



SAN JOAQUIN VALLEY REGIONAL

Broadband
CONSORTIUM

CASE STUDY:
The Shafter Fiber Network

March 2013

Introduction

Local governments large and small are increasingly considering the merits of sponsoring communications services for their communities. For the most part, government intervention in telecommunications was, until recently, primarily focused on small communities that ran their own utilities operations. However, as documented in the 2008 report *Wired for Wireless: Towards Digital Inclusion and Next Generation Government-Led Wireless Networks*, local governments are increasingly looking inward to develop their own broadband networks “to enhance government services and operations, to achieve public policy goals, and to provide public and affordable access to the Internet as a way to bridge the digital divide.”¹ The most common pro-municipal broadband argument is that many small communities are underserved and can leverage their other utility assets to provide broadband access within their jurisdictions where private sector firms might not have the resources or economic incentives to do so.

In the San Joaquin Valley, the city of Shafter in Kern County has one of the few municipally owned broadband networks in the state of California. In the San Joaquin Valley Regional Broadband Consortium’s efforts to promote increased broadband coverage throughout the valley, we have worked with the city of Shafter to compile the following case study as a how-to guide for other communities interested in building their own broadband networks.

The San Joaquin Valley Regional Broadband Consortium has identified the Shafter Municipal Fiber Network as a model best practice and an example to other communities considering a broadband project of their own. The SJVRBC is dedicated to accelerating the deployment, accessibility, and adoption of broadband in targeted communities and populations within the eight counties of the San Joaquin Valley (San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern). One of our main goals is to expand and replicate successful model programs to increase access to broadband and Information Technology to bridge the digital divide. In November, the San Joaquin Valley Regional Broadband Consortium (SJVRBC) coordinated a webinar to showcase the Shafter Municipal Fiber Networks success.

The webinar featured Scott Hurlbert, Assistant City Manager for the City of Shafter. During the webinar, Scott explained how the city built a municipally owned fiber network for its own needs while simultaneously creating a tool for economic development. Participants were provided insight into what the city had to do, where they are at in the project, and the advantages of having a network like they do. As reflected in this document, the city leadership’s **adaptability**, **perseverance** and **dedication** to their long-term vision of broadband access stand out as key components to their success.

This document is a case study that closely examines these topics and is based on discussions from the webinar, which is available to view at:

<https://student.gototraining.com/1498j/recording/6941228248099897088>

¹ *Wired for Wireless: Toward Digital Inclusion and Next Generation Government-Led Wireless Networks*

Overview of the City of Shafter

Shafter is a small city of about 17,000 residents located in Kern County. The core of the city is roughly 4 square miles and is where the majority of the population resides (just over one dozen families reside outside the central core). Through the years, there have been several large annexations for growth and development but also to stop the encroachment of Bakersfield (from the south) and maintain a distinction between the two cities.

Shafter's physical location is situated between State Route 99 to the East and Interstate 5 to the West. In addition, State Route 43 and some railroad tracks run through center of town. With its proximity to major transportation routes and the availability of large parcels of land, Shafter is well suited as a strategic location for large scale residential, commercial, and industrial developments in the state.

Early Stages of the Shafter Fiber Network

In 2005, the city saw an influx of industrial and commercial site selectors for businesses looking to expand or relocate. Initially, questions from site selectors were focused on zoning ordinances and water availability, with questions regarding broadband service availability being low on their prioritization lists. As time went on, Internet service availability and capacity grew in importance until they soon rose to the top of site selectors' prioritization lists. City officials quickly recognized that telecommunications service availability was an increasing priority for commercial and industrial site selectors and could bolster economic development opportunities for the city. It became evident that the lack of a reliable fiber network was holding the city back from a number of development opportunities and the city embarked on developing its own fiber network.

To address this, staff looked to the incumbent service provider about the feasibility of upgrading the city's infrastructure to fiber, who expressed reluctance. In addition, a forecast of recurring costs for continuing to lease connections from a private sector firm was an additional motivational factor that made building the fiber network worth investigating.

When trying to determine how to improve the odds of bringing companies to Shafter, they looked at a number of wireless type solutions (e.g. wireless mesh, and others). They settled on fiber as the most logical way to proceed. The city began research and developing an economic model based on an initial Fiber to the Home (FTTH) build out. They saw the way to finance that and establish a fiber network in Shafter would be to ride the wave of residential development and make it part of the development standard for the city so that all 11,000 planned homes would be wired into the fiber network.

To calculate these assumptions, they calculated how many houses were going to be built, estimated what percentage of residents would choose the city network over one of the other commercial carriers, and multiplied that by a monthly profit to figure out how long the project would take to pay for itself.

The economic model and studies of return on investment (ROI) and how to finance the project were all based upon the assumption that residential building would continue at a pace similar to trends seen during the height of the housing boom (late 2007 – early 2008).

Economic Adaptability of the Shafter Fiber Network Business Model

Because housing trends did not continue at the pace at which they had during the early 2000s, following the real estate crash of 2008, the master planned communities in Shafter were canceled. Not a single home was built and the land is still being farmed today. However, what did continue was the recognition among city leaders that Shafter is located in a strategic location attractive to business. With the railroads and major highways along each side of the city, and its close proximity to Los Angeles as well as a local market in Bakersfield, Shafter is an attractive location for large scale industrial distribution and manufacturing activities.

Fortunately, the city recognized these opportunities and kept the fiber project afloat. The city reassessed the project and reworked the model to integrate its unique industrial opportunities as the basis for a new economic model. The city would have to take a more strategic and incremental approach to planning and building out the fiber backbone. More details about the incremental approach adopted under the revised economic model and the second phase will be explained further on. With this in mind, they changed from a full FTTH strategy by stripping the project of the residential component from their plans. They continued as planned and built out the network to address the revenue building opportunities associated with commercial entities rather than addressing those from the residential side of the project. Doing so would allow the city to maintain the benefit of attracting commercial and industrial entities.

The process of designing and building the network evolved over a number of years and what started out as a full Fiber to the Home (FTTH) build out slowly evolved into a two phase project:

Phase 1: Construction of a four mile core network designed to upgrade the city's upgrade the existing T-1 (1.5 Mbps) wireline and wireless connections and connect primary middle mile facilities

Phase 2: An incremental expansion of the core network by building an additional seventeen mile stretch that will connect local businesses and to attract more commercial and industrial developments

Phase One Core Network

There were immediate benefits associated with the first phase of construction. The first phase of the project allowed the city to replace its low speed T-1 and wireless connections with a 4 mile stretch of fiber backbone. The wireless area network (WAN) system that is still in place no longer encounters problems due to windstorms, dust storms, fog, etc. The 4 mile stretch of Phase 1 serves the following anchor institutions with a 1 Gbps connection (though they can handle up to 10+ Gbps):

- City Hall
- Police Department
- Correctional Facility
- Elementary Schools

- Junior High Schools
- High School
- Kern County Courts
- Kern County Sheriff's Network
- Veteran's Hall
- Youth Center
- A test subdivision with empty conduit (pilot subdivision)
- Communications Tower and Animal Control (via wireless)
- Public Works Yard (via VPN).

The network office is currently operating out of the police department. However, there is a larger, more permanent central office planned for the second phase of construction that will be located on a parcel the city already owns.

Another important aspect of the city's plan was establishing itself as an e-rate vendor. Under the Cal E-Rate program (a CPUC subsidy program based on free or reduced lunch percentages), the school district leases dark fiber segments from the city at a small percentage of the market rate for that connection. The city will then receive a full competitive rate reimbursement from the state. For example, if 90% of the school's students receive free lunches, then the state will pay the city 90% of the cost for the connection while the school pays the city the remaining 10% of the connection cost. Incoming revenue goes back into the fiber fund for maintenance and future expansion. As a result of the new connection and E-Rate discount, the school district receives cheaper, faster and more reliable service with greater capacity than it had before. The city has entered into multi-year leases with the school district with an expected 4-5 year payback for those connections. Now the schools are capable of running online multi-media over the leased dark fiber that couldn't be done with their previous connections.

Following the completion of the first phase, the city recently passed the payback point on the initial four mile build of the fiber core network that serves municipal facilities. It is important to consider the city's focus on the bottom line when considering this case study. While better reliability, faster speeds, the ability to help out the school district while bringing in extra revenue were all selling points, city officials determined that serving the city's own purposes while avoiding long term out of pocket costs for leased lines justified the project from an economic standpoint.

Phase Two Development

As mentioned earlier, the 2008 Real Estate market crash prompted the city to abandon the full FTTH build out as a startup economic model for their fiber network. Instead, city officials focused on enabling economic development. However, calculating a return on investment based on the new economic model was a little more difficult than the residential-based model. To do so, staff had to take into account the incremental value of businesses choosing Shafter when the availability of fiber is part of their decision making process. The same process is done with other public infrastructure projects, such as building out sewer and water delivery capacity, policing capacity, and roads. Now, the city has

included fiber backbone in that calculation and they can use part of that incremental growth to return that investment and justify the project moving forward.

The new model allows for a more incremental approach when building out the second phase of the fiber network. Planners can target specific areas they know where development will occur and run fiber directly to or near it instead of taking a “shotgun approach.” With a shotgun approach, fiber is run to areas with a hope that development will follow. This runs the risk of running fiber to areas where development might not occur, which has the potential to result in a waste of municipal resources. With the incremental approach, it is almost guaranteed that the fiber backbone design will successfully reach targeted areas for current and anticipated commercial and industrial development.

The incremental network expansion is to be broken up into different segments. Routes have been chosen for a number of reasons based on factors like who owns the land, planned roads, and expected development. In addition, those routes have been planned to extend broadband service to areas of expected development. In the case of Shafter, one segment will go out to the developing airport area and other segments spur off in different directions along existing and proposed roads to planned development areas in the southern part of the city. Ultimately, the backbone will connect back to the existing four mile section, which will create a ring. As far as fault tolerance goes, rings are highly desirable. In the event that if the fiber gets dug up and cut the network is designed to still be functional until repairs are made to the damaged portion. The project went out to bid in March 2013 and the project is expected to start later in 2013.

Lessons Learned:

The availability or prospect of fiber service has helped a number of companies make the decision to move to Shafter, many of which can be linked to the benefits tied to the new economic model and planned Phase 2 expansion. At this time, primary industrial developments are happening on the southern edge of city limits. A 1.2 million square foot Target distribution center, as well as other large scale warehouse distribution facilities, have moved into this area. A number of other companies are also showing interest and developing near the former Minter Airfield, which is now an independent airport district within the city limits near State Route 99. Based on the webinar with city staff, we have identified the following as lessons learned for others looking to replicate a municipal broadband network like Shafter’s:

- When discussing the idea of a municipal fiber network it is important to research your market to understand incumbent and private providers in your city. Ask questions such as: Is there a need for such a network? What benefits could be gained by connecting certain facilities?
- During discussions, educate the City Council, City staff, and other stakeholders. The more educated people are about the benefits of broadband and fiber networks, the more likely they will support them.
- Expect to spend a significant amount of time learning the technology, jargon, methodologies. It takes a lot of time and money to learn everything there is to know when involved in planning and building a network. Invest upfront.

- Find a technology partner you trust. A manufacturer is likely not the right fit. Shafter found a good partner in a design and engineering firm with construction experience.
- Start with a manageable project with an easily defined return on investment. You will learn a lot and a successful first project will encourage stakeholders to continue support.
- Good contract management will carry over to a successful project.
- Consider bringing public works resources into the project. Once they gain familiarity with the unique practices used in fiber OSP construction, they can provide low cost help.
- If an agency does not have the internal resources to plan and manage the network, consider an out-sourced relationship. There are a number of highly skilled and experienced companies specializing in installing wireless/ FTTH, networks etc.
- Dig once policies that allow the local government to lay conduit during another public works project (such as a road expansion) streamline the process and enable the agency to efficiently allocate resources.

As mentioned earlier, the SJVRBC considers the Shafter Municipal Fiber Network a true success story. After assessing their current and future needs and trying to work with an incumbent provider, Shafter successfully planned and built a fiber network of its own. The network that Shafter created is now a long term asset that operates in the best interest of the community. The entire project is financially sustainable and was paid for out of the City's General Fund, which is remarkable when compared to other municipal fiber networks across the country. That being said, the Shafter Municipal Fiber Network is a fine example municipal dollars being spent responsibly. Not only does the network meet the City's own needs but it also has a number of added side benefits. As the project moves forward, the network will successfully encourage more economic development and provide access to residents and other small business within the community at a later date. To give companies already located in Shafter (a rural community) the high capacity data services that you can normally only find in larger metropolitan areas is very rare in California.