



Number 8
SEPTEMBER
2020

Built by E-Rate

A Case Study of Two Tribally-Owned Fiber Networks and the Role of Libraries in Making It Happen

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Abstract

Just over half of Native Americans living on tribal lands have access to high-speed internet service.¹ Tribal libraries and schools in New Mexico joined together to address their connectivity challenges and bring broadband to their respective communities. A key factor facilitating the deployment of the broadband infrastructure is the modernization of the Federal Communications Commission's E-rate program. Additional factors necessary to successfully plan and execute broadband infrastructure projects include managing collaborations and stakeholder involvement. The library contributions to the networks' success provide inspiration and a model for overcoming barriers to broadband availability and affordability in tribal and rural communities. Key takeaways and lessons learned are discussed. Recommendations for federal and state agencies to improve and increase their support of tribal libraries generally and their participation in the E-rate program specifically are provided.

Executive Summary

Six tribal libraries and two schools in north-central New Mexico aggregated their demand for broadband and built two tribally-owned and -operated, 60-mile fiber-optic networks. The first tribal projects of their kind since the Federal Communications Commission (FCC) launched the E-rate modernization in 2014, and the largest E-rate award in the state of New Mexico in 2016—the high-speed broadband networks deliver superior speeds at significantly lower costs, with an ability to scale their usage to meet future broadband demand. (See [Box 1](#) for the consortia network maps).

Tribal libraries were critically important in the development of these broadband networks. Tribal libraries reside at the heart of their communities in every sense—from their central location within their pueblos, to their core functions of language preservation and

learning. They played a key role in building trust among their tribal leadership and educating leaders about the value of connectivity for their communities. With the complexities, challenges, and duration of these E-rate projects, tribal libraries provided a collective voice on the importance of broadband, and they continue to play a vital role in digital inclusion and digital literacy efforts, bridging generational divides and integrating new technologies to support their traditional communities.

Even though most tribal libraries have temporarily closed in response to Covid-19, they have remained a gateway for connectivity. Leaving their WiFi networks on, community

"We have gone beyond being known as the underserved and want to step it up and be known as equally served across Indian Country. For me as a tribal member bringing fiber optics to Pueblo land, we will be known as equally served for the future."

—Cynthia Aguilar, librarian of Santo Domingo Pueblo Library

members continue to access the signals from library parking lots, at a time when internet connectivity has been more critical than ever for accessing education, health resources, and connecting socially.

As with the development of all library broadband networks, no one person or organization bore sole responsibility for the creation of these two tribal broadband networks. Making them a reality required leadership, cooperation, and coordination across federal, state, and tribal levels. Reaching agreements with neighboring tribes and managing the implementation of the networks across tribal lands required significant time and attention. External support also was needed—ranging from learning about the new E-rate rules and application process to adhering to E-rate requirements as well as state and federal regulations during the construction phase. The success of this broadband infrastructure build-out depended on assembling a diverse

team, leveraging existing relationships, and developing new partnerships.

By working together to build the infrastructure, the tribes gained many benefits. Applying as consortia yielded far greater results than operating alone. The tribes were able to share resources, such as IT expertise, as well as allocate rights-of-way and codify their legal agreements as necessary.

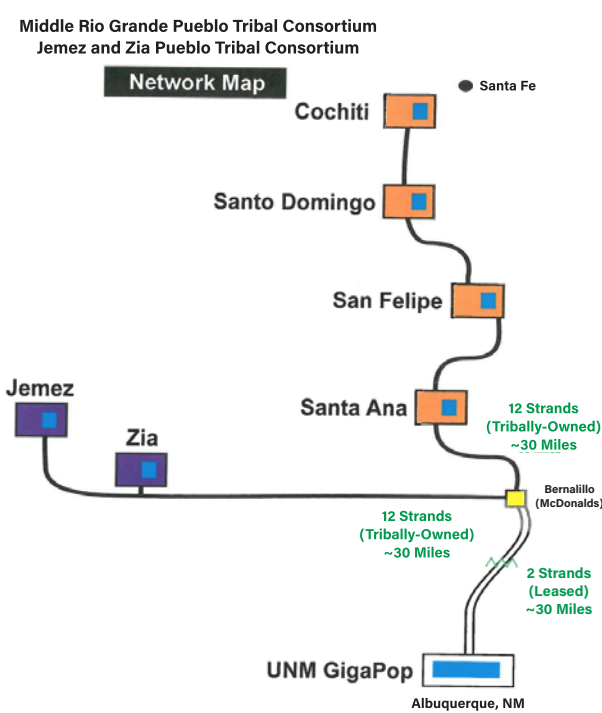
The tribes also were able to plan their networks to maximize fiber connectivity.

The design of the networks was an integral component to their success. Combining self-provisioned fiber and leased dark fiber to construct their networks, the consortia dramatically increased their access to the internet. By connecting their networks to a major internet interconnection point, rather than the nearest service line, they gained numerous efficiencies and near-limitless capacity. Tribal libraries and schools will have the ability to scale their usage over time, based on demand, without a corresponding increase in costs as their usage increases. This flexibility opens countless opportunities for libraries and schools to add new services as well as gain access to advanced education networks, including Internet2.

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BOX 1. Consortia Network Maps

Forming two separate consortia, tribal libraries and schools in six pueblos aggregated their demand for broadband and built two tribally-owned and -operated, 60-mile fiber-optic networks. Each consortium received 95 percent of their funding, roughly \$3.9 million of the \$4.2 million total costs, from the E-rate program; state and tribal matches contributed the remaining amount. As a result of their network design, the consortia dramatically increased their internet access speeds (from 3 Mbps to 100 Mbps) and decreased costs (from \$106/Mbps to \$3/Mbps), with ability to scale up to 10 Gbps.



The Middle Rio Grande Pueblo Tribal Consortium connects 4 tribal libraries in the Pueblos of Santa Ana, San Felipe, Santo Domingo, and Cochiti, located between Santa Fe and Albuquerque. This network consists of 30 miles of self-provisioned fiber built across the four pueblos and extends 30 miles south via a connection to leased dark fiber, reaching the Albuquerque GigaPop, operated by the University of New Mexico. The Jemez and Zia Pueblo Tribal Consortium connects 2 tribal libraries and 2 charter schools to the west, using a similar combination of 30 miles of self-provisioned fiber through the two Pueblos Jemez and Zia, and continues 30 miles south with leased dark fiber before also joining the GigaPop in Albuquerque.

The American Library Association (ALA) carried out this case study for several reasons. Among the broad range of libraries represented by the ALA and its affiliates, tribal libraries are the least connected. As the work of libraries demands robust and reasonably priced broadband for the education, employment, entrepreneurship, and empowerment of local communities, advancing policies and programs that support the increased demand for broadband access is a central priority. Furthermore, solutions that bring high-speed internet access to libraries on tribal lands also can benefit public libraries in rural and remote locations facing similar broadband access challenges. Special construction through E-rate—though far from a simple or standard solution—may be the only cost-effective option for small, rural, and remote communities that struggle with limited, expensive, or unavailable broadband access.

While E-rate modernization offers greater flexibility in choosing how to acquire broadband connectivity,

Special construction through E-rate—though far from a simple or standard solution—may be the only cost-effective option for small, rural, and remote communities that struggle with limited, expensive, or unavailable broadband access.

the implementation of special construction projects, especially on tribal lands, is not without challenges. In addition to a steep learning curve for the E-rate program, the management of special construction E-rate projects requires significant time and leaves little room for error. Administrative mistakes or omissions can result in projects being delayed or denied. Furthermore, implementing telecommunications projects on tribal lands adds another layer of complexity, as broadband deployments are often subject to regulations from different federal and state agencies. While much-needed updates to regulations governing rights-of-way agreements on tribal lands are improving previous barriers to advanced telecommunications deployments, these additional requirements increase the time and expense of these projects and often require outside expertise to assist with their implementation.

Drawing on the challenges and lessons learned from the network projects, three sets of recommendations are offered to enhance support for tribal libraries and their participation in the E-rate program. These recommendations cut across state and federal agencies and focus on three areas: promoting awareness of E-rate opportunities and processes; advocacy for the eligibility and inclusion of tribal libraries in E-rate opportunities and initiatives; and technical support



Ploughs are able to 'sew' the conduit into the ground by cutting a 6" opening to lay the conduit at depth without the labor costs and invasiveness of a backhoe to complete the same job.



Kelly Cable of NM Directional drilling equipment utilizes trenchless technology on the Jemez-Zia project to install the conduit for the fiber optic cable across rugged terrain, such as arroyos, or under roads.

throughout E-rate application and implementation steps.

First, and foremost, the FCC must revise the definition of tribal libraries to be in keeping with the language in the 2018 reauthorization of the Museum and Library Services Act (MLSA) amending the definition of a library, so as to increase the number of tribal libraries that are eligible to participate in the E-rate program. Second, the FCC should improve training opportunities for tribal libraries to increase awareness of and participation in the E-rate program. Third, to maximize broadband opportunities at the federal and state levels, the Institute of Museum and Library Services (IMLS) is urged to convene workshops and increase support for tribal libraries to learn from and share experiences of the benefits of increased broadband connectivity. Finally, states are encouraged to support tribal libraries by explicitly including tribal libraries in state level initiatives and funding opportunities, as well as by lending technical and administrative assistance to tribal library E-rate application processes and procedures.

The case study begins with an overview of the limited availability of broadband on tribal lands and describes how the modernized E-rate program is helping to bring connectivity to tribal libraries and schools. Next, the case study details important elements in the development of E-rate broadband networks like this one, including: the roles and responsibilities of tribal libraries and the diverse team involved, the external support received during different phases of the E-rate projects, and the importance of managing

collaborations and stakeholder involvement for the successful planning and execution of E-rate supported broadband infrastructure projects. The case study also considers implementation challenges specific to special construction projects in tribal areas. And, it provides an update on the tribal broadband networks and new applications, which high-speed internet has allowed these tribal libraries to develop and support. The case study concludes with the key takeaways and lessons learned as well as recommendations for federal and state agencies to improve and increase their support of tribal libraries generally and their participation in the E-rate program specifically.

Tribal Communities are the Least Connected to High-Speed Broadband

Just over half of Native Americans living on tribal lands have access to high-speed internet service.² This is far below the national average, of 78 percent, and well below the average rate in rural counties, of 65 percent. Recent data from the U.S. Census Bureau reveal the severity of the digital divide in Indian Country³—a divide that appears to be even wider than previous estimates.⁴

The lack of consistent and reliable data increases the difficulty of addressing the digital divide. And, as new research by the American Indian Policy Institute (AIPI) at Arizona State University underscores, there are multiple digital divides—ranging from insufficient broadband access due to outdated infrastructure, to unreliable access due to overburdened infrastructure, to

mobile-only access because no other service is available.⁵ In examining technology and barriers to its use on tribal lands, AIPI found mobile technology to be the most prevalent, and often it is the only option that is available. Though mobile coverage is essential for some forms of communication as well as emergency services, AIPI emphasizes that mobile access “can never be the sole alternative for hardline internet services [...] such as those needed for education, healthcare, and economic development functions.”⁶

Multiple factors limit the deployment of broadband infrastructure on tribal lands: the rural and rugged terrain makes the deployment of internet service expensive; sparsely populated areas decrease the return on telecommunications investments; and complicated rights-of-way agreements and easements on tribal lands increase uncertainty and often cause delays when deploying advanced communication infrastructure.⁷ Income is another factor that impacts broadband access. Based on the Census Bureau’s recent survey, counties with higher rates of income have more internet subscriptions than counties with lower rates of income.⁸ As Indian Country has some of the highest levels of unemployment and poverty in the U.S., affordability is also a significant barrier to high-speed internet access and use, if and when it is available.⁹ This is precisely what the U.S. Government Accountability Office (GAO) concluded in 2006,¹⁰ and these conditions continue to persist today. Yet, one bright spot is the increased

ability of tribal libraries and schools to directly address and provide for some of their broadband infrastructure needs as a result of the modifications to the E-rate program.

E-rate Brings Fiber Optic Connectivity to Tribal Libraries and Schools

A key factor facilitating the deployment of broadband infrastructure detailed in this case study is the modernization of the FCC’s E-rate program. E-rate partially covers costs associated with broadband service and related infrastructure for public libraries and K–12 schools, including eligible tribal libraries and tribal schools, enabling these institutions and those they serve to benefit from robust and affordable internet connectivity. To meet the growing need for and the increasing costs of broadband access, the FCC modified many facets of its E-rate program in 2014. One change, in particular, expands eligibility for E-rate funding from only broadband services delivered by a service provider (i.e., lit fiber) to include self-provisioned and dark fiber services, if they are the most cost-effective¹¹ service. The updated program provides applicants with greater flexibility in choosing how to meet their broadband needs and an opportunity to overcome barriers limiting connectivity, particularly in tribal and rural areas. See **Box 2** for an overview of the changes to the E-rate program.

BOX 2. E-rate Modernization

In 2014, the FCC overhauled its E-rate program to address the increasing demand for and cost of broadband in public libraries and K–12 schools. The FCC’s E-rate two Modernization Orders brought many changes to the program, including an increase to its annual funding from \$2.4 billion to \$3.9 billion, plus inflation adjustment. In addition, several changes were made to give applicants more options to procure affordable, high-speed broadband connections. These changes included:

- Permitting E-rate funds to be used for applicants to construct their own, or portions of their own, networks.
- Allowing E-rate funds to be used for special construction charges for leased dark fiber. (Prior to modernization only special construction for leased lit fiber was E-rate eligible.)
- Increasing an applicant’s E-rate discount for special construction charges up to an additional 10 percent if the state contributes a matching 10 percent of the special construction costs.
- Suspending the policy requiring applicants to amortize the upfront charges for special construction projects exceeding \$500,000 over three years. This allows applicants to receive their entire E-rate discount in one year. Additionally, applicants can now pay the non-discounted share of special construction charges over four years rather than being required to pay all of their share in a single E-rate program year.

Note: throughout this case study, the term “consortia” will be used to refer to both networks and the shared experience or process among the consortia members. When specific details or factors involve only one network, the actual names of each consortium will be used: Middle Rio Grande Pueblo Tribal Consortium and the Jemez and Zia Pueblo Tribal Consortium.

The Impetus for a Tribally-Owned and -Operated Fiber Optic Network

It all began with a desire for language preservation (See **Box 3**). The Santa Fe Indian School (SFIS), owned and operated by the 19 Pueblos of New Mexico, wanted to address this pressing concern among the tribes.¹² The school recognized tribal libraries as hubs through which tribal members could access native language teachers and other resources through distance learning. SFIS was eager to use its newly acquired fiber optic broadband connection to support its emerging native language curriculum.

SFIS recognized that video conferencing could offer a host of benefits for native language instruction.

Specifically, video conferencing could: facilitate instruction in native languages without a written form; reduce the burden of travel and expenses for native language teachers; accommodate substitute language teachers, if necessary; and meet academic requirements at SFIS to offer language classes several times per week. While SFIS had sufficient capacity to launch its distance learning curriculum, it quickly discovered that tribal libraries in New Mexico could not sustain a connection for video conferencing with their current capacity. With a long history of participating in the E-rate program, SFIS leadership charged its technology staff with helping the tribal libraries apply for E-rate.

Determined to follow through with their language programs, then IT Coordinator at SFIS, Kimball Sekaquaptewa, and Alana McGrattan, the former Tribal Libraries Program Coordinator for the New Mexico State Library, tried to increase broadband capacity at the libraries. As they both recounted, they “hawked E-rate up and down the Middle Rio Grande Valley.” However, when they attempted to increase the libraries’ broadband capacity to 100 Megabits per second (Mbps), the standard for broadband established by the FCC, they

BOX 3. Native Languages and Tribal Libraries

A leading concern among many tribes nationwide and those in New Mexico in particular is the loss of their native languages. As these languages are primarily oral, without a written form, the only way that the traditions, history, and songs of individual tribes will be remembered is if younger generations continue to speak their native languages. In Jemez, one of the pueblos in the consortia, only 50 to 70 percent of youth are fluent in Towa compared to 85 to 90 percent of older adults.* Without interventions, the Towa language slowly will be lost. While Towa is considered a threatened language, Kewa, spoken in the other pueblos is classified as an endangered language, with few proficient speakers under 20 years old in two of the five pueblos across the consortia.*

Tribal libraries are cultural stewards for their native communities preserving native languages, lifeways, and sacred materials. Among tribal libraries in New Mexico, almost all offer programming and resources to support their native languages. Many libraries house tribal language programs and coordinate language classes and other culturally relevant activities. Tribal

libraries often serve as hubs for youth language programs, collaborating with their local schools or with neighboring pueblos to facilitate language training. And, some tribal libraries have created programs, such as SPARK in Jemez, which stands for “Supporting Partnerships to Assure Ready Kids,” to support the Towa language and early childhood development.*

Tribal libraries also share many commonalities with public libraries. They provide public access to information and resources, offer programming and training, and serve as community meeting places. And, like public libraries, tribal libraries have a vital role in providing access to broadband.* Tribal libraries also effectively address broadband adoption difficulties associated with high rates of poverty and unemployment as well as knowledge and skills gaps that also limit access in tribal communities.

* New Mexico Community Foundation, “Harlan McKosato discusses the importance of tribal languages and the SPARK Program,” July 8, 2013, <http://nmcf.org/2013/07/08/harlan-mckosato-discusses-the-importance-of-tribal-languages-and-the-spark-program/>.

discovered that no commercial broadband services were available to increase library broadband at any price.

For instance, when the tribal library in Cochiti Pueblo, located 50 miles north of Albuquerque, tried to increase its broadband capacity, it was not able to do so. Only one copper T1 line was available to service the entire tribal government and library—delivering at most 1.5 Mbps—far below the FCC’s broadband standard. (See **Box 4** for a sample of the minimum broadband speeds needed for common online applications.)

With no additional broadband capacity available for purchase at any price, the library found a creative solution. By bundling two cellular cards together in a wireless router, the library was able to obtain a maximum download speed of 24 Mbps, with upload speeds varying at different times of the day. After exceeding 25 GB of data per month, per the cellular data plan, the library would pay for usage over this amount. Despite the high costs, the library felt proud to have facilitated this modest increase in broadband speed.

Thus, when the E-rate modernization rules went into effect in 2015 a group of tribal libraries in the region was already aware of their collective lack of adequate broadband infrastructure. In this context, the libraries realized a self-construction fiber project might be the solution to pursue.

The Role of Tribal Libraries and E-rate Project Development

An earlier study by the ALA on the development of library broadband networks found that libraries play an essential role by advocating to policymakers and other decision-makers about the importance of these networks.¹³ This finding is consistent with the participation of libraries in the development of the tribal library networks as well.

Building trust among the tribal leadership about the value of these networks was vital. As tribal librarians themselves learned about broadband technology, they had the important role of explaining to their tribal leadership how these networks would benefit their communities. Involving tribal leadership was essential, as tribal councils and tribal governors, who are annually appointed, must approve many aspects of the E-rate projects—ranging from building on tribal land, to allocating scarce financial resources, to authorizing

BOX 4. Broadband Speeds Needed for Common Online Applications

What online applications can a user access with a 1.5 Mbps internet connection? According to the FCC’s Broadband Speed Guide that provides estimates of minimal download speeds needed for typical online activities, 1.5 Mbps is sufficient for basic web browsing, emailing, streaming online radio, and some internet-based phone calls (e.g., Skype).^{*} However, this speed falls short of what a typical student needs and is insufficient to download large files, stream multimedia content, or conduct video conferences, telehealth, or distance learning, which require 5 Mbps to 25 Mbps.

* FCC, Broadband Speed Guide, <https://www.fcc.gov/reports-research/guides/broadband-speed-guide>.

procurement for libraries in financial contracts. Therefore, the education and advocacy efforts of tribal libraries for broadband and the subsequent support of tribal leadership was necessary for the success of these projects.

When she presented broadband technology to the tribal council, Cynthia Aguilar, the librarian of Santo Domingo Pueblo Library, would carry a strand of fiber optic cable with her and use her native language to describe the technology. She explained its function using native words for “glass” and “conduit,” as well as how fiber optics encircle the earth and pass through undersea cables. As many of the words related to broadband technology did not exist in their language, she created new words, tweaking the language to find ways to explain new concepts.

Continuity through annual tribal leadership transitions was also important. Emphasizing the importance of continually educating the tribal council, one librarian recounted that she recalled hearing from a tribal leader: “You are now going to disrupt Mother Earth once again.” As the librarian knew what was going into the ground and that the route was deliberately designed to dig only along roads where the land was already disturbed, she eventually

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gained the leader's trust and the consortium had his blessing to go forward with the project. Each January, as a new tribal governor arrived, she would begin her education and outreach efforts anew.

The centrality of libraries in this process cannot be overstated. Given the complexities, challenges, and duration of these E-rate projects, the consistent advocacy of the libraries, who offered a collective voice for why broadband was so important, was key. As John Chadwick, E-rate Coordinator of New Mexico Public Education Department, emphasized, "broadband development is more than connecting wires; it is about transforming lives." The librarians were able to convey the essence of this statement to tribal leadership in a way that connected to community priorities. As IT coordinator Kimball Sekaquapetewa explained, "This was the story we would come back to to explain to our leadership and to reassure ourselves why we were pursuing this. It was for our children and for sustaining our way of life for future generations."

Library networks require leadership, cooperation, and advocacy from a broad range of individuals. Libraries must also work with schools and other state agencies to develop a cooperative network plan.¹⁴ The varied roles and functions of different individuals contributed, in large part, to the success of the consortia networks. Kimball Sekaquapetewa additionally emphasized, "librarians, education directors, tribal administrators, and IT staff

came together to navigate the application process, engage Pueblo leadership, and coordinate with New Mexico state efforts, and advocate to move this project forward."

In describing this E-rate group, she noted: "Our group was big and the composition ebbed and flowed depending on the phase we were in. We would look ahead at the upcoming tasks then look back at our group and ask, who are the people we need to make it happen and match them up. We very much took things just one chapter at a time because nobody had ever done this before. And each of us, at one point or another, had to stand up and stick our necks out, risking our professional reputation, if not more, to say this is worth it."

Some of the other roles and functions that were essential in developing these networks include the following:

- **Having a project champion**—a respected community member, to engage new tribal leadership and maintain continuity during tribal leadership transitions and through different phases of the project. Everett Chavez, a former governor of the Santo Domingo Pueblo and broadband advocate for education and future generations, was one such champion who helped librarians move these projects along.
- **Working with education directors** not only for school-related participation in E-rate applications but also for sharing responsibilities and advocacy



Santo Domingo Pueblo Consortium members learn about high-density small form factor fiber optic cable technologies. (L-R) Tribal Programs Administrator Everett F. Chavez, Finance Specialist Dakotah Cuny, and Cynthia Aguilar, Tribal Librarian.

support for these networks, as tribal libraries are often governed by Departments of Education.

- **Involving IT staff** in determining technical requirements and sharing IT expertise. Only three of the six tribes across the two consortiums had IT Departments, but those departments were able to provide IT leadership during the application process and implementation phase for the larger group.
- **Retaining the tribes' legal counsel** at times was necessary to advise the tribes in terms of what was permissible regarding rights of way and easements on tribal lands.

In addition to these broader areas of involvement, knowledge of the E-rate administrative process as well as project management skills were necessary. While the former requires an understanding of the application procedures, compliance with the rules, and adherence to the deadlines, the latter involves overseeing deliverables from contractors and coordinating actions between the different groups and stakeholders. To complete the construction, project management (which was provided in-kind by AMERIND Critical Infrastructure, a native firm) helped to facilitate work between the tribes, permitting agencies, and the Universal Services Administrative Company (USAC)—the designated administrator of the E-rate program.

At the request of AMERIND, Kimball Sekaquaptewa left the Santa Fe Indian School to join their emerging critical infrastructure division and continued to manage the work on the E-rate network projects. In previous roles, she had experience managing IT projects, including obtaining and refining quotes from vendors, monitoring contracts, and closing out projects financially. She also had professional contacts in the telecommunications industry through her work on several Broadband Technology Opportunities Program (BTOP) applications. (BTOP, part of the American Recovery and Reinvestment Act, provided grants to increase the development and adoption of broadband in unserved

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and underserved areas.) Kimball Sekaquaptewa was able to draw on these prior experiences to coordinate the two consortia E-rate applications and support the fiber-optic network deployments.

Preparing and Submitting E-rate Applications

The consortia knew they needed to learn more about the new E-rate rules and leverage the state's resources to get the most out of the program. While Kimball Sekaquaptewa had applied for E-rate discounts many times in the past, she greatly benefited from learning about the changes to the E-rate program. Working with the state of New Mexico, the consortia gained insight into the E-rate modernization changes as well as received assistance with filing their E-rate applications for each consortium.

Working with the State

As E-rate modernization attracted broader attention throughout the state, New Mexico governor, Susana Martinez, launched a state-led initiative to bring high-speed internet access to all classrooms.¹⁵ To move this initiative forward the state created the Broadband for Education (BB4E) program, in 2016, bringing together the New Mexico Public Education Department, New Mexico Department of Information Technology, and the Public School Facilities Authority, with support from Education Superhighway¹⁶ and E-rate Central.¹⁷ By working with BB4E, the tribal consortia gained insight into the E-Rate Modernization Orders as well as garnered assistance with the E-Rate application process.

Though tribal libraries or Bureau of Indian Education (BIE) schools were not officially included or eligible to receive the state designated matching funds for E-rate projects,¹⁸ Kimball Sekaquaptewa was aware of the statewide initiative. She was invited to attend the weekly working group meetings on an informal basis, and also was able to receive assistance from the non-profit and education consultants hired by the State. Attending the working group meetings was invaluable for the consortia when it came to learning about the changes to the E-rate program, gathering information about the E-rate process and application procedures, as well identifying a source for matching funds which was needed to qualify for additional E-rate discounts.



The Every Thursday Middle Rio Grande Consortium Meeting. (L-R) Merrill Yazzie, Cochiti Tribal Planner; Kevin Lewis, Cochiti Education Director; Ovidiu Viorica, NM PFSA; Kimball Sekaquaptewa, Project Manager; Eric Moores, RediNet CEO; Dakotah Cuny, Santo Domingo Finance Specialist; Alana McGrattan, NM State Library Tribal Liaison; Everett F. Chavez, Santo Domingo Tribal Program Administrator; Bruce Garcia, San Felipe Tribal Administrator; Chris Ruggeri, Santa Ana Network Administrator; Larry White, Santa Ana IT Director; Cassandra Zamora, Cochiti Tribal Librarian; Christel White, Cochiti GIS Specialist.

Other resources from the state-led effort provided useful support for the E-rate applications of each consortium. This included templates to prepare calculations (which could be adapted for use by the tribal consortia), as well as support from the E-rate consultants to prepare and upload applications using the FCC's new online portal, the E-rate Productivity Center (EPC). The Tribal Liaison of USAC also played a critical role by supporting the consortia in using the EPC portal, responding to USAC inquiries, and aiding with FCC appeals.

A Source for Matching Funds

Through participation in the BB4E meetings, the consortia learned that tribal libraries were eligible for up to a 90 percent discount of the network costs. And, that the E-rate program was offering an additional 5 percent discount if applicants could obtain a matching source of funds from a federal, state or tribal source to cover the remaining network costs.

The consortia identified General Obligation (GO) Bonds as a funding source. In New Mexico, the State Library administers GO Bond Funds to provide supplemental funds for public libraries when these funds are allocated by the legislature and approved by voters in statewide elections.¹⁹

With support from the New Mexico Public Education Department and assistance from the New Mexico State Library, the state legislature introduced new legislation to broaden the use of GO Bonds to include special fiber construction. After New Mexican voters approved this measure, the consortia were able to use the GO Bonds as the match for their E-rate application, allowing the E-rate program to subsidize 95 percent of the network costs. The tribal charter schools in the state also were eligible to receive BB4E matching funds.

The consortia's working relationship with New Mexico's congressional delegation also was beneficial for the successful completion of one of the networks. The delegation intervened on behalf of the consortium to accelerate responses from New Mexico state agencies, so that construction of the Jemez and Zia Pueblo Tribal Consortium network could be completed by the E-rate deadline.

Gathering Feedback from Pre-proposal Meeting

In addition, following the advice of the state team on the E-rate proposal process, the consortia solicited interest from the vendor community during a pre-proposal meeting. At this gathering, questions and answers on the proposed tribal networks could be obtained

before submitting a formal proposal to bid on the project.²⁰ In planning for this meeting, the consortia made use of the state's industry contacts as well as industry contacts that had been developed through working on BTOP applications. Turnout at the meeting was high, with many of the service providers in the area in attendance. Most importantly, from this meeting, the consortia learned that their proposed network—in its original form—would need to be revised to be competitive.

The pre-proposal meeting was especially significant when it came to the ultimate success of one of the tribal networks. The proposed network for the Middle Rio Grande Pueblo Tribal Consortium originally included just

two tribal libraries—one in Cochiti and the other in Santo Domingo. Drawing on knowledge gained when applying for BTOP, the consortia knew that they wanted their network to interconnect with a “carrier hotel,” a colocation point where fiber and other internet service

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providers physically converge, rather than connecting to the nearest service line, to gain access to high-speed broadband capacity at competitive prices. This destination point was located 60 miles south in Albuquerque. However, as a result of the pre-proposal meeting, they realized that there was no way to build a fiber network that would reach this regional hub without going through two more pueblos—San Felipe and Santa Ana—located due south of the Cochiti and Santo Domingo en route to Albuquerque.

Revising the Network Plan

With 60 days remaining before the E-rate filing deadline, the consortium had to reach out to two independent tribal governments. They decided to approach the Pueblo of Santa Ana first. Geographically, this pueblo was the closest to Albuquerque, and Santa Ana also had an established IT department, staffed with four IT professionals—more than any other pueblo in the consortia. Santa Ana already had fiber and wireless connectivity in their community, and they understood the benefit of bringing in additional fiber connectivity. With the technical assistance of the IT department, Santa Ana's tribal leaders agreed to join the consortium and eventually agreed to serve as the fiscal agent. The fiscal agent can act on behalf of the other entities in the application, and also assumes the financial and legal responsibility for all



Kelly Cable of NM crew reviews route maps to complete the final 12-mile stretch along NM State Highway 550.

entities included on the form in terms of their compliance with the E-rate rules.

Convincing San Felipe to join the consortium was more difficult. This pueblo, located between Santa Ana and Santo Domingo, had finally reached an agreement with a large service provider to bring fiber from the interstate into the pueblo—a tremendous accomplishment when Cochiti, the pueblo to the north, could only connect by one T1 line from the same service provider. This connectivity would cost San Felipe \$5000 per month for 100 Mbps, over 10 times more per month than the same connectivity would cost if provided by the proposed self-provisioned fiber network (at \$300 per month). Despite the high costs, San Felipe was hesitant to join the consortium as they were close to getting fiber connectivity while the success of the consortium was yet unknown.

As the E-rate deadline approached, the consortium dropped everything and spoke to everyone in San Felipe: the fiber consultants, the tribal leadership, the IT personnel, the librarian, and the education director. They convinced San Felipe to at least join in the consortium's Request for Proposal (RFP), and decide—based on the responses the consortium received from industry—if they would make a full commitment.

Once they had all the pueblos on board through the Letters of Agency (LOA) designating Santa Ana as the fiscal agent, the consortium reissued the RFP, this time including four tribal libraries located in the pueblos of

Cochiti, Santo Domingo, San Felipe, and Santa Ana. Despite the broad interest from the vendor community, none of the major carriers or service providers submitted a proposal. Some were prevented from bidding by internal policies requiring all rights of way issues to be resolved in advance, which would not coincide with the E-rate timeline; others did not want to build the network if they would not provide the service. The consortium received only *one* industry proposal in response to their request. The winning proposal did not come from a telecommunications carrier, but from a fiber builder, Kelly Cable of New Mexico.

"The self-provisioned network designed to connect at the Albuquerque GigaPop opened our eyes to a whole new world. Other than upgrading our equipment at the ends of the network, our costs are fixed and will not increase as our usage increases."

— Kimball Sekaquaptewa

Network Design for Self-Construction

The design of the network was key in terms of achieving both exponential increases in broadband capacity and substantial cost savings. Kelly Cable of New Mexico brought the combined experience—of laying fiber-optic networks for telecommunications providers and other utility companies as well as knowledge of existing dark fiber in the vicinity—to successfully chart a path for both



Pueblo Governors at the Middle Rio Grande Groundbreaking in December 2017 at San Felipe Pueblo. (L-R) San Felipe Former Governor Michael T. Sandoval & Lt. Governor Carl Valencia, Santo Domingo Former Governor Everett F. Chavez & Governor Brian Coriz, Project Manager Kimball Sekaquaptewa, Cochiti Governor Eugene Herrera & Lt. Governor Bernard Suina, Santa Ana Lt. Governor Arnold Lujan, and Pueblo youth.

networks. Their proposal included: 1) a self-construction component to lay fiber optic cable across tribal lands, 2) a long-term lease of dark fiber from Zayo, a dark fiber provider, 3) the use of carrier-grade optical transport from Juniper Networks, and (4) an agreement to connect with the Albuquerque GigaPop, an interconnection facility (or “carrier hotel”) in downtown Albuquerque where all the major carrier networks in the southwest converge, and where high-speed broadband capacity can be obtained at competitive prices.

Dark Fiber

In addition to constructing new physical networks on behalf of the consortia, Kelly Cable leveraged its knowledge of Zayo’s dark fiber, which added an essential component to the network design. Dark fiber providers, like Zayo, typically offer fiber and bandwidth connectivity to telecommunications carriers, content providers, and other large enterprises.²¹ While access to dark fiber for smaller groups like the consortia is less common, E-rate rule changes envisioned this option as viable and made it eligible for funding. Thus, two-strands of dark fiber complement the self-provisioned fiber-optic networks. Obtaining a long-term lease for two strands of dark fiber from Zayo provided the necessary capacity, at significant cost savings, for the tribal networks. Access to Zayo’s dark fiber also enabled the most efficient path for the networks to reach the Albuquerque GigaPop. Additionally, as Kelly Cable had performed extensive work inside the GigaPop facility, it was familiar with both its capacity and mission, which aligned with the tribal library and education community.

The Albuquerque GigaPop

The Albuquerque GigaPop is a non-profit initiative that offers reliable, efficient, and affordable access to high-speed broadband to further education and research efforts throughout the state of New Mexico.²² It collaborates with local, state, and regional efforts to provide access to advanced regional and national networks, such as Western Regional Network and Internet2, and partners with universities, industry, and government to facilitate high-speed access for applications ranging from telemedicine to digital libraries.²³

Routing the consortia networks to connect with the GigaPop opened yet another level of access to tribal libraries and schools. They gained access to wholesale internet pricing as well as local peering and caching of content and services, such as Microsoft and Google, which keeps a large portion of their internet traffic local and increases the efficiency of their network traffic.

Through the GigaPop tribal libraries and schools can access New Mexico’s higher education institutions for dual enrollment, distance learning, and a connection to Internet2. The GigaPop also serves as the network operations center for the two consortia networks, monitoring their network equipment and ensuring the reliability and stability of the tribal networks in a secure facility. As Kimball Sekaquaptewa added, “The self-provisioned network designed to connect at the Albuquerque GigaPop opened our eyes to a whole new world. Other than upgrading our equipment at the ends of the network, our costs were fixed and will not increase as our usage increases for a 20 year expected lifespan.”

One of the instances that guidance from the BIA is not needed is when a particular action on tribal land is for the tribe’s own use.

E-rate Project Implementation Challenges

While E-rate modernization offers greater flexibility in choosing how to acquire fiber connectivity, the implementation of special construction projects, especially on tribal lands, is not without challenges. The following examples from the two networks were not the only challenges encountered but are representative of common



Middle Rio Grande Pueblo fiber marker near San Felipe Pueblo connecting to Santo Domingo Pueblo follow previously disturbed back roads to minimize the environmental impact of the fiber route.

obstacles when deploying advanced telecommunications on tribal lands. They also demonstrate that each broadband deployment is unique, even when compared to other projects in a single region. Challenges discussed below include: rights of way, construction delays, and implementation difficulties.

Rights of Way

By working together, the Middle Rio Grande Pueblo Tribal Consortium was able to overcome one of the most frequently encountered obstacles affecting telecommunications deployment on tribal lands—rights-of-way agreements.²⁴ Using the Bureau of Indian Affairs (BIA) updated regulations and retaining legal representation, tribal governments were better equipped to secure a right-of-way than commercial network operators.

The BIA, under the Department of the Interior, is responsible for granting and approving actions affecting title, including rights-of-way, on tribal lands. This requires all service providers to work with BIA, or its contractor, to obtain a right-of-way before installing telecommunications infrastructure on certain tribal lands. While BIA is responsible for ensuring a right-of-way suits the purpose and size of the equipment being installed on these lands, the federal regulations upon which these decisions are made were outdated, and thus delays and lack of clear guidance were inevitable. As the GAO reported in 2006, federal regulations then lacked “descriptions and guidance for advanced telecommunications infrastructure [...] because the regulations were created prior to the advent of modern telecommunications equipment.”²⁵ Only recently, federal right-of-way regulations have been updated.

In 2015, the BIA published a Final Rule, overhauling its Right-Of-Way Regulations.²⁶ The Final Rule separates Right-Of-Way Regulations into six subparts, including service line agreements, which pertain to internet service.²⁷ It also offers guidance to help determine when a right-of-way from the BIA is needed, and when it is not.²⁸ One of the instances that guidance from the BIA is not needed is when a particular action on tribal land is for the tribe’s own use.

Because the Middle Rio Grande Pueblo Tribal Consortium was unable to resolve the rights-of-way issues working directly with the BIA, the consortium retained



Fiber crews coil the fiber optic cable in large figure eights in preparation to blow the fiber between pull boxes located approximately 2000' feet apart. The process is repeated every 1-2 pull boxes for the 30-mile route.

legal counsel to interpret the new regulations and determine how they should be applied to their network deployment. Working with the legal counsel from each tribe, they determined, first, that the consortium would not need BIA to grant a right-of-way to move forward, since the network would be on tribal land for the tribes’ use. Second, each tribe revised its tribal charter agreement to codify this decision and to grant the network assets to each pueblo in the consortium. Following this change to their charter agreements, construction was able to proceed, and the Middle Rio Grande Pueblo Tribal Consortium network was “lit” in June 2018.

Construction Delays

The Jemez and Zia Pueblo Tribal Consortium encountered a different set of obstacles during the construction phase of their network, despite its close geographical proximity to the Middle Rio Grande Pueblo Tribal Consortium. The path planned for the self-provisioned fiber network appeared to be contiguous tribal land on a map; however, it comprised small swaths of federal, state, and private lands. Each required different permits and approval procedures, which were difficult to align with an E-rate timeline. Project extensions were necessary, but they were not always timely. In retrospect, requesting an extension for a longer period of time (e.g., for two or more years) would have been preferable given the challenges surrounding the permitting process and other regulations associated with this land.

Additionally, while on the surface, the high desert terrain was rocky and appeared to be dry, some of the

dry ditches the network would traverse were arroyos and considered to be navigable waterways, under the Clean Water Act.²⁹ During periods of heavy rains, the ditches could fill with water and damage the buried cables. Procedures specified by the U.S. Army Corps of Engineers required the consortium to bore deeper and drill through large rocks and boulders for the fiber construction. Fortunately, the fiber contractor knew the terrain and accounted for these variations in the construction within the budgeted costs.

However, other expenses and time delays were unanticipated. The New Mexico Department of Transportation (DOT) required a full archaeological review to be conducted of the construction path. In New Mexico, all construction projects must ensure they do not come into contact with historical sites, and only registered archeologists can conduct these reviews to confirm whether the project complies or not. Based on these findings, an engineer then assesses whether there are any issues with the planned network path and determines if the path ought to bypass particular sites—going around them or underneath them. As a portion of the Jemez and Zia Pueblo Tribal Consortium’s network crossed state land, the consortium was required to follow these procedures.

While the consortium was willing to comply with all necessary steps, the unanticipated work and lags in response time from the New Mexico’s DOT placed the completion date for the network (as per E-rate rules) in jeopardy. In the end, the consortium asked their congressional representatives, including the offices of Senator Udall, Senator Heinrich, and Representative Ben Ray Luján, as well as leadership from state agencies, to intervene on their behalf—to verify that they had complied with all requirements and to move their paperwork forward—so they could begin construction again.

When construction was permitted to resume—with less than two weeks before the E-rate deadline—Kelly Cable committed most of its crews in New Mexico to the project. Trucks could be seen on the side of the road every half-mile for the 12-mile stretch that needed completion. The crews worked overtime seven days a week, until sundown on the last day the permit was in effect, to construct as much of the network as possible.

The work of the consortia also continues to bring high-speed connectivity to other parts of Indian Country. New E-rate projects are using key elements from these broadband infrastructure projects to inform the build out of additional high-speed broadband networks.

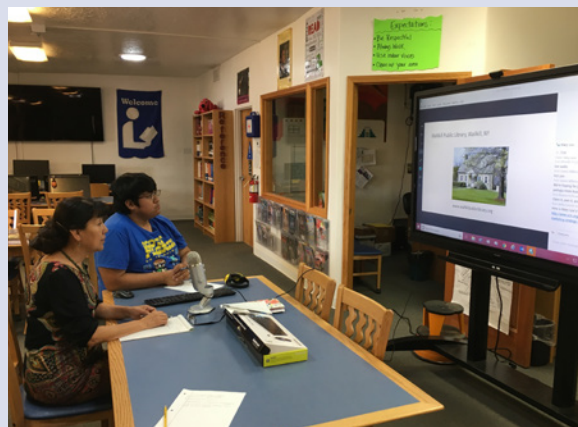
Administrative Error

While the network of the Jemez and Zia Pueblo Tribal Consortium was “lit” on June 30, 2018, the entire 60-mile network might not have been constructed due to an administrative error that occurred on the day the project was approved. This consortium project was awarded on the last day of the E-rate funding year. However, the paperwork to request an extension for the project was not submitted on the day the project was awarded, but 12 days later.

This small but significant administrative oversight could have caused the entire project to end before it even began. However, Jemez tribal leadership appealed in-person to the FCC during visits in Washington, D.C., and at other regional meetings—leading the advocacy effort to waive the missed deadline to approve the construction deadline extension. Additionally, in the process of requesting an appeal, the consortium received support from former FCC attorneys at AMERIND and the National Congress of American Indians.

Afterword

In fall of 2019, 16 of the 19 Pueblo libraries in New Mexico received digital whiteboards and video



Santo Domingo Librarian Cynthia Aguilar and Youth Intern Brandon Coriz join an on-line meeting using the new 100 Mbps symmetrical broadband Internet connection, which was not possible with the previous satellite Internet connection.

conferencing cameras, including all the tribal libraries in the Middle Rio Grande and Jemez Valley Pueblos, as part of the Santa Fe Indian School Pueblo Connect project based on a grant from the United States Department of Agriculture (USDA), Distance Learning and Telemedicine (DLT) program. This deployment allowed distance learning of native languages to commence, with language classes starting within a few days of receiving the equipment at one library. While native language learning and preservation was the original impetus for the tribal fiber optic networks, the opportunities the high-speed connections offer are much broader: enabling interaction and collaboration within the pueblos; increasing communication and reducing travel time for tribal libraries and education departments; allowing tribal governors and officials to conduct remote meetings; as well as facilitating communication from Pueblo communities with the outside world.

While Covid-19 has halted many library services and functions, others continue, and tribal librarians continue to meet via video conferencing to pursue new opportunities to increase broadband access within their communities. While tribal library doors were closed, following Pueblo Governors' strict lockdown orders, library parking lots were full, as many tribal libraries were able to leave their WiFi on to facilitate internet access from outside the library buildings. Additionally, some tribal libraries are working with the New Mexico State Library seek out opportunities for extending their

broadband signals farther into their communities and even into homes, by lending WiFi hotspots.

The work of the consortia also continues to bring high-speed connectivity to other parts of Indian Country. New E-rate projects are using key elements from these broadband infrastructure projects to inform the build out of additional high-speed broadband networks. One such project aims to bring high-speed connectivity to the Navajo Nation, which spans over 27,000 square miles and three states—Arizona, New Mexico and Utah. This E-rate project will connect libraries and schools, including one of New Mexico's newly established tribal libraries in Torreon/Star Lake Chapter, two hours west of Santa Fe, located on the New Mexico side of the Navajo Nation.

Similar to the networks featured in this case study, the Navajo Nation Tribal Consortium leading one phase of this multi-year effort to bring 380 mile of new fiber to the Navajo Nation, used a consortium approach and the same network design model that also interconnects the new high-speed networks at the Albuquerque GigaPop. By connecting to the tribally-owned equipment that is physically located in the Albuquerque GigaPop suite, it creates a private network for the tribal schools and libraries in New Mexico and allows for the delivery of network services. The tribal library in Torreon, established in 2017 with the assistance of the New Mexico State Library, will have a 100MB fiber connection by the end of 2020.



Santo Domingo Tribal Library patrons benefit from a host of new technology-rich trainings on basic computer skills, on-line bill payments, to entrepreneurial artist webpages. Additionally, the library has since started coding classes for youth.

Other best practices from the consortia efforts detailed in this case study are benefiting upcoming E-rate projects. In an effort to increase vendor participation, the next phase of the Navajo Nation network buildout will release the new RFP earlier to allow vendors more time to propose technical solutions. Additionally, the success of the consortia projects had a direct impact on the New Mexico State Library and their efforts to help other tribal and public libraries gain access to high-speed broadband. In 2019, the New Mexico State Legislature approved the Broadband for Library Infrastructure Fund, appropriating \$1 million dollars over 4 years; the fund helped to establish an E-rate matching program and to hire a full-time broadband manager to assist tribal and public libraries to apply for E-rate.³⁰ As a result of the fund and assistance from the New Mexico State Library, 3 additional tribal libraries, not part of the consortia, have established broadband internet connections (Jicarilla Public Library, Mescalero Community Library, and Santa Clara Pueblo Community Library), and the New Mexico State Library will work to bring broadband to the remaining tribal libraries in 2021.

Key Takeaways

Although each new tribal network will be unique, others can benefit from the experience of the consortia in this case study. Key takeaways relevant to the development of self-provisioned fiber networks on tribal and rural lands include the following five points.

Tribal Libraries Play a Critical Role—Tribal libraries provided the initial impetus for these broadband networks recognizing, among other things, the role that this access could play in supporting native language preservation and related distance learning initiatives. The libraries built trust among their tribal leadership and educated them about the value of these networks for their communities. They provided a collective voice throughout the complex development and build-out process as to why increasing broadband capacity was such an important undertaking for the tribes.

Leadership, Cooperation, and Coordination are Essential—Leadership from tribal libraries was critically important but constructing fiber networks require cooperation and coordination with individuals, groups, and organizations at the state, tribal, and federal levels.



Given the lack of computers and internet access on tribal lands, Pueblo youth use the library's computers and internet after school and during school breaks.

This required working with a diverse team and receiving project management support to successfully implement these broadband infrastructure projects under the E-rate program.

A Consortium Approach Brings Many Benefits—Tribal libraries and schools were able to aggregate demand and proceed with a fiber deployment more extensive than any one tribal entity could undertake on its own. Working together, they also were able to combine resources, such as IT expertise, as well as codify their own legal agreements simplifying use agreements and procedures.

Support from External Partners is Key—The consortia benefited greatly from support and assistance provided by the State of New Mexico, including the State Library, as well as other critical partners of the BB4E program. The consortia members played an active role in forming these connections, building on the experience of a diverse team, leveraging existing relationships, and forging new ones.

Design Choices for Self-Provisioned Networks are Significant—The design of the networks was integral to their overall performance and capacity. By combining self-provisioned networks with leased dark fiber, both networks were able to reach a major interconnection point in the southwest, rather than the nearest service line. As a result of this design choice, the consortia dramatically increased their internet access speeds at substantially lower costs, and have an ability to scale their capacity, as their demand increases, for a fixed cost.

Lessons Learned

While the changes to the E-rate program offer greater flexibility in choosing how to acquire fiber connectivity, the implementation of special construction projects is not without challenges. Drawing from the implementation of the consortia E-rate networks, the following are among the lessons learned for tribal libraries.

Request More Time for Implementation—Given the complicated rights-of-way agreements and difficult permitting processes on tribal land, overseen by state and federal agencies, longer lead-times are necessary to complete these procedures. Extension requests for some E-rate deadlines will most likely be required, as many projects will require more time (i.e., more than one year) to complete.

Plan to Engage External Expertise—Advice from subject matter and legal experts will likely be necessary or advisable at some phase of an E-rate project on tribal land. External consultants can help applicants adhere to E-rate rules and procedures to ensure an application is not delayed or denied. External partners can help procure network equipment or navigate the construction and permitting processes. In other cases, tribes themselves may be the best equipped to resolve rights of way issues, and they may need to retain legal representation to advise and codify their agreements.

Involve Multiple Individuals in the E-rate Application Process—While the E-rate program provides opportunities to bring much-needed connectivity to tribal libraries and schools, it presents a steep learning curve for new applicants and involves a significant time commitment, particularly for consortium applications engaged in special construction projects. As learning and coordination build over time, it is imperative to involve two or three individuals from each tribal community in the application process so the learning can be continuous and sustained year over year.

Seek Broader Support—Due to limited tribal resources, the lack of interagency coordination, and a small pool of industry vendors willing to bid on tribal infrastructure projects, among other factors, tribal libraries and schools need to proactively seek support from a broad range of stakeholders and critical partners to overcome multiple

challenges in implementing infrastructure projects on tribal lands.

Increase Technical Capacity in Tribal Libraries—As high-speed broadband becomes accessible in tribal libraries and schools adequate maintenance and on-going network support are necessary to provide safe and secure access to the internet. This requires having IT staff who can oversee and advise in these areas as well as procure hardware and software to maintain the performance and safety of these systems while complying with existing laws and regulations governing the use of E-rate funded networks.

Recommendations

As this case study demonstrates, the E-rate program's expanded rules supporting different fiber network architectures can be the most efficient and effective means to secure high-capacity broadband, especially for tribal libraries which often have no alternatives.

The following recommendations focus on three themes that cut across agencies at the state and federal levels: promoting awareness of E-rate opportunities and processes; advocacy for the eligibility and inclusion of tribal libraries in E-rate opportunities or initiatives; and technical support throughout E-rate application and implementation steps. The recommendations for federal and state agencies would enhance support for tribal libraries, more broadly, and for their participation in the E-rate program, in particular.

Federal Communications Commission

The FCC must take immediate action to reconcile the definition of a library in the E-rate program with the language in the 2018 reauthorization of the Museum and Library Services Act, which amends the definition of a library. Up to this point, some types of tribal libraries have not been eligible to participate in the E-rate program. The amended definition of what constitutes a library corrects this long-standing issue. Beyond this, there are a number of steps the FCC can take to increase awareness of and participation in the E-rate program among tribal libraries. The FCC should:

- Establish a clear channel of communication between the Office of Native Affairs and Policy,

the Wireline Competition Bureau, and USAC, the administrator of the E-rate program, so that outreach and feedback regarding needs of tribal libraries and their communities inform policy that impacts the ability of tribal applicants to maximize their participation.

- Improve data collection and reporting on tribal libraries that participate in the E-rate program including services requested, costs for category one and two services, broadband speeds, and barriers or challenges encountered in seeking and securing high-capacity broadband.
- Increase USAC's capacity for outreach to and support of tribal library applicants. USAC currently has only one dedicated tribal liaison position for both libraries and schools.
- Direct USAC to increase the number of trainings targeted to tribal libraries (in-person and virtual). Locations for in-person trainings must consider the long distances and travel time required for many tribal libraries to attend.
- Direct USAC to consult with tribal library staff to ascertain needs, staff technical knowledge and capacity, and other factors that influence E-rate participation in order to develop relevant training materials.
- Increase the effectiveness of training programs and resources for tribal libraries by ensuring content informs applicants about external factors that can impact the implementation of broadband infrastructure projects. These include rights-of-way issues and common regulatory issues at the state and federal level.
- Dedicate additional resources for USAC to provide technical assistance to tribal library applicants to manage these external issues and program specific challenges, including addressing the need for long implementation periods to work through rights-of-way issues. Such assistance should include training opportunities for tribal librarians and staff to increase cyber security knowledge, including potential risks and threats to library broadband infrastructure as well as the online safety of its users.
- Initiate a Notice of Inquiry (NOI) to gather public input on the need for a priority funding window or rule changes to enhance successful participation

in the E-rate program for tribal applicants. The NOI should seek specific information about tribal libraries and schools that do not currently participate in the program in addition to current applicants and other stakeholders. The NOI should also aim to surface additional challenges to securing broadband for tribal libraries and schools as well as ways to mitigate such obstacles.

Institute of Museum and Library Services (IMLS)

As the federal agency tasked with building the capacity of libraries, IMLS has a critical role in ensuring tribal libraries are equipped to maximize broadband opportunities at the federal and state levels. IMLS should:

- Serve as a convener across federal agencies to increase awareness of the role of tribal libraries in digital inclusion and broadband adoption in their communities.
- Immediately coordinate with the FCC and USAC to convene a stakeholder working group consisting of representatives from the tribal library community, telecommunications and internet service providers that serve or could serve Indian Country, and other relevant groups to develop recommendations that can address the lack of access to affordable broadband and the low participation rate among tribal libraries in the E-rate program as well as share and develop best practices for developing critical partnerships.



With the new fiber connection, Pueblo youth pack the libraries to use the computer stations and internet connection.

- Conduct outreach to stakeholder groups to identify current needs and challenges tribal libraries have in providing digital inclusion services, especially in relation to securing high-capacity broadband. Outreach should include field hearings and virtual participation options to maximize participation among tribal librarians and staff. Findings should result in a public report or reports as well as inform strategic investment in the Native American grants programs.
- Establish a technical assistance program which includes funding opportunities for tribes to build local capacity in navigating project management aspects of securing high-capacity broadband for tribal libraries covering such themes as leadership, partnerships and collaboration, and state and local political influences.
- Convene and facilitate collaboration opportunities for tribal librarians and staff to develop digital inclusion models targeted to multiple generations. Themes to explore should include emerging ideas and potential pilot programs that support economic development and entrepreneurship as well as opportunities to develop new native capabilities that are possible through connections to broadband networks such as Internet2.

States

State support of broadband infrastructure and E-rate assistance is critical for successful outcomes. New Mexico offers a leading example of the importance it places on broadband infrastructure that includes tribal communities. To enhance their support for tribal libraries, states should:

- Explicitly list tribal libraries as eligible entities for funding and/or services in broadband initiatives and legislation as well as eligible partners in instances where public or other libraries are included as eligible.
- Provide assistance and access to available resources to establish tribal libraries, if there is community interest and one does not yet exist.
- Invite tribal libraries to be partners in broadband and digital inclusion efforts as well as participants in state-facilitated workshops, roundtables, field hearings, and other convenings.
- Ensure tribal libraries have ongoing support to participate in the E-rate program. Such support should include technical assistance related to network needs assessment, service eligibility, and using the online application portal. Outreach and training facilitated by the state E-rate coordinator for libraries should be targeted specifically to tribal libraries.



A rainbow over the Jemez-Zia fiber optic route at the edge of Jemez lands after the network was completed and the fiber had begun transmitting data to Jemez Pueblo.

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10. “[T]he rural location of tribal lands (which increases the cost of installing telecommunication infrastructure) and tribes’ limited financial resources (which can make it difficult for residents and tribal governments to pay for services) can combine to deter service providers from making investments in telecommunications on tribal lands. This lack of investment can result in a lack of service, poor service quality, and little or no competition.” <https://www.gao.gov/assets/250/248920.pdf>, p. 35.
11. Modernizing the E-Rate Program for Schools and Libraries, 29 FCC Rcd 8870 (2014) (“First E-rate Modernization Order”); Modernizing the E-rate Program for Schools and Libraries, FCC 14-189 (“Second E-rate Modernization Order”).
12. For a list of the pueblos, see https://www.sfis.k12.nm.us/19_pueblos_of_new_mexico.
13. American Library Association, Office for Information Technology Policy, “Making Connections: Lessons from Five Shared Library Networks,” 2010, <http://www.ala.org/advocacy/sites/ala.org.advocacy/files/content/advleg/pp/pub/books/oitp-case-studies.pdf>.
14. Ibid.
15. In October 2015, the State of New Mexico’s Governor Susana Martinez announced an initiative to bring high-speed internet access to every classroom by the 2018 school year, <http://www.broadband4education.nm.gov/overview.aspx>.
16. Education Superhighway, a nonprofit launched in 2012, aims to increase high-speed internet connectivity in K–12 public schools through research, advocacy, and direct support to states and school districts. The organization will sunset in 2020 having reached its goal of connecting 99 percent of schools to internet connections that provide at least 100 Kbps of bandwidth per student. See: www.educationsuperhighway.org.
17. E-Rate Central is a firm established in 1997 to help schools, school districts, and libraries navigate the rules and procedures of the Federal E-rate Program, and to provide consulting, compliance, and forms processing services for E-rate applicants. See <https://e-ratecentral.com/>.
18. As part of the BB4E program, New Mexico passed Senate Bill (SB) 159 in March 2014 that allowed the Public School Capital Outlay Council to spend up to \$10 million annually for five fiscal years (FY2015–FY2019) to correct deficiencies in broadband infrastructure affecting public schools throughout the state.
19. For more information about this source of funding, see <http://nmstatelibrary.org/services-for-nm-libraries/funding-libraries/go-bonds>.
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 25. Ibid.
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 28. See: <https://www.bia.gov/sites/bia.gov/files/assets/as-ia/raca/pdf/idc1-033607.pdf>.
 29. 33 U.S.C. §1251 et seq. (1972)
 30. In 2019, the New Mexico State Legislature approved an appropriation SB 280 to establish the Broadband for Libraries Infrastructure Fund of \$1 million spanning 4 fiscal years from 2020-2023. The fund is to be used for matching funds in order to leverage additional federal funds for Broadband deployment to public and tribal libraries in New Mexico.

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