BROADBAND STRATEGIC PLAN

Northern Arizona Council of Governments Economic/Workforce Development has partnered with Magellan Advisors to develop a Regional Broadband Strategic Plan to promote the expansion of robust broadband options for Apache, Coconino, Navajo, and Yavapai Counties. The purpose of this project is to develop a regional plan for NACOG and its members to increase the deployment of broadband infrastructure that will support economic development, telehealth, distance learning, remote work, and broadband-enabled everyday functions for businesses and residents across Northern Arizona.

This project will include:

Northern Arizona Council of Governments Economic/Workforce Development

Focus Areas:
Apache, Coconino, Navajo, and Yavapai Counties

- Funding analysis to determine and prepare for state and federal grant opportunities to fund deployment of additional infrastructure.
- Asset assessment to examine of the current and future public and private broadband infrastructure (including fiber, conduit, streetlights and provider networks) within the region.
- Market & gap analysis to identify available options and locate unserved and underserved areas within the community.
- Needs assessment including workshops and a survey to engage a variety of stakeholders including public agencies, tribal leaders, businesses & non-profits, and community organizations.
- Business model & partnership evaluation to identify opportunities for regional collaboration, public-private partnerships, and dovetailing with other ongoing efforts.
- Conceptual network design that considers the needs of all stakeholders, leverages existing assets, and aligns with funding opportunities, creating a shovel-ready project for deployment of additional broadband infrastructure.

STAKEHOLDERS & COMMUNITY ANCHORS

County & Municipal Governments | Tribes | Schools

Economic & Community Development Agencies | Libraries

Parks & Recreation | Chambers of Commerce

Police & Fire Services | Utilities | Transportation Districts |

Business Community | Healthcare Providers |

Broadband Providers

PROJECT BENEFITS AND OBJECTIVES

- Increase the availability, affordability, and reliability of broadband in Northern Arizona
- Determine the areas of greatest need among the community and its stakeholders
- Engage with potential partners to leverage opportunities for joint efforts
- Develop an actionable, shovel-ready plan with conceptual network design components to expand broadband infrastructure

Requested Data

Magellan will be requesting the following data from NACOG's communities for the Broadband Strategic Plan project. This data will assist us in identifying the opportunities in the region and will contribute directly to the development of the Broadband Strategic Plan project deliverables. It is important that we receive this information in a timely manner to ensure that the rest of the project is not delayed.

Please redact any confidential information from the data sets before providing them.

- ✓ Current publicly owned fiber-optic network and conduit maps exported in GIS SHP or Google Earth KML files
    - o Conduit and fiber running lines
    - o Strand count information and status (occupied vs. available)
    - o Structures, vaults, manholes, handholes
    - o Splice points, termination points
- ✓ Publicly-owned property in tabular format or GIS SHP or Google Earth KML files
    - o Current County & City facilities
    - o Towers
    - o Cameras
    - o Traffic signal system
    - o Other property
- ✓ Economic and commercial information in GIS SHP or Google Earth KML files
    - o Business parks
    - o Schools
    - o Fire stations
    - o Police/other public safety agency locations
    - o Economic development focus areas
- ✓ Planned Capital Improvement and Development Project Lists
    - o Location (if available, GIS SHP or Google Earth KML files)
    - o Project description
    - o Project timeline

BROADBAND FAQ

Q: WHY IS BROADBAND SO IMPORTANT FOR COMMUNITIES?

A: As more of our lives transition to the digital world, access to the internet and its multitude of applications becomes increasingly important. While it was once just a complement to our physical lives, the virtual world has now become a crucial part of what we do every day. Online applications for business, health, education, security and entertainment have all become integrated into our daily routines. These applications and new ones continue to grow at an alarming pace. To function, they must be carried across high-speed, reliable broadband infrastructure, which we can think of as the highway system for the electronic world.

Local roads feed into state roads, which feed into the interstate highway system to interconnect individuals to the country's infrastructure. Similarly, local broadband infrastructure connects to regional and national high-speed networks that interconnect with the global Internet. If local broadband infrastructure is insufficient, (i.e. local roads are insufficient), users (drivers) will have difficulty accessing the global Internet (interstate highway system).

Therefore, broadband access is critical to ensure that users are able to reach the electronic world over a reliable, high-speed local broadband infrastructure. Without this, the applications they use everyday breakdown.

Q: WHAT IS BROADBAND INFRASTRUCTURE?

A: Broadband infrastructure consists of the cabling and electronics that wires homes and businesses into the local telecommunications or cable company offices. From these offices, connections to other communications networks and the Internet are made, interconnecting local users with Internet, telephone, television and other services.

Q: WHAT IS BANDWIDTH?

A: In a network, bandwidth (what engineers call bitrate) is the ability to carry information. The more bandwidth a network has, the more information it can carry in a given amount of time. Networks with high bandwidth also tend to be more reliable because fewer bottlenecks disturb the flow of information.

Q: HOW MUCH BANDWIDTH DO WE NEED?

A: The amount of bandwidth we need grows every year. The largest growth has been for video – traditional pay TV, "over the top" or Internet-based video, and video communications. This trend is expected to continue at least for the rest of this decade. Video requires not only extra bandwidth but also extra reliability. Additionally, internet-based video applications continue to push more and more bandwidth, such as Hulu and

Netflix. Business applications have become more bandwidth-intensive and also need reliability to function correctly.

Q: WHAT ABOUT OTHER KINDS OF DATA?

A: Bandwidth requirements for many kinds of data are exploding. For example, new digital cameras can create larger and larger images; 30 megabytes is not uncommon. In health care, the medical images produced by equipment such as CT scanners are a hundred times larger than camera images. In the last few years, many industries have entered the era of "Big Data" applications that collect and analyze data on massive scales. Today's Big Data applications range from consumer pricing models to online marketing to DNA sequencing to particle physics to control of electrical grids. Big Data doesn't work without broadband services that maintain high bandwidth and reliability.

Q: CAN'T COPPER CARRY HIGH BANDWIDTH?

A: Copper, which includes broadband systems such as DSL and cable, can carry far less capacity than fiber-optic. It can support high bandwidth for only a few hundred yards, since it is a distance sensitive technology. The longer a signal travels on copper, the more the bandwidth degrades and the less data that is available. Fiber-optic is unique in that it can carry high-bandwidth signals over enormous distances. Fiber uses laser light to carry these signals. Under some circumstances, a signal can travel 40 miles (60 kilometers) without degrading. Fiber is also better able to support symmetrical bandwidth. Symmetrical bandwidth provides the same speed in both directions, whereas many copper-based broadband carries different speeds, such as 6 Mbps down, 2 Mbps up. Symmetrical bandwidth is important as it provides high speeds in both directions, not just on downloads.

Q: WHAT ABOUT WIRELESS? CAN IT PROVIDE HIGH-SPEED BROADBAND?

A: Many wireless broadband systems are shared technologies whereby each user on the system shares bandwidth among other users. Cellular, 3G, 4G and LTE systems are similar. In these cases, users do not receive guaranteed bandwidth for their use, if a few users are consuming all of the bandwidth, other users will not receive any. Wireless point-to-point, or microwave systems do have the ability to provide guaranteed bandwidth in some instances and are widely used in areas where fiber-optic is infeasible. However, the carrying capacity of these wireless systems is far less than fiber-optic.

The fifth generation of mobile wireless networks, known as 5G, was recently designed and developed, with commercial availability in 2020 and an increased maturity of the network in subsequent years. 5G networks operate multiple frequencies using millimeter wavelengths to offer anticipated download/upload speeds of 1 Gbps. The networks are designed to provide increased efficiencies while decreasing latency and are designed for improving the performance of connected devices that define the Internet of Things. Examples include autonomous vehicles, healthcare monitoring technologies, ultra-high-definition video, virtual reality, and many more applications that are ripe for development.

It should be noted, however, that these wireless networks are not a substitute for a wired fiber-optic network, but are complementary. While users will likely see an increase in speed with the transition to 5G, wireless connections are still dependent on ideal environmental factors including having a line of sight to the small cells for data transmission. Trees, buildings, and even weather can impact the reliability of wireless technologies. Additionally, due to the large amounts of data needed to support a growing number of uses and applications, wireless networks will require wired fiber networks to backhaul information. Due to fiber's increased capacity and reliability, a wired fiber network enables wireless.

Q: WHAT EXACTLY MAKES FIBER "FUTUREPROOF"?

A: The equipment used to send light signals over glass fiber keeps getting better. So, equipping an existing fiber network with new electronics and with lasers that pulse light faster, or lasers that use different wavelengths of light, can vastly increase available bandwidth without changing the fiber itself. New electronics are very cheap compared with the original cost of installing the fiber. Therefore, once fiber has been deployed, network operators can keep increasing bandwidth at a much lower cost.

Q: HOW LONG HAS FIBER TECHNOLOGY BEEN IN USE?

A: Fiber-optic technology is the foundation of the world's telecommunications networks. It has been used for more than 30 years to carry communications traffic from city to city and from country to country. Almost every country has some fiber-optic infrastructure, allowing them to deliver services reliably and inexpensively. The first time fiber delivered a signal directly to an American home (in Hunter's Creek, FL.) was more than 20 years ago.

Q: ISN'T DSL AND CABLE GOOD ENOUGH?

A: It's not good enough to make your community competitive in attracting or supporting a tech-savvy company or home-based businesses. Today's cable modems and DSL lines may suffice for consumers to send emails, download songs or share family photos. However, healthcare, education, and commerce are steadily requiring more and more bandwidth. Almost 100 communities have deployed fiber broadband networks and more are on the way as communities realize that these types of networks are critical to economic development and competitiveness.

Q: WHY AREN'T PROVIDERS UPGRADING TO FIBER-OPTIC BROADBAND IN MY COMMUNITY?

A: One key issue found in many smaller communities is that the smaller demand does not warrant investment in upgraded broadband infrastructure by telecommunications providers and cable companies. In large metropolitan environments, providers can warrant the investment, given high volumes of users, which allow them to realize the return on investment needed for the upgrade. In smaller communities, this is not the case, because demand is lower and their fixed costs remain high. Upgrading communities to

widespread fiber-optic broadband services is a significant cost for providers; the current average cost to wire a home for fiber-optic services is $1,200. Multiply that by 20,000 users in a community, and the cost to the provider is $24,000,000. Providers must be assured that they will gain enough market share to generate a reasonable return on this investment. Without a strong uptake, providers will not make the investment. In small communities, this generally holds true and thus, the current infrastructure, which may be DSL or cable, is maintained.

Q: WHAT IS THE BROADBAND STRATEGIC PLAN DESIGNED TO DO?

A: This plan will develop strategies for NACOG EWD and its partners to leverage and expand fiber-optic network assets, in cooperation with broadband service providers, to make more broadband available to public sector organizations, businesses, and residents at affordable prices. Why fiber? Because fiber is the fastest, most reliable broadband technology to meet the needs of our local businesses, outpacing many of the other DSL, cable and wireless technologies available today. It also enables our businesses to be connected with a technology that can support their growing bandwidth needs over the long-term as they adopt more online technologies that make them more competitive and efficient. The project will focus heavily on how this network can be strategically employed to improve economic development, education, healthcare, public safety and general quality of life in our community.

Q: WHAT ROLE CAN THE CITY PLAY IN EXPANDING BROADBAND?

A: Public organizations have several important roles to play in the expansion of broadband in their communities.

- **First**, local government has, by charter, the objective of serving its local community. Broadband is a community-wide need that impacts residents, businesses, schools, hospitals, public safety and overall quality of life.

- **Second**, local government has financial instruments at its disposal that the private sector does not, including a variety of funding sources that can be used to support long-range projects such as broadband networks.

- **Third**, local government has a much longer investment horizon than private service providers and the ability to invest in long-term projects, including water, sewer, roads, electric and gas. Broadband infrastructure falls into this same category as another infrastructure investment.

- **Fourth**, local government has important public policy powers that it can use to positively influence the development of local broadband infrastructure. Many local governments now incorporate broadband standards into their land development code, which enables this infrastructure to be installed with companion water, sewer, road, electric and gas projects, at costs significantly lower than could be achieved without these companion projects.

- **Fifth**, local government has efficiencies in permitting and right-of-way management that allow it to streamline the construction of local broadband infrastructure.

- **Sixth**, local government has access to grants and loans that allow it to implement infrastructure projects using local, state and federal funding.

- **Seventh**, local government can improve local broadband conditions without competing with broadband service providers and without "getting into the business." Local governments can implement networks that are open and available to any qualified service provider to use in delivering their end user services. These networks also keep local governments out of the "retail" business, minimizing operational costs and requirements to support end user services.

Q: WHAT ARE THE LIMITS OF PUBLIC ORGANIZATIONS IN BROADBAND DEVELOPMENT?

A: Generally, local governments are not in the business of providing telecom services, internet or television. However, they are in the business of providing infrastructure: roads, water, sewer and other physical framework. Broadband is just another form of infrastructure, digital infrastructure. It is constructed similar to existing infrastructure, follows right-of-way and interconnects throughout the community. This is the primary opportunity for government to build local broadband infrastructure, which includes the conduit, fiber-optic cable and related items. However, instead of providing services directly, local government's best option might be to allow telecommunications and cable companies to use this infrastructure to reach customers in the community. Because local government can often build this infrastructure under more favorable conditions than private providers, it makes sense for local government to coordinate with the private providers, allowing them to use the infrastructure to deliver services to the community.

Q: WILL NACOG AND ITS MEMBERS BE COMPETING WITH OUR CURRENT LOCAL SERVICE PROVIDERS?

A: No. An important initial goal of the project is to enable local service providers to serve more of the community at affordable rates by working with them to deploy their technologies so they can provide cost-effective services. We believe that local service providers are stakeholders too and their needs should be incorporated into the overall strategy. As such, the project team will be engaging with local service providers throughout the project.

Q: WHAT ROLE DO SERVICE PROVIDERS PLAY IF LOCAL GOVERNMENT BUILDS BROADBAND INFRASTRUCTURE?

A: Broadband service providers, including telecoms, cable companies, ISPs and wireless providers utilize the public broadband infrastructure to deliver their services to the community. Local government owns the "pipes" over which the providers deliver their content to end-users. There are several recommended models for this, including open-access, whereby the local government allows any qualified service provider to use its

infrastructure, or public-private partnerships, in which municipal and county governments select partners to operate and maintain some of their fiber infrastructure to provide service to end users.

> **Q: WILL MY CONSTITUENTS OR I BE ABLE TO GET IMPROVED SERVICES AT OUR HOMES?**

A: In some cases, local governments that develop broadband initiatives can positively impact residential services. However, these impacts generally are realized over the long-term. Public broadband initiatives generally start with near-term opportunities to improve services for local community anchors, such as schools, hospitals, clinics, public safety and local government itself. In addition, a near-term focus on economic development that increases choice, improves affordability and makes new services available is a common strategy employed by local governments. Over the long-term, local governments sometimes find opportunities to bolster residential services and enable broadband service providers to reach new parts of the community.