



Benefits of Expanding Broadband Infrastructure in Apache County

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Executive Summary

Broadband is being utilized at an increasing rate, from running a credit card at a local shop, video conferencing a doctor, remote working, attending a virtual college course, streaming a film, or communicating with family – a broadband connection is essential to our everyday lives.

As our dependence on broadband connectivity grows, the divide between underserved communities and areas with a reliable broadband connection will continue to grow. Both individuals and businesses demand reliable, fast, and accessible internet connectivity.

Broadband service has become an economic foundation item and is essential to day-to-day communication much like telephone service. Reliable means of telecommunications are also a critical component of economic development growth in rural areas. A lack of this infrastructure in rural areas, such as Apache County, limits business activity, community well-being, educational opportunities, and overall economic potential.

This report is the first segment in a broader effort to identify growth opportunities in Apache County. It examines how an investment in improving broadband infrastructure and availability will support economic growth, enhance workforce development and educational opportunities and mitigate the negative impacts from future coal-plant closures by supporting a transition to a more sustainable and resilient economy.

Approximately 66.0% of the land in Apache County is federally recognized Native American tribal land. While expanding broadband access will benefit all residents and businesses throughout the entire County, this report primarily focuses on the economic conditions of the non-tribal areas of Apache County and the potential impacts of expanding broadband in those areas.

Synopsis: The economic benefits associated with broadband infrastructure investment will be partly dependent on how the relevant communities also find ways to invest in enhanced workforce development and added transportation infrastructure. However, in isolation, it is estimated that broadband infrastructure investment at the scale of \$10M+ will result in the creation of 730 jobs by the 10th year following the investment.

The following summarizes the key findings of this initial effort.

Key Findings

- Apache County has been experiencing a declining population over the previous decade. From 2011-2021, the population in Apache County declined at an average annual rate of 0.7%. The population of the non-tribal areas of the county declined by 0.03% per year over the same time period.
- The decline in population is, in part, caused by a lack of employment opportunities. Since 2012, employment in the non-tribal areas of the county has declined at an average rate of 0.1% while employment in Apache County as a whole declined by 1.2% per year over the same time period.
- Enhancing broadband connectivity can help to reverse the trend of negative growth by helping local businesses expand, providing additional workforce development and educational opportunities, and improving the county's competitive position in regard to business recruitment and attracting new residents.



- For example, a reliable broadband connection will allow Apache County residents to utilize telemedicine technologies, as well as other online resources. As a result of the access to telemedicine, residents will save money by eliminating the need to travel to the doctor's office or hospital. These savings can then be used to support local businesses.
- In 2021, an estimated 86.1% of those living in the non-tribal areas of the County had a broadband connection at their house.¹ However, this estimate does not tell the whole story. Many of these connections are transmitted via satellite. Satellite broadband connections are unreliable, rarely maintain broadband speeds and are subject to interruptions.
- Data collected from Microsoft Cloud Services' Broadband Usage Dataset indicated that the broadband usage rate in Apache County was 5.0%, as of 2020. In other words, only 5.0% (or 3,600 people) of those living in the County actually utilized broadband internet, as of 2020. This compared to a usage rate of 54.2% for the state of Arizona.²
- If an investment in broadband raised the usage rate in Apache County from 5.0% to 7.5% for example, an additional 1,800 people would utilize a broadband connection. The resulting increase in economic activity would generate 800 additional jobs and \$50.2M in additional economic output over 10 years. Increased access to telemedicine would generate a total of nearly \$3.0M in healthcare savings by year 10.
- As another example, if the usage rate in Apache County rises from 5.0% to 10.0%, an additional 3,600 people will utilize a broadband connection. Over 10 years, the resulting economic activity will generate a total of 1,500 additional jobs, \$70.3M in additional wages, and nearly \$100.0M in additional economic output. County residents will benefit from a total of \$6.0M in healthcare savings over 10 years.
- For additional context on the economic and fiscal benefits of expanding broadband services in Apache County, a model was developed to calculate the direct and multiplier effects if the County was to reverse its current growth trajectory as a result of the expanded broadband over a 10-year period.
- Over the next 10 years, the population in Apache County is projected to decline at an average rate of 0.2% per year (a total of 1,210 persons). Employment is projected to increase by 330 jobs (an annual average rate of 0.2%) over the next 10 years.
- The expanded broadband access resulting from a proposed \$10.2M capital investment in Apache County will enable local companies to expand their operations, create new business and industry development opportunities, increase tourism activity and attract new residents. It is estimated that the \$10.2M investment would result in approximately 14,400 new broadband users. *Note: The conclusions formed in this report remain valid regardless of the grant application and potential for award.*
- With the \$10.2M broadband enhancement, employment in Apache County will increase by approximately 1,060 (compared to the 330 increase that is currently projected under current conditions) over 10 years. By 2030, the population in the County is projected to increase by 980 persons with the broadband enhancements, compared to the decline of 1,210 that is currently projected under current circumstances.
- If a reliable broadband network is established by the \$10.2M investment in Apache County, by 2030, approximately \$3.2M in additional annual tax revenues will be collected by the state and local governments (compared to the estimated \$855,900 based on current projections).

¹ Esri; Growth for Knowledge

² Microsoft Cloud Services Broadband Usage Dataset



Introduction

Salt River Project (“SRP”) and Tucson Electric Power (“TEP”) commissioned a series of economic development/impact studies to identify economic growth opportunities in Apache County, Arizona (“Apache County” or “County”). The overall purpose of the broader effort is to support communities and regions that are heavily impacted by coal plant closures and to help these communities as they transition to a more sustainable and diversified economy.

This segment of the effort examines the potential for the County to realize additional economic growth if the area’s broadband infrastructure is enhanced, and how this telecommunications infrastructure investment might blend with other economic growth enhancers such as workforce training and transportation infrastructure.

Broadband Fundamentals

Broadband is defined as an internet connection that maintains a speed of 25 megabits per second (“Mbps”) and an upload speed of at least 3 Mbps.³ The source of the connection can vary dependent on the provider and equipment.

A broadband connection can be transmitted through fiber cables, digital subscriber line (“DSL”), cable modem, wireless radio link, by satellite or through powerlines. Broadband connections are also categorized as “fixed” or “mobile.”

Traditionally, when potential investments in broadband are being discussed, the debate revolves around improving access to fixed broadband connections as they are the most reliable types of connection. A brief review of each broadband transmission method is included below.⁴



- *Fiber Optic Cables (fixed)* convert electrical signals carrying data to light and sends the light through transparent glass fibers. Fiber transmits data at speeds far exceeding current DSL or cable modem speeds, typically by tens or even hundreds of Mbps.
- *Digital Subscriber Line (fixed)* is a wireline transmission technology that transmits data faster over traditional copper telephone lines already installed in homes and businesses. DSL-based broadband provides transmission speeds ranging from several hundred thousand bits per second (“Kbps”) to hundreds of Mbps. The availability and speed of DSL service may depend on the distance of a home or business to the closest telephone company facility.
- *Wireless (mobile or fixed)* broadband connects a home or business to the internet using a radio link between the customer’s location and the service provider’s facility.

³ Federal Communications Commission

⁴ Federal Communications Commission



- *Cable modem (fixed)* service enables cable operators to provide broadband using the same coaxial cables that deliver pictures and sound to a television set. Transmission speeds vary depending on the type of cable modem, cable network, and traffic load. Speeds are comparable to DSL.
- *Satellites (mobile)* can provide links for broadband. Satellite broadband is another form of wireless broadband and is also useful for serving remote or sparsely populated areas. Typically, a consumer can expect to receive (download) at a speed of about 500 Kbps and send (upload) at a speed of about 80 Kbps. This is far below the minimum requirement for broadband (25 Mbps), despite many satellite providers claiming customers will obtain broadband speeds.

Technological advances to satellite broadband are underway and new providers will likely enhance the speed and reliability of the connection (e.g., Starlink has released technology that advertises securing broadband up to 200 Mbps). However, this new technology is not yet available in Apache County and its reliability for county residents is uncertain.

- *Broadband over powerline (fixed)* is the delivery of broadband over the existing low- and medium-voltage electric power distribution network. BPL speeds are comparable to DSL and cable modem speeds. BPL can be provided to homes using existing electrical connections and outlets. BPL is an emerging technology that is available in very limited areas. It has significant potential because power lines are installed virtually everywhere, alleviating the need to build new broadband facilities for every customer.

Benefits of Enhancing Broadband Access

Reliable broadband infrastructure is becoming, together with transportation infrastructure and workforce development, a primary pillar of economic growth for communities, businesses and people. All components of the economy, from base sector, high-wage industries (e.g., manufacturing, healthcare, etc.) to high volume employment industries (e.g., retail trade, education services, accommodation and food services, etc.) are requiring a broadband connection for even basic daily operations.

For example, telemedicine and virtual appointments have become a major growth component in the healthcare industry, online classes are becoming an increasingly large part of the curriculum at all levels of education, (i.e., K-12 and higher education) and the hybrid workplace environment has changed the way employees and companies conduct daily operations.



A lack of sufficient infrastructure presents a significant threat to Apache County's growth potential. Areas that are underserved in terms of telecommunications infrastructure are routinely eliminated early during the site selection process for businesses seeking to expand or relocate. If not addressed properly, local businesses will not be able to expand, and new businesses will not be able to locate in the County. A lack of job opportunities will force those in the labor force to leave the County in search of employment.

While some of this aforementioned economic decay has begun in parts of the County, an investment in broadband infrastructure can help to reverse this trend.



Enhancing broadband access throughout the County is the first step in building a solid foundation upon which a broad economic development strategy can be built.

Reliable broadband will support local business growth, enhance workforce development by providing greater education and training opportunities, and increase the County's competitive advantage in regard to business recruitment and attracting new residents.

Additionally, enhancing broadband connectivity will greatly improve communication throughout the region. The current primary methods of communication (e.g., texting, email, video conferencing, etc.) rely on a reliable broadband connection. This may soon be true for the communication network for emergency services as well.

The Next Gen 911 ("NG911") initiative seeks to replace the existing communication system for emergency service providers, which currently relies on analog technology, with a digital infrastructure. This will allow emergency responders and 911 call centers to receive a wider range of communications (e.g., texts, pictures, videos, etc.) as well as provide emergency medical personnel access to data transmitted from wearable devices.⁵

This information can be critical for a variety of emergency situations, including search and rescue operations, natural disasters, and mass causality incidents, to name a few. However, this enhanced communication infrastructure will not function properly without a reliable broadband connection. Improving the connectivity throughout the County will ensure greater access to emergency services.

This study analyzes the demographic and economic conditions in the County to highlight the need for an economic development strategy. Two economic models were also developed to quantify the expected benefits of improving broadband infrastructure in the County.

⁵ Understanding Next Generation 911 (https://www.911.gov/project_ng911publicsafety/ems/understandingng911.html)



Apache County Profile

Apache County consists of approximately 11,200 square miles and is located in the northeast corner of Arizona. The County is boarded by Utah to the north and New Mexico to the east. This region is also known as the Four Corners region and is the only place in the U.S. where four different states meet (Arizona, New Mexico, Colorado and Utah). The County is also home to nearly 25.0% of Arizona's Native American population as the Navajo and Apache Indian reservations cover approximately 66.0% of the County's land area.

For initial perspective, the Arizona Office of Economic Opportunity ("OEO") estimated that Apache County was home to 66,400 people in 2021 with 18,200 people living in the non-tribal areas.

Similarly, the County's total employment was 16,840 as of 2021, according to the OEO. Approximately 39.1% of the workforce, or 6,600 people live in the non-tribal areas.

A review of the economic and demographic profile indicates that declining employment levels, increasing unemployment rates, below average wages, and diminishing employment opportunities in Apache County have resulted in above average poverty rates and have caused people to leave the County in search of economic opportunities elsewhere.





A comprehensive economic development strategy is needed to reverse the declining economic trends. The strategy should include programs and policies to expand access to broadband services, advance workforce development initiatives, and enhance the County's transportation infrastructure.

A lack of employment opportunities and below average wages have been the primary causes of stagnant economic growth and threaten the long-term growth potential in the County. The following are some key observations on how broadband can help economic conditions in the County.

Key Observations:

- Population and employment growth in the non-tribal areas have been positive in recent years compared to the County as a whole. This indicates more favorable economic conditions in these areas.
- Employment in the non-tribal areas grew by 6.8% from 2020-2021. This compares to a 3.6% growth statewide and a 2.0% decline for the County as a whole.
- Despite relatively favorable conditions, there is a higher poverty rate, lower educational attainment and lower median incomes in the non-tribal areas compared to statewide averages.
- Employment in the County is projected to grow at an average rate of 0.2% per year over the next 10 years, compared to the statewide average of 2.2%.
- However, the projected 0.2% employment growth may not occur if the issue of broadband availability is not addressed.
- Broadband is an increasingly important factor for the growth of many industries but particularly for the healthcare, retail trade and educational services industries.
- Telehealth and virtual visits to the doctor, online classes and the e-commerce sector continue to grow and will be pillars of growth for these industries.
- These three industries accounted for 44.3% of the workforce in the non-tribal areas of the County in 2021. The growth potential of these industries will be limited without a reliable broadband connection.
- With broadband increasingly becoming a daily part of business operations in all industries, it will be more difficult for businesses to locate, expand and thrive in the County if the necessary infrastructure is not in place to support their operations.
- Furthermore, it will be more difficult to attract and retain residents to the County if adequate employment opportunities do not exist.

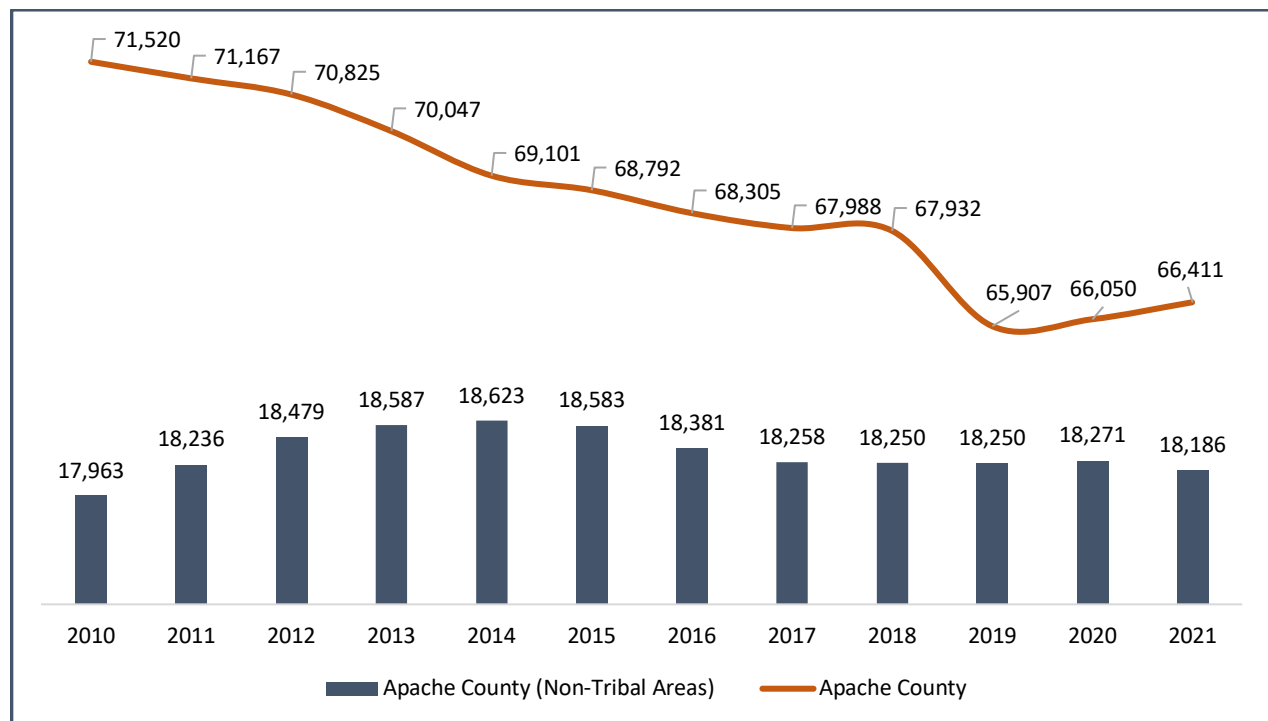


Population Counts and Future Growth

In 2021, there were 18,200 people living in the non-tribal areas of the County, according to estimates derived from the U.S. Census Bureau. These areas represented 27.4% of the County's total population, which was 66,400 in 2021, according to the Arizona Office of Economic Opportunity ("OEO").

From 2020 to 2021, the population in the County grew by 0.5%, while the population in the non-tribal areas declined by 0.5% over the same time period. Over the last 10 years, the County's total population declined at an average rate of 0.7% per year and the population in the non-tribal areas declined at an average annual rate of 0.03%. The population of Arizona grew by 1.5% from 2020 to 2021 and has grown at an average annual rate of 0.6% since 2011, according to the OEO.

Figure 1: Annual Population Level in Apache County

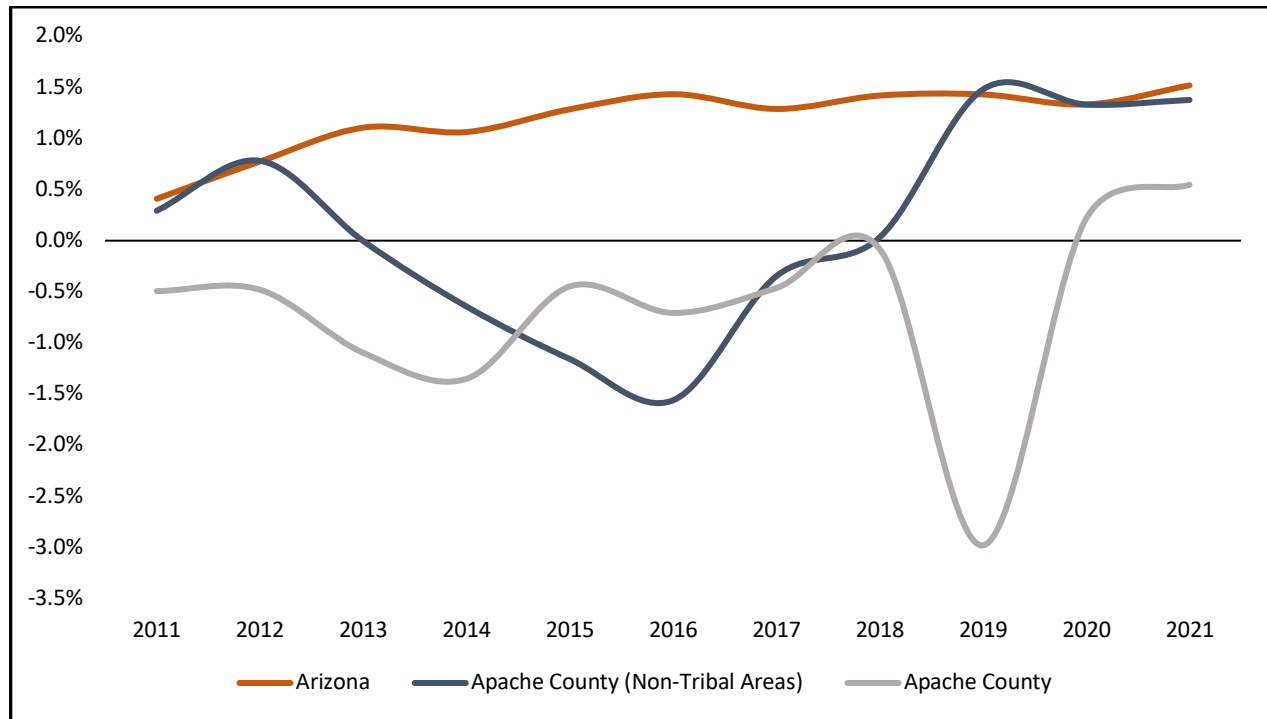


*Projected Values

Source: Esri; U.S. Census Bureau; Arizona Office of Economic Opportunity



Figure 2: Annual Population Growth in Apache County and Arizona



Source: Esri; U.S. Census Bureau; Arizona Office of Economic Opportunity

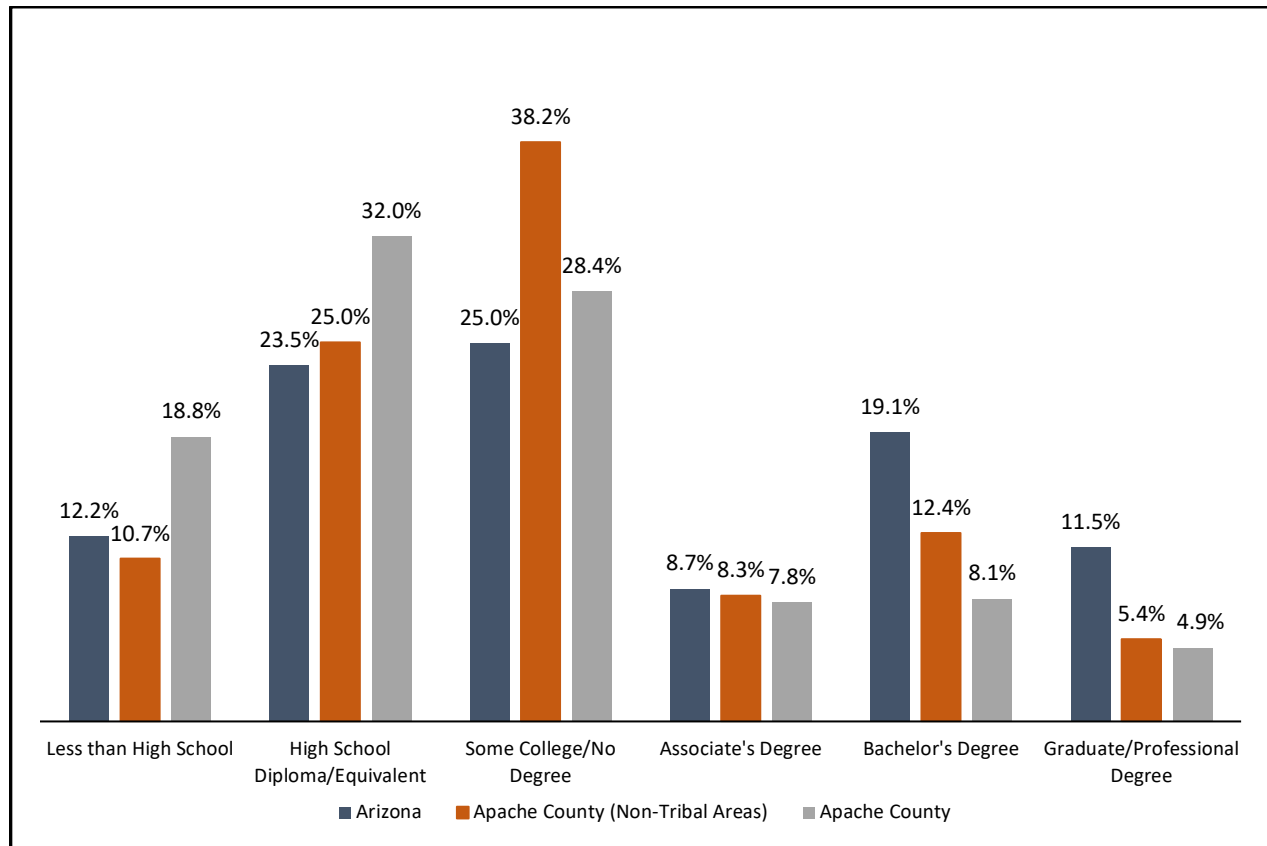
Despite the recent population growth, the non-tribal areas of the County are performing at below average levels in other indicators. In 2021, approximately 22.2% of those in the non-tribal areas of the County were living below the poverty line compared to the statewide average of 14.1% and the County average of 34.4%.

The median household income for those in non-tribal areas was approximately \$39,500 in 2021. This was 35.9% below the statewide median household income of \$61,600, but slightly above the median household income of \$35,200 for the County as a whole.

Approximately 12.4% of those ages 25 and above living in the non-tribal areas of the County had attained a bachelor's degree as of 2021. This compared to 19.1% of those 25 years and older throughout Arizona and 8.1% in the County.



Figure 3: Educational Attainment in Apache County and Arizona in 2021



Source: Esri; U.S. Census Bureau

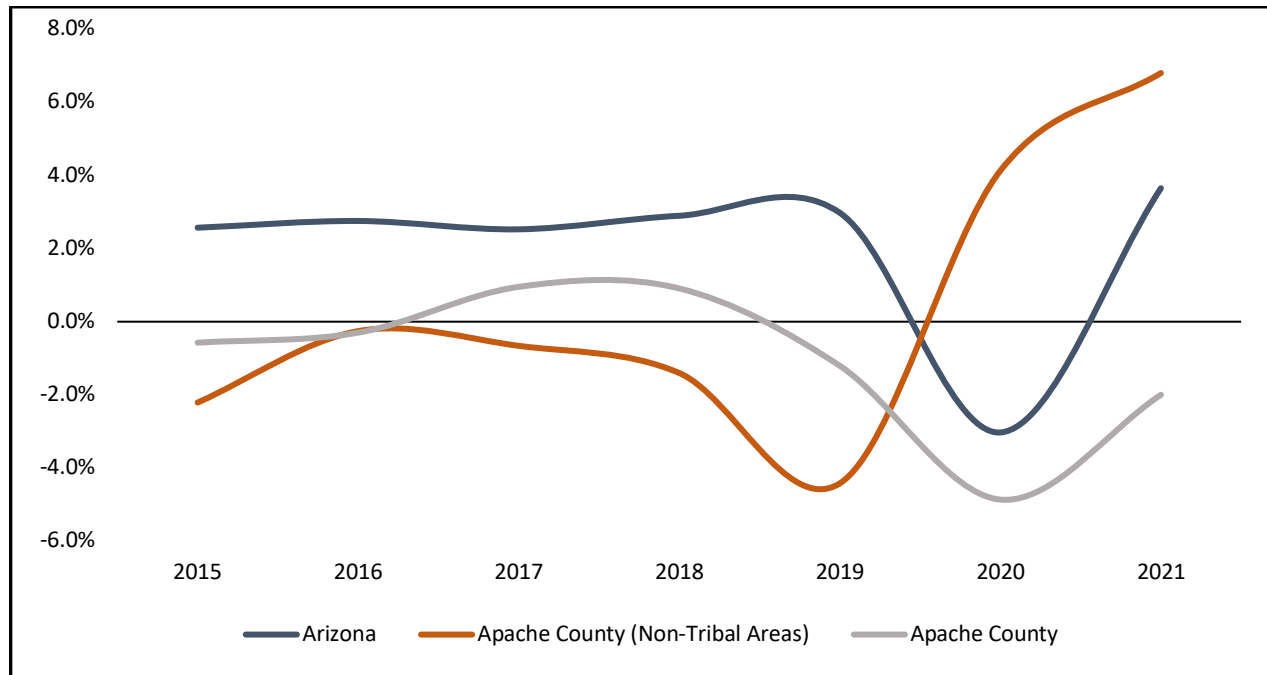
Employment Counts and Future Growth

As of 2021 (most recent data), there were approximately 6,000 people employed in the non-tribal areas of the County, a 6.8% increase from 2020. Arizona employment increased by 3.6% over the same period. Overall, since 2012, employment in the non-tribal areas has declined at an average annual rate of 0.1%. This compares to statewide employment growing at an average rate of 2.1% per year.

While employment in the non-tribal areas experienced positive growth, employment throughout the County as a whole declined by 2.0% from 2020 to 2021. Employment projections from the OEO estimate that over the next 10 years, employment will grow at an average rate of 0.2% per year. This compares to a 2.2% annual growth projected for statewide employment over the same time period, according to the OEO.

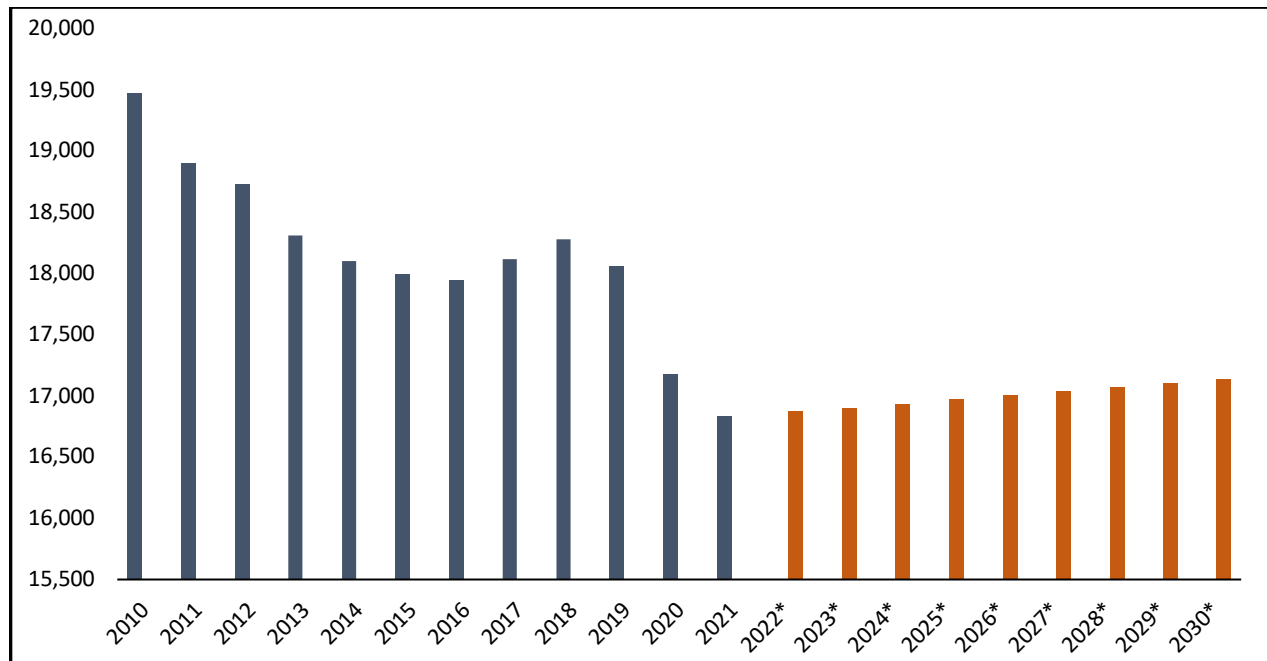


Figure 4: Annual Employment Growth in Apache County and Arizona



Source: Esri; U.S. Census Bureau; Arizona Office of Economic Opportunity

Figure 5: Annual Employment Level in Apache County



*Projected Values

Source: Arizona Office of Economic Opportunity

However, realizing even these modest employment projections will be challenging without improvements to the County's broadband infrastructure. As discussed previously, the demand for broadband is a driving growth factor for many industries and particularly for the healthcare, retail trade and education services industries. These three industries represent 44.3% of the workforce in the non-tribal areas of the County.



Telemedicine, virtual appointments, as well as online scheduling and communication are just a few of the changes that are at the forefront of the healthcare industry. Online classes offer educational advancement opportunities to a much larger student base than traditional in-person classes. As a result, education programs of all levels are adding online courses to the curriculum.

The e-commerce market allows retailers to reach more customers than ever before. As the sector continues to grow, traditional brick-and-mortar retail establishments will need to adapt their business models to include maintaining a reliable broadband connection.

The healthcare industry employed the largest share of the workforce in the non-tribal areas of the County with 16.7% (1,000 jobs) employed in the industry in 2021. The retail trade industry employed 15.8% (950 jobs) of the workforce in 2021.

Figure 6 displays the employment composition by industry in the non-tribal areas of Apache County.

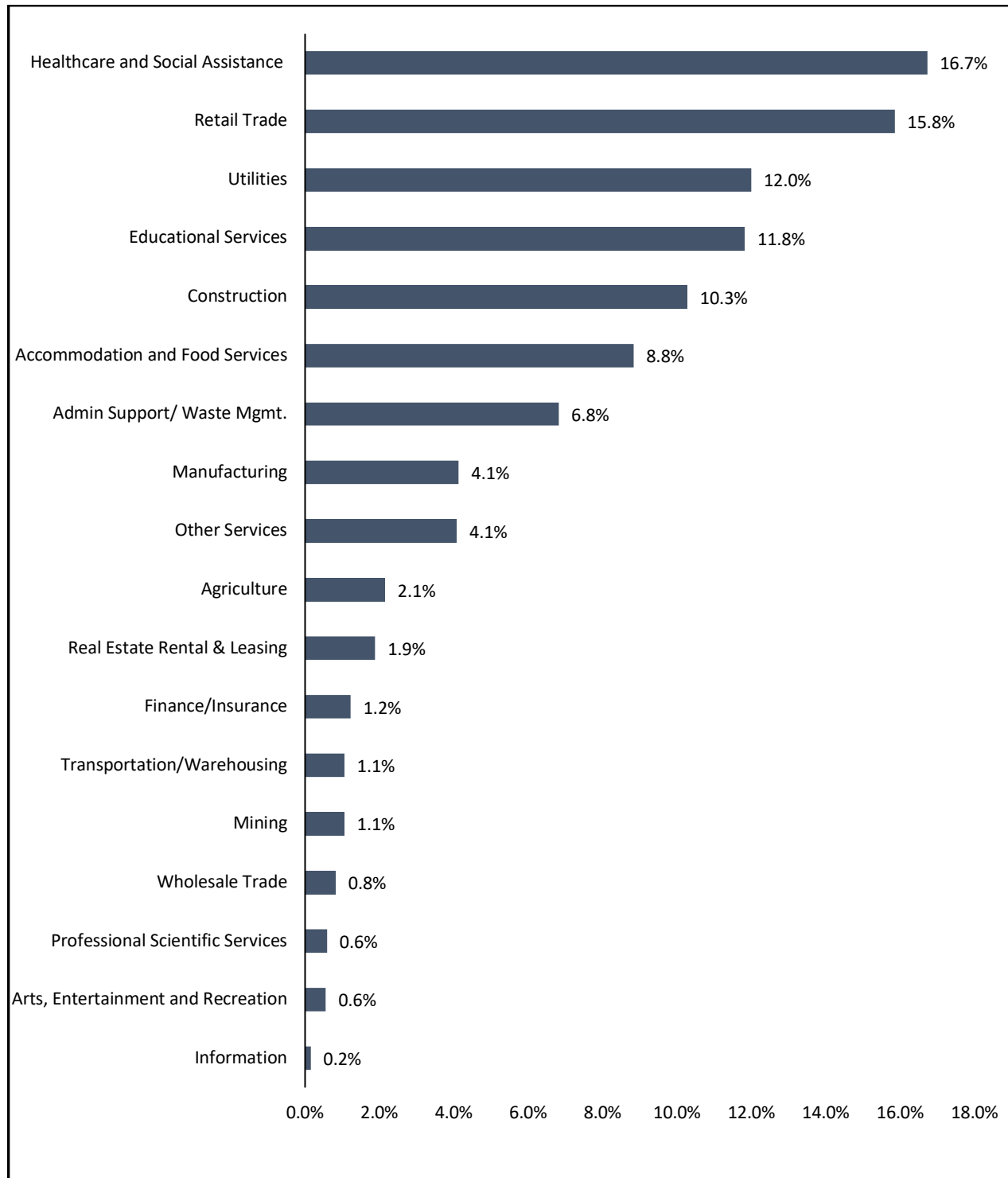
The wages paid in each of the industries in Apache County are lower than the statewide average. The average wage paid to employees in the healthcare industry in the County was \$51,800 in 2021, according to the U.S. Bureau of Labor Statistics (“BLS”).

This compared to the statewide industry average of \$57,600. Overall, the average wage in the County was \$45,500 compared to the Arizona average of \$58,200 (Table 1).





Figure 6: Share of Total Employment in Non-Tribal Areas of Apache County by Industry



Source: Esri; U.S. Census Bureau; Arizona Office of Economic Opportunity



Table 1: Average Wage Level in Apache County and Arizona by Industry		
Industry	Apache County	Arizona
Agriculture/Forestry/Fishing	\$38,252	\$39,266
Mining	\$50,646	86,017
Construction	\$52,037	\$63,056
Manufacturing	\$36,395	\$82,375
Wholesale Trade	*	\$85,972
Retail Trade	\$26,052	\$39,090
Transportation/Warehousing	\$31,157	\$50,432
Utilities	*	\$111,952
Information	\$68,321	\$90,871
Finance/Insurance	\$44,585	\$89,922
Real Estate Rental & Leasing	\$41,057	\$60,940
Professional Scientific Services	*	\$83,621
Admin Support/ Waste Mgmt.	\$47,982	\$44,559
Educational Services	\$44,862	\$47,064
Healthcare and Social Assistance	\$51,822	\$57,640
Arts, Entertainment and Recreation	\$28,606	\$46,150
Accommodation and Food Services	\$17,808	\$24,095
Other Services	\$31,762	\$42,482
Total	\$45,534	\$58,171

*Wage data not available

Source: U.S. Bureau of Labor Statistics

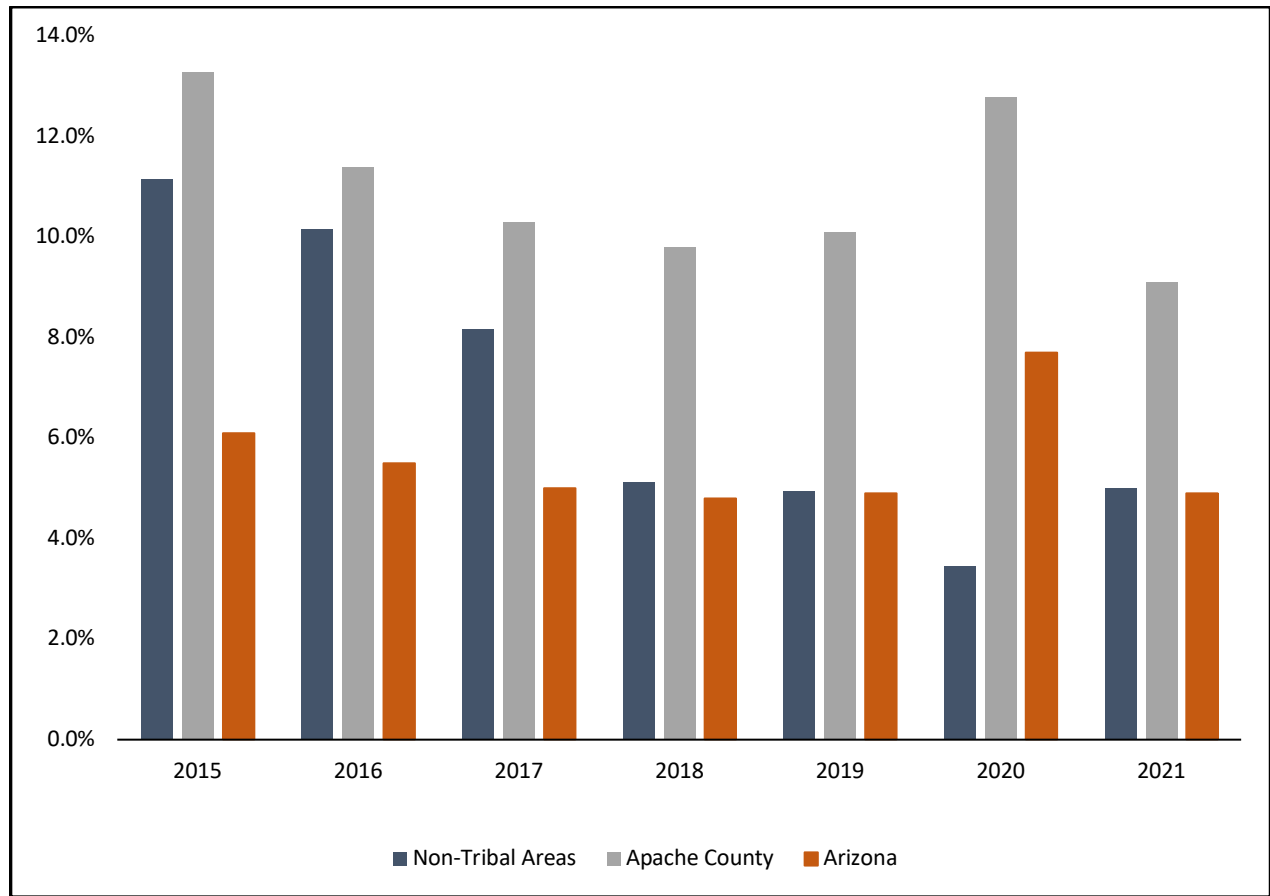
A lack of employment opportunities has historically caused above average unemployment rates in the County. However, unemployment in the non-tribal areas has steadily declined since 2015, and after a reported rate of 3.4% in 2020, the unemployment rate in the non-tribal areas rose to 5.0% in 2021, according to the U.S. Census Bureau. This compared to the statewide unemployment rate of 4.9% and an overall unemployment rate of 9.1% for the County as a whole.

Figure 7 below displays the unemployment rate in Arizona, Apache County and the non-tribal areas of Apache County. While the unemployment rate in the non-tribal areas has been lower than the rate in Arizona in recent years, this may not be due to enhanced employment conditions but rather a result of a declining labor force.

There were 5,800 people in the labor force in the non-tribal areas of Apache County in 2020, a 2.5% decline from 2019. Since 2012, the labor force in the non-tribal areas has declined at an average annual rate of 2.3%.



Figure 7: Annual Unemployment Rate in Apache County and Arizona



Source: Esri; U.S. Census Bureau; Arizona Office of Economic Opportunity



Case Studies on Enhancing Broadband

The following case studies were reviewed and summarized to provide context as to the economic effects of expanding broadband internet in rural areas. The first case study (Case Study 1) highlights the results of an analysis conducted by the University of Missouri (“UM”). In the study, UM measured the economic benefits of enhancing broadband availability in three rural counties.

The second case study (Case Study 2) highlights the results of a survey of rural small businesses in Arizona. The results of the survey are then incorporated into an economic model that measures the economic benefits to rural small businesses of broadband connectivity and online resources.

Case Study 1: Rural Missouri Broadband Investment

UM designed a study in which three rural counties, each with varying levels of broadband availability, hypothetically received an investment to expand broadband infrastructure. The study quantified not only the economic impacts (i.e., jobs, wages and economic output), but also other benefits that enhance the quality of life (i.e., savings from better healthcare and productivity savings in education due to enhanced online resources).⁶

The three counties selected for the study were Bollinger, Henry, and Nodaway. Each county represents a different region of rural Missouri. Additionally, these counties represent a mix of demographic and economic conditions, and each having a different level of broadband access. This was done to demonstrate how universal the positive impacts of enhancing broadband access can be.

The population in Bollinger County was 12,133 in 2019 and was the smallest county of the three in terms of population. The 2019 population in Henry and Nodaway was 21,824 and 22,092, respectively. The three counties had an employment base of 3,888, 11,009, and 11,975, respectively as of 2019. Select economic and demographic characteristics for each county are displayed in Table 2.

Table 2: Select Economic and Demographic Characteristics by County			
	Bollinger	Henry	Nodaway
Demographic Characteristics			
Population	12,133	21,824	22,092
Households	4,593	9,328	8,395
Share of Households with a Broadband Subscription	19.3%	48.0%	65.4%
Households without Broadband	3,705	4,848	2,907
Households with Broadband	888	4,480	5,488
Economic Characteristics			
Employment	3,888	11,009	11,975
Labor Income	\$99.3M	\$468.0M	\$448.0M
Gross Domestic Product	\$182.0M	\$722.0M	\$823.0M

Source: Economic Benefits of Expanding Broadband in Select Missouri Counties; U.S. Census Bureau, American Community Survey 2015-2019 5-Year Estimates

⁶ Economic Benefits of Expanding Broadband in Select Missouri Counties
(https://mobroadband.org/wp-content/uploads/sites/44/2021/06/Exceed_BroadbandImpactReport_Jun2021.pdf)



The UM economic model assumes that an investment in broadband infrastructure was made in each of the selected counties such that the share of households with a broadband subscription increases over 10 years under two different scenarios. A summary of the cumulative impacts of enhanced broadband availability follows.

Bollinger County:

Located in rural southeast Missouri, Bollinger County held the lowest level of current broadband adoption at 19.3% in 2019. The first growth scenario assumes the share of households with a broadband subscription increases to 29.3%. The second scenario assumes the share of households with a broadband subscription increases to 39.3%. According to the UM study, this level of broadband expansion would require a \$14.1M investment.

As a result of the increased broadband availability, a total of 460 additional households in the first scenario and 920 households in the second scenario obtained a broadband subscription over 10 years. In total, those living in the county saved between \$2.7M and \$5.3M in healthcare savings due to increased access to telemedicine by year 10.



Teachers in the K-12 education system gained a total of \$680,900 worth of enhanced productivity over 10 years from greater access to online resources.

By year 10, the enhanced economic activity from greater broadband access resulted in total employment increasing by 551 jobs under the first scenario and 957 jobs under the second scenario. Labor income, which represents the total wages and benefits earned by workers in the county, increased by a total of \$16.4M by year 10 in scenario 1 and by \$26.7M in the second scenario. Gross domestic product ("GDP") gains, or the total value of the goods and services produced in the county, totaled \$23.3M under the first scenario and \$38.7M under the second scenario.

Each of the households that adopted broadband in scenario 1 experienced an increase in annual household income of \$1,045. Those that adopted broadband in scenario 2 experienced an increase in annual household income of \$2,092 by year 10.



Table 3: Bollinger County – 10-Year Economic Benefits

	Scenario 1		Scenario 2	
	Base	+10 Years	Base	+10 Years
Basic Assumptions				
Households without Broadband	3,246	-	2,787	-
Households with Broadband	1,347	+460	1,806	+920
Share of Households with a Broadband Subscription	19.3%	+10.0%	19.3%	+10.0%
Telemedicine Benefits				
Reduced Use of Emergency Dept.	-	\$1,874,903	-	\$3,749,806
Initial Health Consult. via Internet	-	\$786,213	-	\$1,572,425
Telemedicine	-	\$10,702	-	\$21,403
Missed Work Income	-	\$13,335	-	\$26,670
Total Healthcare Related Savings	-	\$2,685,153	-	\$5,370,304
Income and Employment Benefits				
Employment Gains	3,888	+551	3,888	+957
Total Labor Income Gains	\$99.3M	+\$16.4M	\$99.3M	+\$26.7M
Total GDP Gains	\$182.0M	+\$23.3M	\$182.0M	+\$38.7M
Income Gain per Household that Adopts Broadband	-	+\$1,045	-	+\$2,092

Source: University of Missouri: Economic Benefits of Expanding Broadband in Select Missouri Counties

Henry County:

Henry County has a broadband subscription rate of 48.0% in 2019. This is relatively close to the statewide median rate which was 49.7%.

Under the first growth scenario, the share of households with a broadband subscription increased to 58.0% and 933 additional households obtained a broadband subscription by year 10. Under the second growth scenario, the share of households with broadband increased to 68.0%, and 1,866 additional households obtained a broadband subscription by year 10.

The additional online resources available to those that had access to broadband yielded over \$5.0M in healthcare savings benefits under the first scenario. Under the second scenario, a total of \$10.0M in healthcare savings was realized.





Total employment gains by year 10 in Henry County were estimated to be 1,509 under the first scenario and 2,832 under the second scenario. Under the first scenario, annual household incomes for those that gained broadband increased by \$1,017 by year 10. Under the second scenario, the annual household incomes for those that newly acquired broadband increased by \$2,168 over the same period.

Table 4: Henry County – 10-Year Economic Benefits				
	Scenario 1		Scenario 2	
	Base	+10 Years	Base	+10 Years
Basic Assumptions				
Households without Broadband	3,915	-	2,982	-
Households with Broadband	5,413	+933	6,346	+1,866
Share of Households with a Broadband Subscription	48.0%	+10.0%	48.0%	+10.0%
Telemedicine Benefits				
Reduced Use of Emergency Dept.	-	\$3,342,700	-	\$6,685,401
Initial Health Consult. via Internet	-	\$1,596,732	-	\$3,193,465
Telemedicine	-	\$44,519	-	\$89,038
Missed Work Income	-	\$40,931	-	\$81,862
Total Healthcare Related Savings	-	\$5,024,882	-	\$10,049,766
Income and Employment Benefits				
Employment Gains	11,009	+1,509	11,009	+2,832
Total Labor Income Gains	\$468.0M	+\$78.8M	\$468.0M	+\$148.4M
Total GDP Gains	\$722.0M	+\$109.4M	\$722.0M	+\$205.9M
Income Gain per Household that Adopts Broadband	-	+\$1,017	-	+\$2,168

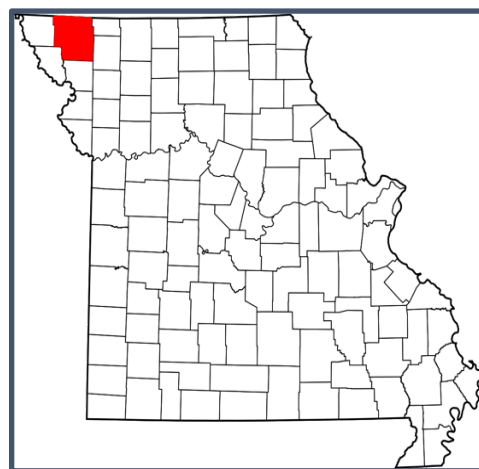
Source: University of Missouri: Economic Benefits of Expanding Broadband in Select Missouri Counties

Nodaway County

Located in the northwest corner of Missouri along the Iowa border, Nodaway County held the highest broadband subscription rate of the three counties. In 2019, 65.4% of the households in the county had a broadband subscription.

The high broadband subscription rate can be largely attributed to the presence of Northwest Missouri State University which is located in the county.

In the first growth scenario, it is assumed that an investment in expanding the broadband infrastructure in the county raised the broadband subscription rate to 72.9%, with 630 new households obtaining a broadband subscription by year 10.



The second scenario assumed that as a result of the investment, the broadband subscription rate increased to 80.4% and 1,259 new households obtained a broadband subscription by year 10.



Table 5 displays the various benefits of expanding broadband in Nodaway County under the two scenarios. The additional availability of broadband resulted in a total healthcare related savings of \$3.4M under the first scenario and \$6.8M under the second scenario.

Nodaway County will gain a total of 851 workers under the first scenario and 1,581 workers under the second scenario by the 10th year. Total economic production in the county will increase by a total of \$55.7M under the first scenario and \$102.8M under the second scenario after 10 years. The new households that obtain a broadband subscription under both scenarios will experience an increase in annual income equal to approximately \$1,045 by year 10.

Table 5: Nodaway County – 10-Year Economic Benefits				
	Scenario 1		Scenario 2	
	Base	+10 Years	Base	+10 Years
Basic Assumptions				
Households without Broadband	2,277	-	1,648	-
Households with Broadband	6,118	+630	6,747	+1,259
Share of Households with a Broadband Subscription	65.4%	+7.5%	65.4%	+15.0%
Telemedicine Benefits				
Reduced Use of Emergency Dept.	-	\$2,246,459	-	\$4,492,918
Initial Health Consult. via Internet	-	\$1,077,769	-	\$2,155,537
Telemedicine	-	\$29,919	-	\$59,838
Missed Work Income	-	\$26,209	-	\$52,417
Total Healthcare Related Savings	-	\$3,380,356	-	\$6,760,710
Income and Employment Benefits				
Employment Gains	11,975	+851	11,975	+1,581
Total Labor Income Gains	\$448.0M	+\$37.3M	\$448.0M	+\$68.8M
Total GDP Gains	\$823.0M	+\$55.7M	\$823.0M	+\$102.8M
Income Gain per Household that Adopts Broadband	-	+\$1,045	-	+\$1,046

Source: University of Missouri: Economic Benefits of Expanding Broadband in Select Missouri Counties

It is worth noting that for the three counties analyzed, the increased adoption of broadband led to an increase in the employment to population ratio for each investment scenario. In other words, an increase in the share of households that had a broadband connection resulted in an increase in employment that was larger than the increase in population over 10 years.

This indicates that enhancing broadband connectivity will encourage local economic development by supporting the expansion of local businesses. This leads to an increase in employment for existing residents and attracts an influx of new residents, which will further enhance economic development efforts. While the scenarios above are based on a predictive economic model, similar results can be expected in Apache County as a result of enhancing broadband accessibility.



Case Study 2: Importance of Adequate Broadband Infrastructure in Rural Arizona

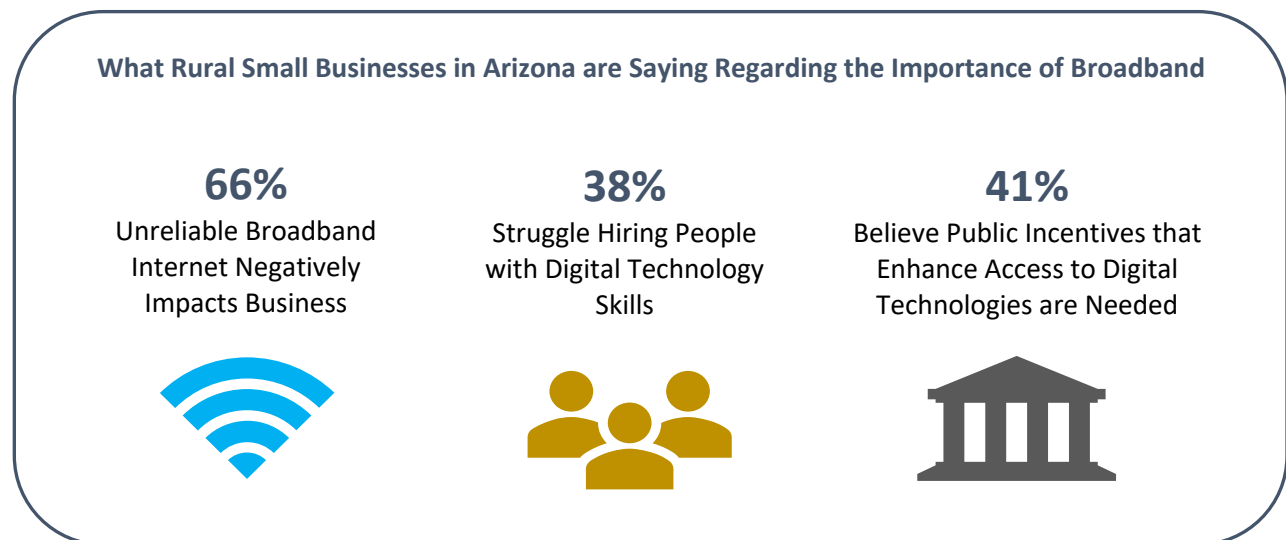
The U.S. Chamber Technology Engagement Center (“CTEC”), together with Amazon, conducted a study that estimated the economic impacts and overall importance of digital technologies (i.e., access to a broadband internet connection, online resources, etc.) to rural small businesses in Arizona.⁷

The study also estimated the potential economic impacts of increased access to digital technologies to rural small businesses as well as unrealized economic gains that were lost to rural small businesses as a result of inadequate access to digital technologies.

The results of this study provide additional context as to the importance of broadband access among rural communities in Arizona. Given the significant economic cost of limited access to digital technologies, it will become increasingly more important to provide broadband infrastructure to the rural communities to close the broadband availability gap between the state’s rural and urban areas.

An inferior current broadband infrastructure coupled with Apache County’s underperforming economic status leave the county particularly vulnerable to increasing economic gaps as the economy changes to adopt more technology.

According to the study, 66.0% of rural small business owners in Arizona state that poor or unreliable internet connectivity negatively impacts business operations. Approximately, 38.0% of business owners struggle finding a workforce that has adequate experience operating digital technologies and 41.0% of Arizona’s small business owners believe that policymakers need to create public incentive programs (i.e., grants, subsidies, etc.) that make it easier for rural small businesses to incorporate digital technology into their daily operations.



Source: U.S. Chamber of Technology Engagement Center, Unlocking the Digital Potential of Rural America

⁷ Unlocking the Digital Potential of Rural America

(<https://americaninnovators.com/wp-content/uploads/2022/04/Unlocking-the-Digital-Potential-of-Rural-America.pdf>)

(https://americaninnovators.com/wp-content/uploads/2019/03/rural_report_factsheet_AZ.pdf)



Expanding the availability of digital technologies to rural small businesses in Arizona has the potential to produce an additional \$680.0M in annual sales, add nearly 3,400 jobs, pay \$139.9M in additional wages and generate an additional \$394.0M in gross state product (“GSP”) for the state each year.

These impacts will be realized as access to broadband internet and other digital technologies enhances business operations, provides the workforce in rural areas with development opportunities and generates additional economic activity.

According to estimates of the CTEC, there is also a cost associated with the lack of access to digital technologies on behalf of Arizona’s rural small businesses in the form of opportunity losses. Over the previous three years, it was estimated that Arizona forwent approximately \$591.0M in annual sales, nearly 3,000 jobs and \$342.1M in GSP per year due to inadequate broadband.

Table 6 details the economic impacts of digital technologies on rural small businesses in Arizona.

Table 6: Economic Impact of Digital Technologies on Rural Small Businesses in Arizona		
	Opportunity Cost ¹⁾	Potential Gains ²⁾
Sales	\$626.1M	+\$680.0M
Economic Output	\$362.6M	+\$393.9M
Jobs	3,111	3,379
Wages	\$121.5M	+\$139.9M

1) The costs associated with inadequate broadband internet access in rural Arizona.

2) Potential impacts of expanding the availability of digital technologies to rural small businesses in Arizona.

Source: U.S. Chamber of Technology Engagement Center, Unlocking the Digital Potential of Rural America



Enhancing Broadband Access in Apache County

Improving broadband infrastructure throughout Apache County will enhance the County's competitive position related to business recruitment and retention and increase commercial and economic activity. These benefits will lay the foundation upon which economic development strategies can be formed.

Broadband access will also provide residents with greater opportunities for educational advancement, better access to healthcare, enhanced communication with public safety and emergency services, and an improved quality of life overall. These benefits are critical to reversing the trend of a declining population and stagnant employment growth in the County.

How Broadband Affects Economic Growth as a Whole

As discussed previously, reliable access to a broadband connection is rapidly becoming a primary pillar of overall economic growth. Together with adequate transportation infrastructure and workforce development, broadband access helps to build a stable foundation upon which Apache County can grow.

Enhanced broadband access will increase business development throughout the County, generate additional economic activity and provide the County's workforce with opportunities for additional development and education. This new growth will help to diversify the County's economy instead of a large concentration of the workforce being employed by a single industry or business. This diversification will enhance the resiliency of the economy and mitigate the negative impacts of business cycle downturns.

With the creation of new business development throughout rural Apache County, the need for adequate transportation infrastructure becomes critical. New businesses created through the use of broadband internet create additional economic activity that will generate additional traffic throughout the County to support this growth.

For example, transportation improvements to roadways into rural communities allows for an increased flow of commercial activity into the area derived from the direct broadband business activity. The new business development spurs supporting business activity and generates new tax revenues that can be used towards additional transportation and broadband improvements.

Improving transportation infrastructure and improving broadband are similar in that both require a significant capital investment. In order to mitigate the total cost, improvements to transportation infrastructure and improvements to broadband infrastructure are often completed at the same time.

A study from Pepperdine University, indicates broadband and transportation infrastructure investments are a driving force for business creation and development. Additionally, the rate of business development accelerates in rural counties as broadband becomes more available.⁸

Many of the roads in Apache County are in need of improvements. According to a study conducted by the Arizona Association of County Engineers ("AACE"), approximately 17.0% of the roads in the County are in poor/very poor condition. Over the next 10 years, the County will need to invest a total of \$73.5M into the

⁸ Pepperdine University, The Importance of Transportation, Broadband, and Intellectual Infrastructure for Entrepreneurship (<https://digitalcommons.pepperdine.edu/cgi/viewcontent.cgi?article=1067&context=sppworkingpapers>)



County's transportation infrastructure in order to improve and maintain the existing roadway system.⁹ This presents an opportunity to coordinate efforts and improve broadband infrastructure at the same time.

The transportation investments are vital to Apache County as the road networks assist the flow of people, commerce, and services throughout the region. Coupling the improvements with broadband development will further amplify the level of economic impacts experienced in the region.

The Arizona Department of Transportation ("ADOT"), together with the Arizona Commerce Authority ("ACA") has developed a strategic plan that seeks to address broadband coverage gaps throughout the state while improving the transportation infrastructure of major interstates and state routes. In this strategic plan, both the Interstate 40 and the State Route 191, which traverse Apache County, were identified as potential targets for additional transportation infrastructure and broadband investment.¹⁰

Broadband Infrastructure Availability vs Utilization

In 2021, an estimated 77.6% of those living in the County had a broadband connection in their home.¹¹ This compares to the statewide average of 89.2% of households. The difference is even smaller if only the non-tribal areas of the County are considered. An estimated 86.1% of those living in the non-tribal areas of the County had a broadband connection at their house.

The purpose of an investment in broadband services in Apache County should not solely be focused on enhancing the availability of broadband infrastructure. Efforts should also be aimed at increasing the access to current infrastructure that County residents have but cannot afford. Improving overall access will likely require the installation of new broadband infrastructure (i.e., laying cables, installing distribution centers, nodes, and receivers, etc.) as well as making the existing broadband services more attainable financially for residents.

As previously mentioned, 86.1% of those living in non-tribal areas of the County had a broadband connection. This is only slightly below the statewide average of 89.2%. However, this estimate does not account for the fact that for many residents the only internet access available is through a satellite or cellular connection. These sources often generate a less reliable connection and scarcely generate a connection strong enough to maintain a broadband speed. It is in these areas that new broadband infrastructure may be required.

On the other hand, there are areas of the County with sufficient broadband infrastructure to provide households with a reliable fixed connection via DSL or fiber cables. However, the costs of these services can be prohibitive for many households. This is particularly true in Apache County where the median household income is below the statewide median and the cost of broadband service in Apache is similar to costs in the more populated areas of the State.

In other words, County residents are required to spend a disproportionately large share of their income on broadband access compared to other areas of Arizona. This is a difficult requirement for households that already have limited resources. Therefore, a portion of the effort to enhance broadband should be dedicated to reducing the financial strain of accessing existing broadband services.

⁹ Arizona Association of County Engineers, Roadway Needs Study (https://cdn.ymaws.com/www.azace.org/resource/resmgr/docs/2018_aace_roadway_needs_asse.pdf)

¹⁰ Arizona Statewide Broadband Middle-Mile Strategic Plan (<https://www.azcommerce.com/media/vvslgr2e/aca-broadband-strategic-plan-final-2-2-22.pdf>)

¹¹ Esri; Growth for Knowledge



Additionally, data sources that utilize information collected through Microsoft's Cloud Services provides an estimate of the broadband *usage* rate for Apache County. The usage rate does not account for those who have access to a broadband internet connection; only counting those that are *utilizing* broadband.

It is estimated that the broadband usage rate in Apache County was approximately 5.0%, as of 2020 (latest available data).¹² In other words, only 5.0% (or 3,600 people) in the County actually utilized broadband internet. This compared to a usage rate of 54.2% for the state of Arizona.¹³

The utilization figure provides additional context into the broadband needs of Apache County. While there appears to be a need for improved access to more reliable forms of broadband, there is also a need to assist people and businesses with actually connecting to services. Surveys of the population and business community could help to explain what the primary deterrents are to gaining access.

Economic Modeling Scenario – Increased Utilization

Multiple economic models were used to produce scenarios for the potential economic gains related to improved broadband access within the County. The first model is similar to the one developed by UM and was adjusted for Apache County.

Within this first modeling approach, three different broadband usage scenarios were analyzed. The first estimates the impacts that occur as a result of the broadband usage rate increasing from 5.0% to an overall usage rate of 7.5%.

The second analyzes the effect of a 100% increase in the usage rate (i.e., an overall 10% usage rate) and the third analyzes the impacts if the usage rate in Apache County rose to the statewide average (54.2%). This last scenario is not economically feasible, but it does provide context into the economic gains at that scale of broadband access.

For each scenario, it is assumed that there will be a 10-year “ramp up” period where broadband usage initially increases rapidly following infrastructure improvements and then stabilizes after year 10. The various impacts are defined in terms of new broadband users, employment, labor income, economic output, and healthcare savings. A brief description of the impacts is included below.

- *New Broadband Users* is the number of additional broadband users under each usage scenario.
- *Employment* is the number of jobs (full- or part-time) added to the economy after 10 years. Employment will rise as businesses expand and locate in the area as a result of the improved infrastructure.
- *Labor Income*, a component of output, represents employee-earned income and wages. The labor income component is used to measure the total change in income throughout the economy due to economic or business activity.
- *Economic Output* captures the broader level of economic activity or the total value of goods and services produced in the region, similar to how statistics like GDP capture economic volume in individual states and across the country.

¹² Microsoft Cloud Services Broadband Usage Dataset

¹³ Microsoft Cloud Services Broadband Usage Dataset



- Healthcare Savings is the total savings that occur as a result of greater access to telemedicine over 10 years. These savings are generated through fewer visits to the doctor's office, emergency room, physical therapy visits, etc. These appointments and visits incur costs in the form of transportation expenses (i.e., fuel, time, vehicle depreciation, etc.) and lost income (i.e., having to miss work for the appointment).
- Education Savings occur in the form of productivity gains by teachers who can use online resources to improve efficiency, saving time and covering the curriculum in more depth. Students also benefit from increased resources for learning materials and greater access to the teacher and other students.

Table 7 displays the cumulative impacts of each broadband investment scenario after 10 years. Under the first investment scenario, broadband infrastructure is enhanced such that the overall usage rate in the County increases from 5.0% to 7.5%. This means that by year 10, a total of 1,800 additional people would be utilizing a broadband connection.

The increase in economic and business activity as a result of the enhanced broadband will produce an estimated 800 additional jobs, \$35.3M in additional wages, and \$50.2M in additional economic output by year 10. Increased access to telemedicine and other online resources would generate a total of nearly \$3.0M in healthcare savings and \$583,500 in education related productivity benefits.

The second investment scenario assumes that the usage rate in the County increases from 5.0% to 10.0%. Under this scenario, an additional 3,600 people will utilize a broadband connection. By year 10, the resulting economic activity will generate a total of 1,500 additional jobs, \$70.3M in additional wages, and nearly \$100.0M in additional economic output. County residents will benefit from a total of \$6.0M in healthcare savings over 10 years. The cumulative productivity gains for teachers and students would be valued at nearly \$1.2M over 10 years.

For additional context, consider the following. If the broadband usage rate in Apache County was increased to 7.5%, the resulting economic growth would replace the jobs lost by the closure of the Coronado Generating Station in 7 to 8 years. The additional jobs created from enhanced broadband will be important in helping the County transition toward a sustainable and resilient economy.

Note: The gains related to additional workforce development and transportation infrastructure improvements in the County will be calculated in a subsequent white paper. For analysis purposes, it is recommended that the 7.5% scenario be utilized. The previous grant application identified that the \$10.2M in requested funding would result in approximately 14,400 new broadband users.

Table 7: Cumulative Impacts of Select Broadband Infrastructure Investment Scenarios in Apache County

	7.5% Usage Rate	10% Usage Rate	Reaching Arizona Usage Rate
New Broadband Users	1,800	3,600	35,300
Employment	800	1,500	14,300
Labor Income	\$35,304,100	\$70,305,800	\$648,968,400
Economic Output	\$50,200,800	\$99,946,000	\$923,151,300
Healthcare Savings	\$2,998,500	\$5,997,000	\$59,000,900
Education Savings	\$583,500	\$1,167,100	\$11,483,800

Source: U.S. Census Bureau; University of Missouri; Rounds Consulting Group, Inc.



Economic Modeling Scenario – Incremental Growth

The second modeling scenario involved an economic and fiscal impact model developed to analyze the effects resulting from the expansion of broadband services in Apache County. The model calculates the direct and multiplier effects resulting from the expected capital investments (i.e., the construction impacts) and improvements to population and employment projections over a 10-year period (i.e., the ongoing impacts).

The impacts are estimated in terms of jobs, labor income, economic output, and tax revenues. *Jobs* refers to the number of jobs supported by the activity on an annualized basis. *Labor income* is the aggregated employee-earned income and wages. *Economic output* refers to the total value of all the economic activity that is generated by certain activities over a given time period (similar to how GDP measures economic activity). *Tax revenues* is the sum of all state and local (county and city) tax revenues generated by the activity being analyzed.

The following outlines the economic and fiscal impacts of the Incremental Growth Model.

Economic and Fiscal Impacts of the Incremental Growth Model:

Investments in broadband will have both short- and long-term impacts. During the initial capital investments in constructing the necessary broadband infrastructure, Apache County and local communities will realize one-time job, labor income, economic output, and tax revenue impacts.

Approximately 132 jobs will be supported by the one-time construction and capital investments required to enhance broadband service in Apache County based on an estimated \$10.2M in capital expenditures (a conservative estimate for the funds needed to enhance broadband service). This will add \$6.8M in labor income (i.e., the total employee-earned wages and benefits) to Apache County and local communities. The initial activity will produce \$18.5M in economic output and \$1.0M in state and local tax revenues.

Table 8: Construction Impacts				
Impact Source	Jobs ¹⁾	Labor Income ²⁾	Economic Output ³⁾	Tax Revenues ⁴⁾
Total Construction Impact	132	\$6.8M	\$18.5M	\$1.0M

1) Full-time equivalent jobs.

2) Salaries and wages plus benefits.

3) Total value of economic activity produced.

4) Sum of state and local (county and city) tax collections.

Note: May not sum to total due to rounding. In 2022 dollars.

Source: Arizona Department of Revenue; IMPLAN; Rounds Consulting Group, Inc.

As of 2021, there were approximately 66,410 people living and 16,830 individuals employed within Apache County. According to the OEO, by 2030, the population of the County is projected to decrease at an average annual rate of 0.2%, approximately 1,210 fewer residents compared to the current population level. Employment is expected to increase by 330 workers and grow at an average annual rate of 0.2% over the same time period.

Enhancing broadband service in Apache County will enable local companies to expand their operations, create new business and industry development opportunities, increase tourism activity, attract new residents, and help improve the health and wellbeing of the community by providing access to telehealth



and educational opportunities. This will lead to new jobs and attract new residents to Apache County. These conditions equate to an increase in the annual employment growth rate from 0.2% to approximately 0.8%.

The following table displays the current population, employment, labor income, economic output, and tax revenue levels, as well as the projected levels under a scenario without broadband enhancements, and a scenario with the aforementioned improvements to Apache County's growth rates. The differences in the estimates represent the gains or lost opportunities associated with the broadband enhancements.

By 2030, as higher education is more readily available through virtual learning and businesses expand in the region, new higher value-added jobs will be created in Apache County. This will raise average wages and create additional spinoff jobs. Under the scenario with the broadband enhancement, employment in Apache County will increase by approximately 1,060 (compared to the 330 increase that is currently projected under the status quo). This represents a broadband job impact equal to 730. This closely approximates the new job generation estimate under the scenario of 7.5% broadband access (see Table 7).

Apache County's outflow of residents will also be reduced as job opportunities arise. By 2030, the population is projected to increase by 980 persons with broadband enhancements, compared to the decline of 1,210 that is currently projected under current conditions.

The development of a reliable broadband network will increase Apache County's labor income by \$86.8M (compared to \$14.7M estimated based on current projections) and increase economic output by \$185.5M (compared to the \$31.4M estimated based on current projections) each year by 2030.

If a reliable broadband network is established in Apache County, by 2030, approximately \$3.2M in additional annual tax revenues will be collected by the state and local governments (compared to the estimated \$855,900 estimated based on current projections). A breakdown of the state and county tax revenues is displayed in Appendix A.

Note: Impacts were calculated based on conservative assumptions derived from industry standards, currently available information, and local tax structures. Such information was compiled from a variety of sources and is subject to uncertainty and variation. Therefore, actual impacts may vary, and some impacts may not materialize due to unanticipated events and changing circumstances.



Table 9: Economic and Fiscal Impact Summary

	2021 – Current Levels ⁶⁾	2030 – Current Projections ⁷⁾		2030 – Enhanced Projections ⁸⁾	
	Annual Estimate	Annual Estimate	Net Change	Annual Estimate	Net Change
Population ¹⁾	66,410	65,200	-1,210	67,400	+980
Jobs ²⁾	16,830	17,160	+330	17,890	+1,060
Labor Income ³⁾	\$747.2M	\$761.9M	+\$14.7M	\$835.4M	+\$86.8M
Economic Output ⁴⁾	\$2.2B	\$2.2B	+\$31.4M	\$2.3B	+\$185.5M
Tax Revenues ⁵⁾	\$43.7M	\$44.5M	+\$855.9K	\$46.9M	+\$3.2M

1) Population is the number of residents living within Apache County.

2) Jobs is the total number of full-time equivalent workers in Apache County.

3) Labor income is the total employee-earned wages and benefits in Apache County.

4) Economic output is the total value of economic activity produced in Apache County.

5) The sum of the state and local (county and city) tax revenues generated in Apache County by employee induced state personal income taxes, sales taxes, local property taxes, vehicle taxes and fees, and State Shared Revenues.

6) Current levels represent current estimates as of 2021.

7) 2030 projections based on Arizona Office of Economic Opportunity estimates.

8) 2030 projections based on a scenario with broadband enhancements.

Note: May not sum to total due to rounding. In 2022 dollars.

Source: U.S. Census Bureau; U.S. Bureau of Labor Statistics; U.S. Bureau of Economic Analysis; Arizona Department of Revenue; Arizona Office of Economic Opportunity; IMPLAN; Rounds Consulting Group, Inc.



Appendix A: Incremental Growth Details

The following table displays the annual tax revenues that will be generated in 2030 based on the enhanced projections enabled by broadband.

Table 10: 2030 Annual Fiscal Impact - Enhanced Projections				
	Arizona	Apache County	Local Municipalities ⁶⁾	Total
Sales Taxes ¹⁾	\$15,196,700	\$751,900	\$2,877,600	\$18,826,200
Personal Income & Payroll Taxes ²⁾	\$23,835,600	-	-	\$23,835,600
Property Taxes ³⁾	-	\$428,900	-	\$428,900
Vehicle License Tax & Fees ⁴⁾	\$3,122,300	-	-	\$3,122,300
State Shared Revenues ⁵⁾	-	\$376,000	\$354,400	\$730,400
Total	\$42,154,600	\$1,556,800	\$3,232,000	\$46,943,400

1) Sales taxes generated by employee spending.

2) Personal income taxes and payroll taxes generated by employee wages.

3) Property taxes levied on employee-owned real estate.

4) Vehicle license taxes and fees levied on employee-owned vehicles and use.

5) State Shared Revenues include state direct, indirect, and induced employee generated income taxes, sales taxes, and other tax monies distributed to counties and cities (based on their population).

6) The sum of all Eagar, St. Johns, and Springerville tax collections.

Note: May not sum to total due to rounding. In 2022 dollars.

Source: Arizona Department of Revenue; IMPLAN; Rounds Consulting Group, Inc.



Appendix B: Model Methodology & Assumptions

Economic and fiscal impact models are an effective way to demonstrate the regional implications of a particular project, policy, business, development, or other activities in a given area. The study area can range from a single neighborhood or city to an entire state or country. Typically, the level of effects resulting from the activity is estimated in terms of output, labor income, employment, and tax revenues.

RCG developed an economic and fiscal impact model to analyze the effects resulting from the expansion of broadband services in Apache County. The RCG proprietary model employs an input-output model methodology commonly used by economists to determine impacts. This method was used to estimate the “multiplier” or “ripple” effects caused by the activities being analyzed. The activity was then converted into tax revenues in each of the relevant categories.

Economic Impact Methodology

An economic impact model provides a quantifiable method to estimate the economic activity of a particular activity in a given area. Impacts can be used to measure existing activity and to measure potential expansions/contractions of an area’s economy resulting from changes in economic activity. Typically, the level of economic effects resulting from the activity is estimated in terms of *output*, *labor income*, and *employment*. These are defined as:

- *Output* captures the broader level of economic activity or the total value of goods and services produced in the region, similar to how statistics like gross GDP capture economic volume in individual states and across the country.
- *Labor income*, a component of output, represents employee-earned income and wages. The labor income component is used to measure the total change in income throughout the economy due to economic or business activity.
- *Employment* is the total number of full-time (or equivalent) jobs created in the economy on an annualized basis.

The economic effects occurring as a direct consequence of the initial activity create additional activity in the regional economy. This relationship is known as the “multiplier” or “ripple” effect. The basis for multiplier effects is the interdependencies between industries, how one industry impacts other sectors, and the cycle of spending and re-spending within the regional economy.

An input-output model is used to generate these multipliers. These multipliers quantify relationships among industries and estimate the extent that the area being analyzed can capture sales, labor income, and the job impacts within the region.

Input-output models measure impacts based on their source. *Direct* effects are the result of the initial activity being analyzed. The multiplier effects, or secondary effects, are measured as either *indirect* or *induced*. These are defined as:



- *Direct effects, or impacts*, measure business activity at an individual site or the initial change in the economy attributed to the development under consideration. For example, this would include the impacts generated from the new businesses that will relocate or expand in Apache County.
- *Indirect impacts* capture additional output, labor income, and employment changes generated as a result of increased demand in the industries which supply services or products to the direct business or development under consideration. For example, this would include the workers employed by supplier companies that provide goods and services to the new direct businesses.
- *Induced impacts* capture additional output, labor income, and employment changes generated as a result of increased spending in the local economy made by the households of both the direct and indirect employees. For example, the additional wages received by the direct employees and the indirect supplier employees induce spending at grocery stores, gas stations, clothing stores, etc. These induced companies respond by hiring, increasing payroll hours, and increasing wages.

A commonly used input-output model used to generate economic multipliers is IMPLAN (short for “impact analysis for planning”). Originally developed by the U.S. Forest Service in the 1970s, the responsibility for developing IMPLAN data sets shifted to the University of Minnesota as demand grew for regional models. Now, IMPLAN runs as a private organization and is the leading provider of nationwide economic impact data and analytical software.

The RCG custom economic impact model employs this input-output model methodology and uses Arizona-specific IMPLAN multipliers.

Fiscal Impact Methodology

Fiscal impact models provide estimates for the government revenues that are generated by a particular project, policy, business, development, or activity in a given area. Typically, fiscal impacts examine revenues that are likely to result from a project or activity and are determined by the study area’s tax structure. In general, the types of government taxes analyzed include sales taxes, excise taxes, lease taxes, income taxes, and property taxes. The type of activities subject to these taxes include payrolls, retail sales, utility use, leases, and construction, to name a few.

Fiscal impacts are categorized similar to economic impact studies and are broken down at the direct, indirect, and induced levels in which they are created. In general, direct revenues can be estimated by definable sources such as sales taxes generated by taxable business expenditures and direct employees’ retail purchases. Indirect and induced revenues are generated by the wages, residency, and spending of those indirect and induced employees who are supported by the direct economic activity.

The RCG fiscal impact model employs this methodology. The model was designed to produce revenue information for the state and local governments.

The data and assumptions used in this report are subject to marginal uncertainty and variation. Therefore, actual impacts may vary, and some impacts may not materialize due to unanticipated events and changing circumstances. However, RCG has made extensive efforts to confirm the accuracy of the information contained in this analysis.



Modeling Assumptions

In order to identify the extent that employment in a sub-group will be impacted, such as those significantly tied with rural broadband access, an estimate for the current employment base must be calculated. One study that was conducted in 2016 (see *The Economic Impact of Rural Broadband* below) calculated that Arizona's rural regions have approximately 1,100 jobs that are directly tied to the provision of broadband infrastructure and supporting services.

The estimated 1,100 jobs (expanded to 1,250 as of 2021) do not include those industries and occupations that utilize broadband infrastructure. Additional broadband will allow for the current employment base to expand because of the efficiencies created by the investment. Furthermore, the lack of telecommunication infrastructure in the region has dampened the ability of the higher wage industries to develop.

Thus, broadband will not only grow the current employment sectors but will also add new sectors to the region. This can be captured by comparing rates of growth for the State vs. the region, and making assumptions on the extent the region will begin to grow at a rate more consistent with the State as a whole.

The OEO currently estimates that the region will grow its employment base by a very weak 0.2% each year, deriving from the lack of infrastructure resources. If the region matches the State's employment growth rate for the remainder of the decade under a scenario of more broadband infrastructure, the average annual rate of growth would be 2.4%.

However, reaching 2.4% will require investment in broadband as well as roads and workforce training. If the 2.4% rate of growth were reduced to 1/3 of the 2.4%, consistent with its role related to growth opportunity, the average annual rate of growth for the region would be 0.8%. This equates to 1,060 new jobs over the next decade.

The additional 1,060 jobs are modeled in this study. However, access to broadband, if combined with other economic development investments such as transportation infrastructure and workforce development, will further accelerate the employment growth within the County. This means that the estimate included in this study should be considered conservative.

Additional Sources:

- Hanns Kuttner, *The Economic Impact of Rural Broadband*, Hudson Institute, 2016, <https://s3.amazonaws.com/media.hudson.org/files/publications/20160419KuttnerTheEconomicImpactofRuralBroadband.pdf>
- Mark A Jamison, Ph.D., *The Impact of Broadband Investment in Rural America*, American Enterprise Institute, Statement before the Senate Committee on Commerce, Science and Transportation Subcommittee on Communications, Technology, Innovation, and the Internet, 2019, <https://www.commerce.senate.gov/services/files/56720C75-388E-467E-9582-A259AB2862AD>