies. By serving as agile, high-tech scouts in the sky, UAVs help protect communities and conserve natural ecosystems by enhancing situational awareness and operational capabilities in wildfire management.
- **Real Time Wildfire Tracking Systems**: Emergency response resource allocation, based on real-time fire location and severity data, revolutionizes the traditional approach to wildfire management by dynamically optimizing the deployment of firefighters, equipment, and other critical resources. Utilizing a data-driven model fed by an array of inputs—including satellite imagery, ground sensors, UAV footage, and weather forecasts—this system employs advanced analytics to assess the evolving nature and risk of active or potential fires. Based on this real-time analysis, the system then automates or advises the allocation of available resources, ensuring that they are directed where they are needed most. By providing a responsive, adaptive, and highly efficient method for marshaling resources, this approach substantially enhances the effectiveness of wildfire response efforts, ultimately saving lives, protecting property, and minimizing environmental damage.
- **Connected Infrastructure Systems:** Infrastructure systems linked to wildfire monitoring are designed to safeguard essential utilities by providing real-time alerts to utility companies, enabling the immediate shutdown of power lines and gas lines in areas at risk from an active wildfire. These integrated systems utilize data streams from a variety of sources, such as satellite imagery, ground sensors, and predictive analytics, to identify zones where fires are likely to spread. Upon detection of an emerging threat, the system triggers automated or manual protocols to temporarily disable vulnerable utility lines, thereby preventing them from serving as additional ignition sources or suffering damages. This multi-layered, responsive approach allows for a more coordinated and effective emergency response, enhancing both public safety and infrastructure resilience by reducing the risk of wildfire-induced utility failures and catastrophic events.
- **Online Public Wildfire Tracking Application**: Public Facing Web Applications offer a real-time, interactive platform to provide communities with critical information on wildfire locations, air quality, and designated safe zones. Sourced from a network of ground sensors, satellite imagery, and other monitoring systems, these applications serve as a centralized hub for data visualization and situational awareness. With user-friendly interfaces and geolocation features, they enable residents to easily track fire movements, assess air quality levels, and identify the nearest safe havens in the event of an emergency. By offering timely and accurate updates, these web applications empower

individuals to make informed decisions for their safety and well-being while also facilitating more effective communication and coordination among residents, community organizations, and emergency services. In situations where timely information can make all the difference, these public-facing platforms are indispensable tools for community resilience against wildfires.

- **Real-Time Evacuation Protocols:** Evacuation Protocols based on real-time monitoring of wildfires represent a groundbreaking approach to public safety. These protocols ensure that residents receive timely warnings and access to the safest and fastest evacuation routes away from danger zones by using a dynamic system that continuously ingests data from an array of sources, such as ground sensors, satellite imagery, and UAV footage. Advanced algorithms analyze this real-time information to identify emerging threats and dynamically update evacuation plans. Residents receive immediate alerts via multiple communication channels, including text messages, phone calls, and apps, which provide warnings and turn-by-turn directions to the nearest safe locations. These smart evacuation protocols minimize the time between threat detection and community action, substantially increasing the odds of a successful and orderly evacuation.
- **Post-Fire Recovery Assessment**: Assess post-fire rehabilitation systems utilize advanced monitoring technologies to evaluate the damage wrought by wildfires on properties, the environment, and infrastructure. These systems employ a combination of satellite imagery, UAVs equipped with high-resolution and thermal cameras, and ground sensors to generate a comprehensive picture of affected areas. This data is then processed through specialized analytics software to quantify the extent of the devastation, from scorched landscapes and ruined buildings to compromised roads and utility networks. The detailed assessments help prioritize the most critical needs for restoring communities and natural habitats. Moreover, the collected data can be archived and studied to improve future fire mitigation strategies. By providing precise, real-time insights into the aftermath of wildfires, Assess post-fire rehabilitation systems play a pivotal role in facilitating effective and efficient recovery efforts.
- **Wildfire Frequency Trend Analysis and Risk Modeling:** Wildfire frequency trend analysis and risk modeling systems are designed to synthesize a multitude of data points, including historical wildfire incidents, weather patterns, and land use, to better inform future wildfire mitigation efforts in the wildland-urban interface (WUI) as well as in land management, climate adaptation planning, and insurance adjustments. The systems use machine learning algorithms and big data analytics to provide predictive models that identify areas of increased fire risk and estimate the likely frequency and intensity of future events. By isolating key variables and their interdependencies, these models serve as a robust basis for a range of applications, from guiding controlled burns and zoning regulations to influencing insurance premiums and climate resilience measures. As climate change intensifies the threats posed by wildfires, these advanced analytical tools safeguard communities and natural ecosystems alike by helping to proactively plan and inform decision-making.

## Benefits

- **Early Detection and Rapid Response:** Live monitoring for wildfires allows for early detection and rapid response efforts to prevent wildfires.
- **Faster Wildfire Response Times:** Faster response times can result in putting out wildfires before they get out of control.
- **Disaster Reconnaissance:** Utilizing UAV for wildfire reconnaissance can quickly give emergency responders valuable information that mitigate wildfire damage and save lives.
- **Real-Time Tracking:** During an extreme wildfire event, first responders can accurately track the location, speed, and intensity of a wildfire and respond accordingly.
- **Enhanced Public Communication:** Robust communication saves lives during wildfire events.

- **Rapid Recovery and Adaptation:** The ability to determine areas that are frequently at risk from wildfires provides responders with information to guide the recovery process.

## Metrics and Key Performance Indicators

- **Wildfire Detection Accuracy:** The accuracy of wildfire detection systems in identifying and locating wildfires in rural areas. This can be expressed as a percentage of correct detections compared to false alarms.
- **Response Time:** The time it takes for emergency services to respond to a detected wildfire. A shorter response time can minimize damage and save lives.
- **Evacuation Efficiency:** An evaluation of how quickly and efficiently residents in affected areas are evacuated during wildfire events. This can be measured in terms of evacuation completion time and the percentage of the population successfully evacuated.
- **Air Quality Index (AQI):** A measure of the AQI in urban areas affected by wildfires. High AQI levels can have health implications for urban residents, so maintaining good air quality is vital.
- **Infrastructure Resilience:** The resilience of critical infrastructure (e.g., power lines, water supply) to wildfire events. Metrics might include the percentage of infrastructure that remains functional during a wildfire and the time it takes to restore services.
- **Community Preparedness:** The level of preparedness of urban communities for wildfires. This can include the percentage of households with emergency kits, evacuation plans, and awareness of evacuation routes.
- **Emergency Communication Reliability:** The reliability of communication systems during wildfire events, such as cell networks and emergency alert systems.

## Risks

- **Cost Overruns:** Developing and maintaining advanced monitoring systems can be expensive. There's a risk of budget overruns if the initial cost estimates are not accurate or if ongoing maintenance costs are underestimated.
- **Technological Challenges:** The integration of various technologies such as satellite imaging, drones, AI, and communication infrastructure can be complex. Technical failures or compatibility issues between these systems can disrupt monitoring efforts.
- **Data Privacy and Security:** Collecting and storing sensitive data related to wildfire detection and climate monitoring raises concerns about data privacy and security. Unauthorized access and data breaches could compromise citizen privacy and critical information.
- **False Alarms:** Overly sensitive detection systems may generate frequent false alarms, which can strain emergency response resources and lead to complacency among the public.
- **Public Resistance:** Some communities may resist the installation of monitoring infrastructure due to concerns about privacy, aesthetics, or perceived health risks such as those associated with cell towers.
- **Data Quality and Reliability:** Ensuring that the data collected by monitoring systems is accurate and reliable is crucial. Inaccurate data can lead to incorrect assessments of wildfire risks and climate trends.
- **Infrastructure Vulnerability:** The infrastructure supporting these monitoring systems may themselves be vulnerable to natural disasters such as wildfires or extreme weather events, potentially causing service disruptions.
- **Community Engagement:** Engaging with local communities is essential to gaining their support for these systems. Resistance or lack of cooperation from residents can hinder implementation and effectiveness.

- **Changing Climate Patterns:** Climate change can lead to shifts in wildfire behavior and patterns, making it challenging to predict and respond to these events accurately.
- **Resource Allocation:** Allocating resources to wildfire detection and climate monitoring may divert funds from other important planning initiatives. Misallocation can impact the overall effectiveness of the system and potentially impact overall community development.
- **Interagency Coordination:** Coordinating efforts among various agencies responsible for wildfire response and climate monitoring can be complex and require effective collaboration.

## Potential Partnerships

When implementing strategies for expanding wildfire detection and climate monitoring systems in rural California, it's important to collaborate with various partners to ensure the success of these initiatives. The following includes some potential partners and stakeholders:

- **State and Local Government Agencies:** Agencies such as CAL Fire, local fire departments, the California Office of Emergency Services (CalOES), and the California Department of Fish and Wildlife (CDFW) aid in comprehensive wildfire management.
- **Federal Agencies:** Federal agencies, such as the United States Forest Service (USFS), National Oceanic and Atmospheric Administration (NOAA), Federal Emergency Management Agency (FEMA), and the National Interagency Fire Center (NIFC), can provide access to federal resources, funding, and expertise.
- **Nonprofit Organizations:** Nonprofit organizations such as the Sierra Club, The Nature Conservancy, and the National Wildfire Foundation, can aid in wildfire prevention, conservation, and climate action.
- **Academic Institutions:** Academic institutions such as the University of California system, Stanford University, and the National Center for Atmospheric Research (NCAR) can leverage their research capabilities in climate monitoring and wildfire prediction.
- **Technology Companies:** Technology companies, such as SpaceX for satellite imaging, DJI for drone technology, IBM for AI predictive analytics, and Verizon for communication infrastructure can utilize specialized capabilities in their respective fields.
- **Community Groups:** Local community groups, including the California Fire Safe Council and local Neighborhood Watch programs, can engage communities in preparedness efforts.
- **Utility Companies:** Utility companies such as PG&E, Southern California Edison, and San Diego Gas & Electric can enhance the resilience of critical infrastructure to wildfires.
- **Environmental and Conservation Organizations:** Organizations such as the Audubon Society, Environmental Defense Fund, and Earthjustice can enhance environmental protection and sustainable land management practices.
- **Emergency Services and First Responders:** Organizations such as the California Professional Firefighters and the California Highway Patrol can foster more effective response coordination.
- **Private Sector and Business Community:** Local businesses and industries, including the California Chamber of Commerce, can help with disaster planning and recovery support.
- **Community Leaders and Elected Officials:** Elected officials such as California's governor, senators, and congressional representatives can encourage their advocation for funding and policy support.
- **Grassroots Organizations:** Grassroots organizations, such as 350.org and local climate action groups, can mobilize community support.

- **Telecommunication Providers:** Telecommunication companies such as AT&T and T-Mobile can ensure robust communication infrastructure for timely alerts.
- **Weather Forecasting Services:** Weather forecasting services such as The Weather Channel and local meteorologists can help integrate accurate weather data into monitoring systems.
- **Insurance Companies:** Insurance providers such as State Farm and Allstate have an interest in reducing wildfire-related losses. They support risk assessment and mitigation strategies to reduce wildfire-related losses and minimize insurance claims.

Effective partnerships can enhance the resilience of rural California communities to wildfires and climate-related challenges. The choice of partners will depend on the specific goals and needs of the monitoring initiative and the local context.

## Case Studies

The following case studies from Cal Fire's Sonoma-Lake-Napa unit, Sonoma County, and Australia serve as examples for rural California communities interested in deploying wildfire detection and monitoring systems. These success stories offer adaptable strategies that can be tailored to meet local needs.

Cal Fire's Sonoma-Lake-Napa unit, in collaboration with the ALERTCalifornia system at UC San Diego, is among six regional units testing the use of fire lookout cameras with artificial intelligence to speed responses.[282] The Sonoma-Lake-Napa unit covers six counties, including Colusa, Solano and Yolo counties. According to Cal Fire, the sensors are designed to detect wildfires "within minutes, often during their early smoldering phase, greatly reducing the risk of spreading or becoming larger or more catastrophic." They also monitor forest microclimates; temperature; humidity; and air pressure in dark, dense areas of the forest where remote, rugged terrain limits connectivity. The statewide system now boasts 1,032 high-definition cameras strategically deployed around California—199 of them sponsored by Cal Fire. The cameras feature pan-tilt and zoom capabilities and near-infrared night vision, with the ability to provide 24-hour surveillance and 360-degree sweeps every two minutes, monitor the same peaks and ridge tops from different perspectives, and train the cameras on specific points to monitor unfolding events. The devices can view up to 60 miles during a clear day and up to 120 miles during a clear night. Cal Fire has invested $20.3 million in the system, with a commitment to provide at least $3.5 million more in the coming year.

Sonoma County recently partnered with the software company Alchera to deploy Firescout, an AI smoke detection solution.[283] This comprehensive system uses a network of strategically positioned fire watch cameras powered by advanced AI algorithms to detect smoke in its earliest stages. Firescout is on 24/7, and its optimized real-time alerting mechanism enables rapid notifications to emergency responders and local authorities. Beyond detection, it provides precise information about smoke plume location and characteristics, facilitating resource allocation and evacuation planning. This proactive approach exemplifies Sonoma County's commitment to safeguarding lives and properties in the face of California's persistent wildfire threat and showcases the pivotal role of technology in modern emergency management.

Australia's comprehensive FireWatch system[284] integrates a multitude of sources—including weather data, satellite imagery, and fire behavior modeling—to provide data to the public via an online map that displays real-time information about current wildfires. Firefighters and emergency services also rely on the data it provides about previous wildfires. During the devastating 2019-2020 bushfire season in Australia, FireWatch emerged as a critical asset; it tracked fire movements, predicted fire behavior, and played a central role in coordinating firefighting efforts and ensuring public safety during evacuations.[285]

[282] Cal Fire Tests AI Tech in Wildfire Detection System (govtech.com)
[283] Staying Alert: California wildfire prevention with artificial intelligence - ABC7 San Francisco (abc7news.com)
[284] https://firewatchaustralia.com/the-firewatch-system/
[285] https://myfirewatch.landgate.wa.gov.au/

■ **Estimated Costs**

A comprehensive approach must be taken when estimating the costs for implementing wildfire monitoring and detection systems. First, a community must identify the specific technologies and components required, such as satellite imagery, ground sensors, drones, communication infrastructure, and data analytics software. The scale of coverage, including the area to be monitored and the density of monitoring points, should be considered. Next, it's necessary to assess ongoing operational costs, including data processing, maintenance, and personnel. Additionally, the cost of system integration, training for personnel, and contingency planning should be factored in. Collaboration with experts in the field will help generate accurate cost projections and allow for consideration of potential scalability and expansion. It's crucial to account for both initial setup costs and long-term operational expenses when estimating the budget for such systems.

Funding for wildfire monitoring and detection systems can come from both in-state and national sources. California can allocate resources through its budget for emergency management and wildfire prevention. Funding may also be available through agencies such as Cal Fire, the California Department of Forestry and Fire Protection, and the California Office of Emergency Services. At the national level, the Federal Emergency Management Agency (FEMA) can provide grants for wildfire mitigation and preparedness. Collaborative initiatives with federal agencies such as the United States Forest Service (USFS) and partnerships with private sector companies involved in technology and environmental monitoring can also secure funding. Additionally, California can explore federal disaster relief funds for post-fire rehabilitation efforts, making it essential to establish strong intergovernmental relationships to effectively access these resources.

### 9.4.3 Strategy: Deploy Charging and Fueling Infrastructure to Support Zero Emissions Vehicles and Electric Vehicles

■ **Description**

Zero emissions vehicles (ZEV) and electric vehicles (EV) are a transformative advancement in transportation technology. Since these vehicles operate without tailpipe emissions, they contribute to a significant reduction in air pollution and greenhouse gas emissions. EVs utilize advanced battery technology to store and provide power to an electric motor, enabling smooth and quiet acceleration. By harnessing electricity from renewable sources, ZEVs and EVs offer a sustainable and environmentally friendly alternative to traditional internal combustion engine vehicles. With a growing emphasis on sustainability and combating climate change, electric vehicles play a pivotal role in the transition towards cleaner, more eco-conscious transportation solutions.

■ **Applications and Use Cases**

The implementation of EV charging stations contributes significantly to the reduction of carbon emissions by encouraging residents to switch to electric vehicles, leading to a smaller carbon footprint.

Charging stations serve as a fundamental part of the Internet of Things (IoT) infrastructure in smart cities, allowing for better energy management and distribution. Ability to link these stations to smart grids for efficient power supply, real-time monitoring, and returning excess power to the grid. Comprehensive data from these stations enables local governments to analyze usage patterns for strategic planning and decision-making.

Deployment of these systems typically consists of a partnership with a providing company. Third party providers may also develop additional analytical metrics that can be used in further decision making.

## Benefits

- **Usefulness to Residents:** : Local administrators that channel investments into electric vehicle charging infrastructure help foster and facilitate the adoption of EVs, thus enhancing their city's allure for residents. Such initiatives are an investment in the well-being and overall quality of life for citizens, cultivating an environment conducive to the health and prosperity of current and forthcoming generations. This not only generates cost savings for residents but can also direct those funds toward city-wide recreational pursuits—which, in turn, contributes to increased tax revenues and city benefits.
- **Analytical Capabilities:** Leveraging automotive data aids local governments, traffic infrastructure planners, and charging station providers, in strategically placing charging infrastructure. Information such as location, timestamp, state of charge, ignition status, odometer readings, distance traveled, vehicle model, temperature, and battery capacity can be analyzed to discern driving patterns and identify driver clusters during various timeframes. These vehicle-derived insights empower municipalities to design a well-distributed network of EV charging stations.
- **Economic Development:** Considering the existing range constraints, EV drivers tend to be particularly aware of charging station availability along their routes and strategically plan their stops. The substantial time investment, even with the use of fast charging infrastructure, might encourage EV drivers to optimize their refueling breaks by integrating them with other activities such as shopping, dining, and exploring local attractions such as parks and even casinos. Maintaining a link to the larger EV charging network benefits local residents and visitors by contributing to the economic growth of local businesses and generating revenue through these combined experiences.[286]

## Metrics and Key Performance Indicators

- **Number of Charging Stations:** The total number of operational EV charging stations across the county. This is a direct indicator of accessibility for electric vehicle users.
- **Usage Rate:** The frequency with which charging stations are used. This can indicate how often residents and visitors are using electric vehicles and thus the demand for further stations.
- **Energy Consumption:** The total amount of energy consumed by the charging stations. This can provide insights into peak usage times and energy demand, aiding in planning for energy management.
- **Charging Time:** Average duration of a charging session. Shorter charging times could indicate more efficient charging technology or vehicles.
- **Downtime:** The amount of time charging stations are out of service. Lower downtime equates to higher reliability and service quality.
- **GHG Emissions Reduction:** The amount of greenhouse gas emissions reduced by using electric vehicles instead of fossil-fuel-powered vehicles. This helps quantify the environmental impact of the shift to electric vehicles.
- **Customer Satisfaction:** Feedback from users about their experience with the charging stations. This can be gathered through surveys or online reviews and can provide insights into areas for improvement.
- **Economic Impact:** Tracking the increase in local economic activity due to the implementation of charging stations, such as growth in tourism or electric micromobility businesses.
- **Number of EVs in the county:** Tracking the growth in the number of electric vehicles registered in the county can give an indication of the adoption rate and success of the initiative.

[286] https://www.transportation.gov/rural/ev/toolkit/ev-benefits-and-challenges/community-benefits#:~:text=BEVs percent20run percent20with percent20zero percent20tailpipe,businesses percent20and percent20provide percent20health percent20benefits

- **Vehicle-to-Grid:** In cases where vehicles or charging stations can give unused power back to the grid, measuring this energy can indicate the efficiency of this system.[287]

## Risks

- **Upfront Costs:** The initial investment of establishing an EV infrastructure network is substantial, and it may be geographically infeasible to provide an extensive EV network.
- **Infrastructure Vulnerability:** Maintaining EV infrastructure is also at the mercy of the natural elements, and particularly dangerous or powerful storms can wreck the electrical or utility systems needed to support the existing network.[288]

## Potential Partnerships

Potential partnerships may include cooperative relationships with EV infrastructure providers or individual EV automobile companies. The following includes some potential partners and stakeholders:

- **Utility Companies:** To build and maintain EV infrastructure, cooperative agreements with local energy companies and developers of charging stations could provide analytical insights into usage. Additional cooperation may include cost- and energy-sharing agreements.[289]
- **Public/Private Partnerships:** Private automobile manufacturers may also partner with infrastructure developers, particularly those automobile makers looking to enter the EV market against established, privately developed infrastructure companies such as Tesla.[290] Relationships between smaller EV automobile makers and private infrastructure providers may benefit the community by opening the door to new enhanced opportunities. Regardless, committing to public-private partnerships may aid municipalities in achieving ZEV/EV-related goals.

## Case Studies

The following case studies from California cities serve as examples for rural California communities interested in deploying ZEV and EV infrastructure projects. These success stories offer adaptable strategies that can be tailored to meet local needs.

Los Angeles has been a leading U.S. city in the implementation of EV charging stations, with programs such as Charge Up LA! that offer rebates for home and commercial charging equipment installation. The city's Department of Water and Power (LADWP) has a goal to install 10,000 public charging stations by 2022. LA also integrates EVs into their public transit and city fleet, contributing to a reduction in the city's carbon emissions.

The Bay Area is known for its tech-savvy population and its commitment to sustainability, making it a natural fit for EV adoption. The city offers incentives for EV purchases and has implemented a significant number of charging stations in public parking facilities and at workplaces. The Bay Area Air Quality Management District's Charge! Program offers grants to public agencies and businesses to install charging stations.

Sonoma County in Northern California has been proactive in establishing EV charging infrastructure in suburban and rural areas. With a blend of urban centers, suburban communities, and rural areas, Sonoma provides a great case study. It launched

[287] *https://otonomo.io/blog/why-municipalities-should-invest-in-electric-vehicle-charging-infrastructure-today/#:~:text=Electric percent20Vehicle percent20Advantages&text=They percent20emit percent20no percent20direct percent20emissions,accompanies percent20their percent20charging percent20and percent20running*

[288] https://www.transportation.gov/rural/ev/toolkit/ev-benefits-and-challenges/challenges-and-evolving-solutions

[289] https://evchargingsummit.com/blog/ev-partnerships/

[290] https://www.axios.com/2023/07/26/electric-car-charging-network

the Sonoma County EV Charging Station Program, providing incentives for the installation of charging stations in public areas, workplaces, and multi-unit dwellings. This comprehensive approach helped make EVs a feasible option for a larger population.

Rural Humbolt County in northern California has made significant strides in installing EV charging stations, despite its rural nature. The Redwood Coast Energy Authority has been working, with local and state partners, to increase the number of EV charging stations throughout the county. This has included installations at key locations, such as local businesses and tourist destinations, in an effort to make EV ownership more convenient for residents and visitors.

Monterey Bay has implemented an extensive network of charging stations throughout the region. With its largely suburban and rural makeup, the Monterey Bay community has benefited from the Monterey Bay Electric Vehicle Incentive Program (MBeVIP) that provides incentives for the purchase or lease of new EVs.

The San Joaquin Valley, including Fresno County, has been a focus for clean transportation initiatives due to its air quality challenges. The Charge Up! program, managed by the San Joaquin Valley Air Pollution Control District, provides funding to businesses, public agencies, and property owners who install publicly accessible charging stations.

Placer County, a rural/suburban area in the Sierra Nevada, has seen increased installation of charging stations. This effort has been bolstered by the Placer County Air Pollution Control District, which provides incentives for the installation of EV charging stations.

Green Raiteros, an electric vehicle (EV) ride-sharing initiative, has emerged as a beacon of mobility justice in Huron. The community-organized initiative uses a fleet of EVs to provide free transportation to low-income and elderly residents for medical appointments. Born from a lack of public transit and environmental concern, the program now boasts 30 strategically placed charging stations around the city, transforming Huron into an example of how rural communities can overcome transportation barriers while reducing carbon emissions.

### ■ Estimated Costs

Infrastructure costs associated with deploying EV systems include actual physical charging systems as well as associated electrical engineering. Charging stations are developed on levels, and the cost may fluctuate with the different levels: Level One chargers cost between $300 to $1,500, Level Two chargers cost between $400 to $6,500, and DC Fast Chargers cost between $10,000 to $40,000.[291] Installation costs can range anywhere from $2,000 to $60,000.[292]

[291] https://afdc.energy.gov/files/u/publication/evse_cost_report_2015.pdf

[292] https://www.icf.com/insights/transportation/electric-vehicle-charging-infrastructure-costs

### 9.4.4 Strategy: Improve Digital Access and Equity

■ **Description**

Digital equity refers to fair and equal access to technology and digital resources, regardless of factors such as income, race, or geographic location. It involves ensuring that all individuals and communities have access to the tools and resources needed to participate fully in the digital world, including access to high-speed internet, digital devices, and digital literacy training. Digital equity is important for promoting social and economic inclusion and for ensuring that everyone has the opportunity to benefit from the many advantages of technology and digital innovation.

■ **Applications and Use Cases**

- **Public Wi-Fi:** Public Wi-Fi networks, often provided in locations such as parks, libraries, community centers, and transport hubs, serve as an essential resource for people who may not have consistent, reliable internet access at home. These networks offer a point of digital entry, allowing individuals to check emails, perform online tasks, engage in social media, and access information or services. For travelers, public Wi-Fi can be a lifesaver, providing a way to navigate unfamiliar locations or stay connected when abroad. While concerns about security and privacy do exist, steps can be taken to secure these networks and educate the public on safe online behavior. Overall, public Wi-Fi serves as a vital lifeline, connecting people to the digital world and thereby enhancing digital equity across communities.
- **Digital Resource Centers:** Community centers, such as libraries, play a transformative role in modern society as central hubs of digital access and opportunity. By offering free internet access, these centers ensure that all community members, irrespective of their economic background, can tap into the vast online world—whether for research, learning, or leisure. This inclusivity is pivotal, especially as the global workforce shifts more towards remote work. For many who lack dependable internet connections at home, community centers provide essential connectivity to work or explore job opportunities, engage in virtual collaborations, or conduct digital tasks. In bridging the digital divide and facilitating remote work access, community centers stand as pillars of digital equity and socio-economic empowerment in their locales.
- **Device Lending:** Device lending programs have become an invaluable resource in bridging the digital divide. By allowing individuals to borrow laptops, tablets, or even portable Wi-Fi hotspots for temporary use, these programs extend the realm of digital access beyond fixed locations such as libraries or internet cafes. This is a critical service for low-income families who can't afford personal devices, students who need reliable technology for remote learning, and professionals or job seekers who require specific digital tools for remote work. By offering a "technology library" of sorts, device lending programs democratize access to essential digital resources, thereby fostering a more equitable digital landscape for all.
- **Digital Literacy Training:** In today's digitally driven world, access to devices and the internet is only half the battle; the ability to navigate these tools effectively is equally crucial. Digital literacy programs aim to equip individuals with the essential skills needed to use technology responsibly and efficiently. These programs cover a broad range of topics, from basic computer operations and online safety protocols to more advanced topics such as coding or digital content creation. They serve as a vital educational foundation for various demographics—be it low-income families who are new to digital technology, students looking to supplement their classroom learning, or adults learning new skills for job opportunities in the digital realm. By fostering digital literacy, these programs empower individuals to participate fully in the modern world, thus advancing the cause of digital equity.
- **Promote Digital Access Programs and Grants:** Government initiatives such as the Federal Communications Commission's Affordable Connectivity Program play a pivotal role in enhancing digital equity across communities. This program provides financial assistance to low-income households, helping them afford internet services and

connected devices. By subsidizing the cost of connectivity and essential digital tools, the program removes significant financial barriers that often deter people from engaging with the digital world. For families, this means greater access to educational resources for children and more opportunities for adults to seek employment or work remotely. These kinds of government interventions not only broaden internet access but also elicit broader societal benefits, such as improved education outcomes and greater economic mobility. Therefore, the Affordable Connectivity Program serves as a cornerstone in the larger framework of efforts aimed at achieving digital inclusion for all.

## Benefits

- **Economic Opportunities:** Digital access opens doors to a plethora of economic benefits, such as online job searches, remote work, e-commerce, and digital entrepreneurship, that enable individuals to remove local constraints to global opportunities.
- **Educational Advancement:** Enhanced digital access ensures that learners at all income and educational levels can benefit from educational resources available online. This is particularly important for remote or blended learning, skill development, and lifelong education.
- **Access to Online Healthcare and Mental Health Support:** Digital access enhances healthcare equity by enabling telemedicine for physical ailments and providing online resources for mental health support, regardless of geographical or social constraints.
- **Social Inclusion:** The internet can be a powerful tool for social mobilization and engagement. Communities that are digitally connected can better advocate for their rights and needs, thereby enhancing social justice.
- **Civic Participation:** From accessing government services to participating in democratic processes such as voting, digital access enables fuller engagement in civic activities.
- **Enhanced Creativity and Innovation:** Access to digital resources and collaboration tools can foster innovation and creativity, as diverse perspectives and skillsets can converge to solve problems and create new opportunities.

## Metrics and Key Performance Indicators

- **Internet Penetration Rate:** Percentage of population with internet access.
- **Broadband Speed:** Average upload and download speeds in a particular area.
- **Device Ownership:** Percentage of households with smartphones, tablets, or computers.
- **Public Wi-Fi Availability:** Number of free, public Wi-Fi within a community.
- **Digital Literacy Rate:** Percentage of people proficient in basic digital skills
- **Online Engagement Metrics:** Frequency and diversity of internet usage, such as social media participation, online shopping, and content creation.
- **Course Completion Rates:** Percentage of participants who successfully complete online courses.
- **Remote Work Participation:** Percentage of the workforce engaged in remote or online work.
- **E-commerce Activity:** Volume and value of online business transactions in a community.
- **E-Government Utilization:** Percentage of citizens using online government services.
- **Civic Engagement Metrics:** Rates of Online civic participation, such as e-petitions signed, or community forums engaged in.
- **Telehealth Utilization Rates:** Percentage of healthcare visits conducted via telemedicine platforms.

- **Metal Health Online Support Engagement:** Metrics related to the usage of online mental health resources, such as forums, therapy sessions, and informational sites.
- **Disparity Indicators:** Compare metrics across different socio-economic, racial, or geographic groups to identify digital divide gaps.
- **Accessibility Metrics:** Measures the accessibility of online resources to people with disabilities.

## Risks

- **Data Breaches**: With increased access to digital platforms, there's a higher risk of personal information being exposed through data breaches.
- **Cybersecurity Threats:** Unsecured public Wi-Fi and lack of cybersecurity education can expose users to various online threats such as phishing and malware.
- **Misinformation and Disinformation:** Greater digital access can also mean faster dissemination of misinformation or disinformation, affecting public opinion and sometimes even public health.
- **Digital Redlining:** In efforts to expand digital access, care must be taken to avoid digital redlining, where certain communities are still systematically excluded.
- **Accessibility Issues:** Not all digital resources are accessible to people with disabilities, exacerbating existing inequities.
- **Screen Addiction and Mental Health:** Increased digital access can sometimes lead to excessive screen time, affecting both physical and mental well-being.
- **Social Isolation:** While technology can connect people, it can also sometimes create feelings of social isolation.
- **Legal Consequences:** With more people online, there's a higher chance of activities that could have legal repercussions, such as copyright infringement or hate speech.
- **E-Waste and Energy Consumption:** The production and disposal of digital devices contribute to electronic waste and increased energy consumption.

## Potential Partnerships

- **Government Agencies:** Entities such as the California Public Utilities Commission (CPUC) and Federal Communications Commission (FCC) can be crucial in policy making, funding, and implementation of broadband and digital equity initiatives.
- **Educational Institutions:** California State Library and California Community Colleges can offer vital spaces and resources for digital literacy programs, device lending, and internet access to local communities.
- **Tech Companies:** Silicon Valley giants such as Google, Apple, and Facebook have resources, a vested interest in expanding digital equity, and can be invaluable partners in tech donation or literacy programs.
- **Local ISPs:** Regional Internet Service Providers such as Sonic or Frontier Communications can collaborate to expand affordable internet access and infrastructural development.
- **National Non-profits:** Organizations such as the National Digital Inclusion Alliance (NDIA) can offer expertise in program design and execution related to digital access and literacy.
- **Corporate Telecom:** National telecommunications companies such as Verizon and AT&T can provide extensive resources and reach for infrastructure expansion and affordability programs.

- **Universities and Research Institutions:** Academic institutions can contribute valuable research and data analytics to help understand digital divides and the effectiveness of various programs.
- **Community-Based Organizations:** Local non-profits and community groups can facilitate outreach efforts and serve as trusted liaisons between the community and government or corporate initiatives.
- **Healthcare Institutions:** Partnerships with healthcare providers can facilitate telehealth services and mental health support via digital platforms.
- **Federal Departments:** Collaboration with the U.S. Department of Education can secure grants and ensure schools have adequate digital resources, making educational institutions valuable partners.
- **Private Sector Initiatives:** Programs such as Microsoft's Airband can offer technological solutions for expanding broadband in rural and underserved areas.
- **International Organizations:** Bodies such as the United Nations can offer global perspectives, best practices, and additional funding sources for enhancing digital equity.
- **Media and Communication Partners:** Local and national media outlets can play a crucial role in awareness-raising and public education on digital equity issues.
- **Local and Regional Authorities:** Collaboration with city and county governments can help in localized planning, funding, and implementation of digital access initiatives.
- **Accessibility Experts:** Professionals specializing in making digital platforms accessible to individuals with disabilities can assist in ensuring that digital equity is truly inclusive.

## Case Studies

For rural California communities looking to achieve greater digital equity, the following case studies from Portland, Shasta Public Libraries, and RS Fiber Co-Op offer a roadmap of successful adaptable strategies that can be tailored to meet local needs.

In Portland, Oregon, the city's Digital Equity Action Plan demonstrates the effectiveness of forming a Digital Inclusion Network made up of local organizations, governmental agencies, and private sector partners. Through this network, Portland has been able to disburse grants to fund digital literacy programs that directly benefit thousands of residents. This community-focused approach is particularly relevant for rural California communities, where public and private stakeholders can come together to pool resources and expertise. Even in a rural setting, a local alliance could work to secure grant funding for training programs, public Wi-Fi installations, or device lending libraries that would help bridge the digital divide.[293]

Shasta Public Libraries in Redding, California, has employed digital access and literacy strategies that could be particularly instructive. Their Device Lending Program and expansion of Wi-Fi access into library parking lots are innovative yet simple solutions that maximize existing community assets. For rural Californian towns, similar initiatives could be carried out through community centers, schools, or even local businesses with the capacity to offer public Wi-Fi. Given that many rural Californian communities may already have public spaces such as libraries, leveraging these existing assets to offer device lending and extended Wi-Fi services could be a cost-effective way to immediately improve digital access.[294]

Finally, Winthrop, Minnesota's RS Fiber Co-Op serves as an inspiration for rural California communities willing to invest in long-term solutions. This community-owned broadband model could overcome the challenges posed by being overlooked by

[293] https://www.portland.gov/bps/com-tech/digital-equity/deap/digital-equity-action-plan#toc-progress-reports
[294] https://www.shastalibraries.org/computers/

major service providers, offering reliable and affordable internet service. The cooperative model not only ensures the provision of vital services but instills a sense of ownership among community members. Supplementing this with public Wi-Fi spaces can make internet access more equitable across different socioeconomic classes, something that is often a challenge in rural settings.[295,296]

Rural California can find actionable insights in each of these case studies. By forming multi-stakeholder alliances such as Portland's Digital Inclusion Network; maximizing existing community resources in the vein of Shasta Public Libraries; and, following the example of RS Fiber Co-Op, investing in community-driven digital infrastructure, rural communities in California can make meaningful strides toward achieving digital equity for all their residents.

■ **Estimated Costs**

Estimating the costs for improving digital access and equity is a complex endeavor that requires a multi-faceted approach. First, a community should conduct a comprehensive needs assessment to identify the specific gaps in access, digital literacy, and device availability in targeted communities. This would involve market research, surveys, and consultation with experts in the field. Infrastructure costs, including laying down broadband lines, setting up Wi-Fi access points, and purchasing devices, should be tallied. Operational costs, including maintenance, customer service, and digital literacy programs, should also be calculated. Administrative costs for program management and potential costs for legal compliance should also be accounted for. Once all these elements are identified, a detailed budget can be prepared, which may need to be revised periodically as the project unfolds.

A blend of public and private funding can help communities attain financing for improvements in digital access and equity. Government grants from agencies such as the FCC and the U.S. Department of Education can be pivotal, especially for large-scale initiatives. Public-private partnerships, wherein tech companies or telecom providers invest either as part of their corporate social responsibility or as a long-term business investment, can also be a lucrative resource. Local governments may allocate a portion of their budgets to enhance digital inclusivity in the community. Crowdfunding and donations from philanthropic organizations can also contribute to the financial pool. Additionally, some communities might wish to explore a tiered service model, in which higher-paying customers subsidize costs for lower-income users. Ensuring a diverse portfolio of funding sources can not only meet the initial financial requirements but also provide sustainability for the long-term success of digital equity programs.

### 9.4.5 Strategy: Expand use of Clean and Renewable Energy Systems to Reduce Carbon Emissions, Increase Community Equity, and Improve Resilience

■ **Description**

Approximately 40 percent of all energy consumed is used by a combination of residential and commercial buildings. Lawrence Berkeley National Labs estimated that 90 percent of building energy use can be eliminated through electrification and energy efficiency upgrades such as heat pumps, improved equipment, smart building and home energy controls, and Distributed Energy Resource Management Systems (DERMS). Several innovative systems used to generate, transmit, and store clean renewable energy are described below.

*Distributed & Community Renewable Energy Generation Systems*

[295] https://www.yesmagazine.org/economy/2016/08/03/tired-of-waiting-for-corporate-high-speed-internet-minnesota-farm-towns-build-their-own
[296] https://www.rsfiber.coop/rs-fiber-phone-service-now-available-in-winthrop/

Distributed and community clean energy systems utilize renewable energy sources such as solar, wind, hydro, geothermal, and biomass to generate electricity and heat, which is then managed through microgrids and battery energy storage systems. Designed to deliver low cost, reliable, and carbon-free power to communities, these systems provide greater resiliency against energy failures caused by wildfires, floods, landslides, storms, and earthquakes as well as grid failures and rolling blackouts. Adopting these clean energy systems accelerates the transition away from fossil fuels towards sustainable, renewable energy sources that can help avoid local energy pollution and hopefully minimize the long-term effects of global climate change.

*Microgrid & Community Energy Management Systems*

Renewable energy generation systems alone can improve the energy delivered to individual buildings, but in order to take the full benefit of these systems, they will need to be built to interoperate and balance the energy use and production within a community. This is often done through adding battery energy management systems either at the building itself or through a custom community system called a microgrid. Much like a conventional utility's distribution system, a microgrid connects large sets of buildings to energy generation and storage but with greater flexibility, as microgrids can be designed for individual buildings, campuses, or entire communities. They are different from conventional distribution systems in that they are bi-directional, smart (with controls that better allow energy users to communicate and interoperate with generation and batteries), resilient, controlled locally, and can isolate a community from a power outage on the larger grid. Microgrids communicate with buildings through interfaces that manage energy use within a building through DERMS, allowing the generator to signal to the building the need to reduce energy use and even provide an economic incentive for doing so.

*Building Energy Consumption, Efficiency, and Energy Management Systems*

Buildings are increasingly moving toward greater efficiency and electrification. There are tremendous resources today to help building owners add insulation, windows, doors, and other features that keep energy use within a building to a minimum. Further, a new generation of heat pumps allow for up to a 60 percent reduction in HVAC energy use. In certain locations, these heat pumps can be combined with geothermal energy, which uses the relative heating and cooling effects of the earth to lower the energy needed for heat pumps. There are many incentives for these and other new energy efficient appliances available through the Inflation Reduction Act and state/utility energy efficiency rebate programs.

Other major components for smart homes and buildings include smart breaker boxes—an upgrade to conventional wiring that allows circuits and appliances to be controlled through apps often connected to the internet. These can also be the gateway for individually owned solar and battery energy storage systems to keep equipment such as refrigerators, heat pumps, and computers running during a power outage. Smart breaker boxes, along with energy control systems and smart thermostats, can be made interoperable with a microgrid or local utilities in order to receive incentives for lowering energy consumption on certain equipment in buildings or selling back electricity from the battery to the grid, also known as a virtual power plant (VPP).

## ■ Applications and Use Cases

Clean energy systems provide electricity and heat to end users by generating, managing, and distributing energy from renewable sources. In contrast to conventional centralized power plants and municipal or national electricity grids, clean energy systems leverage distributed energy resources (DERs), which generate or store energy near the point of consumption and utilize decentralized aggregation to provide greater resiliency and reduce the environmental impact of the energy sector.

**Distributed Energy Resources (DERs)**

- **Renewable Energy Generation:** Renewable energy sources are natural resources such as biomass, geothermal, sunlight, water, and wind that can be converted into energy to meet consumer demand. Solar panels can be used to harness energy from the sun and convert it to electricity. Biomass is derived from organic materials and can be

converted into liquid fuels to be used for transportation, heat, and electricity.[297] Geothermal energy is sourced from reservoirs of steam and hot water below the earth's surface to be applied in electricity generation and heating and cooling.[298] Energy generated from the natural motions of wind can be harnessed via turbines and water through hydropower infrastructure such as dams and diversion structures.

- **Battery Energy Storage:** Battery energy storage involves the use of rechargeable batteries to store electrical energy. These batteries can be charged during periods of low demand or excess generation and discharged when demand is high or generation is low, thus reducing strain on the grid by responding quickly to fluctuations in demand or supply. Battery storage systems can mitigate the intermittent nature of resources such as solar and wind, providing the stability and voltage regulation necessary for integrating renewable energy sources into the grid. The stored energy can serve as backup power during outages or emergencies, ensuring uninterrupted operations at critical facilities such as hospitals and data centers. Vehicle-to-grid technology can enable electric vehicles to serve as DERs.

**Decentralized Integration of DERs**

- **Microgrids:** Microgrids are localized small-scale grids that can disconnect from the centralized grid and operate autonomously. This independent operability enhances energy resiliency during outages and emergencies, improves reliability, and reduces downtime.[299] When connected to the main grid, microgrids can provide ancillary services such as frequency regulation, voltage control, and peak shaving. They can help optimize grid operations and enhance overall system efficiency.
- **Virtual Power Plants:** Virtual Power Plants (VPPs) are cloud-based networks of decentralized, heterogeneous energy sources that are aggregated to provide several megawatts of capacity and appear to utilities as a single resource, such as conventional power plants.[300] VPPs utilize information and communications technologies to control the power aggregated from DERs. They provide increased demand flexibility and can be traded on the electricity market. Through a combination of hardware and software, operators can remotely and automatically adjust DERs in a VPP to provide reliable energy to consumers.

## Benefits

- **Emissions Reduction:** Aside from the relatively small amount of greenhouse gas (GHG) emissions associated with the manufacture and installation of renewable energy and communications technologies, clean energy systems emit far less GHGs that contribute to climate change than traditional energy systems.
- **Resiliency and Reliability:** Expansion of clean energy systems can enhance grid stability and improve reliability by providing backup power, ancillary services, and flexibility to promptly mitigate fluctuations in supply and demand.
- **Reduced Pollution and Public Health Risks:** By reducing air pollution and contamination of water and soil, clean energy technologies can support the health of natural ecosystems and reduce rates of asthma, cardiovascular disease, and other public health issues.[301]
- **Cost Savings and Revenue Generation:** Distributed and community power can often be delivered such that its cost is significantly lower than that of a conventional utility while its quality of service and reliability is increased. As technology continues to develop, DERs are becoming more affordable. Once installed, DERs can also serve as an additional revenue stream for consumers, as the excess energy generated can be sold on the electricity market.

[297] Bioenergy Basics | Department of Energy
[298] Geothermal Basics | Department of Energy
[299] Microgrids & Vehicle-Grid Integration | Grid Integration Group (lbl.gov)
[300] What are distributed energy resources and how do they work ? | Cummins Inc.
[301] Environmental Impacts of Clean Energy | Department of Energy

Distributed and community energy systems can create significant amounts of equity by lowering the energy burden within a community and creating community assets that can return money to energy owners. Further, communities that have their own reliable energy systems are attractive and can experience an increase in the value of their properties over the long run.

- **Support for Electrification:** Expansion of clean energy systems can support the increase in demand introduced by large-scale electrification of sectors such as transportation, buildings, and industry.
- **Employment & Economic Opportunities**: Installation of more clean energy infrastructure can create jobs in construction, engineering, and manufacturing.

## Metrics and Key Performance Indicators

- **Energy Cost:** Utility records and energy bills can provide an indication of the financial impact of clean energy systems.
- **Greenhouse Gas Emissions:** The carbon footprint of clean energy systems is heavily dominated by the emissions associated with the manufacture and installation of renewable technologies. Measuring the GHG emissions of clean energy systems on different timescales, including hourly, annual, and life-cycle analysis, can provide an indication of the effectiveness of the energy transition in reducing global warming impacts.[302]
- **Energy Mix:** The proportion of energy generated from renewable sources can serve as an indicator of the energy system's diversity and cleanliness.[303]
- **Energy Burden Change:** The percentage of gross household income spent on energy costs can serve as an indicator for how affordable and equitable the energy system is.[304]
- **Unscheduled Outages:** The number, frequency, and duration of unscheduled service interruptions can serve as an indicator of energy system reliability and resilience.[305]

## Risks

- **Climate Events:** Installation of clean energy infrastructure such as wind turbines and dams can disrupt existing ecosystems in sites, introduce visual disturbances and noise, and present land use issues.
- **Physical & Cyber Security:** The collection and storage of sensitive data related to cloud-based technology, connected infrastructure, and internet-enabled software can render the energy sector more susceptible to cyberthreats and concerns about data privacy and security. Data breaches and unauthorized access could compromise citizen privacy and critical information as well as risk disruptions to critical infrastructure and emergency services reliant on electricity.[306]
- **Geopolitical Hazards:** Critical minerals that are needed to produce batteries and other clean energy technologies are concentrated in a small number of locations around the world and may be subject to regulatory and trade restrictions, potentially linking energy security with supply chain and mineral security as the energy sector transitions to clean energy systems.

[302] When 100 percent renewable energy doesn't mean zero carbon (stanford.edu)
[303] Microsoft Word - ~4239551.doc (un.org)
[304] Title (pnnl.gov)
[305] Measuring the Resilience of Energy Distribution Systems | RAND
[306] IEA report shares three hidden energy transition challenges | World Economic Forum (weforum.org)

- **Workforce Impacts:** Transitioning to clean energy systems may present hardships for workers and communities reliant on fossil fuels if proactive measures are not taken to protect job security.[307]

## Potential Partnerships

When implementing clean and renewable energy systems in rural California, it's important to collaborate with various partners to ensure the success of these various initiatives. The following includes some potential partners and stakeholders:

- **State and Local Government Agencies:** Scientific and technological research funded by the California Energy Commission's Electric Program Investment Charge (EPIC) program can help accelerate the transformation of the energy sector.[308] Potential partnerships with EPIC-funded projects may help advance the implementation of smart technologies for the expansion of clean energy systems. The California Energy Commission also offers low-interest rate loans to public entities for renewable energy generation and storage systems through its Energy Conservation Assistance Act.[309] In outlining its roadmap for supporting the state's vision of a 100 percent clean energy future in its DER Action Plan,[310] the California Public Utilities Commission (CPUC) offers a Microgrid Incentive Program that provides funding for clean energy microgrids to support critical energy needs in vulnerable communities.[311]
- **Federal Agencies:** Utilities and power generation is one of the sectors in EPA's Smart Sectors Program, which engages collaboration at the national and regional levels for forward-thinking strategies to advance environmental progress. The Green Power Partnership is one such partnership, encouraging organizations to protect human health and the environment with renewable energy generation.[312]

## Case Studies

The following case studies from Tesla and Shadow Mountain serve as examples for rural California communities interested in deploying clean and renewable energy systems. These success stories offer adaptable strategies that can be tailored to meet local needs.

In 2022, Tesla launched an Emergency Load Reduction Program in partnership with the Pacific Gas and Electric Company (PG&E). This pilot program established a VPP consisting of Powerwall rechargeable home battery systems deployed throughout California.[313] The program compensates participants $2 for every additional kWh of energy delivered by their Powerwall system during an event that challenges grid conditions.

Shadow Mountain in Menifee, a city between San Diego and Los Angeles, is California's first residential microgrid community.[314] The community consists of 219 net-zero smart homes, equipped with rooftop solar systems and battery energy storage, and a shared centralized 2 MW community battery for additional capacity. An all-in-one panel serves as an energy center for each home, allowing users to track energy usage from their smartphones. The project is projected to reduce energy use by 40 percent and supported by a US Department of Energy (DOE) grant and partnerships with KB Home, SunPower, UC Irvine, Southern California Edison, Schneider Electric, and Kia.[315]

---

[307] How the clean energy transition affects workers and communities - Environmental Defense Fund (edf.org)
[308] Electric Program Investment Charge Program - EPIC | California Energy Commission
[309] DSIRE (dsireusa.org)
[310] Distributed Energy Resource (DER) Action Plan (ca.gov)
[311] Resiliency and Microgrids (ca.gov)
[312] About the Green Power Partnership | US EPA
[313] Emergency Load Reduction Pilot | Tesla Support
[314] California's First Residential Microgrid Community (se.com)
[315] Solar microgrid community launched in California – pv magazine USA (pv-magazine-usa.com)

■ **Estimated Costs**

The upfront cost of clean energy systems includes installation of renewable energy infrastructure as well as controls and communications equipment for aggregation and grid integration.[316] Battery energy storage system costs range between about $300 and $800 per kWh, depending on the technology, power capacity, and duration.[317] Over the past decade, costs for renewable power generation have been declining. In 2020, the global weighted-average total installed cost of utility-scale solar photovoltaic technologies was estimated to be $883 per kW and total installed costs for onshore wind averaged $1355/kW.[318] Total installed costs averaged $1870 per kW for hydropower and $4468 per kW for geothermal.[319] A 2018 National Renewable Energy Laboratory (NREL) study analyzing microgrid costs in the US found the mean cost for community microgrids to be about $2.1 million per MW of DERs installed,[320] and the Shadow Mountain microgrid community is supported by a $6.5 million DOE grant.[321]

# 9.5 Goal, Objectives, and Policies

A Smart Community plan is anchored by goals, objectives and policies that describe the intended outcomes. A goal is a broad statement that describes what a community wishes to achieve, providing direction and vision for the plan. An objective provides detailed guidance on how to implement the goal, and typically includes measurable targets. A policy is a specific action to step that is taken to implement the goal and objectives. The suggested goal, objectives, and policies presented below are intended to implement the prioritized Smart Community strategies identified in the previous section.

**Goal**: Inyo County shall integrate smart community technology to address existing community challenges, enhance the quality of life of residents, promote sustainable development, and foster economic growth.

- **Objective**: Develop a comprehensive plan for the future development in the floodplains or hazardous zones to reduce runoff, altering the floodplains, and endangering public safety**.**

**Policies:**

- Invest in sophisticated flow modeling and replication tools, as an example hydraulic and hydrological models, to app raise stream risks, mimic distinct stream scenarios, and assess the efficiency of stream prevention measures.
- Require flood risk assessment before a project can be approved adjacent to or within the floodplain or hazardous zones.
- Existing levees shall be maintained regularly and upgraded with connected sensor technologies to monitor potential risk.

**Objective:** Increase access for emergency personnel to properties with high probabilities for fires.

**Policies:**

- Connect digital wayfinding with wildfire alert monitoring systems to enhance emergency response time.

[316] US Distributed Energy Resources (DERs), Explained | World Resources Institute (wri.org)
[317] Energy Storage Cost and Performance Database | PNNL
[318] Renewable power generation costs in 2020 - Executive summary (irena.org)
[319] Global Trends (irena.org)
[320] Phase I Microgrid Cost Study: Data Collection and Analysis of Microgrid Costs in the United States (nrel.gov)
[321] Connected Communities Funding Program | Department of Energy

- Establish training protocols to understand proper use of wildfire alert monitoring systems for all emergency personnels, to ensure preparedness for any emergency.
- Assess emergency response time in various parts of the community and prioritize monitoring and other investments in vulnerable areas with long response times.

**Objective:** Develop a guidance document for deploying electric charging stations throughout the county

**Policies:**

- Perform an inventory of exiting publicly available charging stations to identify gaps in coverage.
- Prioritize EV charging deployment in multifamily, public, office, industrial, and other commercial land uses.
- Encourage non-residential development with off-street parking to provide EV-Ready or EV-capable infrastructure for 20% of parking spaces.
- Explore alternative financing arrangements, including ground leases with third party vendors and revenue sharing.
- Ensure that electric charging stations are implemented in the low-income and underserved communities.

**Objective:** Increase the broadband providers within the county, to allow for options within the community for residents.

**Policies:**

- Promote Federal subsidies and programs for home broadband services, with a focus on addressing barriers (financial, language, educational) faced by those at risk of being left behind.
- Investigate the feasibility of municipal or county-owned broadband networks and leases to third party service providers.
- When practical, install dark fiber in conjunction with public works improvements, such as roadways.
- Address environmental impacts of digital infrastructure and the potential of connectivity in addressing climate emergencies.
- Provide incentives for new broadband industries to establish networks within the county.

**Objective:** Ensure access to affordable, reliable, sustainable and modern energy for all.

**Policies**

- Assess emerging renewable energy technologies and amend County development standards as needed to accommodate suitable new technology types.
- Encourage new development to comply with the optional energy efficiency measures of the CALGreen Code
- Encourage the use of solar canopy facilities as shade structures in parks and community centers, and over parking lots and parking structures.

# 9.6 Implementation and Funding Sources

In order to effectively implement the prioritized Smart Community strategies, it's recommended that Inyo County prepare a Smart Community Plan. This will serve as a roadmap to guide the integration of Smart Community strategies and technologies into existing County policies and processes.

## 9.6.1 Community Engagement

Smart Community plans should be co-created with residents, businesses, and other members of the community. It's recommended that the county engage the public in a collaborative visioning process to identify community needs that may not have been addressed in this document, or to confirm that the identified needs are indeed most important. This could consist of stakeholder focus group meetings, public workshops, online surveys, and other means of civic engagement and public participation. The county should strive to be inclusive and equitable, making accommodations for Justice 40 communities, persons who do not speak English as a first language, and other underserved communities. Next, the county and community members should collaboratively determine if the recommended prioritized Smart Community strategies in this document are the most relevant for current and anticipated needs and include additional strategies as appropriate. Once the county has the confirmed list of prioritized Smart Community strategies, it can move on to the Project Development phase.

## 9.6.2 Project Development

The prioritized Smart Community Strategies presented in this report are high-level "concepts of exploration" that describe a wide range of use cases. For each identified strategy, the county should perform benefit-cost analysis and identify a responsible department or partner agency, potential cost-sharing partnerships, risks, and any alignment with County policies and planned projects. Specific implementation cost estimates will be developed at this time, potentially for one or more pilot projects. Projects should then be included in annual or five-year capital improvement program (CIP) budgeting processes. Where applicable, the county should seek grant funding (described further below) or explore the potential for public-private partnership (P3) funding.

## 9.6.3 Smart Communities Plan and Documentation

Finally, it is important for the county to formally adopt (by resolution or ordinance) the recommended goal, objectives, and policies into its strategic planning or regulatory documents (General Plan, Strategic Plan, etc.). This establishes the public policy, purpose, and need for project implementation. The plan should be reviewed and amended periodically to adjust for changing policies and laws, additional climate hazards, changes in technology, and other factors.

## 9.6.4 Funding Sources

**Flooding and Landslides**

- Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance (HMA) Grant: https://www.fema.gov/grants/mitigation

- Natural Resources Conservation Service (NRCS) Emergency Watershed Protection (EWP) Program: https://www.nrcs.usda.gov/programs-initiatives/ewp-emergency-watershed-protection

**Digital Access and Equity**

- The California Emerging Technology Fund (CETF): https://www.cetfund.org/
- The Emergency Broadband Benefit program and the Emergency Connectivity Fund: https://www.fcc.gov/emergency-connectivity-fund
- Broadband Deployment Assistance Grants: https://www.floridajobs.org/community-planning-and-development/broadband/broadband-opportunity-program

**Wildfire Prevention**

- FEMA's Assistance to Firefighters Grant Program (AFG): Assistance to Firefighters Grants Program | FEMA.gov
- CAL FIRE's Fire Prevention Grants Program: CAL FIRE Wildfire Prevention Grants Program FY 2022-2023 - California Grants Portal
- Bureau of Land Management's Wildland Fire Management Assistance Program: Community Wildfire Assistance | Bureau of Land Management (blm.gov)
- Community Wildfire Defense Grant Program | US Forest Service (usda.gov)
- California Climate Investments Fire Prevention Grant Program: Fire Prevention Program — California Climate Investments

**ZEV**

- California's National Electric Vehicle Infrastructure (NEVI) Plan was adopted in August 2022322. The state will receive approximately $383M for charging infrastructure along Alternative Fuel Corridors (AFCs) over a five-year period. This funding will be administered by CalTrans in accordance with the adopted NEVI Plan.
- As a local government, Inyo County is eligible to apply for the Charging and Fueling Infrastructure (CFI) discretionary grant program. This $2.5B fund has two separate programs (corridors and communities) and is intended to fill in the gaps that are not covered by the AFCs designated in the NEVI plan. The CFI program prioritizes underserved and disadvantaged communities, including rural areas and low- and moderate-income neighborhoods. A Notice of Funding Opportunity (NOFO) will be posted on Grants.gov on an intermittent basis over a five-year period.
- California Electric Vehicle Infrastructure Project (CALeVIP) 2.0 https://www.energy.ca.gov/programs-and-topics/programs/california-electric-vehicle-infrastructure-project-calevip-20

**Clean and Renewable Energy Systems**

*California Energy Commission*

The following are grant funding offered by the California Energy Commission for energy research and development:

- Social Costs and Non-energy Benefits
- Decarbonizing Heating, Ventilation, and Air Conditioning Systems in Large Buildings
- Advanced Prefabricated Zero Carbon Homes

[322] https://www.energy.ca.gov/programs-and-topics/programs/national-electric-vehicle-infrastructure-program-nevi

- Advancing Envelope Technologies for Single Family Residential Buildings, Low-rise Multifamily Buildings, and Mobile Homes
- De-carbonizing Healthcare and Large Buildings
- Developing non-Lithium-Ion Energy Storage Technologies to Support California's Clean Energy Goals

*California Department of Community Services & Development*

The following are grant funding offered by the California Department of Community Services & Development:

- Community Solar Pilot Program
- Low-Income Weatherization Program
- Weatherization Assistance Program
- Low Income Home Energy Assistance Program

*Internal Revenue Service (IRS)*

The IRS offers tax credits worth 30 percent of total cost to install solar panels and batteries:

- Residential Clean Energy Credit

SECTION

# 10

# RECOMMENDATIONS AND NEXT STEPS

# 10.1 Recommendations

Tilson was engaged to research the telecommunications industry landscape in Inyo County, including the locations of existing fiber optic cable and other assets, the service areas and service offerings – by technology – of retail internet service providers (ISPs) in the county, the locations of premises lacking access to adequate broadband service, and available funding for broadband infrastructure. These findings then informed custom recommendations to support Inyo County's pursuit of network deployment. We focus on four sets of recommendations below:

1. **Identifying and developing broadband infrastructure projects:** Municipalities should consider working with either the GSCA or nearby existing providers to improve connectivity in unserved and underserved areas. More detailed recommendations discuss next steps to develop these options.
2. **Developing a better broadband deployment environment:** Local policies can have a significant impact on both the cost and time required to deploy new networks or expand existing service areas. These recommendations identify opportunities to reduce broadband deployment costs and can be implemented regardless of whether community broadband leaders choose to develop formal partnerships, coordinate with interested ISPs, or simply improve permitting and infrastructure access policies. Municipalities have limited time and resources to revise local policies, so our recommendations focus on coordinating with interested ISPs to streamline permitting and information-sharing practices that matter most to those ISPs.
3. **Developing broadband project funding strategies:** Using the information about each funding source provided above, these recommendations focus on the next steps to acquire funding for projects to connect eligible unserved and underserved areas, with focus placed on the three most likely sources of funding. Using designs, cost models, and other strategic plans created using the LATA grant, the GSCA is in an excellent position to develop project proposals to acquire funding from the BEAD and BIA programs. Recommendations also consider the next steps that municipalities can follow to help interested ISPs to acquire grant funding.
4. **Developing smart community strategies:** The introduction of additional high speed broadband connectivity will enhance the ability of Inyo County to deploy smart community technologies that provide more efficient public services and enhance sustainability, resilience, equity, and quality of life for residents and businesses. VHB reviewed Inyo County's climate, natural hazards, and other issues to evaluate which smart community strategies are most appropriate for those identified needs.

Each of these topics will be reviewed in turn, with a set of recommendations followed by next steps that will allow Inyo County to implement them. We note that some of the recommendations are already in the process of being implemented, while others will require additional planning efforts and coordination between different stakeholders. As a result, the next steps will often be used to elaborate on certain recommendations more than others.

# 10.2 Identifying and Developing Broadband Infrastructure Projects

The incredible amount of funding to be offered over the next few years has generated excitement among most ISPs. Many had slowed down their expansion efforts over the past several years, so this period is likely the last major expansionary push toward unserved and underserved locations that had simply not been economically viable to connect without significant public financial support. As FFA and BEAD funding help to establish near universal service throughout a significant majority of communities, most ISPs' only service expansion options afterward are likely to be in areas already receiving some form of service. As a result, most ISPs are very interested in using this funding as much as possible to expand and upgrade their networks while these last markets unserved by high-speed broadband are still open.

Municipalities interested in connecting unserved and underserved locations then are in a very favorable position. ISPs are already developing funding-eligible projects, and if municipalities can assist with these efforts, ISPs will be interested in any support they can provide to acquire funding or reduce the cost of their deployments. Municipalities that understand the current market conditions and service areas of each ISP will be equipped to identify which ISPs are most likely to work with them and develop coordination or partnership opportunities. In turn, municipalities can help to shape the proposed project areas, ensuring that as many unserved households as possible are included in these efforts.

Section 4 reviewed ISPs' current service areas by technology and speeds available and any existing deployment commitments resulting from recent grant awards. Section 5 presented available network assets across Inyo County. These reviews have resulted in three sets of broadband project development recommendations:

- Deployment planning options with GSCA's potential open-access last mile network
- A list of suggested project areas that will be eligible for one or more grant programs
- Steps that municipalities can use to develop relationships with ISPs and ensure that their unserved and underserved constituents are connected

**GSCA's open-access last mile network:** In connection with this program and a related project, Tilson developed a high-level network design, cost estimate, and other planning materials for a potential Golden State Connect Authority (GSCA) network to connect locations across the county. Section 5 reviewed the process used to generate these materials. By offering competitive, open-access last mile services to connected locations, this potential new market entrant could have a notable impact on Inyo County's broadband market, adding a vital potential partner for municipalities looking to improve service options in their communities. Tilson recommends that municipalities consider this potential partner when developing any broadband deployment plans.

Nevertheless, this Broadband Strategic Plan has adopted an ISP-neutral approach to evaluating potential broadband projects. Section 4's review of current service areas and specific ISP factors also identified a list of top expansion and upgrade opportunities across the county. Combined with a review of factors influencing these opportunities, this section also identifies which existing ISPs may be the most likely to expand into these unserved and underserved areas, based on their existing networks, changes to middle mile network availability, and other market trends. Due to the proprietary strategic value of GSCA's internal expansion plans developed on an adjacent project, this organization has not been prominently featured in these expansion strategies, but municipalities should also consider them among the top ISPs to partner with to develop new deployments.

Inyo County has three primary residential wireline ISPs Optimum, Lone Pine Communications, and Frontier.[323] Optimum's cable network has the greatest reach, connecting a reported 5,077 locations to its cable service in the most populous portions of the county. However, the network seldom can offer speeds of 100/20 Mbps, so locations served by this older cable network are mostly classified as "underserved" under the BEAD program. Frontier has the next greatest reach, connecting 2,314 locations with its DSL network and now offering fiber services to another 1,167 locations. Frontier has expressed interest in upgrading their existing areas in Aspendell, Alabama Hills, Lone Pine, and Kern County to fiber through multiple submitted FFA projects. Lone Pine Communications focuses on the Lone Pine area, connecting 370 locations with cable services.

An estimated 469 households (5.0 percent) rely on fixed wireless services to obtain basic broadband speeds of 25/3 Mbps in Inyo County. There is only one primary fixed wireless provider in the county. T-Mobile reaches a claimed 7,218 locations. Verizon reports to serve 22 locations as well, but this service area is so small that it is not likely to have a significant impact on the market unless it is expanded significantly. A major portion of these locations served by T-Mobile do not receive speds necessary to be considered broadband. In another FCC data set, a reported 6,605 households (69.8 percent) in Inyo County can receive some form of fixed wireless service, but 5,480 of those households (57.9 percent) cannot even reliably receive speeds of 10/1 Mbps.

**Suggested project areas:**

- Frontier's fiber presence in Bishop and West Bishop can be extended along US 395 to areas with existing DSL service, such as the Big Pine, Fish Springs, Independence, Lone Pine, Olancha, and Haiwee areas, though state or other available middle mile with their existing right-of-way and pole agreements. Their FFA applications in Aspendell, Alabama Hills, and Lone Pine have signaled their intent to adopt this approach.
- Lone Pine Communications and Optimum, the cable providers in Inyo, will need to modernize their existing service offerings to offer services capable of at least 100/20 Mbps and preferably offer download speed of up to 1 Gbps, then expand into other nearby areas.
- The state middle mile network will be able to be leveraged by any provider willing to establish services in some of the most remote areas of the county, or a new entrant, to connect areas, such as Tecopa, Park Village, Furnace Creek, and Death Valley Indian Village along State Route 190.
- AT&T's existing presence may be very small, but it remains a possible entrant to connect unserved areas if the primary wireline providers in the county do not connect all of the BEAD-eligible unserved locations over the next couple of years. They could also expand deeper into Bishop or along any available state middle mile routes, these expansion possibilities are not very likely.
- Other improvement opportunities are covered in more detail in Section 6's review of Broadband Infrastructure Account and BEAD suggested areas for consideration.

These top suggestions are not exhaustive but should serve as a starting point for community broadband leaders to understand their options. The broadband marketplace can be very dynamic, with large ISPs often privately developing regional and local strategies that can shift priorities away from traditional expansion opportunities in this county. Similarly, broadband deployment project requests for proposals (RFPs) can receive unexpectedly strong offers from some ISPs or no answer from the best-positioned broadband providers. Municipalities must use available market information, evaluate the RFP answers, and adjust their options accordingly.

[323] We note that a few other providers claim to offer services to a very small number of residential locations. TPx Communications offer DSL to a single location. AT&T offers DSL to 11 locations, and fiber services to a reported 6 locations.

**Steps that municipalities should use to develop relationships with ISPs:** With the need for adaptability in mind, this report recommends that municipalities that are not already working with ISPs begin the process of reaching out to nearby providers and developing relationships with them that can lead to broadband deployment projects designed to reach unserved and underserved locations. Tilson recommends that:

- As many unserved locations are in close proximity to an existing broadband network, municipalities should work in conjunction with those nearby service providers to expand their existing networks, provided the level of service of those network extensions is appropriate and qualifies for state grant funding. Municipalities should informally reach out to nearby ISPs to establish lines of communication and gauge their interest in expanding their services areas within the community.
- Once the municipality has established this baseline level of information from ISPs, it should issue an RFP for a public-private or public-public partnership if a partner has not already been selected. The municipality may choose to propose contributing matching funds for the broadband infrastructure deployment and that matching funds also be contributed by the private partner(s). Any shortfall in available funding can then be pursued from the state's competitive grant programs.
- The municipality should concentrate on expanding broadband access using wireline technologies. Currently available funding favors wireline technologies, such as fiber optic cable, and should be spent to deploy wireline infrastructure as widely as possible.
- When suggesting the terms of the partnership or coordination agreement, the municipality should likely focus on the "public facilitation of private infrastructure" model discussed in Section 6.1 and offer to the ISP any opportunities to use existing assets, including access to public land necessary for the network deployment, and an enhanced level of coordination and local effort when handling access to poles, underground conduit, rights-of-way, and permit approvals. With nearly all municipalities having little experience owning, operating or maintaining broadband infrastructure, the municipality should require that the ISP generally operate, maintain, and upgrade the network as appropriate. The specific roles and responsibilities of the public private partnership members should be negotiated and codified.

## 10.3 Developing a Better Broadband Deployment Environment

Municipalities can implement process improvements, policies, and best practices that do not require direct financial commitments or formal partnerships. These *Broadband Ready Community* strategies can often be done with little or no additional cost to the municipality while reducing ISP deployment costs, fostering better coordination between ISPs and municipalities. These strategies can also reduce the administrative efforts of the municipality itself. While Section 7 contains additional suggestions, Tilson highlights the following recommendations:

### ■ Adopt policies to improve access to information

To plan and complete network deployment projects, ISPs need access to a large amount of information about local broadband needs, current infrastructure, other deployment efforts, construction policies, and permitting processes. County and local governments often have access to much of this information but may not have made it easily accessible to interested ISPs. Local governments are often in a better position to organize this information more efficiently and at a lower cost than an

interested ISP. As a result, municipalities that adopt "access to information strategies" will help ISPs to better analyze location details, such as permitting and access rights, and can reduce an ISP's ultimate deployment planning costs.

- Municipalities should establish a dedicated broadband issues webpage on their official websites. A centralized broadband webpage can provide direct links to information on permitting, mapping, and infrastructure development efforts. This site is an opportunity to encourage residents to sign up for broadband service subsidy programs, such as the Affordable Connectivity Program (ACP) and Lifeline, and to provide information about local service providers' low-cost internet plans.
- Municipalities should develop a permitting manual that reviews the rules, regulations, and permitting processes that ISPs must follow to conduct broadband constriction projects in the municipality's jurisdiction. This manual should include permit cost, timeline expectations and clarify acceptable underground construction techniques and practices.
- Municipalities should revise internal record-keeping processes to improve information-sharing and facilitate ISPs' use of existing assets, such as fiber, conduit, and attachment or placement rights. While this strategy may be costly upfront to implement, it is likely to reduce record-keeping costs in the long run and provide greater efficiency when these assets need to be repaired, upgraded, replaced, or utilized in new ways.

### ■ Adopt policies to improve local government coordination

To facilitate ISP deployments, municipalities must coordinate with the ISPs themselves and often other organizations, such as local utilities. ISPs must also often work with municipality staff from different departments that handle permitting, infrastructure planning, and even IT and GIS staff. As a result, unprepared municipalities may face significant challenges coordinating both internal and external communications.

- Municipalities should designate a single point of contact for coordination with outside organizations. This broadband coordinator may allocate certain ongoing coordination responsibilities, such as permitting applications and GIS requests, to other staff as needed, while remaining responsible for overall staff utilization for broadband projects.
- Municipalities should ensure that their internal coordination strategy can address broadband issues. Municipalities must recognize how broadband issues impact each department and develop interdepartmental broadband plans that address the municipality's broadband development and digital equity strategic plan, coordination with other municipalities and essential third parties, and between the municipality and ISPs active in the area.

### ■ Adopt permitting process to streamline deployments

Municipalities generally oversee permitting processes related to construction, rights-of-way and access. Most permitting regulations specify a set of circumstances under which permits must be granted or denied, while the process used to ensure compliance with these regulations establishes the way that the ISP must submit information for review by the municipality. Broadband Ready Communities have generally begun to place time limits on permitting reviews and cost limits of permitting fees, while a wider range of best practices covered in Section 7 discuss further streamlined permitting processes. Tilson suggests that:

- Municipalities should adopt a core set of best practices relating to permitting, including:
  - Ensure that each permitting process has been properly updated to consider broadband deployment issues and reviewed by staff who understand telecommunications factors
  - Allow applicants to submit required permitting documentation digitally
  - Provide permitting process timelines and update applicants about their permit requests when the review reaches any milestones

- Provide examples of permit planning and design standards, such as right-of-way diagrams, trench construction and pavement restoration, and pole attachments to improve ISPs' submission quality and better demonstrate standards
- Regularly revisit permitting rules and processes to improve alignment with federal, state, and other local requirements.

- Municipalities should establish a "Dig Once" policy to promote conduit and fiber optic cable construction. These policies require that any organization conducting certain types of underground construction provide opportunities for additional conduit and/or facilities to be included to ensure that other organizations can benefit from better underground access or for other organizations to install infrastructure in the trench while it is available (also known as a "joint trench" policy).
- Municipalities should establish a "One-Touch Make-Ready" policy, where a single contractor (or small group of contractors) pre-approved by the pole owner(s) and the attachment owners can perform all the work necessary to complete the make-ready work needed for new attachments. This approach reduces costs and time necessary to complete the process.
- Municipalities should enable ISPs to leverage municipal assets. A municipality's existing conduit, fiber, rights-of-way, and facilities all present direct opportunities for broadband network developers to reduce their deployment costs, while potentially offering additional benefits to the municipality itself. To facilitate ISP use of municipal assets, the municipality can create a template lease agreement, which should include lease rates that prioritize broadband deployment over revenue generation and should allow for modifications to accommodate specific needs.

■ **Utilize other, more formalized examples of Broadband Ready Community strategies to support revision efforts**

A few states, such as Colorado, Indiana, and Georgia, have analyzed these Broadband Ready Community strategies and created certification programs to help municipalities adopt them more easily. Municipalities looking to improve their permitting practices can use these examples to support some of their revisions when presenting their proposals to local government representatives.

- Indiana's program focuses on the appointment of a single point of contact for all broadband development project issues, supporting electronic submission of all forms, applications, and documentation required for a broadband development project, and shorter deadlines for all permit reviews and inspections. The program also forbids the use of application review fees or discrimination against any ISPs. Information about this program is available at: https://www.in.gov/indianabroadband/broadband-ready-communities-program/broadband-ready-certification/
- Georgia's program offers a model ordinance that similarly establishes a single point of contact for all broadband development project issues while setting short permit application review deadlines and restricting application fees to $100 or less. Information about this program is available at: https://broadband.georgia.gov/broadband-community-application-information
- Colorado's program offers more detailed materials, including a checklist that covers a number of additional local policy areas, coordination efforts, and additional resources that provide links to other checklists. This approach requires that municipalities complete a set of tasks, such as identifying local broadband champions, developing a local broadband team, engaging with the local community, reaching out to local ISPs, conducting a local asset inventory, and ultimately developing a project communication plan that will ensure all stakeholders are engaged as the municipality works with an interested ISP to develop, fund, and construct a broadband network. This more step-by-step approach applies many of the recommendations made in Section 7 and can be used as a useful tool to guide local policy efforts. Information

about this program is available at: https://broadband.colorado.gov/funding/advance-colorado-broadband-grant-program/broadband-ready-community-program

# 10.4 Developing Broadband Project Funding Strategies

In this report, Tilson dedicated considerable time to describing current and upcoming funding opportunities for broadband infrastructure. This is intentional and is to emphasize the magnitude and importance of these funding opportunities. The coronavirus pandemic has brought about three significant pieces of federal legislation, the CARES Act, ARPA, and the IIJA, each of which provides significant funding for broadband infrastructure to connect unserved locations. While CARES Act funding is largely spent, ARPA and IIJA broadband infrastructure funding will flow through the states to be distributed by state broadband offices through competitive grant programs. The CPUC will administer the distribution of these funds in California.

The current and upcoming funding for both broadband infrastructure and affordability, which will flow from 2022 to 2028, represents a watershed event in broadband funding opportunities. This period will go down in history as by far the most significant funding opportunities of their kind. Robust participation in these funding opportunities, and robust preparation and planning for participation in these funding opportunities, cannot be recommended highly enough for the county.

A review of funding options and related factors has been presented in multiple parts. Section 6.2 evaluated the possible federal and state funding sources that could aid Inyo County's efforts to connecting unserved and underserved households and businesses. Section 6.1 reviewed how municipalities can work with ISPs to develop grant-eligible broadband projects and share the financial commitments across those funding sources, the ISP, and even the municipality itself. This section, along with Section 7, also reviewed strategies that the municipality can use to reduce the cost of the deployment itself or leverage the municipality's existing resources and contribute them to the project, even serving at a portion of the matching requirement. This combination of possible federal and state funding sources, private ISP investments, and local cost-reducing efforts or financial contributions should be used as a toolkit of funding options that can be combined flexibly to facilitate deployments in areas long deemed economically unviable if funded by ISP investments alone.

Ultimately, this report focuses on the three primary funding options, the California Federal Funding Account (FFA), the Broadband Equity, Access, and Deployment (BEAD) program, and the California Broadband Infrastructure Account (BIA). To use these and other funding opportunities, Tilson recommends that the county and other relevant stakeholders:

- **Use the challenge processes to ensure that all unserved and underserved locations are eligible for funding**

California's last-mile deployment grant programs discussed above rely on a combination of the FCC's new National Broadband Map and the CPUC's own broadband mapping efforts to determine which locations are eligible for funding. While these maps are a significant improvement over prior efforts, they still rely on ISP to report their own service areas, which can sometimes mischaracterize the services they provide to a location or even an entire area. County and local governments must work with members of their communities and interested ISPs to understand the patterns of ISP service mischaracterizations and develop challenges to ensure that unserved and underserved locations in Inyo County can be identified and reclassified as eligible for the major influx of broadband funding over the next few years.

  - Inyo County should participate in a forthcoming challenge process required under the IIJA BEAD program to correct inaccuracies in federal broadband availability mapping data and identify additional locations that may be eligible for funding. Only units of local government, internet service providers (ISPs), non-profits and tribal governments are permitted to participate in this challenge process, members of the public cannot.

- Municipalities should encourage members of their communities to participate in the individual challenge process options provided by the FCC and California maps.
- Municipalities that have been working with ISPs to develop projects targeting specific areas can work with people in those areas and just beyond them to ensure that the maps accurately reflect current levels of service. The municipality can develop a strategy to collect data specifically in areas under dispute to ensure that locals provide the required evidence to file successful challenges and can even employ broadband engineers to evaluate the physical plant used to provide (or not provide) claimed services in an area. This targeted strategy will enable the municipality to focus its limited resources to make the most impact on areas that are more likely to be included in projects already in planning and development.

### Monitor the evaluation of the first round of Federal Funding Account submissions and adjust when announcements are made

The State of California allocated $13,221,784 to Inyo County to be distributed through the FFA program. In September of 2023, the CPUC received three applications for Inyo County, all from Frontier. One project will span both Inyo and Kern Counties and requested $6,629,936, only a small portion of which will come from Inyo County's allocation. The other two projects located exclusively in Inyo County requested $3,568,487 to connect 706 FFA-eligible locations at an average cost of $5,055 per location.

At the time of this writing, applications are still being reviewed, and winners have not yet been announced. Detailed information about each application, including maps of proposed funded service areas, can be found here:

https://broadbandportal.cpuc.ca.gov/s/objection-page

Given the impact each project award would have on future network deployment efforts in the county, ISPs and municipalities must be flexible when planning for projects that can best utilize the other funding opportunities available over the next two years. The map below shows the locations eligible for the FFA program. We note that the eligibility criteria are broader than the BEAD program's definitions of "unserved" locations.

Considering Frontier's proposed projects during the first round of the FFA program, several areas could be covered with any remaining FFA funding. We suggest considering the following:

- Lone Pine Communications could consider extending its wireline service area to reach Olancha, expanding to eligible for the FFA-eligible addresses to the south, or expanding eastward to reach eligible areas in Keeler, to the east of Owen's Lake. The state's middle mile network will be constructed along US 395 and could serve as the basis for another provider's deployment through Olancha, but Lone Pine Communication's existing unlicensed fixed wireless service in the area could provide a competitive advantage with this areas' customers, as the Lone Pine likely a recognized brand within the community and could transition them to fiber wireline service more easily.
- In the west-central Inyo County, many locations that are already served by Frontier's DSL network are eligible for the FFA program. Frontier could consider pursuing additional support from the FFA to upgrade these networks to fiber in Independence and locations directly to the north of this community. As Frontier has already secured access to poles and rights-of-way in these areas, the provider will likely be able to deploy fiber at lower cost than a new market entrant could.
- Big Pine, in northwest-central Inyo, contains locations eligible for the FFA program that are within both Frontier and Optimum's existing service areas. As the state's planned middle mile network will extend down US 395, both providers could consider using the transport services introduced to the area by this network to facilitate this deployment. If ambitious, this project could include FFA-eligible locations in the very southwestern edge of Big Pine, just off of Sugar Loaf Road.

- Lastly, many locations through Bishop, in north-central Inyo County, are eligible under the FFA program, despite the many providers that serve this population center. In fact, every wireline provider with a presence in Inyo County could consider applying to the FFA to serve these locations, as AT&T, Frontier, Optimum, and Lone Pine Communications all maintain networks somewhere in the city.

### Develop eligible projects for the BEAD Grant Program

A portion of BEAD-defined unserved locations are likely to be scattered in partially served census blocks, but there are a few areas that should be highlighted:

- All of the areas suggested for BIA consideration above should also be considered for the BEAD program. The Laws area in the northwestern portion of the county, the Lone Pine area, and a number of scattered unserved locations found within a few miles of US 395 throughout the county should all be considered for BEAD-funded projects. The state open-access middle mile network is planned to run near a majority of these areas as well, so while Frontier, Lone Pine Communications, and even AT&T may not be near each area, any one of the three could decide to use BEAD funding to establish itself along different portions of US 395.
- The unserved areas in the southeastern portion of the county, such as locations in and near Charleston View, Death Valley Junction, Shoeshone, Tecopa, and Sandy Valley, have been designated as BEAD high-cost areas, so projects to connect these areas will have a much lower matching requirement, if any. The CPUC may designate this area as an "extremely high cost," which would allow fixed wireless ISPs to submit plans for high speed wireless networks capable of providing services of at least 100/20 Mbps if wireline networks to this area are not economically viable. However, the state middle mile network is planned to run along State Route 127, so many locations in this area may be able to receive fiber service to their homes.
- There are a few clusters of unserved locations west of West Bishop, particularly in the outskirts of Round Valley, Starlight, and further southwest in Aspendell. The state middle mile network will run to the intersection of W Highway 168 and Ed Powers Road. If Frontier elects to use the state middle mile network it could extend its existing fiber network to these clusters in West Bishop.

Section 6 also reviews how counties and municipalities can work to ensure that unserved locations are eligible for grant funding. These funding programs require applicants to rely upon broadband service maps from either the FCC or the State of California, but not all locations are accurately classified on these maps. Local governments, ISPs, non-profits, and in some cases, the residents themselves may attempt to reclassify locations to make them eligible for funding if sufficient evidence is gathered to demonstrate that a location is not served. Local governments can implement a number of strategies to gather this information and ensure residents with unreliable or slower services can be included in deployment planning during this unique and brief funding window.

Additional opportunities will likely exist in partially served census blocks scattered across the county. In order to identify these locations, the county and other municipalities should acquire a CostQuest data license that will allow them to access individual location service information necessary to spot these locations and include them in projects submitted to the BEAD program.

### Develop targeted projects that can best utilize the Broadband Infrastructure Account

This program focuses on identifying locations that are either unserved at speeds of 10/1 Mbps or are low-income locations without access to 25/3 Mbps service. The program also allows for smaller applications including fewer locations, allowing applicants to target the most eligible households and create projects that can connect locations across a wider area. While there are a few clusters of areas that are very likely to be prioritized, many projects using this funding source will have to be developed using location-specific service availability and demographic data.

Inyo County has a reported 2,676 locations (28.3 percent) that do not yet receive any service meeting the 10/1 Mbps standard, 1,358 locations (14.3 percent) of which are reported to not receive any form of internet service. This latter group is prioritized by the BIA program, regardless of the income characteristics of the area, but to identify these locations, the municipality will need to license access to the CostQuest address fabric. With a significant portion of unserved locations also located in low-income census blocks, ISPs looking to expand their current service areas should consider using the BIA to expand beyond their current service areas or to upgrade services to low-income households currently receiving DSL services offering less than 10/1 Mbps. Nearly all of the project area suggestions made for the BEAD program below should be considered for the BIA program as well, once the ISP or municipality obtains access to the address fabric and can evaluate the current service characteristics (or more importantly, lack thereof) to each location in those suggested areas.

BIA projects can identify areas as small as individual properties and combine them in one application, so long as the residents of each property are low-income households or lack current service entirely. As a result, this program is a unique option for project proposals across the county that focus on expanding or upgrading existing networks to reach a number of small, non-contiguous areas. Including areas that may already receive 10/1 Mbps service but not 25/3 Mbps service, there are a few clusters in low-income census blocks that are worth highlighting to be considered for the BIA program:

- In the northwestern portion of the county, along a bend in US Highway 6, the Laws area contains low-income census blocks that have been marked unserved. Frontier and Optimum both have nearby infrastructure and can easily connect these locations.
- Near the western edge of the center of the county, there are a scattered number of unserved homes in low-income census blocks near Fort Independence Reservation and the Seven Pines campground area. Optimum may be encouraged to expand its cable reach into these areas by connecting to the state middle mile route along US 395, but Frontier's DSL network could be upgraded and expanded to these locations as well.
- Lone Pine Communications could upgrade their cable network in Lone Pine and extend it into the eligible low-income neighborhoods to the west, particularly along W Whitney Portal Road and Granite View Drive.
- Along US 395 near Haiwee, there appear to be scattered unserved locations in low-income census blocks. Portions of these unserved areas extent to the western boundary of the county from the communities of Coso Junction to Grant. There is another small cluster surrounding the South Haiwee Reservoir. Frontier DSL network could be partially replaced with fiber and extended to these unserved locations.
- The Timbi-Sha Shoshone Reservation, near Death Valley Junction, is largely unserved and at least partially classified as low-income. The state middle mile route will pass through the junction, making this area a potential opportunity to interested ISPs. By deploying in this area, the ISP could extend to the southeast corner, including the town of Charleston View, and locations along Old Spanish Trail Highway, just east of South Nopah Range Wilderness Area.

As with the BEAD program, additional planning efforts will require that municipalities acquire the CostQuest data license that will allow them to access individual location service information. Municipalities should combine this information with demographic information covered in Section 6.2 in order to identify the strongest candidate locations for funding, and work with nearby ISPs to extend service to these locations.

- **Utilize California's Loan Loss Reserve Fund program to reduce the financing costs necessary to build broadband projects that will result in public ownership of network assets**

This program will enable eligible entities to obtain a wider range of financing options with better borrowing terms, thereby increasing the viability of many projects that will require more time to cover initial investment costs. However, this program also includes certain ownership requirements that restrict its use to projects that will result in non-private infrastructure ownership. This distinction will make local partnerships with special eligible entities, such as joint powers authorities, more

appealing, but private ISPs may still consider certain public-private partnerships that would comply with this ownership requirement as well.

## 10.5 Developing Smart Community Strategies

The benefits of broadband access to individual households and businesses are well-documented, but some benefits can occur only when connectivity is used to allow multiple organizations or entire communities to coordinate with one another. Digitally connected communities improve the quality of life for all residents by leveraging both new and existing technologies and the data they gather to enable new ways of addressing community needs, such as transportation, energy, agriculture, natural resource management, and emergency responsiveness. Section 9 reviews a diverse range of applications for smart systems, but we focus on the most impactful suggestions here. To develop smart community systems more generally, Tilson and VHB recommend that municipalities develop an overall smart community plan using a core set of steps.

- **Develop a smart community plan**

The county and major municipalities all can benefit from digital technologies, but their opportunities and resources will obviously differ. For example, municipalities can increasingly use data-driven methods to control public utility infrastructure such as local water drainage systems and transportation infrastructure such as stoplight grids to manage traffic flows at peak times. In contrast, the county will likely focus on issues like fire management systems. Despite these different applications, all municipalities should generally follow the same steps:

- Municipalities should identify their current digital information and coordination systems and evaluate how this data could contribute to other organizations or different use cases.
- Municipalities should engage the public in a collaborative visioning process to identify community needs, using the topics and strategies presented in this report as a starting point to understand what strategies should be prioritized. This engagement process could consist of stakeholder focus group meetings, public workshops, online surveys, and other means of civic engagement and public participation.
- For each priority, the municipality should perform benefit-cost analysis and identify a responsible department or partner agency, potential cost-sharing partnerships, risks, and any alignment with county policies and planned projects. Specific implementation cost estimates can be developed at this time, potentially for one or more pilot projects.
- Municipalities should use smart community plans that contain recommended goals, objectives, and policies to acquire feedback from key stakeholders and the community at large, then refine them into formal resolutions, ordinances, or special projects that can see these plans put into action.

In terms of specific community needs, Tilson and VHB recommend the following:

- **Expand wildfire and flood detection and monitoring systems to improve safety**

Local, state, and federal organizations already monitor a number of environmental conditions and factors. However, to improve their efficacy, these different organizations are currently undergoing a data-driven evolution that aims to share information in real time, improve risk assessment models, and develop processes and strategies that are more responsive to current conditions. These improvements require both coordination between these organizations and their information management systems and, increasingly, the involvement of key community members to expand data-gathering capabilities

and facilitate more localized monitoring. While Section 9 contains additional suggestions, Tilson and VHB highlight the following recommendations:

- The county should work with essential partners involved at other levels of government and key non-governmental organizations (NGOs). To coordinate fire monitoring and prevention strategies, the California Office of Emergency Services (CalOES), the California Department of Fish and Wildlife (CDFW), United States Forest Service (USFS), National Oceanic and Atmospheric Administration (NOAA), Federal Emergency Management Agency (FEMA), and the National Interagency Fire Center (NIFC) can all contribute to a comprehensive wildfire management strategy. Similarly, the California Department of Water Resources and FEMA, the California Data Exchange Center (CDEC), and some of the aforementioned agencies can contribute to a flood detection and water management policy strategy.
- To improve the ability to evaluate trends and more problematic areas, the county should work toward using a single system that can draw on data from its partners and any privately-owned devices that could aid in the monitoring process on the local level.
- Municipalities should prioritize the use of smart infrastructure technologies, such as smart levees, flood gates, and stormwater management systems that can automatically respond to changing environmental conditions.
- The county should use ongoing efforts to improve its monitoring systems to revisit and revise emergency response plans, using the system's increased predictive and real-time capabilities to create more localized or adaptive strategies.

### ■ Deploy charging and fueling infrastructure to support zero emissions vehicles (ZEV) and Electric Vehicles (EV)

Zero emissions vehicles (ZEV) and electric vehicles (EV) are a transformative advancement in transportation technology. On a local level, these transportation options can generate cost savings for residents who adopt them while reducing the county's dependence on and demand for gasoline. Their presence along key roads across the county can also improve cross-county travel, bringing in more visitors and promoting local tourism. While Section 9 contains additional suggestions, Tilson and VHB highlight the following recommendations:

- The county should adopt an initiative to deploy charging and fueling infrastructure to support zero emissions vehicles (ZEV) and electric vehicles (EV).
- Municipalities should reach out to organizations that provide EV infrastructure to develop initial cost and feasibility information.
- Municipalities should conduct feasibility studies to identify optimal locations for charging stations, considering factors such as population density, transportation routes, and community needs.
- Municipalities should work toward developing cooperative agreements with local energy companies to support these systems.
- Using the funding suggestions presented in Section 9.5, the county and local governments should work together to develop scalable deployment plans that leverage additional funding from outside the county to improve the region's transportation options. This strategy will require collaboration between electric utility companies, government agencies, and private sector partners to secure funding and resources for the installation and maintenance of charging infrastructure.

### ■ Use Smart Water and Irrigation Systems to optimize conservation efforts

Smart water systems help ensure sustainable water use for all by utilizing advanced technologies and data analytics to optimize water management and increase efficiency. Sensors that are outfitted with digital communications systems enable

remote monitoring, live data analysis, and real-time decision making. Advanced metering infrastructure, including smart meters sending wireless signals in real time, can be used to improve water accounting and reduce waste. Implementing enhanced pressure and flow management strategies and monitoring distribution networks for infrastructure maturity can prolong the lifespan of a piping network. Modern data analysis tools can also facilitate the use of more comprehensive historical and real-time data to make informed management decisions. While Section 9 contains additional suggestions, Tilson and VHB highlight the following recommendations:

- The county should develop smart drought detection, groundwater, and wastewater management systems that use real-time monitoring, automation, and optimization algorithms to improve the efficiency of overall water supply management methods.
- The county should promote the use of smart soil sensors and irrigation systems, which use sensors to monitor soil moisture levels and weather conditions and allow for more precise and efficient watering of plants and crops.
- The county should work with Groundwater Sustainability Agencies (GSAs) in high and medium priority basins to help protect groundwater resources for the long term. Implementation of smart groundwater monitoring systems may benefit from collaboration with GSAs as well as Sustainable Groundwater Management grants available through the California Department of Water Resources (DWR). The State Water Board's Safe and Affordable Funding for Equity and Resilience (SAFER) drinking water program may also serve as a source of funding for smart water system upgrades for potable water.

## 10.6 Next Steps

Many of the recommendations above have been presented in a sequential manner, with certain topics, such as the public-private partnership formation process or the development of a smart community plan, already presented as a series of steps and considerations that will need to be made to accomplish those overall projects. However, with so little time available before key broadband funding processes begin, the county and other municipalities must prioritize certain recommendations over others now and in the near future. These next steps will be divided into the following four time periods:

- **January to March of 2024:** During this period, additional mapping updates will be released by the FCC and the CPUC, which will serve as the underlying basis to determine location eligibility information. The BEAD challenge process may begin as early as the end of this period as well, requiring that municipalities prioritize all efforts to ensure that these maps accurately reflect unserved and underserved locations that should be included in broadband project proposals. The CPUC may also issue awards for the first round of FFA funding.
- **April to August of 2024:** The BEAD challenge process period will close during this period, which will solidify the final map used to determine BEAD-eligible unserved and underserved locations throughout the county. The initial BEAD application round may begin toward the end of this period as well, so municipalities and ISPs should be prepared to submit their project plans and application materials. The third FFA application window is also expected to open and close during this period, providing what is likely to be the last opportunity to utilize any funding allocated specifically to Inyo County under this program.
- **September to December of 2024:** The initial BEAD application round is more likely to be conducted during this period, so ISPs and their local partners should be prepared to submit eligible projects that focus primarily on unserved locations. Municipalities that have worked to develop local policy revisions strategies also should begin to implement them during this period, setting the stage for any recently funded projects that will need to benefit from the cost- and time-saving efficiencies they enable.

- **2025 and beyond:** If the BEAD program does not exhaust its available funding during the initial application round, there will be another submission opportunity that will focus on projects to any remaining unserved locations that were not connected during the prior round. The program may also have funding available to consider underserved locations, so ISPs and their partners can refine their deployment plans accordingly.

  However, the focus of the county and other municipalities will increasingly shift toward two areas: deployment monitoring and smart community efforts. Whether the municipality formally partnered with an ISP or merely coordinated with one, the municipality should monitor deployment progress closely to understand how service availability is improving and comply with any reporting requirements it may have committed to. With fewer local efforts devoted to deployment planning, municipalities should also devote more attention to developing and implementing smart community strategies.

## January to March of 2024

- **Each municipality should designate its primary point of contact for broadband projects, if it has not already done so:** Of all the local policy best practices advocated by experts and broadband ready community programs implemented in other states, this recommendation is made most consistently. This person will serve as the central source of broadband information to the ISPs and have an opportunity to understand ISP priorities, which will facilitate all other planning and coordination efforts.
- **Municipalities should reach out to nearby ISPs that may be willing to expand or upgrade services in their areas:** Municipalities should establish lines of communication with local ISPs to identity their levels of interest in deployment efforts, any local policy concerns they may have, and their willingness to coordinate or partner with the municipality. This information will be used for all subsequent planning efforts, and the relationships developed here will ensure that any formal RFPs are received and considered by each ISP in a timely manner.
- **Municipalities should monitor mapping updates closely:** This period will see updates made to the FCC and CPUC broadband maps, which will serve as the basis for the BEAD challenge process. These updates have the potential to reveal recent expansion and upgrade efforts made by ISPs after their last service area submissions, which have been used in this report. As a result, any of the locations identified as unserved and underserved and the resulting deployment suggestions developed in this report may change, requiring that municipalities adopt their strategies accordingly.
- **Each municipality should acquire the appropriate CostQuest location information licensing agreement:** Some of the remaining unserved and underserved locations are found in partially served census blocks, so maps that aggregate information about available services on the census block-level can hinder the inclusion of these scattered eligible locations. Municipalities can contact CostQuest and acquire a free license to access location-based information about their jurisdictions that will enable a GIS team to identify these locations and include them in planning efforts and grant applications. This process will also require that the municipality submit certain information to the FCC, but these efforts are minimal, and the strategic planning benefits are significant.
- **Municipalities should begin to conduct community outreach on broadband needs and issues, if it has not already done so:** While mapping and service-level information generally establish eligible service areas for funding programs, each municipality can benefit from active community engagement in a number of ways. Community broadband leaders and other interested parties can identify areas with services that may fall short of the information presented on the broadband maps. This information should be used to identify areas that may need to be included in the challenge process. Active engagement will also allow the municipality to learn about other aspects of the digital divide in their communities, along with any existing digital inclusion efforts and additional needs still not being met. The relationships established during these outreach efforts will also allow the municipality to cultivate local buy-in for local

deployment efforts, which can increase the rate at which locals adopt recently deployed services and improve economic viability accordingly.

- **Municipalities should develop and implement their challenge process strategies:** With the BEAD challenge process occurring so soon, municipalities must immediately review service availability maps closely, identify any areas that are likely mischaracterized, and implement data-collection strategies that can harness well-coordinated crowdsourcing of evidence necessary for successful challenges. Section 6.4 reviews top strategies that municipalities can use to develop and implement these coordinated efforts.
- **Municipalities should review their local policies and begin to identify improvement opportunities:** Using the top recommendations listed above and the more in-depth discussion provided in Section 7, municipalities should review their current policies and identify improvement opportunities. This process should begin immediately, because municipalities need ample time to identify the list of potential changes, evaluate benefits and costs of refining and implementing each change, and ultimately adopt them.
- **Municipalities should begin to consider possible smart community strategies that they may want to implement:** While smart community strategies planning is not as pressing as the development of ISP and community relationships, challenge process information-gathering, or deployment planning in the short term, municipalities should still begin to think about the range of recommendations identified above and in Section 9.

■ **April to August of 2024**

- **Municipalities should develop deployment plans for their priority areas:** During this period, the BEAD challenge process will have finalized the broadband service maps used to identify BEAD-eligible unserved and underserved locations. Municipalities should refine their list of priority locations, using this new information and the CostQuest-sourced location data to create more detailed deployment plans.
- **Municipalities should work with local ISPs to connect unserved locations using the BIA program:** This funding option can offer a lower matching requirement than the BEAD program, so municipalities seeking to maximize funding should use the CostQuest-sourced location data and relevant demographic data to identify high-priority low-income locations that can be connected through this program.
- **Municipalities should release their RFPs and begin the partnership or coordination process with the best candidate ISPs:** After developing lines of communication and a general understanding of interest from each ISP in the prior period, the municipality can develop an RFP that can allow each ISP to submit a formal proposal that includes all the details the municipality should consider to identify its best partnership opportunity. If the municipality has already refined its deployment priority plans, these priority areas can be included as either required or suggested areas for any project proposals.
- **Municipalities should create drafts of revised local policies that will facilitate deployments:** To ensure that these policy revisions are in place before ISPs begin to deploy their networks, this period should be used to develop revised policies, then distribute them to stakeholders for feedback and refinement opportunities.
- **Municipalities should conduct community outreach about smart community strategies:** Building upon prior broadband community engagement efforts, this period can be used to gauge community interest in the different smart community strategies presented in Section 9 and possibly to discover other needs that can be met through the coordinated use of digital technologies.
- **Municipalities should contact the most relevant state and federal agencies and companies that could contribute to smart community strategies:** As the municipality conducts its initial feasibility review of its smart community

strategy options, it should reach out to key organizations that can provide it with more information about what data can be sourced and other factors key to the planning process.

- **September to December of 2024**
  - **Municipalities should work with interested ISPs to develop and likely submit deployment projects to the BEAD program:** The prior period focused on the solidifying project service areas and partnership or coordination details. This period will require that additional project details be finalized, which may require significant time and effort to refine certain project elements if the municipality has chosen to partner with an ISP more formally.
  - **Municipalities should adopt revised local policies that will facilitate deployments:** After drafting revisions, acquiring stakeholder input, and refining proposed policies accordingly, this period should be used to formally adopt the policies and begin implementing them.
  - **Municipalities should develop a draft of their overall smart community plan:** To ensure that the information-gathering efforts occurring in the prior period yield results, municipalities should set the goal of releasing a draft of their smart community plan. This document should include outlines for initiatives to implement each of the recommendations above, along with more detailed proposals of key pilot projects selected as the starting points for these overall strategies.

- **2025 and beyond**
  - **Municipalities should develop and implement deployment monitoring programs:** If the municipality formally partnered with an ISP and co-developed project received a grant award, the municipality may be obligated to conduct detailed monitoring of project progress and financial expenditures that must be submitted regularly to the CPUC. This obligation will depend upon the partnership structure, so municipalities should consider this responsibility when establishing a partnership agreement.

    However, even if the municipality is not obligated to monitor deployment progress at this level of detail, it should still coordinate with the ISP to understand when locations will be able to receive service and keep local communities informed of these timelines.
  - **Municipalities should consider developing additional BEAD project proposals with interested ISPs:** If unserved areas do not receive acceptable project proposals, the BEAD program will likely open up an additional submission round that will focus primarily on ensuring these locations are connected. The BEAD program may also have enough funding available after the first round to enable applicants to include underserved areas, so ISPs and their partners should closely monitor the BEAD application review process and plan accordingly.
  - **Municipalities should monitor additional broadband program developments and changes:** With so much funding available and so many different rules used to direct funding allocations, it is very difficult to predict what sort of emergent problems may arise throughout the next year. These funding programs may have to modify certain rules to address such problems, and municipalities should pay close attention to any changes, because they may impact deployment opportunities significantly.
  - **Municipalities should implement smart community pilot projects, refine their smart community plans, and develop additional projects to take advantage of improved broadband access and new technologies:** With most funding to be awarded over a brief two-year window, municipalities that have devoted significant efforts toward deployment programs will finally be free to shift their efforts toward other broadband-related priorities. Municipalities should be able to develop their smart community capabilities more gradually, using the initial pilot projects as a starting point to expand the municipality's smart community efforts into other areas.

SECTION

# 11

# APPENDICES AND GLOSSARY

## Appendix A: Survey Results and Analysis

Tilson conducted a survey of businesses located throughout the counties participating in this study to collect data on their experiences with internet services. Participants representing a wide variety of businesses responded, ranging from small home ventures and fast-food establishments to larger organizations, such as hospitals and hotels. The survey received a total of 184 responses across 16 counties, as shown below in Table 28:

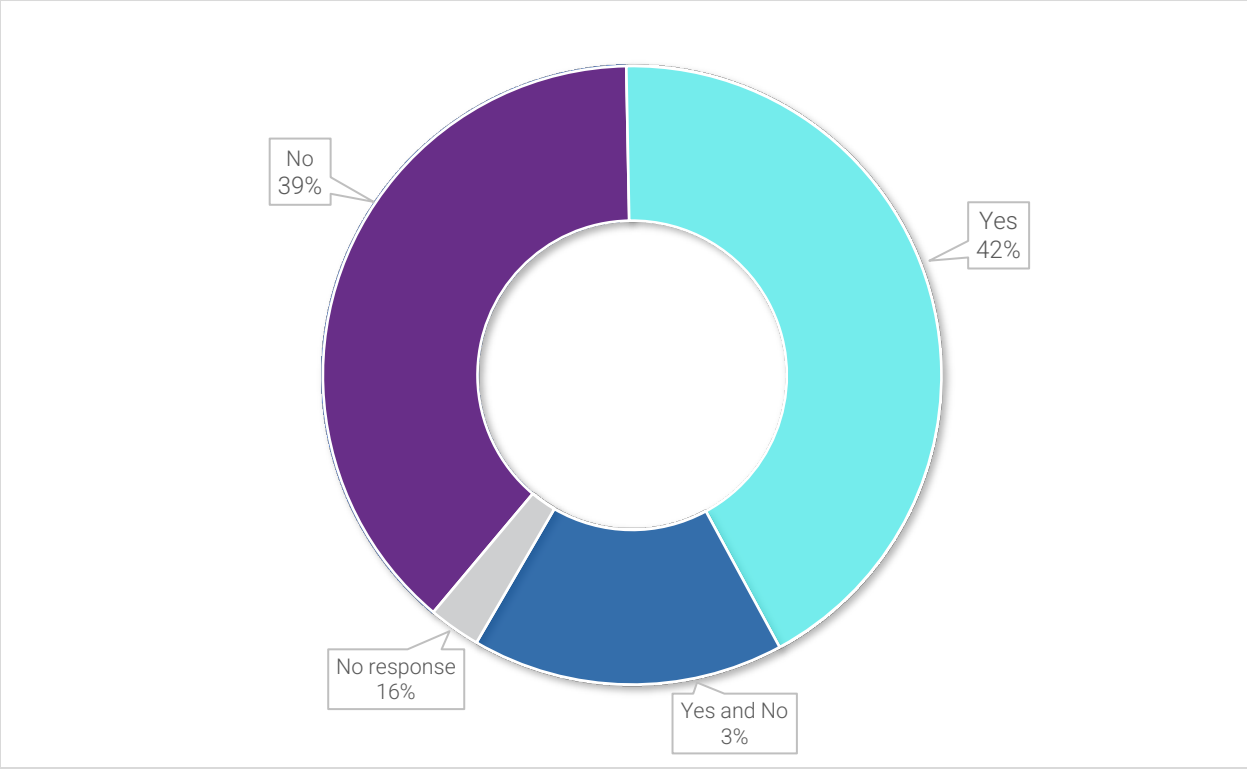
**Table 27: Count of Business Survey Participants, by County**

| County | Count of Survey Participants in County |
|---|---|
| Tehama | 30 |
| Mariposa | 26 |
| Butte | 23 |
| Calaveras | 23 |
| Inyo | 15 |
| Plumas | 14 |
| Lassen | 14 |
| Modoc | 11 |
| Sierra | 6 |
| Colusa | 5 |
| Tuolumne | 5 |
| Napa | 4 |
| Glenn | 3 |
| Shasta | 2 |
| Amador | 2 |
| Nevada | 1 |
| **Total** | **184** |

The survey included a variety of questions intended to capture participants' current internet service (both monthly cost and subscription speeds, in Mbps), experience with this service (performance and/or reliability, the service's suitability, and satisfaction with customer service), and anticipated future bandwidth needs. The survey also collected information on conditions that may impact the actual performance experienced by the business, irrespective of external network conditions, such as the age of the business's network equipment and the state of their building's internal wiring.

Figure 38 below summarizes participant responses to the most fundamental question regarding internet service: whether or not it is sufficient for their business's needs.

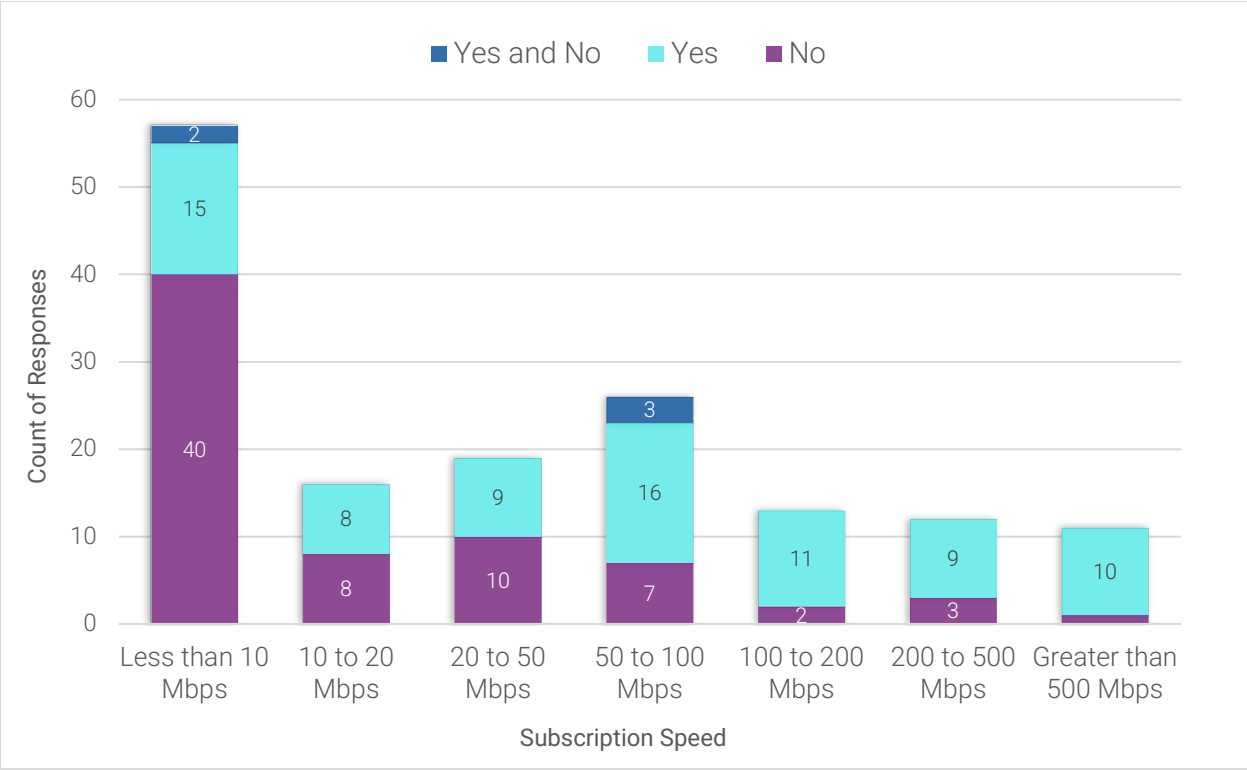
**Figure 38: Summary of Responses to the Question "Is your internet sufficient for your business needs?"**




Of the 184 participants, a slightly greater proportion indicated their internet was sufficient for their businesses' needs (42 percent), as compared to those who did not feel their service was sufficient (39 percent). A small group (3 percent) felt their service was sufficient in some ways, but insufficient in others. The remaining 16 percent of participants did not respond to the question.

As expected, participants' impressions of their internet service's adequacy was somewhat related to the speed of internet service purchased, with businesses receiving slower subscription speeds more likely to identify that their services was not sufficient.

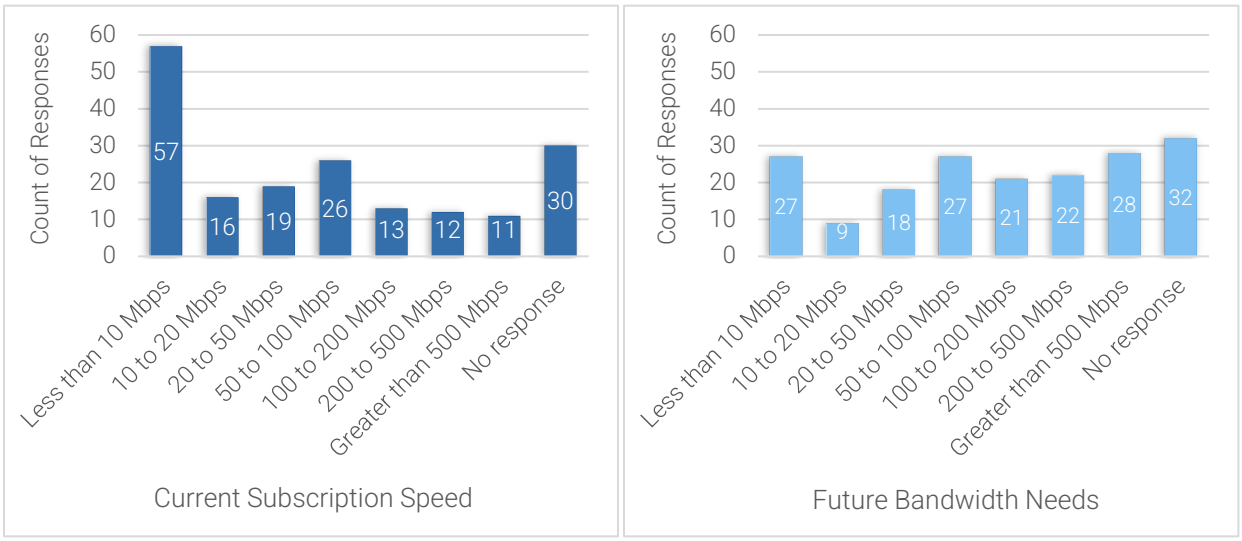
**Figure 39: Summary of Responses to the Question "Is your internet sufficient for your business needs?" by Subscription Speed**




Notably, this survey had a disproportionately high number of respondents who indicated their business relies on internet service of less than 10 Mbps (57), reflecting their likely stronger interest in participating. A larger proportion of this group also indicated their internet service was not sufficient for their business's needs (70 percent), greater than for those subscribing to higher-speed services. As the amount of bandwidth purchased increases, the proportion of survey participants who stated their internet service meets their business's needs generally increased as well, but even with downloads of 50, 100, or 200 Mbps, some businesses identified that they needed better service.

Participants were also asked to estimate their business's future bandwidth needs. Figure 40 below compares the range of participants' current subscription speeds against the range of participants' estimated future bandwidth needs.

**Figure 40: Current Internet Speed vs. Future Bandwidth Needs**

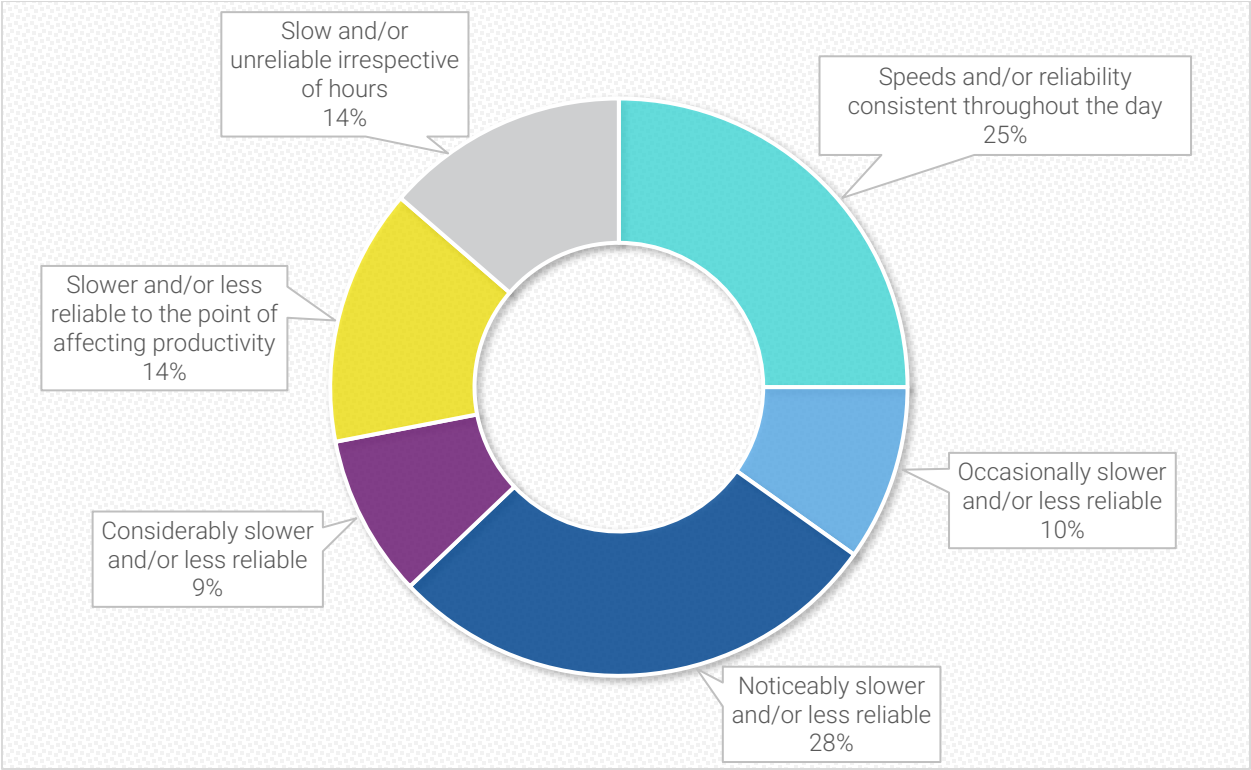



Unsurprisingly, the number of businesses expecting to have their needs met by less than 10 Mbps or between 10 and 20 Mbps dropped significantly, reflecting the extent to which businesses only receiving those levels of service would want faster service options. The number of participants who felt internet service of less than 10 Mbps would be sufficient for their business's future needs fell by approximately 50 percent, the largest decrease among all groups.

The data strongly demonstrates an increased demand for higher-speed services, particularly at speeds of at least 100 Mbps or more. Nearly a quarter of businesses identified that they would need access to speeds of at least 200 Mbps. The group of participants who felt 200 to 500 Mbps would meet future needs is 83 percent greater than those currently purchasing this level of service. Service capable of delivering greater than 500 Mbps increased the most, representing a portion nearly 2.5 times the number of respondents already receiving this option.

Participants were then asked to describe their business internet service's performance and reliability during peak usage hours to understand how increased user demand may affect these areas. Figure 41 below summarizes participant responses to the question, "During peak hours, how would you rate your network congestion and reliability?" Answers provided by this open-ended question have been translated to the following answers, shown in Figure 41, based on (1) whether they identified that speeds were consistent, then (2) whether they identified the issue occurred irrespective of hours, then (3) whether the answer mentioned a reduction in productivity or work, then (4) by the intensity of the remaining answers.

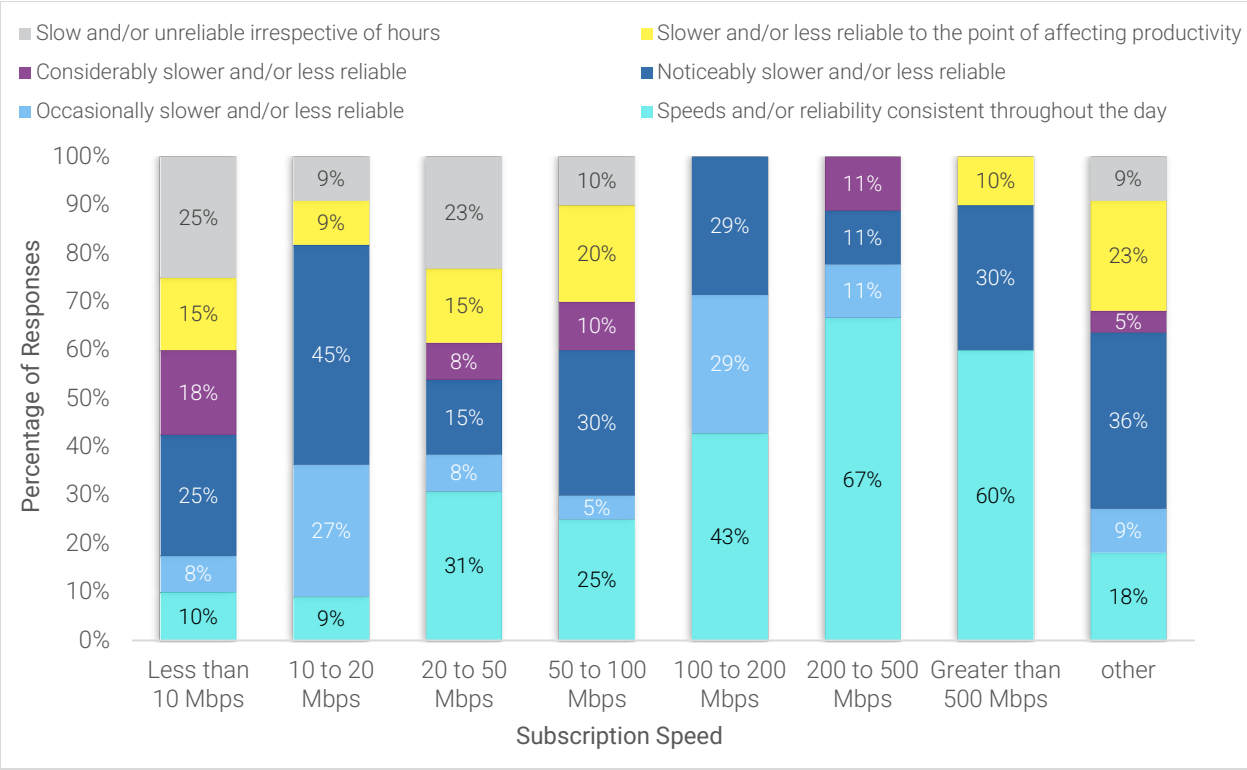
**Figure 41: Summary of Responses to the Question "During peak hours, how would you rate your network congestion and reliability?"**




Three-quarters of respondents identified that they are at least occasionally impacted by slower internet speeds during peak hours. Concerningly, more than half (51 percent) answered that their services were noticeably or considerably slower or less reliable or problematic to the point of impacting productivity. Another 14 percent focused on the issue of occurring any time of day. The data collected by this question suggests that, while a quarter of participants experience consistent speeds and reliability throughout the day, many more face slower and less reliable service as network congestion increases during peak hours.

A greater proportion of participants whose businesses subscribe to lower service tiers experience degradation during peak usage hours when compared to their counterparts who purchase higher tiers. Figure 42 below summarizes this comparison.

**Figure 42: Summary of Responses to the Question "During peak hours, how would you rate your network congestion and reliability?" by Subscription Speed**




Just 10 percent of those subscribing to service less than 10 Mbps report experiencing consistent speeds and reliability throughout the day. This ratio is similarly low for the group subscribing to service between 10 and 20 Mbps (9 percent). In general, those purchasing higher service tiers tend to report more consistent speeds and reliability throughout the day, though some participants in these groups still suffer from service degradation during peak usage hours. Notably, no participants subscribing to speeds at or above 100 Mbps indicated their service was slow and/or unreliable irrespective of hours, in contrast to those subscribing to lower-tier services.

Participants were asked to specify the ISP their business purchases internet services from. Table 29 below provides a count of participants by the internet service provider they patronize and the county their business is located in.

**Table 28: Count of Participant's Internet Service Providers, by County**

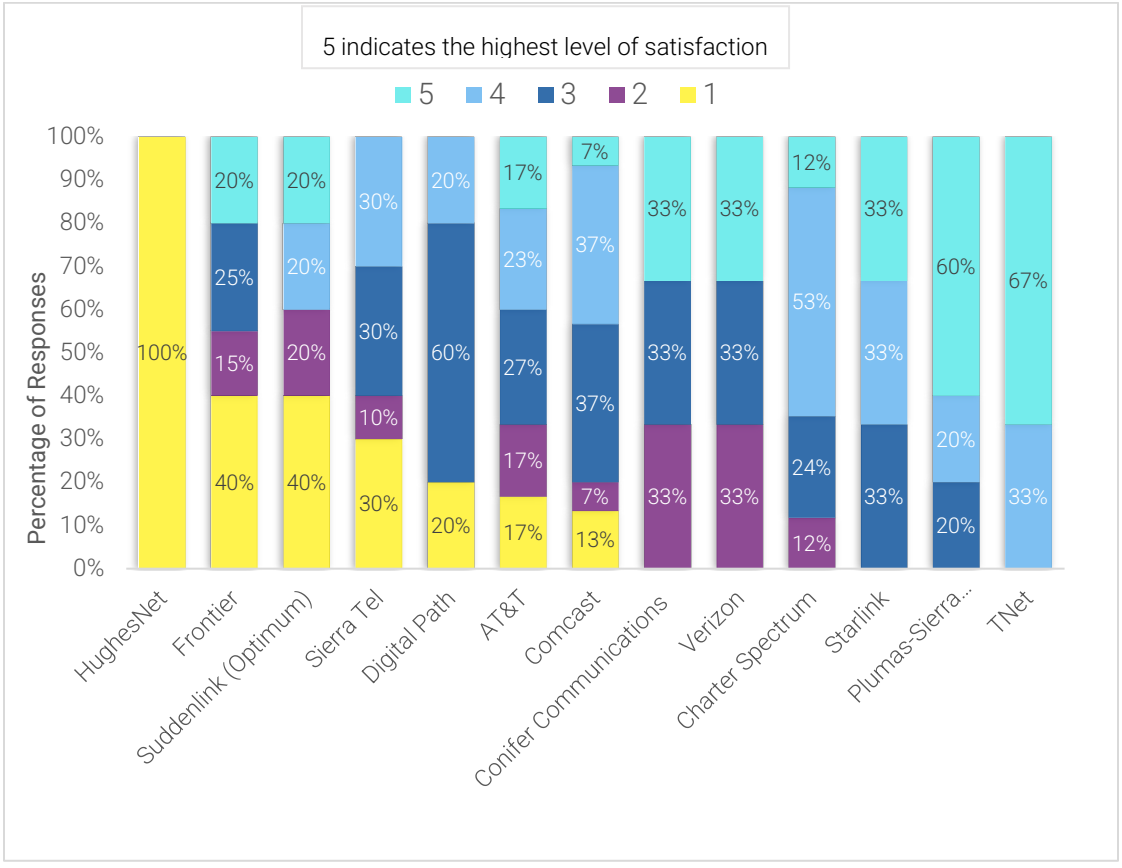
| Provider (Count of Participant Subscribers) | Participant County | Count of Participants |
|---|---|---|
| **Comcast (30)** | Butte | 8 |
| | Calaveras | 14 |
| | Colusa | 1 |
| | Napa | 3 |
| | Tehama | 1 |
| | Toulumne | 3 |
| **AT&T (30)** | Amador | 1 |
| | Butte | 10 |
| | Calaveras | 2 |
| | Glenn | 2 |

| | | |
|---|---|---|
| | Mariposa | 2 |
| | Plumas | 1 |
| | Sierra | 3 |
| | Tehama | 7 |
| | Tuolumne | 2 |
| **Frontier (20)** | Colusa | 1 |
| | Inyo | 4 |
| | Lassen | 8 |
| | Modoc | 4 |
| | Plumas | 3 |
| **Sierra Tel (20)** | Mariposa | 19 |
| | Nevada | 1 |
| **Charter Spectrum (17)** | Tehama | 17 |
| **Plumas-Sierra Telecommunications (5)** | Lassen | 1 |
| | Plumas | 4 |
| **Suddenlink (Optimum) (5)** | Inyo | 5 |
| **Digital Path (5)** | Plumas | 2 |
| | Tehama | 3 |
| **Starlink (3)** | Lassen | 1 |
| | Mariposa | 1 |
| | Modoc | 1 |
| **TNet (3)** | Modoc | 3 |
| **Conifer Communications (3)** | Calaveras | 1 |
| | Mariposa | 2 |
| **HughesNet (3)** | Calaveras | 1 |
| | Plumas | 1 |
| | Sierra | 1 |
| **Verizon (3)** | Butte | 2 |
| | Tehama | 1 |
| **Succeed.Net (2)** | Colusa | 2 |
| **Schat Communications (2)** | Inyo | 2 |
| **Shasta Beam (2)** | Shasta | 1 |
| | Tehama | 1 |
| **Cal.net (2)** | Calaveras | 2 |
| **Hospitality WiFi** | Inyo | 1 |
| **SV.Net** | Modoc | 1 |
| **SONIC** | Napa | 1 |
| **Unwired Broadband** | Mariposa | 1 |
| **T-Mobile** | Calaveras | 1 |
| **Stream IT** | Glenn | 1 |
| **ViaSat** | Sierra | 1 |
| **Caltel Connections** | Calaveras | 1 |
| **Volcano Telephone Company** | Amador | 1 |

| | | |
|---|---|---|
| **ColusaNET** | Colusa | 1 |
| **Zito Media** | Plumas | 1 |
| **Silver Rapid** | Calaveras | 1 |
| **Smarter Broadband** | Sierra | 1 |
| **Other Responses** | | |
| **2 Providers (10)** | Butte | 2 |
| | Inyo | 2 |
| | Lassen | 2 |
| | Modoc | 2 |
| | Plumas | 1 |
| | Shasta | 1 |
| **3+ providers (3)** | Butte | 1 |
| | Lassen | 2 |
| **None or N/A (2)** | Inyo | 1 |
| | Mariposa | 1 |
| **Unknown** | Plumas | 1 |

Participants were asked to indicate satisfaction with their provider's level of service and customer support on a scale from one to five, with one corresponding to the lowest satisfaction and five to the highest. Figure 43 below summarizes these responses, though the graph excludes ISPs with less than three answers to this question.

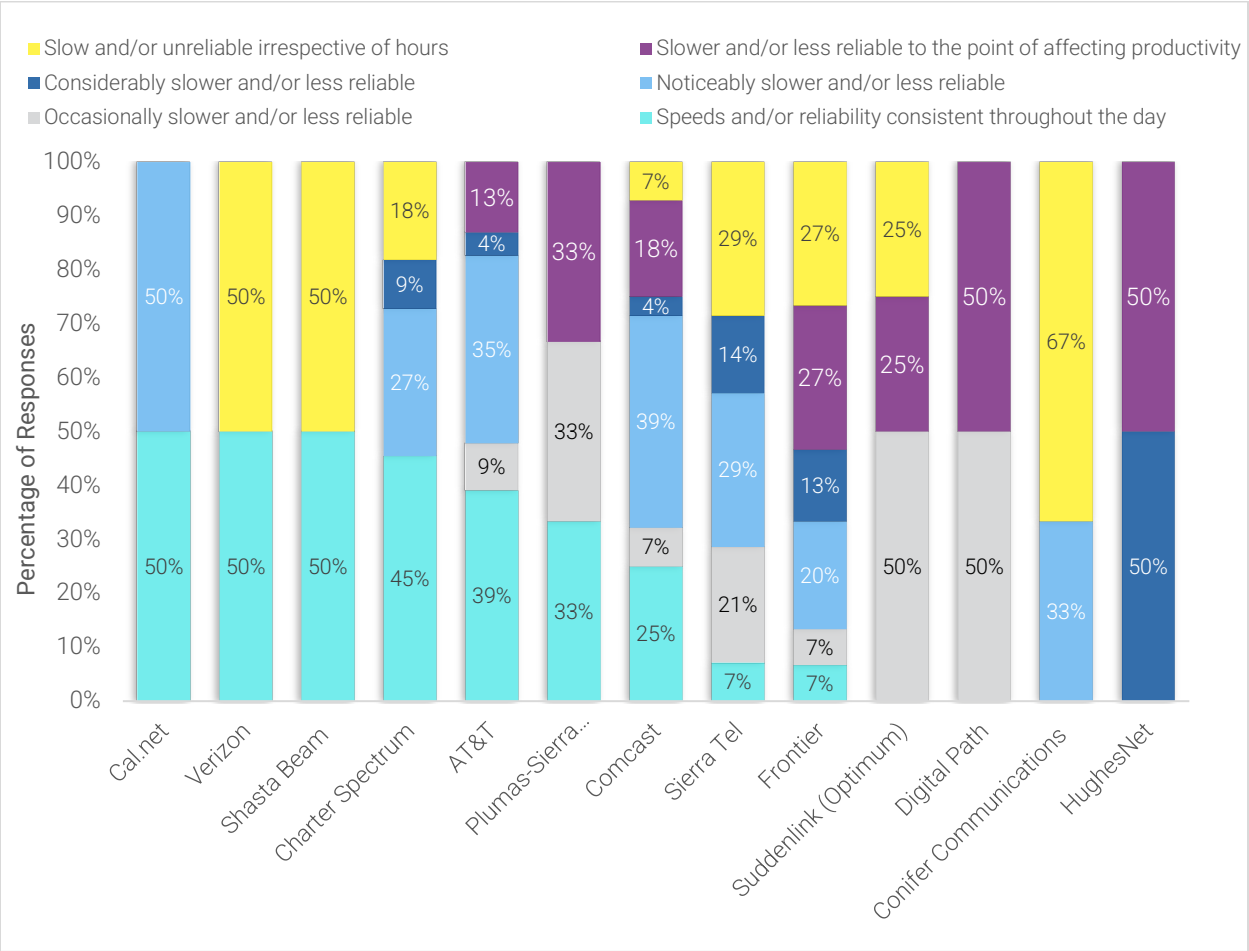
**Figure 43: Satisfaction with Level of Service and Customer Support, by Provider**



Providers on the left-hand side have a higher ratio of responses indicating lower satisfaction with their level of service and customer support. The responses collected may disproportionately represent the opinions of less satisfied customers, who may have felt more compelled to participate in the survey, given the opportunity to voice their concerns.

The bias created by unhappy customers' tendency to complete surveys should also be applied to Figure 44 below, which summarizes participants' experience during peak hours by the provider their business purchases service from. Figure 44 excludes providers who received only one response to this question.

**Figure 44: Summary of Responses to the Question "During peak hours, how would you rate your network congestion and reliability?" by Provider**



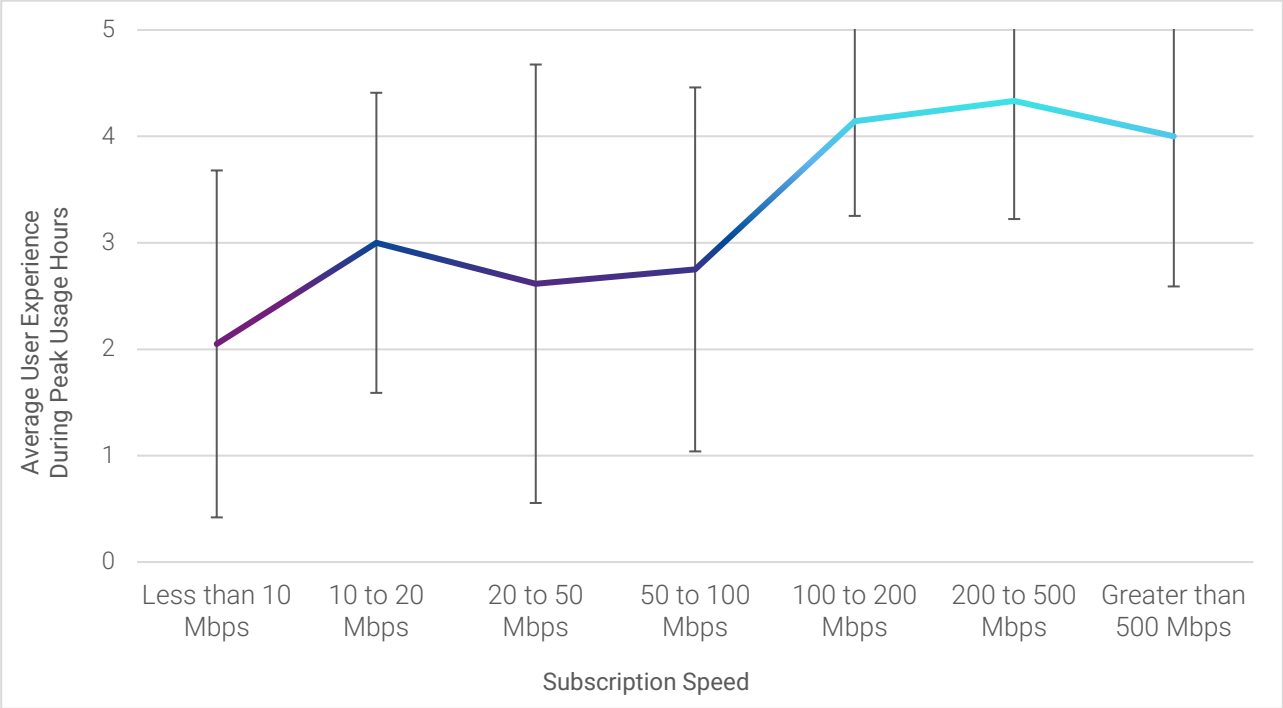

In contrast to Figure 44, providers shown on the left-hand side demonstrate higher ratios of participants who felt their service was consistent throughout the day. However, it should be noted that network performance and reliability vary significantly among participants served by the same provider. Verizon and Shasta Beam are stark examples of this, with 50 percent of subscribers reporting consistent reliability and speeds throughout the day, while the remaining 50 percent experience slow, unreliable service irrespective of the time of day.

This phenomenon is likely due in part to the different subscription speeds that participants purchase from the same provider. Experience during peak hours is poorer on average for those subscribing to lower-tier service offerings. No one subscriber is guaranteed to receive the maximum speeds advertised for the internet service they purchase. As a network becomes more congested, end-user's experienced data transfer rate, referred to as throughput, decreases. This can leave subscribers to

lower-tier offerings more vulnerable to more severe service degradation during peak usage hours when compared to their counterparts who purchase more bandwidth.

Figure 45 below summarizes the relationship between the participant's subscription speed and average experience during peak usage hours.[324]

**Figure 45: Numeric-coded Average of Responses to the Question "During peak hours, how would you rate your network congestion and reliability?" by Subscription Speed**

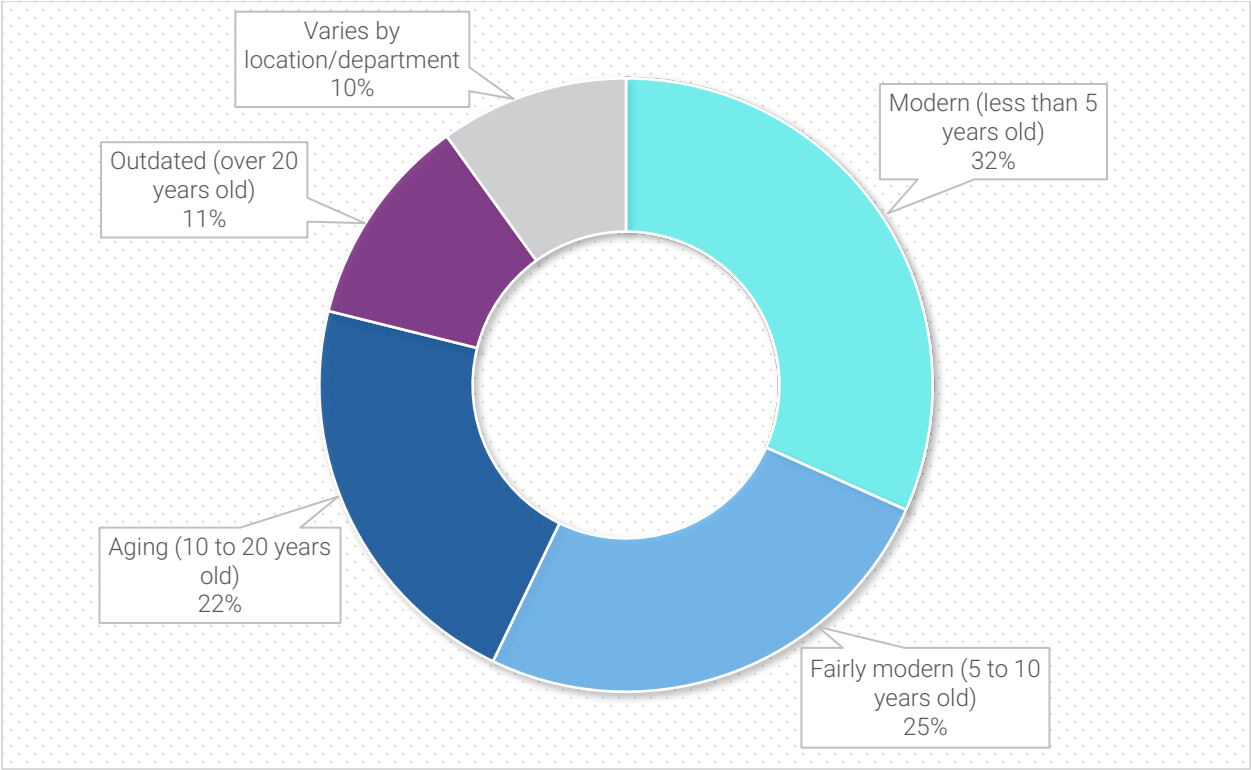



As demonstrated by the relationship shown above, respondents who subscribe to lower-tier service offerings have a poorer average experience during peak usage hours than those who subscribe to higher service tiers. While a portion of this trend is likely due to the relationship between bandwidth purchased and experienced throughput during periods of network congestion, the technology delivering service may contribute. Fixed wireless and DSL networks often face greater service degradation during peak usage hours and offer less bandwidth to end-users. Such technologies require subscribers within a geographic area to share these networks' limited resources, which are inherently less than in hybrid fiber-coax or entirely fiber networks.

Lastly, participants were asked to estimate the age of their business location's internal network equipment and in-building wiring, which can impact end-user speeds irrespective of external network performance. Figure 46 below provides a summary of these responses.

[324] The average of respondents' experience using their internet subscription during peak usage hours was calculated by coding the original qualitative responses to the question as follows: 0: Slow and/or unreliable irrespective of hours; 1: Slower and/or less reliable to the point of affecting productivity; 2: Considerably slower and/or less reliable; 3: Noticeably slower and/or less reliable; 4: Occasionally slower and/or less reliable; 5: Speeds and/or reliability consistent throughout the day.

**Figure 46: Summary of Responses to the Question "What best describes your current building infrastructure (age and quality of wiring and network equipment)?"**




A significant portion of responses indicate their business's in-building wiring and network equipment is less than 10 years old (57 percent). Those with aging or outdated wiring and equipment account for approximately one-third of responses (33 percent). This data suggests that some businesses may not be able to take full advantage of internet services available to them, as aging network equipment and in-building wiring may be unable to support these higher speeds.

## Appendix B: Overview of Previous Funding and Possible Funded Areas

Below is a summary of federal funding programs that have funded projects in the past, some of which may still be in the deployment stage. The FCC maintains a map of areas funded by federal programs that can be found here:[325]

https://fundingmap.fcc.gov/home

**FCC Model-based support – Non-competitive subsidy funding provided to regulated carriers to serve "High-Cost" locations:**

**Connect America Fund Phase II Model-Based Support (CAF II)** utilized a predetermined cost-based model to allocate monthly payments to "price cap carriers" tasked with expanding broadband service to specific fixed locations in eligible areas. The targeted service speed was set at a minimum of 10 megabits per second downstream and one megabit per second upstream (10/1 Mbps). The initial CAF Phase II Model support term spanned from 2015 to 2020. Subsequently, all participating carriers opted for an optional seventh year of support in 2021. These carriers were required to finalize their deployment and adhere to interim deployment milestones by the end of 2021.[326]

**Alternative Connect America Cost Model (ACAM)** allocated predetermined monthly payments based on a cost model to "rate of return" carriers. These payments aimed to facilitate broadband expansion to specific fixed locations in eligible areas. The revised ACAM enhanced model-based support for existing ACAM carriers will require deployment of 100/20 Mbps service. The original ACAM support term, available to carriers that opted for the original ACAM program (excluding Revised ACAM), spanned from 2017 to 2026. ACAM carriers were required to complete their deployment by the end of 2026 while adhering to interim deployment milestones. In contrast, the Revised ACAM support term extends from 2019 to 2028, with Revised ACAM carriers having until the end of 2028 to complete their deployment while meeting interim milestones. The CAF Map encompassed locations funded by both the original ACAM program and Revised ACAM.[327]

**Alternative Connect America Cost Model (ACAM II)** or Revised ACAM, entailed predetermined monthly payments based on a cost model for "rate of return" carriers who voluntarily opted to transition from CAF BLS funding to model-based support. The ACAM II support term ranged from 2017 to 2028, granting ACAM II carriers until the end of 2028 to finalize their deployment and adhere to interim deployment milestones.[328]

**Connect America Fund Broadband Loop Support (CAF BLS)** provided support based on carrier costs and financial data to "rate of return" carriers. This support aimed to expand broadband access to specific fixed locations in eligible areas. The CAF BLS deployment term spanned from 2019 to 2023, with carriers required to complete deployment by the conclusion of 2023. It's important to note that not all existing CAF BLS locations are represented on the map, as CAF BLS carriers do not report locations deployed before May 25, 2016.[329]

[325] https://fundingmap.fcc.gov/home

[326] https://www.usac.org/high-cost/funds/cafphaseii/#:~:text=Connect%20America%20Fund%20(CAF)%20Phase,Mbps)%20to%20a%20specific%20number

[327] https://www.usac.org/high-cost/funds/acam/

[328] https://www.usac.org/high-cost/funds/revised-acam/

[329] https://www.usac.org/high-cost/funds/caf-broadband-loop-support/

**Rural Broadband Experiments (RBE)** offered predetermined monthly payments to telecommunications carriers that successfully secured bids to deploy broadband in unserved "price cap" areas, particularly those in rural regions with the highest deployment costs. The RBE support term covered the period from 2015 to 2025, with RBE carriers obligated to meet interim and final deployment milestones on an ongoing basis.[330]

**Competitive Grant Programs:**

**FCC:**

**Connect America Fund Phase II Auction (CAF II Auc.)** provided monthly payments to entities that won bids in a competitive reverse auction held in 2018. The goal was to extend broadband coverage to areas where the incumbent price cap carrier had declined CAF II Model based funding, as well as other price cap areas with high deployment costs. Payments under the CAF II Auction began in 2019, with support terms extending over 10 years. CAF II Auction carriers had until the conclusion of 2025 to complete their deployment while meeting interim deployment milestones.[331]

**Rural Digital Opportunity Fund (RDOF)** provided set monthly payments to entities that successfully secured bids in a 2020 competitive reverse auction. These funds were allocated to expand broadband coverage in specific areas lacking service at speeds of at least 25 megabits per second downstream and 3 megabits per second upstream (25/3 Mbps). RDOF payments commenced in 2021 on a rolling basis, and support terms extended over 10 years. RDOF recipients were granted up to eight years to complete their deployment while adhering to interim deployment milestones.[332]

**NTIA:**

**Broadband Infrastructure Program (BIP)** is a $288 million broadband deployment program directed to partnerships between a state, or one or more political subdivisions of a state, and providers of fixed broadband service to support broadband infrastructure deployment to areas lacking broadband, especially rural areas. Funded service must be at least 100/20 Mbps.[333]

**Tribal Broadband Connectivity Program (TBCP)** is a $3 billion program directed to tribal governments to be used for broadband deployment on tribal lands, as well as for telehealth, distance learning, broadband affordability, and digital inclusion. Funded service must be at least 100/20 Mbps.[334]

**USDA:**

**Community Connect Grant Program** provides grants to eligible applicants that will provide, on a "community -oriented connectivity" basis, broadband service that fosters economic growth and delivers enhanced educational, health care, and public safety benefits. Eligible service areas must be contiguous and funded service must be at least 100/20 Mbps.[335]

[330] https://www.fcc.gov/general/rural-broadband-experiments
[331] https://www.fcc.gov/auction/903
[332] https://www.fcc.gov/auction/904
[333] https://broadbandusa.ntia.doc.gov/broadband-infrastructure-program
[334] https://broadbandusa.ntia.doc.gov/funding-programs/tribal-broadband-connectivity
[335] https://www.rd.usda.gov/community-connect

**Rural Econnectivity Program (ReConnect)** offers loans, grants, and loan-grant combinations to facilitate broadband deployment in areas of rural America that currently do not have sufficient access to broadband. Proposed funded service areas can be non-contiguous and funded service must be at least 100/20 Mbps.[336]

**US Department of Treasury:**

**Capital Projects Fund (CPF)** was enabled by ARPA and is currently being distributed through the FFA program by the CPUC. With upcoming announcements of FFA program winning applications, CPF awarded areas will start to appear on the FCC's Funding Summary map. Funded service must be at least 100/20 Mbps and scalable to 100/100 Mbps.[337]

[336] https://www.usda.gov/reconnect

[337] https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/capital-projects-fund

## Appendix C: Further Detail on Materials for California Last-mile Network Funding Opportunities

All applications require a list of information about the applicant, including details about how the organization is structured and who the organization's key leaders are. Applicants must also submit information about the financial health of the organization, including audited financial statements from recent years and, in some cases, companywide financial projections in addition to modeling the project's performance.[338]

The programs require that the applicants explain the proposed network using a combination of Geographic Information Systems (GIS) information about the project's location, network diagrams, and written explanations that describe its technical attributes. The required engineering information is relatively similar, but the specific mapping information may differ across each program. For example, the Federal Funding Account requires that applicants identify their proposed deployment areas within the program's application platform, which then generates information about current service availability and location eligibility characteristics, additional demographic information, and other location-based factors. In the case of the BEAD program, it is unclear whether applicants will be required to generate this information themselves.

Project designers must also create a number of documents that identify the project's costs and when they will occur. Detailed project budgets must identify the inventory of equipment and materials used in the network design, all labor necessary to construct the network, and permitting costs, along with any eligible ancillary costs related to the project. Applicants must also explain when each of these costs will occur by providing a deployment plan timeline and a related capital investment schedule.

Applicants must explain how they will cover both the project's required matching contribution and on-going costs before they can be reimbursed by the grant program. In addition to explaining the project's funding sources, applicants must also provide the projected business plan for the project area. This plan includes the menu of service options and their prices to consumers and businesses, expected adoption rates, and an analysis of the project area's on-going operational and maintenance costs and is used to understand the network's financial sustainability and profitability.

[338] FFA Guidelines, p. A-20.

## Appendix D: California's Three Primary Last-Mile Funding Programs: Considerations for Prospective Applicants

### ■ Who Can Apply?

California's three primary last-mile programs have all integrated a number of grant program best practices that states, and federal agencies have developed over the past decade.[339] Each of the three programs will accept applications from a wide range of organization types, including facilities-based broadband providers, non-profits, cooperatives, and all local governmental agencies, such as county or local governments, special utility districts and joint powers authorities, and tribal governments.[340] This flexibility not only facilitates construction to historically unserved areas using a wider range of funding sources and deployment approaches, but it also encourages local governmental agencies to coordinate with ISPs or participate themselves. Additionally, the Federal Funding Account program rewards additional scoring to projects proposed by, owned, operated by, or affiliated with local governments, non-profits, or cooperatives.[341]

### ■ What Technologies can be Deployed?

To "ensure that the network built by the project can easily scale speeds over time to meet the evolving connectivity needs of households and businesses," the BEAD program goes a step further and explicitly requires that all projects in areas that do not meet the state's "Extremely High Cost Per Location Threshold" must provide "service via end-to-end fiber-optic facilities to each end-user premises." [342]

### ■ Digital Inclusion Considerations

Digital inclusion considerations have also been incorporated into these grant programs as well. All three require that funding recipients commit to provide at least some services at prices at or below what they propose in their applications for five or more years.[343] The FFA requires that ISPs participate in the Affordable Connectivity Program and awards additional points to ISPs that will extend their pricing commitment from the required five years to a period of ten years, will offer services eligible for California and federal Lifeline subsidies, and/or will offer a low-cost plan offering 50/20 Mbps service for $40 per month.[344] The programs also have adopted rules that favor low-income areas, so project planners should look closely at the income characteristics of proposed service areas to identify which locations should be prioritized for inclusion.[345]

---

[339] See, e.g., Ryland Sherman et al, *Putting State Broadband Funds to Work: Best Practices in State Rural Broadband Grant Programs*, Benton Institute for Broadband & Society, June 2021, https://www.benton.org/sites/default/files/state-funds-final.pdf.

[340] Cal. Gov. Code § 54951 (2023), identifying the categories of governmental organizations considered to be local agencies; CASF BIA Guidelines, p. A-8, providing an example list of relevant local California agency types, and A-10; FFA Guidelines, pp. A-8 to A-9; BEAD NOFO, p. 37. The CASF BIA identifies that the CPUC uses the NTIA's definition of a facilities-based broadband service provider, "which is generally defined as any entity providing internet access service or middle mile transport, over its own fixed or wireless facilities to residence, businesses, or other institution." CASF BIA Guidelines, p. A-10. The CASF BIA will also accept applications from Wireless carriers registered with the CPUC (i.e., hold a Wireless Identification Registration (WIR). CASF BIA Guidelines, p. A-10. The NTIA's BEAD program has the broadest criteria, requiring that California accept applications from private companies more generally and not use scoring criteria that would unreasonably favor one organizational type over the other. BEAD NOFO, p. 37; BEAD Initial Proposal Guidance, p. 39.

[341] FFA Guidelines, p. A-6.

[342] BEAD NOFO, p. 14.

[343] CASF BIA Guidelines, p. A-14; FFA Guidelines, pp. A-11, A-18; BEAD NOFO, pp. 66-67, requiring that low-cost broadband service options be available for "the useful life of the network assets."

[344] FFA Guidelines, pp. A-6 to A-7, A-12.

[345] See, e.g., CASF BIA Guidelines, pp. A-5 to A-7; FFA Guidelines, pp. A-6 to A-7; BEAD NOFO, p. 41.

### Eligible Costs

CASF BIA and FFA cover a fairly similar range of eligible project costs. They both cover costs directly related to the deployment of infrastructure and upgrades to critical existing infrastructure. They also cover "costs to lease access to property or for internet backhaul services for a period not to exceed five years."[346]

The BEAD program's range of eligible costs are likely to be more expansive. NTIA's guidance identified that in addition to construction, improvement, and acquisition costs necessary to serve the proposed locations, the program can fund long-term leases like fiber indefeasible right-of-use agreements, without the five-year limitation featured in the other programs. The BEAD program can also fund installation of internet wiring or Wi-Fi infrastructure within apartment buildings and other eligible multi-family residences.[347] The program is likely to also include costs related to design, permitting, and other work necessary for environmental, historical, and cultural reviews, cybersecurity training and implementation, subject matter expertise and consulting, and other labor costs necessary to manage the project.[348]

### Reimbursement-Based Structure Considerations

These grant programs offer funding on a reimbursement basis. Projects offered these grants must organize all recent eligible project expenditures and submit them to the grant's administrating agency, the CPUC.[1] These submissions will be evaluated, and once approved, the CPUC will reimburse the awardee for the eligible costs. This submission process then requires that grant awardees have access to enough cash on hand to cover project costs until it can submit and receive its reimbursement.

Each of the programs has its own reimbursement rules. The FFA allows reimbursement requests to be submitted only at specific intervals, after 10%, 35%, 60%, 85%, and 100% of the project's total projected budget has been expended.[349] These fixed intervals create a large demand for cash on hand. For example, a project with the maximum standard FFA grant allocation of $25 million would expend $6.25 million between the 10% to 35% and the 35% to 60% reimbursement periods. While such a project organizes its funding request, submits it, and waits for its reimbursement, the project will continue to cover on-going costs, which can raise its short-term capital demands to $7.5 million or more. Projects may need to seek financing to cover these short-term costs.

[346] CASF BIA Guidelines, p. A-15.
[347] BEAD NOFO, p. 39.
[348] BEAD NOFO, p. 39.
[349] FFA Guidelines, p. A-27.

## Appendix E: Summary of Federal Funding Opportunities

Below is a comprehensive list of the various grant funding opportunities created by the three recent pandemic-related infrastructure bills (ARPA/IIJA/Consolidated Appropriations Act Federal Broadband Programs Survey[350]), which represent the overwhelming majority of broadband infrastructure funding available currently.

**Table 29: Broadband Equity, Access And Deployment Program ("BEAD") (IIJA)**

| | |
|---|---|
| Program name | Broadband Equity, Access and Deployment Program (BEAD) |
| Legislation creating or expanding the program | Infrastructure Investment and Jobs Act (IIJA) |
| At a high level, what does the program fund? | Eligible uses include: deploying infrastructure to un/underserved areas; providing affordable devices; mapping and planning; installing/providing wifi for multifamily residential buildings; and other projects determined by NTIA. Deployment must: first prioritize areas where 80% residents lack 25/3, then areas where 80% lack 100/20; offer 100/20 speeds; provide a low-cost option; and not exclude municipal and cooperative providers. Subgrants should use 25% matching funds, but in-kind or CARES/ARPA funds are acceptable. |
| Which organization determines which projects get funded? | Block grants to states (or administering agency selected by governor), territories, and tribes. Funds may be subgranted. |
| How much money is available in the program? | $42,450,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Formula allocation |
| What kinds of organizations are eligible and/or preferred for funding? | Block grants to states (or administering agency selected by governor), territories, and tribes. Funds may be subgranted. |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | Notice of Funding Opportunity (NOFO) likely by end of May 2022. Funding likely available in 2023 and after FCC releases new maps. |

[350]https://muninetworks.org/sites/www.muninetworks.org/files/Federal%20Broadband%20Funding%20Guide%20%28Common%20Sense%20Media%29.pdf

| | |
|---|---|
| Will the funding be available in a single tranche or multiple tranches, and when? | Multiple tranches. After NOFO is released, states can submit letters of intent to participate in BEAD and receive $5 million for planning if they request it. If submitting request for planning funds, state must submit a 5-year action plan. Once FCC DATA Maps are published identifying unserved vs. served areas, NTIA will calculate state's allocation. State then will submit an **Initial Proposal** to receive the first 20% of its allocation. State must then launch challenge process to provide ISPs and others opportunity to identify whether unserved/underserved areas have been misidentified. To receive remainder of allocation, States must subsequently submit a **Final Proposal,** which must include a proposal for a Low-Cost Broadband Service option. Timeframes for all steps likely to be included in NOFO to be released in May 2022. |
| Are there any key performance metrics known? | Deployment must: first prioritize areas where 80% residents lack 25/3, then areas where 80% lack 100/20; offer 100/20 speeds. |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | No. |

**Table 30: State Digital Equity Capacity Grant Program (IIJA)**

| | |
|---|---|
| Program name | State Digital Equity Capacity Grant Program |
| Legislation creating or expanding the program | IIJA |
| At a high level, what does the program fund? | This program consists of two subprograms: one $60 million program to support the development of state digital equity plans, and a second $1.4 billion program to fund the implementation of those plans. To be eligible for the second program, a state must have its digital equity plan be approved by the NTIA. These plans must include: measurable objectives for promoting internet adoption in vulnerable populations; assessments of plan's impact on state goals for the economy, workforce, education, health, and civil society; and identification of and collaboration with stakeholders. |

| | |
|---|---|
| Which organization determines which projects get funded? | States or administering agencies selected by governor, territories, and tribes. Funds may be subgranted. |
| How much money is available in the program? | $1,500,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Formula Allocation |
| What kinds of organizations are eligible and/or preferred for funding? | The State, a political subdivision, agency, State instrumentality, Indian Tribe located in State, a non-profit entity providing services in the State (which is not a school), a community anchor institution, a state agency, among others. |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | $60m for planning available in FY2022. $1.4 b available between FY 2022-2026. States have 5 years to spend awards. |
| Will the funding be available in a single tranche or multiple tranches, and when? | Planning Grant Applications and State Capacity Grant Applications to be accepted not later than 60 days after notice of funding availability is released. (HR 3684—788, 789) |
| Are there any key performance metrics known? | No |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | No |

**Table 31: Digital Equity Competitive Grant Program (IIJA)**

| | |
|---|---|
| Program name | Digital Equity Competitive Grant Program |
| Legislation creating or expanding the program | IIJA |
| At a high level, what does the program fund? | Eligible uses include: digital inclusion activities; digital navigators; workforce training programs; low-cost devices; and deployment of public broadband. NTIA will prioritize projects that: expand access and adoption among vulnerable populations; represent geographically diverse regions; and do not duplicate other programs. |

| | |
|---|---|
| Which organization determines which projects get funded? | NTIA/Dept. of Commerce |
| How much money is available in the program? | $1,250,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Competitive Grant |
| What kinds of organizations are eligible and/or preferred for funding? | Public entities, private companies, nonprofits, cooperatives, Indian Tribes, Alaska Native Entities. State entities that receive State Digital Equity Capacity grants are ineligible. |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | Post May NTIA NOFA, Assistant Secretary of Commerce begins awarding State Capacity Grants (see above). Within 30 days of this, the Asst. Secretary shall establish the Digital Equity Competitive Grant Program (HR 3684—1039-1040) (IIJA § 60305) |
| Will the funding be available in a single tranche or multiple tranches, and when? | $250m available per year FY 2022-2026. Awardees will submit annual evaluation reports. Grants must be spent within four years. |
| Are there any key performance metrics known? | No |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | No |

**Table 32: Middle Mile Grants Program (IIJA)**

| | |
|---|---|
| Program name | Middle Mile Grants Program |
| Legislation creating or expanding the program | IIJA |
| At a high level, what does the program fund? | Funds middle mile projects that reduce the cost of connecting un/underserved areas and/or promote resiliency by creating redundant network connections. Priority is given to projects that: adopt fiscally sustainable strategies; offer non-discriminatory interconnection to last-mile providers; collaborate with partners that will provide financially sustainable last-mile service; utilize other |

| | |
|---|---|
| | forms of support (e.g., waived permitting fees); and benefit national security and the DoD. |
| Which organization determines which projects get funded? | NTIA/ Dept. of Commerce |
| How much money is available in the program? | $1,000,000,000 (Amount of middle mile grant to eligible entity may not exceed 70% of total project cost) |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Competitive grant |
| What kinds of organizations are eligible and/or preferred for funding? | States, political subdivisions of states, Tribal gov'ts, technology companies, electric utilities, cooperatives, telecommunications companies, nonprofits, Native entities (tribes, Alaskan Native Corporations), EDA's |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | NOFO likely by end of May 2022. Funds available until Sep. 30, 2026 |
| Will the funding be available in a single tranche or multiple tranches, and when? | Unknown |
| Are there any key performance metrics known? | If eligible entity is proposing to use middle mile grant for build infrastructure to connect community anchor institutions via fiber optic technology, minimum speeds delivered must be not less than 1 gigabit per second for downloads; and 1 gigabit per second for uploads to an anchor institution. (HR 3684—808-809) |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | No—the statute allows for terrestrial or fixed wireless middle mile infrastructure as well as fiber optic. |

*The California Department of Technology was awarded $73 million from this program in 2023.

**Table 33: Affordable Connectivity Program (IIJA)**

| | |
|---|---|
| Program name | Affordable Connectivity Program (*Formerly Emergency Broadband Benefit Program--extended and modified by IIJA) |
| Legislation creating or expanding the program | IIJA (*Continued and Modified from the Consolidated Appropriations Act of 2021) |
| At a high level, what does the program fund? | Makes the Emergency Broadband Benefit permanent and renames it to the "Affordable Connectivity Program." Decreases the benefit amount from $50/mo to $30/mo and changes some eligibility criteria. Participating ISPs must: promote the benefit; allow the benefit to be applied to any service offering; notify subscribers of the transition; and implement new consumer protections.<br><br>The benefit provides a discount of up to $30 per month toward internet service for eligible households and up to $75 per month for households on qualifying Tribal lands. Eligible households can also receive a one-time discount of up to $100 to purchase a laptop, desktop computer, or tablet from participating providers if they contribute more than $10 and less than $50 toward the purchase price.<br><br>The Affordable Connectivity Program is limited to one monthly service discount and one device discount per household. |
| Which organization determines which projects get funded? | FCC |
| How much money is available in the program? | $14,200,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | N/A, Consumer subsidy |

| | |
|---|---|
| What kinds of organizations are eligible and/or preferred for funding? | A household is eligible for the Affordable Connectivity Program if the household income is at or below 200% of the Federal Poverty Guidelines, or if a member of the household meets at least *one* of the criteria below:<br><br>Participates in certain assistance programs, such as SNAP, Medicaid, Federal Public Housing Assistance, SSI, WIC, or Lifeline;<br><br>Participates in Tribal specific programs, such as Bureau of Indian Affairs General Assistance, Tribal TANF, or Food Distribution Program on Indian Reservations;<br><br>Participates in the National School Lunch Program or the School Breakfast Program, including through the USDA Community Eligibility Provision;<br><br>Received a Federal Pell Grant during the current award year; or<br><br>Meets the eligibility criteria for a participating provider's existing low-income internet program.<br><br>(Source: https://www.fcc.gov/acp) |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | Currently enrolling |
| Will the funding be available in a single tranche or multiple tranches, and when? | N/A (Monthly payment benefit) |
| Are there any key performance metrics known? | N/A |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | N/A |

**Table 34: Coronavirus Capital Projects Fund (ARPA)**

| | |
|---|---|
| Program name | Coronavirus Capital Projects Fund |
| Legislation creating or expanding the program | American Rescue Plan Act (ARPA) |
| At a high level, what does the program fund? | Block grants to states; each state will get at least $100 million. Eligible uses include: deploying infrastructure to areas that lack reliable wireline speeds of 100/20 and/or where service is unaffordable for a majority of residents; fostering adoption with low/no cost devices, free wi-fi, digital literacy training, and tech support; and building or improving community anchor institutions to enable public internet access. Deployment projects should: offer a low-cost option; accept ACP/Lifeline; deliver 100/100 where possible; and prioritize last mile connections. Treasury encourages use of public, nonprofit, and cooperative networks. No matching requirements. |
| Which organization determines which projects get funded? | Block grants to states from Treasury (or an administering agency selected by governor), territories, and tribes. Funds may be subgranted. |
| How much money is available in the program? | $10,000,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Formula Allocation |
| What kinds of organizations are eligible and/or preferred for funding? | Capital Projects Fund Recipients may award funds to Subrecipients, such as other levels or units of government (e.g., municipalities or counties), non-profits, or private entities. For example, for Broadband Infrastructure Projects, Subrecipients may include co-operatives, electric utilities, and other entities that build or operate broadband networks, including networks that are owned, operated by or affiliated with local governments. (Per Guidance For the Coronavirus CPF, https://home.treasury.gov/system/files/136/Capital-Projects-Fund-Guidance-States-Territories-and-Freely-Associated-States.pdf) |

| | |
|---|---|
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | For eligible Recipients: Request funding from Sep. 24 – Dec. 27, 2021 (Tribes Oct. 1 – June 1, 2022). Submit grant plan by Sept. 24, 2022. Funds must be expended by Dec. 31, 2026. |
| Will the funding be available in a single tranche or multiple tranches, and when? | After Treasury approves an applicant's Grant Plan in whole or in part, Treasury will inform the Recipient of the schedule for payments to the Recipient for purposes of the approved portions of the plan. The amounts, timing, and conditions of such payments will be determined by Treasury in its sole discretion. |
| Are there any key performance metrics known? | The construction and deployment of broadband infrastructure projects ("Broadband Infrastructure Projects") are eligible for funding under the Capital Projects Fund program if the infrastructure is designed to deliver, upon project completion, service that reliably meets or exceeds symmetrical download and upload speeds of 100 Mbps. If it would be impracticable, because of geography, topography, or excessive cost, for a Broadband Infrastructure Project to be designed to deliver services at such a speed, the Project must be designed so that it reliably meets or exceeds 100 Mbps download speeds and between 20 Mbps and 100 Mbps upload speeds and be scalable to a minimum of 100 Mbps symmetrical for download and upload speeds. Treasury encourages Recipients to focus on projects that will achieve last-mile connections. (https://home.treasury.gov/system/files/136/Capital-Projects-Fund-Guidance-States-Territories-and-Freely-Associated-States.pdf) |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | Recipients are encouraged to prioritize investments in fiber-optic infrastructure where feasible, as such advanced technology better supports future needs. (https://home.treasury.gov/system/files/136/Cap |

| | |
|---|---|
| | ital-Projects-Fund-Guidance-States-Territories-and-Freely-Associated-States.pdf) |

**Table 35: Coronavirus State And Local Fiscal Recovery Fund (ARPA)**

| | |
|---|---|
| Program name | Coronavirus State and Local Fiscal Recovery Fund (SLFRF) |
| Legislation creating or expanding the program | ARPA |
| At a high level, what does the program fund? | Block grants to state/county/city governments for general COVID-19 relief from Treasury, but recipients may use funds on broadband infrastructure, digital literacy training, and other programs that promote access to the internet. Projects should: prioritize areas with an identified need for additional broadband infrastructure investment; prioritize last mile connections; deliver speeds of 100/100 and use fiber technology wherever feasible; offer low-cost service options; and encourage public, nonprofit, and cooperative service providers. RDOF and other grant areas are eligible for funding. |
| Which organization determines which projects get funded? | Block grants to states, territories, tribes, metropolitan cities, and counties. Funds may be subgranted. |
| How much money is available in the program? | $350,000,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Formula Allocation |
| What kinds of organizations are eligible and/or preferred for funding? | States, territories, tribes, metropolitan cities, and counties. Funds may be subgranted. |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | Treasury is accepting submissions. Eligible expenses should be incurred by Dec. 31, 2024. Projects should be completed by Dec. 31, 2026. |
| Will the funding be available in a single tranche or multiple tranches, and when? | Two Tranches: Local governments will receive funds in two tranches, with 50% provided beginning in May 2021 and the balance delivered approximately 12 months later. States that have experienced a net increase in the unemployment |

| | |
|---|---|
| | rate of more than 2 percentage points from February 2020 to the latest available data as of the date of certification will receive their full allocation of funds in a single payment; other states will receive funds in two equal tranches. Governments of U.S. territories will receive a single payment. Tribal governments will receive two payments, with the first payment available in May and the second payment, based on employment data, to be delivered in June 2021. (https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/state-and-local-fiscal-recovery-funds) |
| Are there any key performance metrics known? | Confirm that the project is designed to, upon completion, reliably meet or exceed<br>symmetrical 100 Mbps download and upload speeds. If the project is not designed to reliably meet or exceed symmetrical 100 Mbps<br>download and upload speeds, explain why not, and confirm that the project is designed to, upon completion, meet or exceed 100 Mbps download speed and between at least 20 Mbps and 100 Mbps upload speed, and be scalable to a minimum of 100 Mbps download speed and 100 Mbps upload speed. |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | Use of fiber technology wherever feasible; focus on last mile connections, either directly or by ensuring middle-mile projects support new/improved last-mile service. (SLFRF Final Rule, p. 297) |

**Table 36: Emergency Connectivity Fund (ARPA)**

| | |
|---|---|
| Program name | Emergency Connectivity Fund (ECF) |
| Legislation creating or expanding the program | ARPA |
| At a high level, what does the program fund? | Intended to support remote education. Eligible schools and libraries apply to be reimbursed for costs associated with providing devices, hotspots, and internet service (including service to student |

| | |
|---|---|
| | homes) between July 1, 2021 and June 30, 2022 (future funding rounds may expand this window). *Spending on infrastructure is allowed only where infrastructure not otherwise available. |
| Which organization determines which projects get funded? | FCC |
| How much money is available in the program? | $7,170,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Competitive grant |
| What kinds of organizations are eligible and/or preferred for funding? | Schools, libraries, consortia that qualify for E-Rate and/or the Libraries Services and Technology Act. |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | The first two application windows have closed. A third window may be announced for the remaining approximately $1 billion. |
| Will the funding be available in a single tranche or multiple tranches, and when? | Single tranche |
| Are there any key performance metrics known? | None |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | No |

**Table 37: Homeowner Assistance Fund (ARPA)**

| | |
|---|---|
| Program name | Homeowner Assistance Fund |
| Legislation creating or expanding the program | ARPA |
| At a high level, what does the program fund? | Intended to help mid and low-income homeowners who have experienced financial hardship after January 21, 2020. Each state receives a formula-determined allocation and may use it to help homeowners with eligible expenses. May be used to help homeowners pay for internet service. |
| Which organization determines which projects get funded? | States, territories, and Tribes |

| | |
|---|---|
| How much money is available in the program? | $9,900,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Formula Allocation |
| What kinds of organizations are eligible and/or preferred for funding? | Mid- and low-income homeowners who have experienced financial hardship after January 21, 2020 |
| Will the funding be available in a single tranche or multiple tranches, and when? | Unknown |
| Are there any key performance metrics known? | N/A |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | N/A |

**Table 38: Elementary & Secondary School Emergency Relief (ARPA)**

| | |
|---|---|
| Program name | Elementary & Secondary School Emergency Relief (ESSER III) |
| Legislation creating or expanding the program | ARPA |
| At a high level, what does the program fund? | Intended to help educational agencies and school districts operate safely and address the impact of the pandemic. Funding distributed to state educational agencies (SEAs) via formula, and SEAs provide subgrants to local educational agencies (LEAs). Funds may be used on hardware, software, and connectivity for students. |
| Which organization determines which projects get funded? | State educational agencies (SEAs) and then subgrants to local educational agencies (LEAs). |
| How much money is available in the program? | $122,700,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Title I Formula |
| What kinds of organizations are eligible and/or preferred for funding? | State educational agencies (SEAs) and then subgrants to local educational agencies (LEAs). |

| | |
|---|---|
| Will the funding be available in a single tranche or multiple tranches, and when? | Single tranche |
| Are there any key performance metrics known? | N/A |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | N/A |

**Table 39: Broadband Infrastructure Grant Program (CAA21)**

| | |
|---|---|
| Program name | Broadband Infrastructure Grant Program |
| Legislation creating or expanding the program | Consolidated Appropriations Act 2021 (CAA21) |
| At a high level, what does the program fund? | Grants for broadband infrastructure in predominantly rural areas with less than 25/3 and in which no entity is receiving federal or state funding to build infrastructure. |
| Which organization determines which projects get funded? | NTIA |
| How much money is available in the program? | $288,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Competitive Grant |
| What kinds of organizations are eligible and/or preferred for funding? | Partnerships between governments and fixed broadband providers, including public, nonprofit, and cooperative providers |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | Not currently accepting applications. Awards pending. |
| Will the funding be available in a single tranche or multiple tranches, and when? | Single tranche |
| Are there any key performance metrics known? | Minimum service not less than 25/3 Mbps; preference for projects providing at least 100/20 Mbps, but this 100/200 speed preference is lower priority than providing service to the greatest |

| | |
|---|---|
| | number of households in a rural area that are cost-effective. (Public Law 116-260, Dec. 27, 2020) |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | Technology neutral, but infrastructure must be fixed. |

**Table 40: ReConnect Grant Program**

| | |
|---|---|
| Program name | ReConnect Grant Program |
| Legislation creating or expanding the program | Consolidated Appropriations Acts of 2018 and 2020; Coronavirus Aid Relief, and Economic Security Act (CARES) extended funding. |
| At a high level, what does the program fund? | Eligible projects must serve areas that lack speeds of 100/20 and provide service of 100/100 to every location in its service area. Projects will be prioritized if they: target low-density and/or low-income rural areas that lack speeds of 25/3; offer low-cost service options; agree to strong labor standards; are submitted by a local or tribal government, nonprofit, or cooperative. ReConnect offers multiple types of awards, including 100% funded grants, 75% grants, loan/grant combinations, and loans. RDOF and other grant areas are eligible for funding. |
| Which organization determines which projects get funded? | USDA Rural Utilities Service |
| How much money is available in the program? | $2,000,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Competitive grant |
| What kinds of organizations are eligible and/or preferred for funding? | Private companies, cooperatives, nonprofits, state and local governments, tribes, territories |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | Applications were accepted until March 2022. |

| | |
|---|---|
| Will the funding be available in a single tranche or multiple tranches, and when? | Single tranche |
| Are there any key performance metrics known? | To be eligible for ReConnect Program funding, an applicant must serve an area without broadband service at speeds of 100 megabits per second (Mbps) (download) and 20 Mbps (upload) and commit to building facilities capable of providing broadband service at speeds of 100 Mbps (download and upload) to every location in its proposed service area. |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | Technology neutral but see speed requirements above. |

**Table 41: Good Jobs Challenge (ARPA)**

| | |
|---|---|
| Program name | Good Jobs Challenge |
| Legislation creating or expanding the program | ARPA |
| At a high level, what does the program fund? | Grants for projects that bring together employers and workforce trainers to develop and implement programs that train workers in the digital skills that lead to good-paying jobs. EDA prioritizes projects that reach historically underserved populations. |
| Which organization determines which projects get funded? | Economic Development Authority (EDA) |
| How much money is available in the program? | $500,000,000 |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Competitive Grant |
| What kinds of organizations are eligible and/or preferred for funding? | State, local, and tribal governments, nonprofits, and educational institutions. |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | Applications were accepted until February 2022. |

| | |
|---|---|
| Will the funding be available in a single tranche or multiple tranches, and when? | Unknown |
| Are there any key performance metrics known? | N/A |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | N/A |

**Table 42: Lifeline (FCC/USAC)**

| | |
|---|---|
| Program name | Lifeline |
| Legislation creating or expanding the program | |
| At a high level, what does the program fund? | Monthly subsidy to help low-income consumers afford telephone and broadband bills. Provides $5.25/mo for telephone or $9.25 /mo for broadband (and up to $34.25 for those living on Tribal lands). Only one benefit allowed per household. Program funded by the Universal Service Fund (USF). |
| Which organization determines which projects get funded? | ISP's through FCC. Consumers apply by contacting their ISP. |
| How much money is available in the program? | N/A |
| Is it allocated competitively nationwide, or is there a formula allocation to states or municipalities? | Consumer Subsidy |
| What kinds of organizations are eligible and/or preferred for funding? | Consumers and Participating ISP's |
| What is the timeframe in which we expect funding to become available, to the extent known, and are there any application deadlines that are already known? | Ongoing |
| Will the funding be available in a single tranche or multiple tranches, and when? | N/A |
| Are there any key performance metrics known? | N/A |
| Are any technologies favored (like fiber) or disfavored (like fixed wireless or satellite)? | N/A |

## Glossary

**5G**: In telecommunications, 5G is the fifth-generation technology standard for broadband cellular networks, which cellular phone companies began deploying in 2019. Hardware based on the 5G standard can also be used for fixed wireless networks.

**Access:** Broadband access is the ability of individuals or organizations to connect to the high-speed broadband network using a computer or other digital device. Access requires available network service connectivity at a specific location with the required speed. Access requires that the potential subscriber has availability.

**Access Point (AP):** The term Access Point generally refers to a wireless access point mounted to a vertical asset such as a communications tower or rooftop and provides wireless service (mobile or fixed) to multiple end users.

**ACP (Affordability Connectivity Program):** The Affordable Connectivity Program (ACP) provides eligible households with a discount on broadband service and connected devices.

**ADSL (Asymmetrical Digital Subscriber Line):** A form of Internet service communications technology that uses existing telephone wires and delivers constantly accessible data transmissions over copper telephone lines. ADSL is a common brand of DSL and has download speeds between 2 and 6 Mbps and upload speeds reaching 512 Kbps.

**Availability:** Broadband availability is the presence of a high-speed broadband network within the potential subscriber's location. Availability does not require subscriber adoption.

**Artificial Intelligence (AI):** Artificial intelligence is the intelligence of machines or software, as opposed to the intelligence of humans or animals.

**Asymmetrical:** Upload and download speeds of retail internet access services often differ with the download speed being far greater than the upload speed. The term asymmetrical refers to this difference between these two speed measurements.

**Backbone**: A major high-speed transmission line that strategically links smaller high-speed Internet networks across the globe.

**Backhaul**: The portion of a broadband network in which the local access or end user point is linked to the main Internet network.

**Bandwidth**: The capability of telecommunications and Internet networks to transmit data and signals.

**Bit**: The smallest unit of digital information

- **Byte**: Equal to 8 bits
- **Bps**: Bits per second
- **Kbps**: Kilobits per second (1000 bits per second)
- **Mbps**: Megabits per second (1 million bits per second)
- **Gbps**: Gigabits per second (1 billion bits per second)
- **Tbps**: Terabits per second (1 trillion bits per second)

**Bond**: A fixed-income security in which a borrower borrows money from an investor for a specified period of time at a fixed or variable interest rate.

**Broadband**: The term broadband commonly refers to high-speed Internet access that is always on and faster than traditional dial-up access. Broadband includes several high-speed transmission technologies, such as fiber, wireless, satellite, digital

subscriber line, and cable. For the Federal Communications Commission (FCC), broadband capability requires consumers to have access to actual download speeds of at least 25 Mbps and actual upload speeds of at least 3 Mbps.

**Broadband Adoption**: The use of broadband in places where it is available, measured as the percentage of households that use broadband in such areas. Link to Digital Inclusion definition.

**Burstable:** Authorizes a connection to exceed its specified speed, normally up to a set maximum capacity for a period of time.

**Citizens Broadband Radio (CBRS):** CBRS is a 150 MHz broadcast band of the 3.5GHz band in the US. In January 2020, the FCC authorized full use of the CBRS and for wireless service providers. Under the new rules, wireless carriers using CBRS may deploy 5G mobile networks without having to acquire spectrum licenses.

**Central Office**: A telecommunication company's building where consumers' phone lines are attached to equipment that connects a consumer to other consumers in that central office or other central offices across the globe.

**Competitive Local Exchange Carrier (CLEC):** A CLEC (Competitive Local Exchange Carrier) is a local voice service carrier that establishes local network interconnection with ILECs (Incumbent Local Exchange Carriers) and/or other LECs to enable local exchange telecommunications services.

**Community Anchor Institutions**: Schools, libraries, medical and healthcare providers, public safety entities, institutes of higher education and other community support organizations that provide outreach, access, equipment and support services to facilitate greater use of broadband service by the entire population and local governments.

**Dark Fiber**: Fiber that is in place but not being used for broadband services. ("non-lit" fiber, also see "Lit Fiber").

**Digital Divide:** The gap between those of a populace that have access to the Internet and other communications technologies and those that have limited or no access.

**Digital Equity**: Recognizes that digital access and skills are now required for full participation in many aspects of society and the economy. Digital Equity links Digital Inclusion to social justice and highlights that a lack of access and/or skills can further isolate individuals and communities from a broad range of opportunities.

**Digital Inclusion**: Implies that individuals and communities have access to robust broadband connections; Internet enabled devices that meet their needs; and the skills to explore, create and collaborate in the digital world.

**Digital Literacy**: The ability to leverage current technologies, such as smartphones and laptops, and Internet access to perform research, create content, and interact with the world.

**Digital Skills**: Any skills related to operating digital devices or taking advantage of digital resources.

**Data Over Cable System Interface Specification (DOCSIS)**: The international telecommunications standard for cable signaling data and spectrum sharing.

**Digital Subscriber Line (DSL)**: A form of technology that utilizes a two-wire copper telephone line to allow users to simultaneously connect to and operate the Internet and the telephone network without disrupting either connection.

**Digital Subscriber Line Access Multiplexer (DSLAM):** A DSLAM is the piece of hardware used by internet service providers to provide DSL service to multiple end users. The farther an end user is from the DSLAM the weaker the signal strength will be at their location and the slower the internet access speeds will be.

**Fiber (Also referred to as Fiber Strand)**: A flexible hair-thin glass or plastic strand that is capable of transmitting large amounts of data at high transfer rates as pulses or waves of light.

**Fiber to the Home or Fiber to the Premise (FTTH or FTTP)**: The delivery and connection of fiber optics directly to a home or building.

**Fixed Wireless Broadband Access:** The use of wireless devices/systems in connecting two fixed locations, such as offices or homes. The connections occur through the air, rather than through fiber, resulting in a less expensive alternative to a fiber connection.

**Gigabit Passive Optical Network (GPON):** A gigabit passive optical network (GPON) is a fiber optic telecommunications technology for delivering broadband network access to end user customers. Its architecture is a point-to-multipoint design in which a dedicated optical fiber unit in the central office serves multiple endpoints at the customer premise.

**Grant**: A legal instrument reflecting a relationship between a government agency and a recipient. The main purpose of the relationship is to dispense money or resources in order to accomplish a public purpose. No substantial involvement is anticipated by the government agency during the recipient's completion of the activity.

**Internet Service Provider (ISP):** A company that provides users (individuals or businesses) with access (a connection) to the Internet and related services.

**Interconnection**: The linking of numerous telecommunications networks to exchange user traffic.

**Jitter:** The deviation of a periodic signal, or the variation in time delay between when a signal is transmitted and when it's received over a network connection.

**Last Mile**: The technology and process of connecting the end customer's home or business to the local network provider.

**Latency:** Refers to the delay that happens between when a user takes an action on a network or web application and when they get a response. Another latency definition is the total time, or "round trip" needed for a packet of data to travel.

**Lit Fiber:** An active fiber optic cable capable of transmitting data.

**Local Area Network (LAN)**: A group of network devices that are on a high-speed connection and typically within the same building or location.

**Long Haul Fiber:** Fiber cable that traverses great distances such as transcontinental and undersea cables.

**Long Term Evolution (LTE):** A 4G wireless broadband technology that provides speeds up to 100 Mbps download and 30 Mbps upload.

**Make-Ready**: The process of preparing a utility pole for a new cable (including fiber optic) attachment. Typically involves making a request to the pole owner and paying for any work required to ensure the new attachment meets all engineering and safety requirements.

**Microtrenching:** The process of digging a small trench, about one to two inches wide and as deep as two feet, often in existing road pavement, with a specialized machine for the purpose of installing conduits for fiber optic cables. Microtrenching is faster, cheaper, and less disruptive than traditional underground utility construction which involves saw-cutting the top layer of pavement, jack-hammering the material, and excavating down to the desired depth, often about thirty to thirty-six inches.

**Middle Mile:** The connection between a local network, also called a "last mile" connection, and the backbone Internet network.

**Network Infrastructure**: The hardware and software components of a network that provide network connectivity and allow the network to function.

**Open Access Network (OAN):** Networks that offer wholesale access to network infrastructure or services provided on fair and reasonable terms with some degree of transparency and nondiscrimination. Last mile open access networks have multiple retail ISPs in competition with one another using the same network.

**Overbuild:** Overbuild is a term used to describe building something on top of something else, which is some cases is deemed not necessary or overly elaborate and/or expensive.

**Point of Presence (POP)**: The particular place or facility where local Internet service providers connect to other networks. Distance from the Point of Presence can affect service availability and pricing.

**Point to Multipoint**: A common network architecture for outdoor wireless networks to connect multiple locations to one single central location.

**Rate of Return Telephone Company**: Rate of return regulation is a form of price setting regulation where governments determine the fair price which is allowed to be charged by a monopoly. It is meant to protect customers from being charged higher prices due to the monopoly's power while still allowing the monopoly to cover its costs and earn a fair return for its owners.

**Rights-of-Way (ROW)**: ROW are legal rights to pass through property owned by another. ROW are frequently used to secure access to land for digging trenches, deploying fiber, constructing towers and deploying equipment on existing towers and utility poles.

**Service Area**: The entire area within which a service provider either offers or intends to offer broadband service.

**Small Cell:** low-powered cellular radio access nodes that operate in licensed and unlicensed spectrum that have a range of 10 meters to a few kilometers. They are "small" compared to a mobile macrocell, partly because they have a shorter range and partly because they typically handle fewer concurrent calls or sessions. As wireless carriers seek to 'densify' existing wireless networks to provide for the data capacity demands of "5G"; small cells are currently viewed as a solution to allow re-using the same frequencies and as an important method of increasing cellular network capacity, quality and resilience with a growing focus using LTE Advanced.

**Subscriber Module (SM):** Refers to the customer premise equipment located at end users' premises to receive service from a fixed wireless network.

**Switch Port:** The physical opening where a cable (fiber or copper) connects to a piece of networking equipment such as a switch or a router. Switch ports are most commonly Ethernet ports. For copper cables this can be an RJ45 Ethernet port and for fiber cables this can be a SFP Ethernet port.

**Symmetrical**: Upload and download speeds of retail internet access services often differ with the download speed being far greater than the upload speed. More modern technology such as FTTP allows for both the download and upload speeds to be equal. The term symmetrical refers to when these two speed measurements are equal.

**Symmetrical DSL (SDSL)**: A technology that permits the transfer of data over copper telephone lines. The transmission bandwidth for uploads and downloads is equal.

**Telemedicine**: The use of high-speed, high-capacity Internet to support long-distance healthcare services, patient and provider education and enhanced healthcare administration.

**Tier 1 Internet Network**: A network of Internet providers that form a superhighway that allows users access to every other network on the Internet.

**Underserved:** Locations or areas that have internet service at speeds higher than those that are defined as unserved, but lower than the State of Federal definition of broadband. The current definition for broadband is wireline service of <25Mbps/3Mbps.

**Unserved:** Locations and areas that lack internet service at the State or Federal definition of broadband. The current definition for broadband is wireline service of <25Mbps/3Mbps.

**Voice over Internet Protocol (VoIP)**: A technology that allows users to send and receive voice calls using an Internet connection instead of a phone line.

**Wireless Fidelity (WiFi)**: A technology that uses radio transmissions to enable electronic devices to connect to a wireless local area network (LAN).

**Wireless Internet Service Provider (WISP)**: An ISP that provides service through a wireless network.

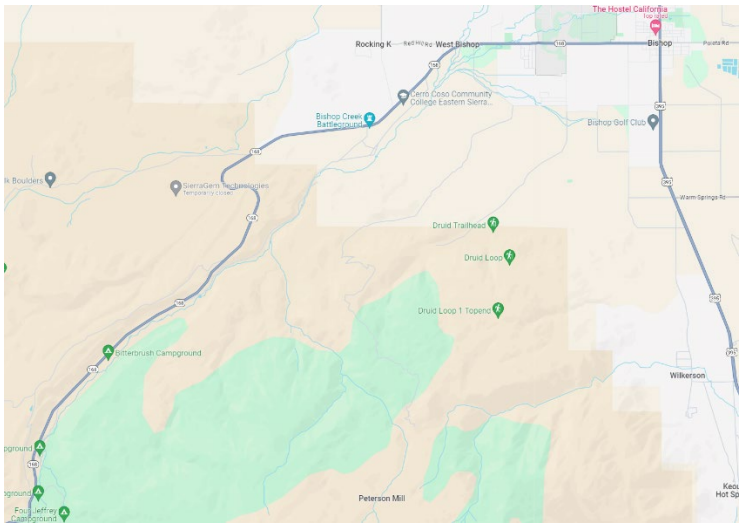
**County Feedback Response**

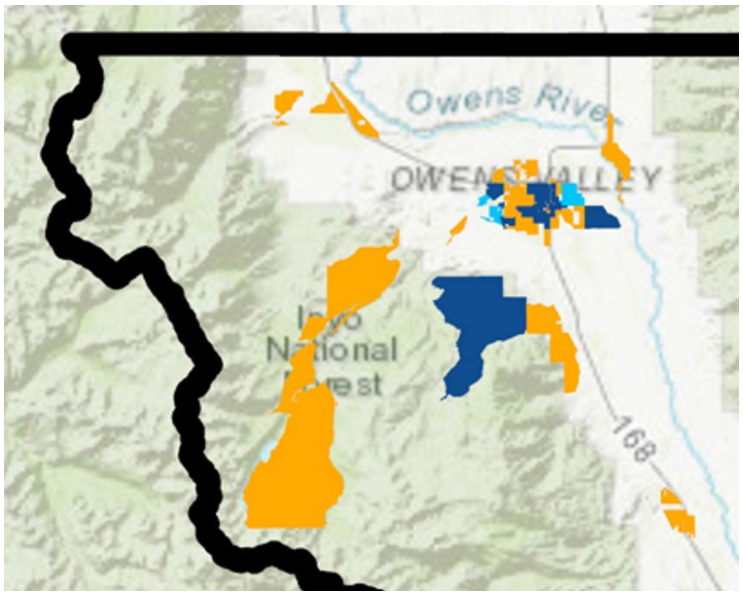
# Inyo County GSCA Study Feedback Responses

Thank you for your thoughtful feedback and questions about the Inyo County Broadband Planning and Feasibility Study. We highly value the time and effort that was put into reviewing the report and appreciate the opportunity to address your comments. We have provided answers to your questions below and have integrated actionable suggestions where appropriate.

Inyo County Questions and Answers:

1. The highway running through our County is US395. It is referred to as I-395 or Interstate 395 in a few locations, mostly toward the beginning and the end of the report.
    - The report has been updated to reflect this feedback.
2. Seven Pines is a campground (up the mountain from Independence on Onion Valley Road) - referenced in a few places. Independence is the town on US395 (County Seat).
    - The report has been updated to reflect this feedback.
3. Trona Wildross Road is mentioned a few times -- it should be Trona *Wildrose*. Connecting the Homewood Canyon area may require collaboration with Kern County to bring the network from the Ridgecrest area to the north. It may be worth mentioning that this area will need to be a coordinated effort between counties.
    - The report has been updated to reflect this feedback.
4. Lone Pine Communications primarily serves the Lone Pine area – they don't provide Internet service to Bishop. I spotted that on pages 10, 68, 192. I think one of the earlier mentions didn't indicate that LP Communications also offered fixed-wireless service.
    - Our apologies about the Bishop misstatement. They allegedly offer service to one census block there, but this way of stating their coverage was a mix-up.
    - LP Communication's unlicensed fixed wireless service was mentioned on page 102. However, we have generally downplayed this type of service, because it is not considered "served" under the BIA and BEAD programs.
5. The last sentence on page 10 seems to be missing a word or two.
    - We have reviewed the last paragraph on page 10 and do not see the error.
6. Peterson Mill is references a few times and is probably not the area that you intended. That place is up in the mountains. Did you intend to reference Wilkerson, the population center just south of Bishop not far from US395, or the Bishop Creek & Southlake area?
    - We were referring to a general area, and as the maps below show, Peterson Mill was the only location that was given a heightened naming priority as a point of reference. Our goal is to minimize confusion, so we removed this reference. There is enough context from the remaining discussion to understand the general area.




7. Death Valley Indian Village – without diminishing the tribal lands, we also have Park Village (NPS residential area) a couple miles to the north and Furnace Creek adjacent to Indian Village.

    - These suggested areas were added. We were focusing on BEAD-eligible areas, but the expansion summary could definitely include these other areas.

8. Frontier's Kern County FFA application includes only the town of Pearsonville in Inyo County, a very small portion of their grant application.

    - This point about the minimal impact has been incorporated in several areas, and the number of locations that could be connected via Frontier's FFA applications has been updated on p. 75. We have also removed the estimate of remaining funding, because it is unclear how Frontier may have loaded the costs between the two counties. Our original general estimate was sufficiently broad as to cover most circumstances, but surprisingly, this particular allocation range is even harder to predict.

9. There were a few references to the Frontier FFA application for Owens Valley. It may be better refer to that application as being for Alabama Hills and Lone Pine.

    - The report has been updated to reflect this feedback.

10. I would suggest not using the BIA acronym. CASF Infrastructure Account, CASF Broadband Infrastructure Account, CASF Broadband Infrastructure Grant Account are all used, but most often it's referred to the Infrastructure Account. The state doesn't abbreviate this grant as BIA, so that could be confusing for the readers who have never seen that acronym.

    - We appreciate your suggestion but felt the need to use abbreviations of some sort. We believe the report is more readable using sensible and appropriate abbreviations. We have followed the professional report-writing convention of introducing the term and abbreviating it as the term is defined. Typically, this convention would suggest that this process of defining the abbreviation only occur once throughout the document, but we have provided a redundant definition at least once in each section containing the abbreviation.

11. Sykes – this should probably be Coso Junction (end of page 14)

    - The report has been updated to reflect this feedback.

12. (clarification) Charleston View and Sandy Valley are a couple of our most remote areas. Charleston View is on Old Spanish Trail, Sandy Valley is accessible from the south (Kern County, I-15).

    - We recognize their remote nature and provided a discussion about how they may be connected using BEAD funding for wireless technologies, which is a lesser known and more challenging strategy to implement.

13. (clarification) The State's MMBI/MMBN will pass by Tecopa and through Shoshone, the larger population centers in the southeastern part of the County.

    - This important fact was noted, but we do not know where you want it discussed further. The report contains several maps showing the middle mile route, and the strategy suggestions were made with this route in mind.

14. Starlite Drive references can just be referenced as Starlite (a community).

    - The report has been updated to reflect this feedback.

15. Reference to TPx in a table – I believe that they're a subcontractor, typically for AT&T, providing services from the State to a regional organization. I'm not sure that they need to be listed as a DSL provider because of the implication that it's an ISP available to residential customers. TPx has set up several circuits between the State and Inyo County. Maybe the same goes for AT&T DSL circuits unless you're referencing the AT&T service in Death Valley – they typically are the contractor for State circuits, even though Frontier is the actual carrier.

    - TPx reports to the FCC that it offers residential service to a single location, an issue we acknowledge in footnotes found in three locations throughout the document. This service can be challenged via one of the challenge options provided in Section 6.

16. Wireless APs instead of Wireless Aps on Page 30 (Mobile and 5G section) - darned autocorrect!

    - Autocorrect indeed! The report has been updated to reflect this feedback.

17. Table 14 (page 61) is extremely misleading. The Broadbandnow.com site lists the populations of all people living in zip codes where there are tribal nations, not the number of people living just in the tribal nations. For example, Inyo

County has only 19,000 residents, so a table with the population of the Bishop Paiute Tribe listed at 13,857 will raise a lot of eyebrows. The Bishop Paiute Tribe community is a fraction of that number.

- We apologize for this inclusion and will not use the BroadbandNow data going forward. This feedback was instrumental in identifying the problem and making this decision. Unfortunately, we have struggled to find a consistent source of reliable information for both the population figures and the additional details, so we have decided to remove the table.

18. Page 68 – Olancha-Haiwee should be referred to as two separate places. Olancha-Cartago is a thing, but Haiwee a ways away and not part of Olancha.

    - The report has been updated to reflect this feedback.

19. AT&T telephone service is primarily in the southeastern part of the County (Tecopa, Shoshone, Furnace Creek, etc.)

    - We have noted that they provide telephone service in these areas in the market summary and the discussion of AT&T's internet service coverage areas.

20. Section 5.1. - carrier routes. I believe that Zayo, along with others, lease dark fiber from the California Broadband Cooperative (CBC, owns the Digital 395 network). The CBC actually owns the fiber and is the middle-mile provider in our area. Frontier has separate middle-mile fiber. I'm not sure that we want that information publicized. The Race fiber in Inyo is a small run from the Digital 395 network into the Rovana neighborhood – not really middle-mile.

    - For the middle mile route information, we used a dataset purchased from GeoTel, who updates this information regularly but still keeps a level of privacy when it comes to the assets beyond the depiction of routes, including obfuscation of real ownership to an extent. For the purpose of the report, we decided to include the depiction seen in Section 5, as well as the files provided in the GIS asset package. This data is widely available through this and other data broker services and was a standardized inclusion in all reports. If necessary, we can make another copy of the document with any pages redacted as you see fit for sharing with the public.

21. 5.3.1. - Inyo County did not engage the GSCA for LATA grant projects.

    - Tilson did not conduct a high-level design under the GSCA scope, as Inyo County did not participate in that project. However, one was conducted under RCRC GSFA, as per the accepted scope in the final contract.

22. Page 150 – estimated population is 19,000, not 18,000. 18,718 per the link.

    - The report has been updated to reflect this feedback.

23. Page 152 – Aspendell is misspelled (Avalanche section)

    - The report has been updated to reflect this feedback.

24. 9.2.2. - I'm not sure the reference to a $2.8M CASF grant for high-speed internet service for Inyo County is correct.

    - The report has been updated to reflect this feedback.

25. Page 191 – GSCA's Open-Access Last Mile network – Tilson didn't do the LATA design work in Inyo County, and the paragraph references Tulare. That doesn't mean we're not interested in extending the GSCA's network into Inyo County.

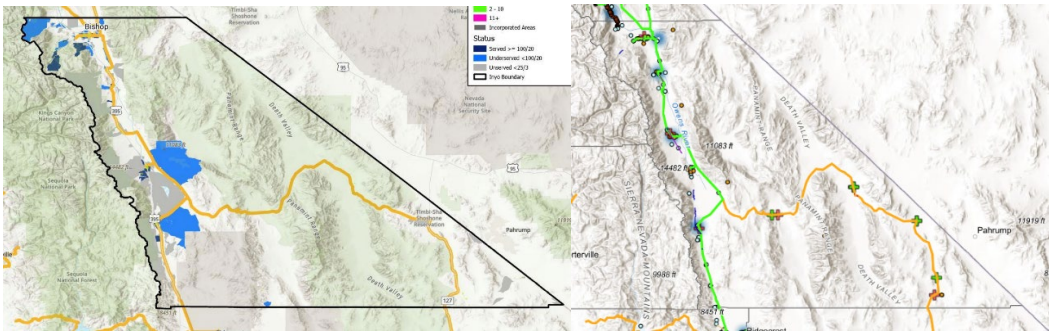
- We resolved the typo references. Tulare was another county that did not participate in the GSCA FFA application process. However, Tilson has created a high-level network design, cost estimate, and other planning materials for a potential Golden State Connect Authority (GSCA) network to connect locations across Inyo County. To obtain more information about these planning materials, interested parties can contact the GSFA.

26. Page 203 – can a non-governmental person in a locality (such as our very small, unincorporated population centers) get a CostQuest license?

    - Unlikely, but we recommend that CostQuest be contacted directly for more information. The Tier D or E licenses typically accessed by localities generally limit the scope of the license to the local government's formal jurisdictional boundaries, so it is unclear how CostQuest would handle a less formal request from someone who is not an elected representative, but they may be willing to create a more custom contract with someone who leads an organization that is formally working with ISPs to develop grant-eligible broadband deployment plans.

27. General gripe: Several of the maps depicting Inyo County look squished and will probably raise some eyebrows. Map from the report is on the left – map on the right is from ESRI's ArgGIS.

    - We acknowledge that Inyo may look different than the depictions in county-prepared maps, based on the County's own internal GIS department's preferred Coordinate Reference System (CRS). Our GIS is set up to use the WGS84 projection as default, which is commonly used by applications such as Google Earth, in accordance with several of the GIS deliverables. An inventory of shapefiles depicted in the report are provided alongside the final deliverable, in formats that will be easily translated to the county's own GIS platforms.



TILSON

## Address

- 16 Middle St. 4th Floor
  Portland, ME 04101

## Phone

- +1 (207) 735-7198

## Contact


- **Bill Trimble**
  *Feasibility Manager*
  *wtrimble@tilsontech.com*