First Step Internet – Management Team Resumes

Kevin Owen
President & CEO, First Step Internet & First Step Research
Kevin joined First Step in 1994 as a technical and financial advisor and purchased the firm in 1996. Focusing on the Internet Service aspect of First Step, Kevin has grown his firm from eight employees and annual sales of $500,000 in 1995, to forty employees and $3.5M in sales in 2007. He is actively involved in marketing and strategic planning, emerging technologies and identifying and acquiring new business and managing all aspects of the project life-cycle. Kevin earned a BS degree in Finance from Washington State University in 1994 and an MBA with an emphasis in Marketing from WSU in 1996. His professional interests include wide-area network design, emerging communications technologies and wireless services marketing. Kevin has been closely involved in every large project at First Step.

Bill Moore
Director of Technology
Bill will provide management oversight for this project. He oversees Technology at First Step, and directs the design and development efforts of a talented group of programmers, system administrators and network engineers. Bill has been with First Step for 20 years, during which time he has worked in systems programming, systems administration, project management and product development. His professional interests include programming (C++, C, Perl, Java and VB Script), network management, and network security issues.

Mike Hall
Area Sales Manager
Mike will serve as the project manager for this project. Prior to his work at First Step, Mike spent seven years as an Account Executive for Edge Information Systems in San Jose, CA. He worked with companies throughout Silicon Valley like Adaptec, National Semiconductor, Quantum Corporation, VISX to design and implement network and computing systems throughout their organizations. Mike has been with First Step since 2001 and directs product and consumer sales efforts for First Step. Mike has also served as lead project manager for several large projects in the past including a $408,000 Rural Utilities Service grants, acquisition of three smaller regional ISPs, and most recently a winner 2008 BBB Torch Award. Mike has written and won federal and state grants for the following network infrastructure projects:

- Bovill, ID: Rural Broadband Grant for $184,835 from USDA
- Deary, ID: Rural Broadband Grant for $137,000 from USDA
- Weippe, ID: Rural Broadband Grant for $24,500 from state of Idaho
- Ferdinand, ID: Rural Broadband Grant for $213,000 from USDA
- Potlatch, ID: Rural Broadband Grant for $84,000 f from USDA

Education:
1994-1997: Western Seminary, Los Gatos, CA Master of Arts in Exegetical Theology
1984-1988: Grace School of Theology, Pleasant Hill, CA, Bachelor of Arts in Biblical Studies
1982-1984: San Jose State University, San Jose, CA, Undergraduate Studies

Mike Harshbarger
Lead System Administrator,
Mike will serve as the lead system administrator for this project. He has been with First Step since 1995. He has a combined 16 years of system and network administration experience. He is highly skilled in local/wide area networking and hardware/software deployment. His Unix system administration specialization is with BSD/SYSV and POSIX systems including FreeBSD, Linux, Solaris and HPUX. Mike's web and connectivity administration include the following protocols BIND4, BIND8, MS-IIS, apache, IIS and SSL. Mike helped manage a group of system administrators on the following projects:

- Moving FSI data center from U of I Business Incubator to Moscow GTE facilities (1997)
- Moving FSI data center and physical plant from Moscow GTE to current facilities (2000)
- Moving FSI analog concentrator lines to digital T1 lines (1998)

- Optical fiber network tie-in (2008)
- Acquisition and integration of RightByte regional ISP
- Acquisition and integration of ConnectWireless regional ISP
- Acquisition and integration of Elk River Cable regional ISP
- Design & implementation of multi-homed, redundant network backbone (TWC + ATT + XO + 360 networks) 2005 - 2008

Eric Flannery
Lead Network Engineer
Eric will serve as the lead Network Engineer for this project. Eric has thirteen years of combined system administration and network administration experience. He has worked for First Step since 2002 and has been the Lead Network Engineer since 2006. He is responsible for monitoring and maintaining a large regional network as well as designing and implementing new network legs. His professional interests include network design, wireless network design, network analysis and troubleshooting, and network routing and switching. Eric directed the efforts of our network engineering group for the following large projects:

- Expansion of rural network backbone infrastructure to Potlatch, Deary, Bovill, Weippe, Palouse (2003 – 2009)
- Optical fiber network tie-in (2008)
- Acquisition and integration of RightByte regional ISP
- Acquisition and integration of ConnectWireless regional ISP
- Acquisition and integration of Elk River Cable regional ISP
- Design & implementation of multi-homed, redundant network backbone (TWC + ATT + XO + 360 networks) 2005 - 2008

FINAL

North Central Idaho Telecom

Assessment and Implementation Plan:

Expanded Study -Schematic Wide Area Network Design

Prepared For:

Clearwater Economic Development Association

1626 6th Avenue North
Lewiston, Idaho 83501
208-746-0015

Prepared By:

Access Consulting

265 West Front Street
Missoula, Mt
59802
406-327-0629

I. Introduction

Project Objective

The objective of this project was to develop and document a schematic design for a wide area network providing reliable and affordable broadband telecommunications services to the North Central Idaho region. This objective was achieved through a seven step study methodology originally proposed by Access Consulting in 2006. The steps to successfully develop this schematic design included:

1. Identifying wide area networks that are currently used to provide regional WAN connectivity by members of four user groups, including local, regional and state government; healthcare; education; and businesses and manufacturers. These user groups were identified in the 2006 North Central Idaho Telecom Assessment and Implementation Plan as the major consumers of WAN connectivity.

2. Identifying critical unmet WAN needs of the user groups.

3. Identifying existing assets that may be used in the design of new WAN resources.

4. Identifying funding resources, both existing and available to each user group, that can be leveraged to meet the combined needs of the region.

5. Develop a WAN network schematic design that documents the network architecture required to meet the integrated needs of the four user communities.

6. Develop a time-phased deployment plan that leverages existing WAN expenditures and available funding opportunities to build out the network over time.

7. Identify criteria required to determine whether to procure service from new or existing providers versus building and operating regional network facilities.

This project was funded through the USDA Rural Development Rural Business Enterprise Grant Program and was conducted by Access Consulting, PC under contract to the Clearwater Economic Development Association.

II. Existing WANs, Unmet Needs, Available Resources (Tasks 1 & 2)

The first step in the design of a regional network infrastructure was to survey potential users to determine their needs for private wide-area (point-to-point or point-to-multipoint) networks and public broadband internet connectivity. Wide area network traffic and broadband internet traffic may both be carried on the same "physical" infrastructure, whether it is wired or wireless. Access Consulting designed and distributed a user survey that asked users to describe their existing use of WAN and/or broadband internet services and to identify any unmet need for those services. The survey consisted of four questions, described in detail below. The survey was originally distributed on January 8, 2008 to a list of businesses and organizations identified by CEDA and the local economic development organizations. It was eventually sent to a total of 71 user organizations in the five counties included in the study (Clearwater, Idaho, Latah, Lewis, and Nez Perce). By the end of May, Access Consulting had received 26 replies. This schematic design was developed from those 26 replies and additional data developed in the original study completed in 2006.

The first question in the survey was directed at existing uses of wide-area networks. Users were asked to detail the locations served by their WAN, the bandwidth on each leg of their WAN, their service provider, monthly or other recurring cost, the network technology being used (DS-3, T-1, frame relay, etc.) and the typical uses of the WAN. The location data was used to identify potential nodes for the schematic design. The bandwidth, typical uses and type of technology were used to identify the capacity and reliability required of the schematic network design. The recurring costs data was used to identify the resources currently being spent on WAN services. This study assumed that those resources, pooled among the users, would be available to fund construction and operations of the new schematic network.

The second survey question sought similar information about users' internet service. Internet traffic often shares the same infrastructure as WAN traffic, so a proper regional network design should have the capacity to carry both types of traffic. As in the first question, users were asked to identify the locations that receive broadband internet service and the bandwidth received at each location. They were also asked to identify their service provider and the location of that provider. Service provider locations, if located within the region, would also be candidates for nodes on the regional network. Users were further asked to identify the type of broadband service they were using, i.e. DSL, cable modem, wireless, or satellite. In a critically underserved region like North Central Idaho, the type of service selected may be the only one available to the user. However, on a case by case basis where we know there are alternatives available, the type of service selected can be used to draw some conclusions about a particular user's requirements for bandwidth, reliability and/or affordability.

The third survey question sought information on any other intra-state networks to which a given user might have access. For the purposes of the first question, a wide area network was defined as belonging to a single entity or agency. The third question sought to identify second- or third-party network services and uses. One example of such a service is Avista's use (in other regions) of cellular voice and 3G data networks to link mobile employees to the company network. Third generation, or 3G, cellular data networks are a cost effective solution for broadband internet and virtual private networking (VPN) for telecommuting and mobile workers. This question sought to identify the availability of such resources within the region.

The fourth survey asked respondents to identify any unmet needs for network services. The question asked the user to specify the type of service required (voice, data, video; the bandwidth or information rate required; the locations requiring such service; and whether the user had tried to obtain such service. The first three parts of this question were focused on determining the type of service and geographic coverage required. The fourth part of the question, whether a user had tried to obtain the service, was intended to develop information about the availability and cost of such services and the existing providers' plans for deploying said services.

Surveys were distributed to private businesses, state and local government agencies, healthcare institutions, and educational institutions. The 2006 Plan had identified these economic sectors as the early adopters of telecommunications services and the results of the surveys bore this out. Survey responses were received from nine private businesses, four County governments, three hospitals, Lewis Clark State College, the University of Idaho, and eight K-12 school districts. The results of the surveys have been tabulated and are presented in Appendix A.

Some general conclusions were drawn from the user input and served as the baseline from which the schematic network was built. While not all respondents provided cost data, those that did showed a total monthly expenditure of over $19,000 for WAN services and over $16,000 for broadband internet services. In any given year the total outlay for broadband and WAN services in the region exceeds $420,000. And this figure represents only a fraction of the population of businesses, agencies, and institutions in the region.

The survey data on bandwidth demand also provided some interesting insights. As could be predicted, the hospitals and higher education users have the highest requirements for bandwidth. However, even taking into consideration all of the bandwidth requirements received from all of the respondents and factoring those numbers for the number of users who did not participate, the total bandwidth demand within the region could still be delivered by a variety of technologies. If money were no issue, a fiber optic network connecting all of the communities in the region would be the best solution. However, more economical wireless solutions are available that could handle the required bandwidth while leaving an adequate margin for growth.

The survey data on the types of applications required (voice, data and video) also has significant implications for the design of the regional network. Medical imaging transport requires significant bandwidth to support the timely delivery of images to remote diagnosticians, but brief interruptions (measured in seconds) in the transmission of that data can be tolerated. Voice and video traffic, such as distance learning or tele-medicine applications, require relatively less bandwidth but require an uninterrupted flow of traffic.

The survey data on unmet needs highlighted both the lack of telecommunications infrastructure in the region and the high cost of services that are available. The respondents also demonstrated that the lack of services extends beyond WAN and broadband internet services. The users provided insightful data on the absence of cellular voice, public safety radio and mobile data coverage. The respondents also provided data on the lack of competitive providers and the resulting high cost of services. Some specific unmet needs included:

- An order for a DS-3 circuit 45 million bits per second) connecting St. Mary and Clearwater Valley Hospitals was denied by Qwest and Verizon for lack of facilities.
- Affordable residential broadband internet service for students in the Highland School District (SD305).

- A T-1 at each school in School District 171 was denied by Verizon because it was “not tariffed.”
- The Latah County Sheriff cited a need for better radio coverage and mobile data service.
- UNIGREP in Orofino requires multiple T-1’s within the year but the service is not available from Verizon because of a lack of facilities.

All of the unmet needs cited by respondents are included in Appendix A.

The surveys did not provide much information on existing assets that might be used in the design of a regional wide area network. The objective had been to identify public or private assets such as water towers, radio towers, tall buildings and similar high points; publicly or privately owned cabled networks; or other facilities that could be contributed to the design to reduce the overall cost of the network. The schematic has instead relied on data obtained during the development of the 2006 plan and through research into the FCC database on antenna structures..

From the survey input, several common network needs and partnering opportunities were identified. Throughout the region, school districts and hospitals require greater bandwidth than the existing network can provide at a reasonable cost. Saint Mary’s Hospital in Cottonwood and Clearwater Valley Hospital in Orofino need an affordable high bandwidth networking linking the two hospitals and outlying clinics. School Districts throughout the region could use a broadband WAN to share limited faculty resources with distance learning applications. One County IT administrator suggested that a broadband wide-area network linking the five County seats would enable the Counties to share in the expense of developing and operating common applications. By pooling their resources and using a single network infrastructure, these three sectors could satisfy their connectivity requirements at the least cost.

III. Preliminary Schematic Design (Task 3)

Our schematic design approach consisted of six elements. First, the network design requirements were derived from the existing WAN and broadband uses and from the unmet needs reported by the survey respondents. Second, the design approach assumed that the network would be built out from existing points of presence. For this region, the existing points of presence are the Qwest fiber in Lewiston and Grangeville and the Verizon Fiber in Moscow. Third, the design assumed a goal of providing two sources on each path. For example, the two sources on the link for Lewiston to Grangeville would be the existing Qwest fiber and the network being designed by this project. Fourth, the design should leverage as much existing infrastructure as possible. This existing infrastructure could include existing wireless facilities or wired facilities. Fifth, the design should assume that existing providers will diversify their service offerings to meet the region’s needs. An example of such diversification would be the deployment of mobile broadband data services by the local cellular provider. Finally, the design should assume and encourage the development of a multi-provider network. Having multiple providers in the region will encourage competition, lower prices and improve service quality.

There are two technology alternatives that were considered for this design. Buried fiber optic cabling provides the greatest bandwidth, service life and reliability. It is the ideal technology if cost and maximum coverage for minimum cost are not concerns. Fiber optic circuits can carry up to 40 billion bits of data each second (40Gbps) over very long distances. However, fiber optic circuits can cost as much as $25 per lineal foot or $130,000 per mile to construct. And once it is constructed it only connects the two end points together. Wireless (microwave) networks are more limited in bandwidth, being practically limited to one hundred million bits per second (100Mbps) per link over long distances. However, microwave networks cost approximately one-fifth of what an equivalent fiber optic circuit would cost. The relative economy of microwave networks is the fundamental reason that they were used to carry the bulk of the Region's intercity voice and data traffic for decades. Microwave networks continue to service communities such as Orofino, Weippe, Pierce and Elk City today. Wireless WAN and broadband internet solutions provide an added benefit in that they can share common infrastructure with other wireless applications such as cellular voice, cellular mobile data, public safety radio, and public safety mobile data.

Beyond the fiber versus wireless choice, there are two network technologies that were considered for the network. Traditional telephone (voice) carriers built their networks using "circuit-switched" technology. A physical circuit is established between the parties at call initiation and "torn down" at call completion. The alternative network technology, commonly called IP (internet protocol) networks, uses packet switching. Packet switching was developed for data networks. The traffic is digitized (turned into ones and zeroes), bundled into packets, and transmitted on a network that is shared by many users at the same time. Intelligent devices on the network called routers direct the packets to the appropriate destination on the network. Because much of the core infrastructure on an IP network is shared, they can be more cost effective to build and operate.

Although circuit switched networks are commonly associated with voice traffic and packet switched networks are commonly associated with data traffic, network technologies have developed to the point where both technologies can handle both types of traffic. Traditional telephone company voice networks are more tightly regulated at the state and federal level. The LATA line dividing north Idaho from south Idaho at White Bird hill is a relic of this regulatory structure. Data networks are relatively unregulated and therefore arguably easier to build and operate. Over the last decade, networks have been migrating to IP technology because of the promise of lower costs and simpler management. For the purposes of this design, we have assumed an IP network.

The bandwidth demands developed through the user survey are modest enough that a microwave solution could meet the region's needs for some time to come. The total WAN and broadband Internet demand reported by users was less than 100 million bits per second. Some of this traffic is intra-city, meaning that it would not impact the regional network. Based on this information, the preliminary schematic design assumed that each leg of the network would consist of two 100Mbps, full duplex links. These links may be fiber optic or wireless. Full duplex links are capable of transmitting and receiving at the same time. Two links were selected to provide redundancy and room for growth.

The next step in the design of the network was to choose a network topology. A network topology is essentially a roadmap of the network. It will denote the endpoints of the links and the capacity (bandwidth) of each leg. Our topology analysis assumed a wireless network because some the requirements for the physical layout of such a network are more stringent than those for buried fiber. Wireless networks require clear sight lines between towers, which can be difficult to realize in a region of deep canyons, tall mountains, and long distances between end points.

Once the basic topology was defined, the design was organized into three construction phases. Time phasing the deployment reduces the complexity of the buildout and the capital that must be raised at any one given time. Reducing the complexity of the buildout may also encourage regional providers to participate in the project. The first phase should consist of the core of the network, the basic connectivity off of which the next two phases will build. The second and third phases will then extend connectivity to smaller and/or more distant communities.

We began this phase of the design by mapping the existing WANs described in the survey responses. We also took into consideration the unmet needs of the survey respondents. Among that data, we believe that two existing WANs could provide a solid foundation from which to build the regional network. Those two existing uses were the Idaho Transportation Department network linking each County seat across the State and the wide area network currently operated by St. Mary Hospital and Clearwater Valley Hospital. The combination of these two networks provides a core network that spans the region and provides a core from which to build the remainder of the network. The paths that result from this combination make up the first phase or the proposed network build and are shown in Figure 1 below.

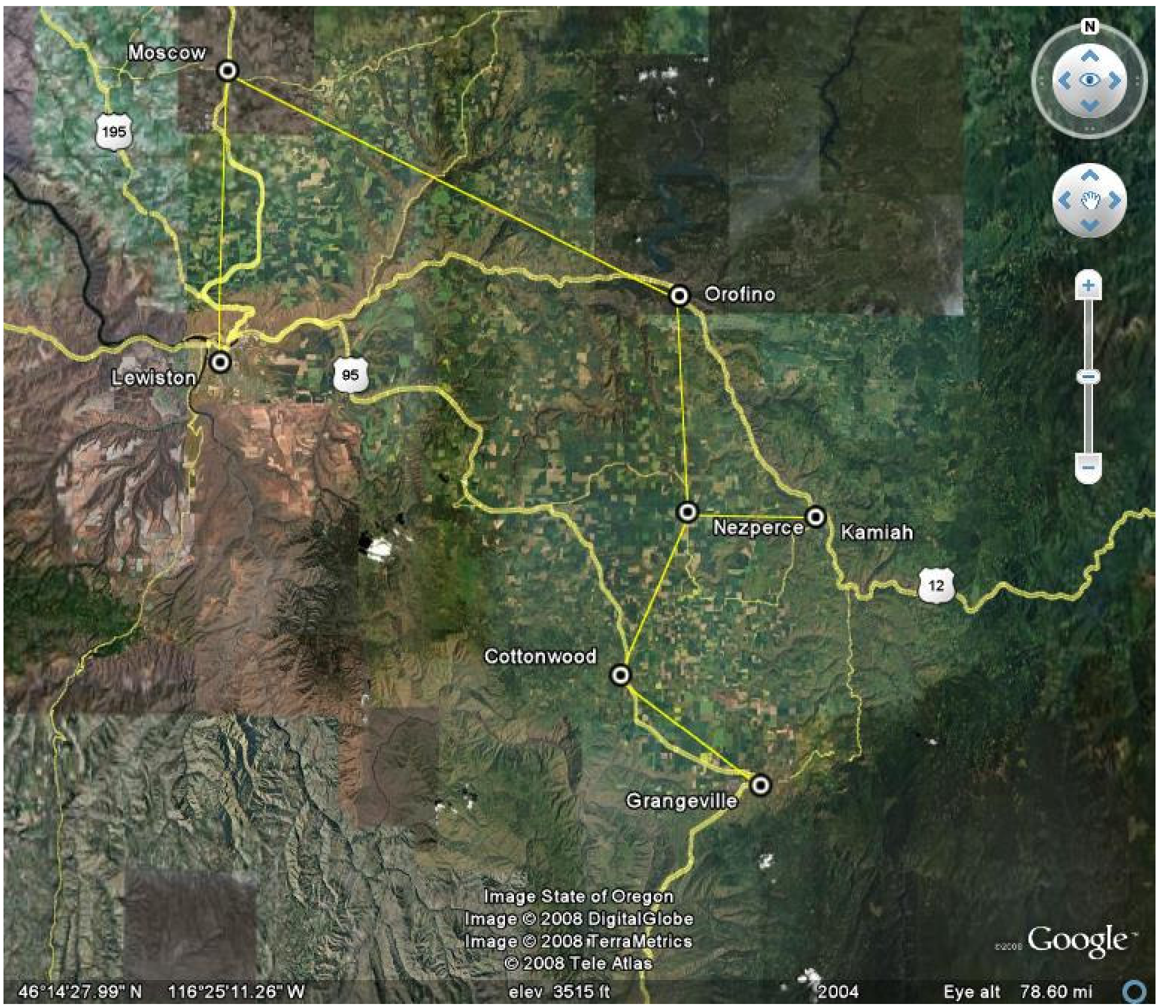

Figure 1. Preliminary Phase One Network

Phase 1 of the network consists of links connecting to existing fiber optic service in Grangeville, Lewiston and Moscow. From Grangeville, the network links to Cottonwood (St. Mary Hospital) using existing wireless infrastructure, then to Nezperce (Lewis County seat) over new wireless infrastructure. At Nezperce, the network branches to Kamiah (Medical Clinic) and to Orofino (Clearwater Valley Hospital), both on new wireless infrastructure. From Orofino, the network links to Moscow (Latah County seat, U of I, Gritman Medical Center) using established wireless infrastructure. From Moscow, the network continues to Lewiston (LCSC, St. Joseph Hospital, Nez Perce County) using some existing wireless infrastructure.

This phase of the network build will provide a significant increase in the bandwidth available to the healthcare system in the region and the opportunity for a significant upgrade to the IDT/State network in the region. This phase uses some existing infrastructure to reduce cost and provides competitive provider options in many communities.

Phase 2 of the network (see Figure 2) extends service to underserved communities in Latah and Clearwater Counties and closes the ring of the network by linking Lewiston and Grangeville. This phase will provide competitive service in Kendrick and Juliaetta, provides path redundancy to existing networks in Idaho, Lewis and Nez Perce counties, and increases network reliability by closing the loop at Grangeville.

Figure 2. Preliminary Phase Two Network (Blue Lines)

Phase 3 of the network design (see Figure 3 below) extends service to the most distant communities in Latah and Idaho counties, builds out the network from Peck to Kooskia in the Clearwater River corridor, and bridges the LATA boundary at White Bird hill. Bridging the LATA boundary will be accomplished by extending the network to Riggins and connecting to Frontier Telecommunications fiber optic services there. This will directly connect northern Idaho to southern Idaho for the first time while also providing competitive broadband service to White Bird and Riggins.

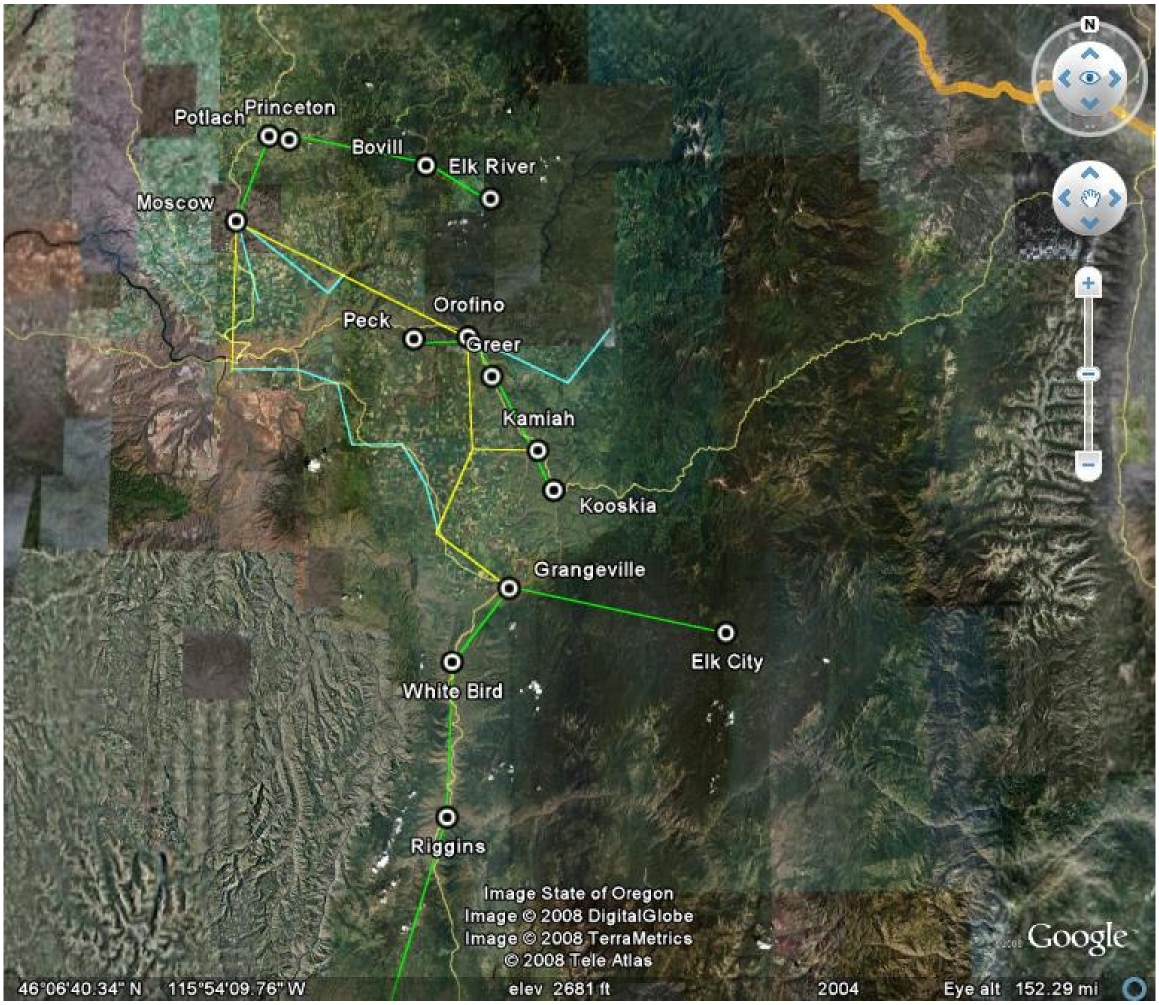

Figure 3. Preliminary Phase 3 Network (Green Lines)

IV. Design Review/Final Schematic Design (Tasks 4 & 5)

The preliminary design described above was presented to the North Central Idaho Telecommunications Consortium Working Group and two stakeholder meetings in May of 2008. Attendees at these reviews were asked to review the topology, technical design, and time phasing. The attendees included network users, service providers, CEDA board members and other Working Group members.

The review concurred with the design approach, technical specifications and network topology. The time phasing was also accepted except for the placement of the link between Grangeville and Riggins in the third phase. This link had been placed in Phase 3 based on the design approach of building the network from the core to the edge. The Grangeville-White Bird-Riggins link is at the extreme edge of the network. A reviewer pointed out, however, that the gap in services at White Bird hill was given the highest priority for action in the 2006 Plan. Based on the consensus of the reviews, the Grangeville–White Bird-Riggins was moved to Phase 1. The final topology of the network phases are illustrated in Figures 4 through 6 below.

The final network design also assumed wireless backbones using redundant radios capable of 100Mbps in each direction. The performance specification of the Proxim Wireless Tsunami GX 200 radio was selected for the purposes of this design. A datasheet on this product is included as Appendix B. New tower site designs were assumed to include a 100 foot steel tower, an equipment shed, and a propane powered backup generator. Sample specifications for a tower site are also included as Appendix C.

Figure 4. Final Phase One Schematic WAN Design (Yellow Lines). Note addition of Grangeville-White Bird-Riggins link to this phase.

Since this regional network is being designed to carry traffic for healthcare and public agencies as well as private traffic, network reliability and security will be vitally important. The final schematic design addresses reliability through the provision of redundant power sources and radio links. For communities that currently only have one provider of network services, the regional network adds path and provider redundancy to further improve reliability. For the region as a whole, the regional network when complete will also provide that same path and provider redundancy.

Network security is another key requirement for the regional network. Healthcare traffic security must comply with the Health Insurance Portability and Accountability Act

(HIPAA). Commercial traffic containing credit card information must comply with the Payment Card Industry (PCI) Data Encryption Requirements. Other network users may have their own security requirements. This design assumes that the end will provide their own encryption/decryption devices. The wireless network technology upon which this design is based supports all common security protocols including, but not limited to, IPSec tunneling and virtual private networks (VPNs).

Figure 5. Final Phase Two Schematic WAN Design

The probable cost of construction was estimated using a parametric cost model based on the number of tower sites and radios required. The cost of using an existing tower site was assumed to be negligible. New tower sites were assumed to cost $200,000 based on the specifications noted above. The 100Mbps radios were estimated to cost $25,000 each. The estimated cost of construction by link and by phase is shown in Table 1 below.

Table 1: Wide Area Network Construction Cost Estimate

End 1	End 2	Existing Sites	New Sites	Radios	Cost	
Phase 1						
Lewiston	Moscow	4	0	12	$ 300,000	
Moscow	Orofino	4	2	20	$ 900,000	
Orofino	Nezperce	0	4	16	$ 1,200,000	
Nezperce	Grangeville	1	1	8	$ 400,000	
Nezperce	Kamiah	0	4	20	$ 1,300,000	
Grangeville	White Bird	0	3	12	$ 900,000	
White Bird	Riggins	0	2	8	$ 600,000	
Total Phase 1						**$ 5,600,000**
Phase 2						
Moscow	Juliaetta	0	1	4	$ 300,000	
Moscow	Genesee	0	1	4	$ 300,000	
Orofino	Weippe	0	4	16	$ 1,200,000	
Weippe	Pierce	0	3	12	$ 900,000	
Cottonwood	Ferdinand	0	1	4	$ 300,000	
Ferdinand	Craigmont	0	3	12	$ 900,000	
Craigmont	Winchester	0	5	20	$ 1,500,000	
Winchester	Culdesac	0	2	8	$ 600,000	
Culdesac	Lapwai	0	6	24	$ 1,800,000	
Lapwai	Lewiston	0	4	16	$ 1,200,000	
Total Phase 2						**$ 9,000,000**
Phase 3						
Moscow	Potlatch	0	1	4	$ 300,000	
Potlatch	Princeton	0	2	8	$ 600,000	
Princeton	Bovill	0	4	16	$ 1,200,000	
Bovill	Elk River	0	2	8	$ 600,000	
Orofino	Peck	0	3	12	$ 900,000	
Orofino	Greer	0	4	16	$ 1,200,000	
Greer	Kamiah	0	4	16	$ 1,200,000	
Kamiah	Kooskia	0	3	12	$ 900,000	
Grangeville	Elk City	0	3	12	$ 900,000	
Total Phase 3						**$ 7,800,000**

Total Project **$ 22,400,000**

The number of hops required for any given link was estimated by examining the topographical profile of the straight line path between the two end points and estimating the number of towers required to provide clear line of sight. A sample profile for the Cottonwood to Orofino path is shown in Figure 7 below. The topographical profile is shown at the bottom of the page, with Cottonwood at the far left and Orofino at the far right. This profile provides a great example of the terrain challenges that the region has to offer.

Figure 6. Final Phase Three Schematic WAN Design

Current Network Development Projects

While this project has been underway, several other projects have been addressing the lack of telecommunications services in the region. All of these projects address links that are part of this effort, although not in the time phasing suggested by this study. Whether these links are built in the order suggested by this study is not important. As long as these independent efforts lead to greater network availability, reliability and affordability within the region, they should be encouraged. A description and status of these independent efforts includes:

- Ferdinand Community Connect Grant: In August 2008, First Step Internet was awarded a USDA Rural Development Community Connect Grant to provide wireless broadband internet service in Ferdinand. At this writing, no details were available regarding scheduled completion or service capacity.
- Elk River Community Connect Grant: In September 2008, Access Consulting completed the construction of a community wide wireless internet service in Elk River, funded by a USDA Rural Development Community Connect Grant awarded to the Elk River Free Library District. This service uses a 3 Mbps wireless backhaul provided by First Step Internet.
- Verizon is currently constructing a fiber optic circuit to Orofino and Weippe. The circuit is supposed to “go live” on December 8, 2008.

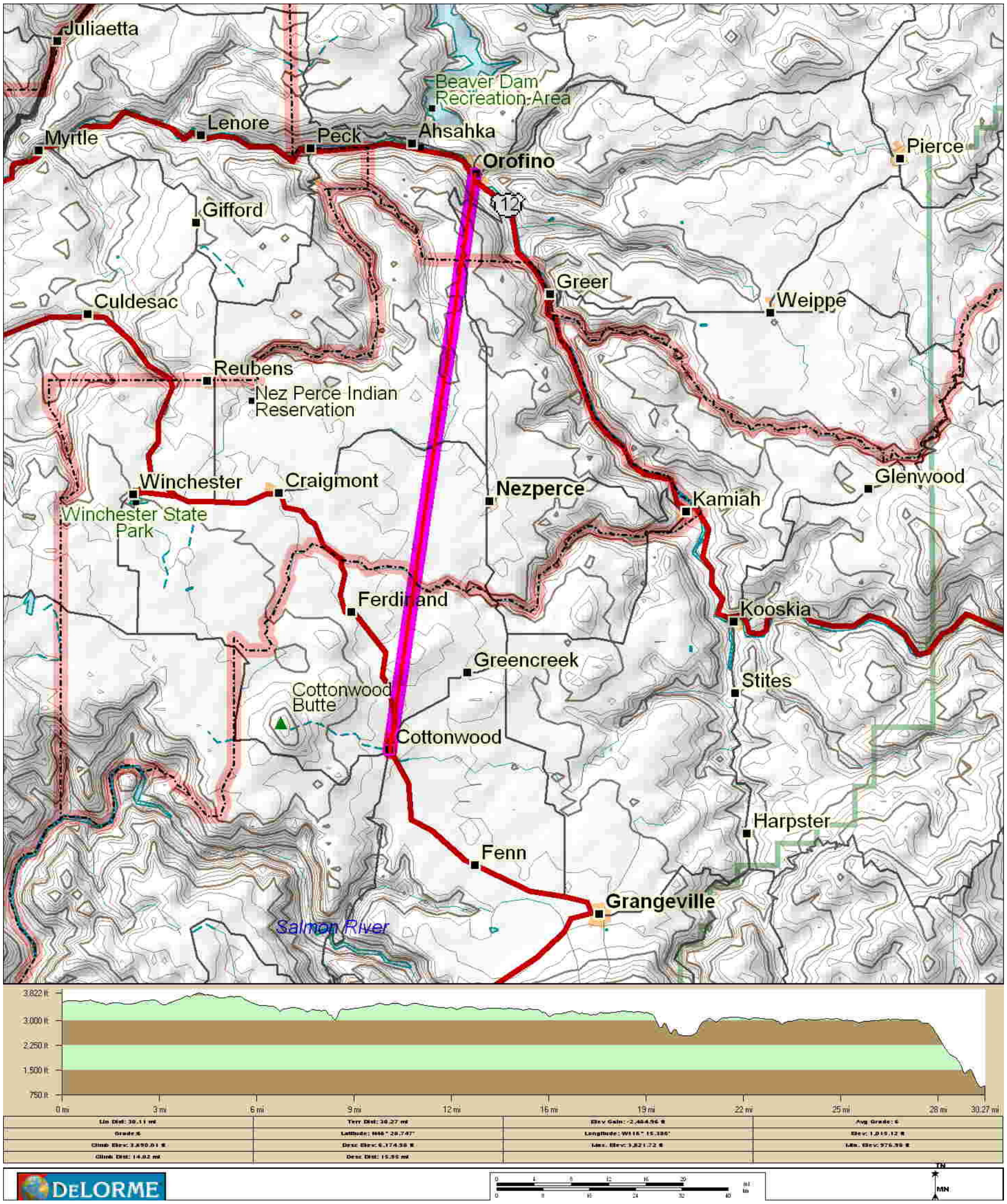

Figure 7. A sample link profile for a path from Cottonwood to Orofino.

- LATA RFP Project Status: During the summer of 2008 CEDA released a Request for Proposal for telecommunications services crossing the LATA gap at White Bird hill. A single proposal was received from Frontier Telecommunications. The proposal was accepted by CEDA and negotiations are set to begin on a Memorandum of Agreement between CEDA and Frontier. If successful, this effort could take the place of the Grangeville – Riggins link in Phase 1 of this design.

- Elk City Community Connect Grant: Framing Our Communities of Elk City has twice applied for a USDA Rural Development Community Connect Grant to provide broadband internet service to Elk City. Unfortunately, both of these applications were not accepted. FOC is currently considering re-submitting a scaled back application.
- IRON: The Idaho Regional Optical Network is a proposal to build a very high speed fiber optic network connecting the Idaho National Labs, the Idaho University system, and other partners. The network would be primarily used for research purposes. The first step in that project was the establishment of a giga-POP, a point of presence with gigabit internet access, in Boise earlier this year. This project has assumed that it will only be using unused, or “dark” fiber and will not be building any new infrastructure. This is unfortunate news for the North Central Idaho region because the IRON network will follow existing fiber optic paths in Oregon and Washington rather than contribute to the building of needed connectivity in that part of the State.

Summary

This project developed a wide area network schematic design for five counties in North Central Idaho. The design was developed to provide affordable and reliable broadband services to public agencies, education, healthcare, and private users. The design was developed from the existing WAN uses and unmet network needs provided by those users. This schematic design provides the most cost effective technical solution currently available. This network design will improve service availability, affordability and reliability throughout the region.

Appendix A

Survey Respondents by County

Clearwater

Clearwater County
Lightforce USA
Unigrep
Clearwater Valley Hospital
Elk River Library
School District 171
The Gorge Group

Idaho County

Idaho County
JC Uhling/Militec
St. Mary's Hospital
SD 242
MVSD 244
Anderson Aeromotive
Avista

Latah County

Latah County
University of Idaho
Kendrick Joint School District
Gritman Medical Center
Potlatch SD 285

Lewis County

School District 305
HillCo
Kamiah Mills/Empire Lumber
Kamiah School District
Kamiah Grants

Nez Perce County

Nez Perce County
Lewis & Clark State College

Appendix A

Existing Wide Area Networks

Owner	End 1	End 2	Circuit Type	Bandwidth (Mbps)	Provider	Cost per Month	Notes
SMH-CVHC	Orofino	Cottonwood	PtP T-1	1.544	AT&T	$ 1,100.00	
SMH-CVHC	Orofino	Cottonwood	PtP T-1	1.544	AT&T	$ 1,100.00	
SMH-CVHC	Orofino	Cottonwood	PtP T-1	1.544	AT&T	$ 1,100.00	
SMH-KMC	Cottonwood	Kamiah	PtP T-1	1.544	Qwest	$ 400.00	
CVHC-MP	Orofino	Orofino	PtP T-1	1.544	Verizon	$ 400.00	
Latah County	Moscow	Moscow	Wireless VPN	4	First Step	$ 155.50	co-location rights included
Latah County	Moscow	Moscow	Wireless VPN	4	First Step		incl
Latah County	Moscow	Moscow	Wireless VPN	4	First Step		incl
Latah County	Moscow	Moscow	Wireless VPN	4	First Step		incl
KJSD	Kendrick	Juliaetta	PtP T-1	1.544	TDS Telecom	$ 300.00	
UI	Moscow	Aberdeen	PtP T-1	1.544	AT&T	$ 850.00	
UI	Moscow	Ada County	Frame Relay T-1	0.768	Qwest	$ 600.00	CIR
UI	Moscow	Boise - GAR	Frame Relay T-1	0.768	Qwest	$ 600.00	CIR
UI	Moscow	Boise - IWC	PtP T-1	3.088	AT&T	$ 1,700.00	
UI	Moscow	Bonner County	PtP T-1	1.544	AT&T	$ 850.00	
UI	Moscow	Caldwell	PtP T-1	1.544	AT&T	$ 850.00	
UI	Moscow	Carmen	PtP T-1	1.544	AT&T	$ 850.00	
UI	Moscow	Coeur d'Alene	PtP T-1	1.544	AT&T	$ 850.00	
UI	Moscow	Idaho Falls	PtP T-1	3.088	AT&T	$ 1,700.00	
UI	Moscow	Kimberly	Frame Relay T-1	0.768	Qwest	$ 600.00	CIR
UI	Moscow	Parma	PtP T-1	1.544	AT&T	$ 850.00	
UI	Moscow	Twin Falls	PtP T-1	1.544	AT&T	$ 850.00	
NP County	Lewiston	Boise	Frame Relay T-1	0.768	Qwest		CIR, 2005 data
ID County	Grangeville	Boise	Frame Relay T-1	0.768	Qwest		CIR, 2005 data
Lewis County	Nezperce	Boise	Frame Relay T-1	0.768	Qwest		CIR, 2005 data
Latah County	Moscow	Boise	Frame Relay T-1	0.384	Verizon		CIR, 2005 data
Clearwater Co	Orofino	Boise	Frame Relay T-1	0.384	Verizon		CIR, 2005 data
SD171	Frame Cloud	Timberline	Frame Relay T-1	0.384	Verizon		CIR
SD171	Frame Cloud	Peck	Frame Relay T-1	0.256	Verizon		CIR
SD171	Frame Cloud	Orofino JH	Frame Relay T-1				
SD171	Frame Cloud	Orofino Elem.	Frame Relay T-1				
SD171	Frame Cloud	Orofino HS	Frame Relay T-1				Collector
Hillco	Nezperce	Nezperce		4	Hillco	$ -	

Appendix A

Existing Wide Area Networks

Owner	End 1	End 2	Circuit Type	Bandwidth (Mbps)	Provider	Cost per Month	Notes
Gritman Medic	Gritman	Vendor	Frame Relay T-1	0.256	AT&T	$ 955.00	
SD242	Cottonwood	Cottonwood	PtP T-1	1.44	AT&T	$ 1,300.00	
MVSD 244	CV Elementary	Grangeville	PtP T-1	1.44	Qwest	$ 544.00	
MVSD 244	CV High School	Grangeville	PtP T-1	1.44	Qwest	$ 515.00	
MVSD 244	Grangeville Elementary	Grangeville	PtP T-1	1.44	Qwest	$ 222.00	
MVSD 244	Elk City	Grangeville	Frame Relay T-1	0.056	Qwest/Frontier	$ 235.00	
						$ 19,476.50	

Appendix A

Existing Internet Circuits

Owner	End 1	End 2	Circuit Type	Bandwidth (Down/Up)	Provider	Cost per Month	
SMH	Cottonwood	Internet	T-1	1.544	AT&T	$ 700.00	
SMH	Cottonwood	Internet	T-1	1.544	AT&T	$ 700.00	
SMH	Cottonwood	Internet	T-1	1.544	AT&T	$ 700.00	
SMH	Cottonwood	Internet	T-1	1.544	AT&T	$ 700.00	
SMH	Cottonwood	Internet	T-1	1.544	AT&T	$ 700.00	
SMH	Cottonwood	Internet	T-1	1.544	AT&T	$ 700.00	
CVHC	Orofino	Internet	T-1	1.544	AT&T	$ 700.00	
CVHC	Orofino	Internet	T-1	1.544	AT&T	$ 700.00	
7 Clinics	Varies	Internet	Wireless/DSL	Varies	Varies	$ 350.00	
Library	Elk River	Internet	Satellite	1	Ground Control	$ 125.00	
Lightforce	Orofino	Internet	T-1	1.544	Verizon	$ 550.00	
Unigrep	Orofino	Internet	DSL	1.544/0.384	Verizon		See below
Unigrep	Orofino	Internet	2xDSL	10/1.728	Verizon	$ 220.00	
Latah County	Moscow	Internet	Wireless	4	First Step	$ 155.50	co-location rights included
Latah County	Moscow	Internet	Wireless	4	First Step		incl
Latah County	Moscow	Internet	Wireless	4	First Step		incl
Latah County	Moscow	Internet	Wireless	4	First Step		incl
KJSD	Kendrick	Internet	T-1	1.544	TDS Telecom	$ 1,000.00	
KJSD	Juliaetta	Internet	T-1	1.544	TDS Telecom	$ 1,000.00	
Kamiah Mills	Kamiah	Internet	Wireless	0.371	Connect Wireless	$ 100.00	
Kamiah Mills	Kamiah	Internet	Wireless	1.371	Connect Wireless	$ 100.00	
SD305	Craigmont	Internet	T-1	1.544	AT&T	$ 676.42	
NP County	Lewiston	Internet	Ethernet	10	XO Communications		
SD171	Orofino HS	Internet	T-1	1.544	Verizon		
SD171	Cavendish	Internet	Satellite		Hughes Net		
Hillco	Nezperce	Internet	DSL	6 down/1 up	Qwest	$ 69.75	
Kamiah Schools	Kamiah	Internet	T-1	3.088	AT&T	$ 1,990.00	
Kamiah Grants	Kamiah #1	Internet	Wireless		QRO	$ 29.00	
Kamiah Grants	Kamiah #2	Internet	Wireless		QRO	$ 29.00	
Kamiah Grants	Kamiah #3	Internet	Satellite		Wild Blue	$ 39.00	
LCSC	Lewiston	Internet	Ethernet	20	XO Communications	$ 1,850.00	
LCSC	Coeur d'Alene	Internet	T-1	1.544	XO Communications	$ 550.00	
LCSC	Grangeville	Internet	Wireless	1.544	Compunet	$ 59.99	

Appendix A

Existing Internet Circuits

Owner	End 1	End 2	Circuit Type	Bandwidth (Down/Up)	Provider	Cost per Month
LCSC	Orofino	Internet	Cable Modem	0.512	Suddenlink	$ 79.99
LCSC	Kooskia	Internet	Wireless	1.544	QRO	$ -
Idaho County	Grangeville	Internet	Wireless	1	ConnectWireless	$ 183.00
JC Uhling Militec	Cottonwood	Internet	DSL	5 dn/1 up	Qwest	$ 56.00
Anderson Aeromc	Grangeville	Internet	DSL		Qwest	$ 69.25
Gritman Medical (	Gritman	Internet	Fiber	20	First Step	$ 1,500.00
Gritman Medical (	Gritman	Internet	DSL	0.768	Verizon	$ 75.00
Gritman Medical (	Adult Day Health	Internet	DSL	3/1.5	Verizon	$ 110.00
Gritman Medical Center		Internet	Wireless	7	First Step	$ -
Gritman Medical (	Potlatch Clinic	Internet	Wireless	7	First Step	$ 55.00
Gritman Medical (	Kendrick Clinic	Internet	DSL	1.5/.768	TDS Telecom	$ 115.00
Gritman Medical (	Wellness Center	Internet	DSL	3/1.5	Verizon	$ 110.00
SD242	Elementary	Internet	Wireless	5.5	Connect Wireless	
MVSD 244	Grangeville	Internet	T-1	1.44	AT&T	
MVSD 244	White Bird	Internet	Satellite		Wild Blue	
MVSD 244	Elk City	Internet	PtP			
						$ 16,846.90

Appendix A

Unmet Needs

WAN, Internet, or Other	**Respondent**	**Requirement**	**Use**	**Comments**
Internet	UNIGREP Orofino	5-10 Mbps (1 Year) 10-30 Mbps (2 Year)	VoIP & VPN	T-1, OC-1, T-3 OC-3 not available due to Verizon facilities T-3 cost would be $8,000/month
Internet	UNIGREP Orofino	3 Mbps	VoIP & VPN	See above
Internet	Lightforce Orofino	> T-1	VoIP, VPN, Other	Currently paying 10x cost of similar service in Boise Boise service is cable/DSL
Internet	Elk River Library	1 Mbps per user for 50 users	Data, video audio	USDA RDUP Grant is only a start
Internet	SMH	Fractional DS-3 9 Mbps	Internet access	Denied by Qwest, lack of facilities
WAN	SMH-CVHC	DS-3	Interconnect hospitals	Denied by Qwest and Verizon, lack of facilities
Internet	CVHC	T-1 (multiple)	Internet access	Denied by Verizon, lack of facilities on Teaken Butte
Voice	CVHC KMC SMH	ISDN PRI ISDN PRI ISDN PRI	Advanced voice services	Denied by Verizon, local switch cannot provide Denied by Qwest, local switch cannot provide Denied by Qwest, local switch cannot provide
Other	Latah County	Sheriff's Radio and Mobile Data		
Other	KJSD	Cellular Service		
Other	KJSD	Competition for services		

Appendix A

Unmet Needs

WAN, Internet, or Other	Respondent	Requirement	Use	Comments

Unmet Needs

WAN, Internet, or Other	Respondent	Requirement	Use	Comments
Internet	SD305	Affordable home broadband	VPN, Distance Ed.	$20/month maximum for students
Internet	SD305	Video conferencing 0.768 Mbps per circuit	Distance Ed.	Share resources with other Districts
WAN	Nez Perce CO	Video conferencing 0.768 Mbps per circuit	Telemedicine Interagency voice, data, video	
WAN	SD171	T-1 at each school		Denied at Timberline, "not tariffed"
Internet	SD171	(2) T-1 at Orofino HS	Increased internet access	Cost prohibitive ($2,992/month)

North Central Idaho Telecom Assessment and Implementation Plan

Prepared For:

Clearwater Economic Development Association

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Executive Summary

Introduction

In March, 2005, the Clearwater Economic Development association retained Access Consulting, P.C. of Missoula, MT to develop an engineering plan to provide broadband telecommunications capabilities to 16 underserved communities in North Central Idaho.

An eight step methodology was used to develop this plan, including:

I. Community Assessment
II. Existing Infrastructure Inventory
III. Application Analysis
IV. Identify Broadband Benefits
V. Analyze Demand
VI. Identify and Evaluate Potential Technologies
VII. Cost Analysis
VIII. Strategy Analysis

The following is a summary of the results developed for each step of the project. Each step is expanded in detail in the full report.

Community Assessment

This data was gathered through a series of public forums held between March and July of 2005 which invited all interested parties to learn about the plan and to participate in the documentation of their community. These community meetings were followed by extensive analysis of available census, employment, housing and business growth data. The results indicate these communities' populations are holding steady or shrinking slightly. The population density is very low, from a low of 1.8 persons per square mile in Idaho County to a high of 44.1 persons per square mile in Nez Perce County. The median age of the population is over 40. Median income ranges from $18,558 in White Bird to $36, 250 in Winchester. Business growth ranges from -2.3% in Nez Perce County to +14% in Idaho County. Three types of geography can describe the subject communities: steep river canyons, rolling plains, or forested mountains. The four counties span 100 miles north-to-south and 75 miles east-to-west. Because most roads are two lanes and follow the terrain, distances between communities is measured by the time it takes to travel between them, rather than in miles.

The picture of the study communities developed by this assessment is one of communities that offer an attractive rural quality of life but can not match that with economic opportunity. In order to develop economic opportunities, the communities are looking to enabling telecommunications services to assist them in growing existing businesses and attracting new development.

Existing Infrastructure Inventory

The region is served by three incumbent local exchange carriers, Frontier, Qwest and Verizon, each enjoying monopoly status in the communities they serve. This study identified substantial gaps in the services provided by the existing carriers. These gaps exist in both the local loop (intra-community) and in the backbone (inter-community) networks. Only six of the 16 communities are served by fiber optic cable from the carrier's network. The Verizon communities are all served by digital radio systems, or buried copper cabling extended from digital radio communities, with limited or no bandwidth available for broadband applications. In communities where fiber optic service is available, there is no competitive pressure to improve broadband affordability. Satellite internet service is available in all communities, subject to "clear view of the southern sky" requirements. Despite its ubiquitous availability, satellite service is not widely used. Satellite service has improved in performance and cost and is becoming a very viable option for remote locations.

Several critical deficiencies in the existing infrastructure were identified during the study. The most significant is the absolute lack of any connectivity over White Bird Hill. Traffic must be routed out of state to move between southern Idaho and any points north of White Bird. The study also identified several Verizon and Frontier communities that can not receive any broadband service at this time because of a lack of circuit capacity. This absence of infrastructure is the single greatest impediment to the expansion of broadband services in the study communities.

Application Analysis

This section identifies the existing users and potential early implementers of high speed telecommunications capabilities. The study identified enough organizations in the region to indicate that, through cooperative planning and investment, sufficient demand exists to eventually support commercial broadband services. The most common existing private party or small business use noted was web-access to buy and sell goods or to advertise local hospitality venues and events. There are also users who required internet access to exchange data files with out of state clients. One user runs a web authoring business via a dial-up connection in White Bird.

Given the poor performance of the existing services, the fact that individuals are able to run internet-based businesses in this region at all is a testament to their desire to live in the area and build local businesses. The absence of affordable broadband in the study communities forces users to work harder to succeed and hinders their ability to grow their businesses even more.

Identify Broadband Benefits

The study identified and categorized some of the possible benefits of broadband services to the region. There are as many possible benefits of broadband access as there are users willing to incorporate it into their personal or business practices.

The benefits were organized into four categories, including:

- Economic development
- Cost efficiencies
- Digital divide issues
- Improved service delivery

Analyze demand

This section presents broadband demand forecasts form the user's perspective and from a "technical expert's" perspective. Because the users have little or no access to broadband connectivity now, it is difficult for them to predict what applications and services they will need five or ten years into the future. Even experts in the field of broadband services can not foresee the new uses that will be developed in that time span. However, by reviewing the most recent developments in information technology, it is possible to predict what general classes of applications will be available and how they will impact the need for infrastructure in the study area.

Users interviewed for this project indicate that demand for broadband services will grow in two areas: 1) faster, more reliable and more affordable internet connectivity and 2) affordable broadband networks that interconnect multiple points in the region. Applications suggested by users include buying or selling in larger markets (e-commerce), telecommuting, distance learning, home-based services for out-of–state employers (e.g. medical transcriptionist), and electronic data interchange with clients (e.g. plans and specifications, electronic products). Affordable regional networking capabilities are needed by healthcare and educational institutions. Public school systems predict they will need broadband connectivity between all the schools in a District to support student database applications, distance learning applications and centralized facility and security monitoring. Hospitals and healthcare providers require regional networking capabilities to deliver telemedicine applications to remote clinics, centralize patient records, provide distance learning and facilitate staff training.

From the “expert’s” perspective, the three developments most likely to impact the study area are e-commerce, Internet telephony and video streaming. The development of Internet telephony technologies (e.g. Vonage, Skype, etc.) has the potential to significantly change how businesses and homes place and receive telephone calls. The availability of these services enables competition with the local telephone company that is not currently present in the 16 study communities. Similarly, the ability to deliver video programming via broadband introduces a new source of competition for franchised cable TV operations and satellite services. In both these cases, competition should serve to reduce the cost of service for consumers while pressuring providers to improve reliability of service as well.

So how much broadband capacity do the study communities need? In at least half the communities, the answer is more than the incumbent providers can provide. For the sake of this study, broadband was defined as a minimum of 200 kilobits per second (Kbps). In reality, this is probably too low. Within two years, the minimum connection speed should be 512 Kbps. This will enable users to take advantage of internet telephony applications and access the internet at speeds that positively impact personal and professional productivity. Within 5 years, the minimum bandwidth per connection should reach 700 to 1000 Kbps to enable business users to achieve productivity benefits by linking remote offices. Speeds like this will also enable the development of competitive video delivery services.

Identify and Evaluate Potential Technologies

The existing infrastructure analysis revealed that there are significant deficiencies in the backbone service to the communities and the local loop service within the communities. In order to design solutions to these deficiencies, bandwidth demand projections were created at start-up, five years and ten years out. These projections were based on community population, number of businesses, assumed growth rates and assumed participation rates. The results of these projections indicate that the study communities will require 1-2 Mbps in the initial year, growing to as much as 14 Mbps at the five year interval and 68 Mbps at the ten year interval.

Backbone: For backbone capacity, we recommend that a licensed wireless network be built to provide two redundant 150 Mbps links into each community. This network will be adequate to carry up to 40% more traffic than the predicted maximum bandwidth in the ten year projection. Further, wireless broadband backbone networks can be constructed for less than half the cost of fiber optic networks. The wireless network specified in the plan will cost between $5,000 and $50,000 per mile, depending on topography. A similar fiber optic network, though capable of much higher bandwidth, would cost between $80,000 and $130,000 per mile. Wireless backbone is clearly the most economical solution that meets the predicted bandwidth needs of the 16 communities.

The proposed wireless backbone can address affordability in a number of ways. As noted above, the cost of constructing the wireless network will be much less than a similar fiber optic network. The tower structures required to support the network can be shared with other radio systems (public safety, cellular, etc), allowing cost sharing of the initial capital costs. The wireless backbone can also be used to introduce competition into the study communities. Experience has shown that competition in this market can reduce costs and improve service to the end user.

To meet the immediate needs of communities with no existing broadband backbone capacity, we recommend the use of satellite internet service from DirecWay or WildBlue. These services can provide up to 2 Mbps download and 1 Mbps uplink. While this service will not support voice or real time video traffic, it will provide a substantial improvement over existing dial-up services. Satellite service will enable the “unserved” communities to immediately bridge the “digital divide” and begin to develop local uses of broadband that can transition to the wireless backbone when available.

Local Loop: Local loop solutions provide for the connection of individual users to a “point-of-presence” (PoP) within their community that is, in turn, linked to the backbone network. We recommend the implementation of fixed, point to multipoint wireless mesh networks for local loop services in all communities that do not currently have a broadband local loop solution. Because cable modem and DSL technologies require expensive equipment at the provider end (i.e. cable modem termination systems and DSL access multiplexers), wireless local loop systems offer a more economical alternative.

Construction Priorities: The magnitude of the backbone segment of this project alone calls for some prioritization of the links to be constructed. The absence of any capacity whatsoever in communities like White Bird or Weippe suggest that they should be prioritized ahead of communities that are already served by a carrier’s fiber optic network. The communications challenges posed by the existence of the LATA boundary between White Bird and Grangeville also suggest that this link receive a higher priority as funding becomes available. We recommend the following priorities for the build out of the wireless backbone:

1. White Bird to Grangeville
2. Orofino to Weippe via Greer
3. Weippe to Pierce
4. Peck to Orofino
5. Elk River to Bovill
6. Elk City to Grangeville
7. Winchester to Craigmont
8. Reubens to Craigmont

As mentioned in the backbone discussion above, the communities that receive lower priority in the build-out of the wireless backbone should implement a satellite-based backhaul solution for the near term. The wireless local loop build-out can begin immediately, using the satellite links as a backhaul.

Cost Analysis

The backbone costs are based on recent experience building fiber optic and wireless networks in rural communities in the Rocky Mountain region. As noted above, wireless backbone networks have a cost advantage over fiber optic networks ranging from 2:1 to 20:1, depending on topography and bandwidth. Wireless mesh networks can be built in typical communities for between $25,000 and $50,000 per square mile of coverage. These costs are based on design models that assume end users live within the city limits. Users living in more remote locations between communities will most likely be best served by satellite providers. End user equipment to connect to a mesh network ranges from the built-in wireless card in a laptop, for those living close to a mesh access point, to an external wireless card, antenna cable and directional antenna (cost: less than $300).

Operational costs depend on the strategy used to build the wireless backbone and local loop services. They also depend on the ability to aggregate demand and increase the population across which to defer the costs. One such opportunity for demand aggregation exists with Greer, Pierce, Weippe and Peck. The backbone cost model shown above assumes that all four of these communities will be linked back to Orofino. A broadband point of presence (PoP) could be established in Orofino and shared by the four communities (and Orofino, if desired). The cost of wholesale internet access also goes down, on a per Mbps basis, with larger bandwidth connections.

Strategy Analysis

This section reviews ten different implementation strategies and how they may be applied to address issues in the study area. The ten strategies are further broken down into three phases: Immediate Actions, Near Term Projects, and Long Range Projects. These three phases are used to demonstrate the priority of the action and the most likely time frame in which the project can be successfully concluded. Each strategy description includes the issue it addresses, its objectives, a detailed description of the strategy, its projected benefits, cost factors and funding options, possible partners, and a timeline for its execution. The strategies include:

- Immediate Strategy 1: Create a Regional Telecommunications Consortium
- Immediate Strategy 2: Install Satellite Broadband in Libraries/Community Centers of Unserved Communities
- Immediate Strategy 3: Wireless Mesh Network Pilot Project
- Immediate Strategy 4: Promoting Broadband Applications – Community Education, E-Commerce, and Telework
- Near Term Strategy 1: Create Wireless Backbone Networks for Communities Not Served by Broadband Networks
- Near Term Strategy 2: Expand Wireless Mesh Local Loop Networks
- Near Term Strategy 3: Support New Private Backbone Initiatives
- Long Range Strategy 1: Integrate Fiber Optic Networks into Larger Public Works Projects
- Long Range Strategy 2: Coordinate State and Local Government Networking Procurement Policy to Support Broadband Development in the Region
- Long Range Strategy 3: Extend Wireless Backbone to Promote Competition and Redundancy

I. COMMUNITY ASSESSMENT: SOCIO-DEMOGRAPHIC-GEOGRAPHIC ANALYSIS

A. Population & Housing Trends

1. Population Growth

Between 1990 and 2000, the four counties that comprise the study area had a population growth rate averaging 10%. Idaho County had the fastest growing population (12.7%) while Clearwater County experienced the slowest growth rate of 5%.

Population estimates for 2004 show that the growth for the study area since 2000 has stabilized. Estimates indicate that Clearwater County had the largest population decrease while Nez Perce County experienced an increase in population in the study area. The increase in Nez Perce County, however, is due to the increase in Lewiston - the largest city in the study area and county seat.

Of the communities in the study area, only Cottonwood is estimated to have increased in population from 2000 to 2004. This slow down in population growth since 2000 for the four county study area contrasts with the State of Idaho which continues to show population gains.

Table 1: Population Growth in Study Area

Location	1990	2000	2004	% Growth 1990-2000	% Growth 1990-2004	% Growth 2000-2004
Clearwater County	8,505	8,930	8,393	5.00%	-1.32%	-6.01%
Idaho County	13,783	15,511	15,616	12.54%	13.30%	0.68%
Lewis County	3,516	3,747	3,753	6.57%	6.74%	0.16%
Nez Perce County	33,754	37,410	37,823	10.83%	12.05%	1.10%
4 County Region	59,568	65,598	65,585	10.12%	10.10%	-0.02%
Idaho	1,006,749	1,293,953	1,393,262	28.53%	38.39%	7.67%

Source: U.S. Census Bureau, Census of the Population & Annual Estimates of the Population

2. Population Distribution

The largest city in the four-county area is Lewiston with over 30,000 people. After Lewiston the next largest cities are Orofino with a 2000 population of 3,247 and Grangeville with a 2000 population of 3,228. The largest city of the 16 communities in the study area is Lapwai with 1,134 followed by Cottonwood with 944 people. In Nez Perce County 88% of the population lived in incorporated cities while 39% of the population lived in incorporated areas in Lewis and Clearwater counties. In Idaho County 55% lived in cities.

Table 2: Population for Incorporated Cities in the Study Area

Location	Population 2000	Dwelling Units
Clearwater County	8,930	4,144
Elk River	156	133
Orofino*	3,247	1316
Pierce	617	303
Weippe	416	196
Greer	86	38
Idaho County	15,511	7,537
Cottonwood	944	383
Ferdinand	145	64
Grangeville*	3,228	1453
Kamiah*	1,160	612
Kooskia*	675	364
Riggins	410	253
Stites*	226	120
White Bird	106	72
Elk City	--	219
Lewis County	3,747	1,795
Craigmont	556	244
Nezperce	523	222
Reubens	72	32
Winchester	308	151
Nez Perce County	37,410	16,203
Culdesac	378	176
Juliaetta*	609	262
Lapwai	1,134	391
Lewiston*	30,904	13,391
Peck	186	101

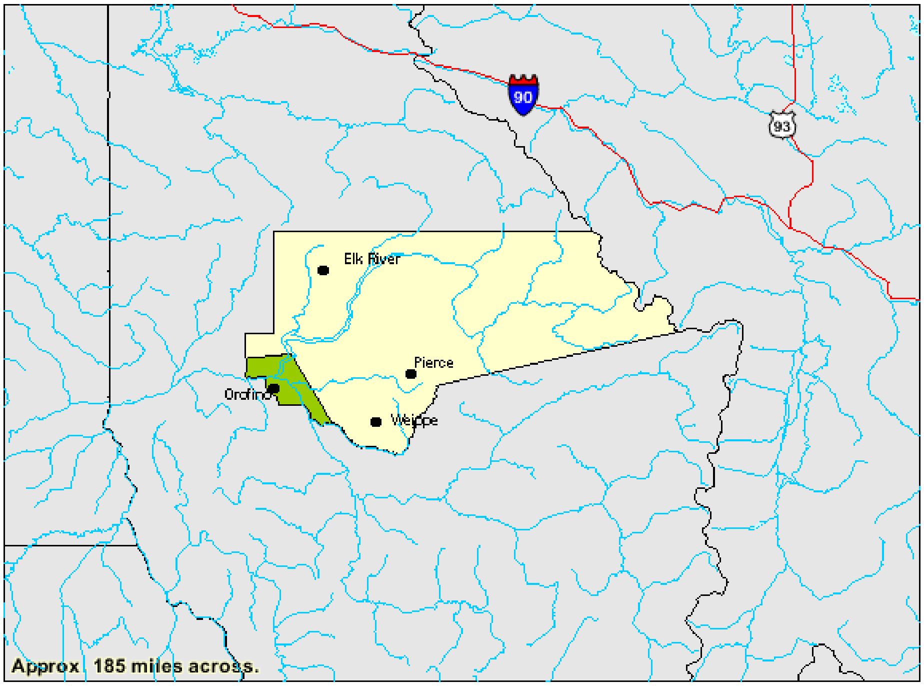
Source: U.S. Census Bureau, 2000 Census of the Population & Annual Estimates of the Population

Notes: 1) Elk City & Greer are not incorporated. Housing and population estimates based on local sources.

*2) * = Cities not participating in the Study are included to indicate where population centers are located in the 4 county study area.*

Nez Perce County is the most populous county with the largest city in the four county area. It has the highest population density of 44.1 persons per square mile. Lewis County is the least populous county but with a small land area it has a population density of 7.8 persons per square mile. Idaho County has a large land area and the lowest population density of 1.8 persons per square mile while Clearwater County has a population density of 3.6 persons per square mile. Despite the low overall population density in Idaho and Clearwater Counties, the population is concentrated along the U.S. Highway 12 & 95. Outside of Lewiston, Nez Perce County has a very low population density while Lewis County has the most evenly distributed population.

Figure 1: Density – Clearwater County



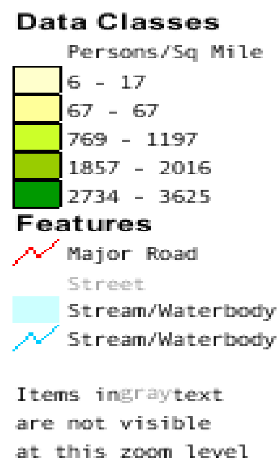


Figure 2: Density – Lewis County

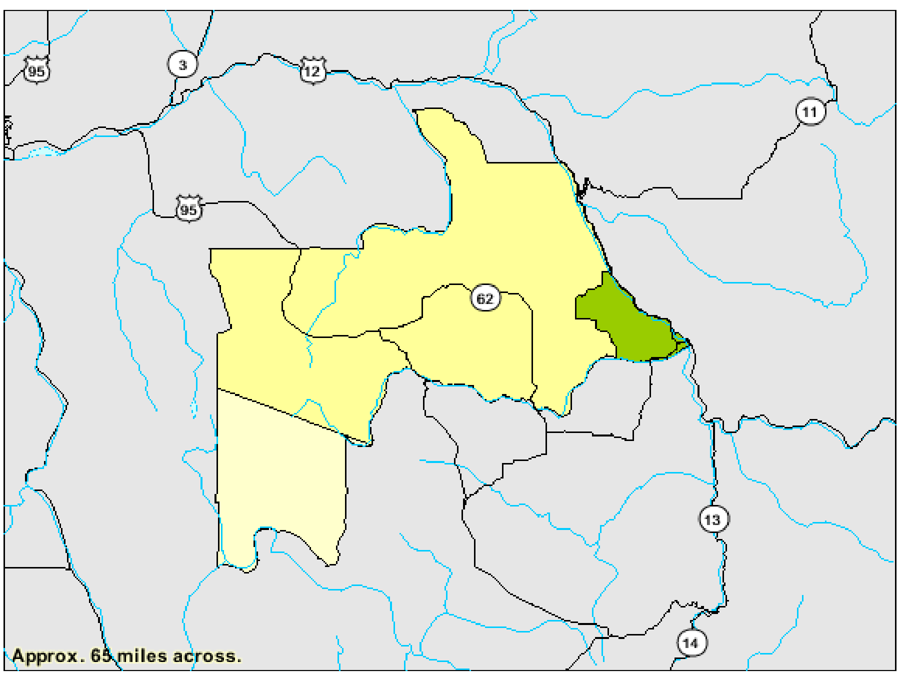


Figure 3: Density –Idaho County

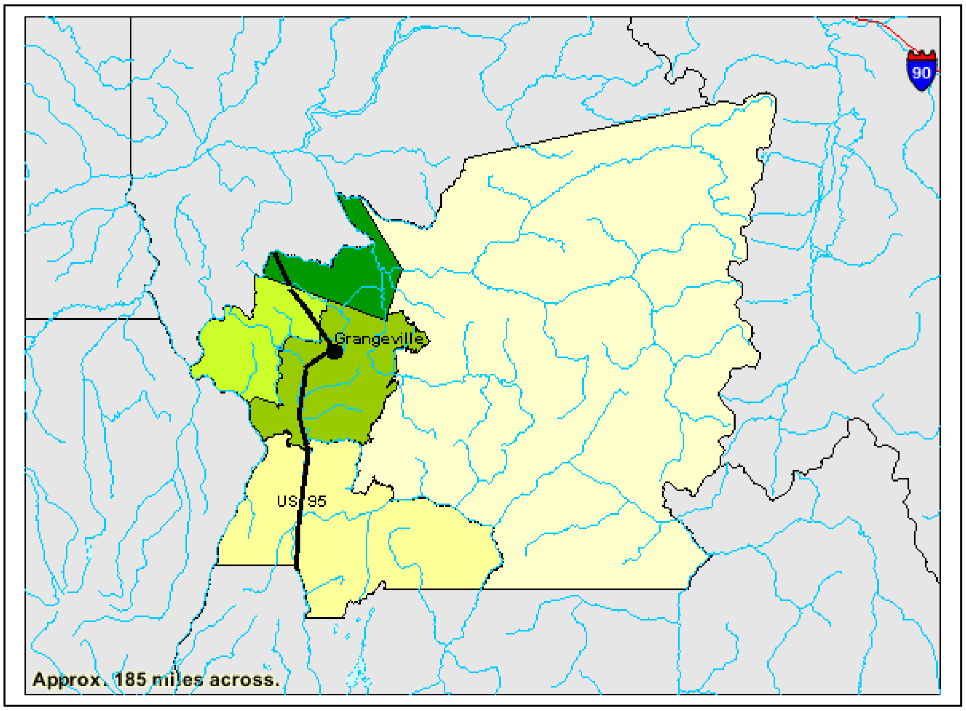
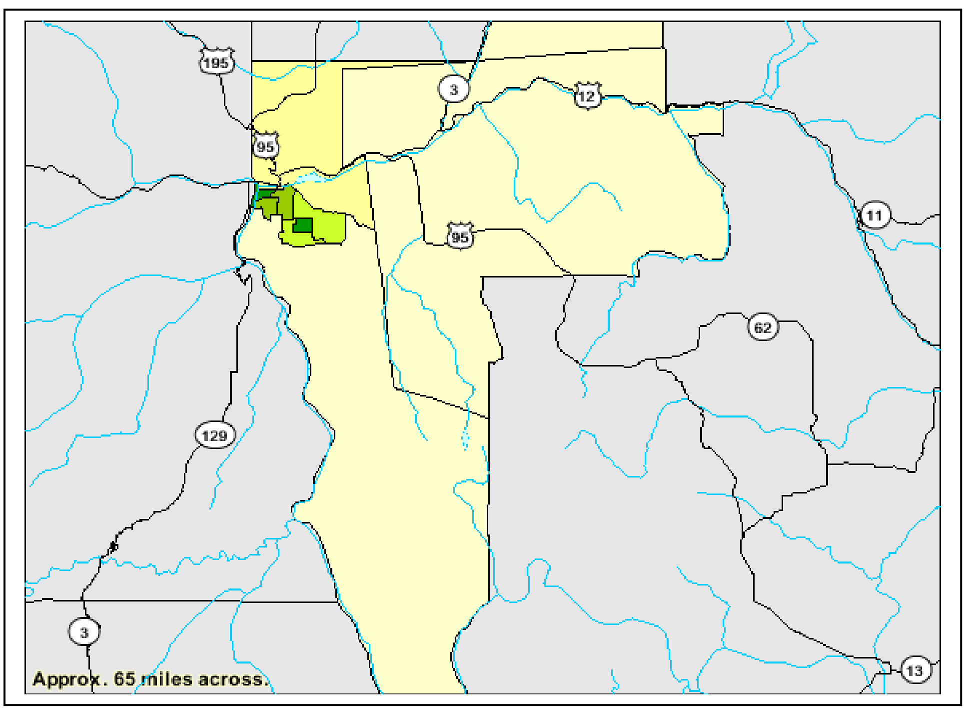
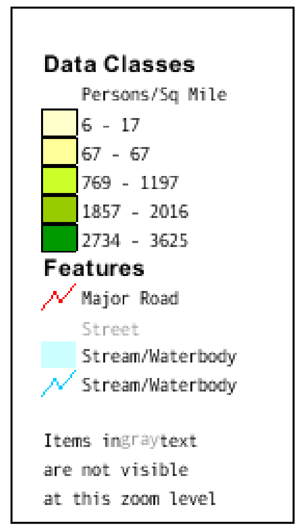


Figure 4: Density – Nez Perce County





3. Housing Units

The number of housing units, distribution, and growth trends generally corresponds to trends in population. In the study area, however, one should note that three of the counties have exceptionally high vacancy rates. Typically, 4% -6% vacancy rates are considered acceptable in a healthy housing market. Except for Nez Perce County, vacancy rates range from 13.4% in Lewis County to a high of 19.3% in Idaho County. Seasonal homes are one factor contributing to the high vacancy rate in Idaho and Clearwater County. Even accounting for these homes, the vacancy rate for the two counties is still around 10%.

Table 3: Vacancy Rates & Seasonal Homes

Location	**# DU**	**% Vacant**	**# Seasonal**
Clearwater County	4,144	16.6%	293
Idaho County	7,537	19.3%	790
Lewis County	1,795	13.4%	53
Nez Perce County	16,203	5.7%	219

Source: U.S. Census Bureau, Census of the Population - 2000

4. Age

The Pew Internet and American Life Project indicates that as of May, 2005 68% of American adults use the Internet. If Internet use is broken down by age group, however, there is a significant drop-off after age 55 and again after age 65 in Internet usage. The four counties in the study area have a significantly higher median age than the rest of the State and the U.S. The percent of people over age 65 is highest in Lewis and Idaho counties.

Table 4: Age Characteristics

Location	**Median Age**	**% over 65**
Clearwater County	41.7	15.6%
Idaho County	42.3	17.0%
Lewis County	42.5	18.5%
Nez Perce County	38.1	16.5%
Idaho (State)	33.2	11.3%
United States	35.2	12.4%

Source: U.S. Census Bureau, Census of the Population - 2000

5. Education

The four counties in the study area generally exceed the national average in percent of population that has completed high school and is comparable to state averages. The percent of the population with a Bachelor's degree, however, is significantly lower in the study area compared to the state and national averages

Table 5: Educational Levels – Age 25 or over

Location	**High School**	**Bachelor Degree**
Clearwater County	80.1%	13.3%
Idaho County	82.9%	14.4%
Lewis County	84.2%	14.8%
Nez Perce County	85.5%	18.9%
Idaho (State)	84.4%	21.7%
United States	80.4%	24.4%

Source: U.S. Census Bureau, Census of the Population - 2000

B. Economic Analysis

1. Median Household Income

The Pew Internet Project reports a strong correlation between household income and subscription rates to broadband services at home. Monthly costs for broadband services are usually $40 to $50 and are easily double the rates for dial-up service. This suggests that high costs for broadband service is a barrier for low income households.

Table 6: Households with Broadband Internet Access by Income - 2004

Household Income	% HH with Broadband
$100,000 +	55%
$75-$100,000	42%
$50 - $75,000	32%
$30 - $40,000	18%
$20 - $30,000	14%

Source: Pew Internet Project

In the study area, household income is lower than the State average. Communities with the highest household income include Winchester, Nezperce, Cottonwood and Pierce. Since the 2000 Census, however, the Potlatch Jaype Mill has closed in Pierce resulting in a drop in household income. A 2002 income survey indicated that 63.5% of persons in Pierce qualified as low-moderate income. Communities with the lowest household income include White Bird and Riggins. Although Nez Perce County has the highest average household incomes this is mostly attributable to the City of Lewiston.

Table 7: Median Household Income in Study Area - 1999

Location	Median HH Income
Clearwater County	**$32,071**
Elk River	$30,000
Pierce	$34,318
Weippe	$26,442
Idaho County	**$29,515**
Cottonwood	$34,167
Ferdinand	$26,250
Riggins	$20,972
White Bird	$18,558
Lewis County	**$31,413**
Craigmont	$31,806
Nezperce	$36,094
Reubens	$29,375
Winchester	$36,250
Nez Perce County	**$36,094**
Culdesac	$25,750
Lapwai	$26,800
Peck	$27,500
Idaho – State	**$37,572**

Source: U.S. Census, 2000 Population of the Census

2. Unemployment & Poverty Rates

Unemployment and poverty rates are signs of economic distress that indicate both the need for broadband deployment as an economic development tool as well as the necessity to keep broadband rates low to encourage higher penetration rates in the community. Poverty rates are higher than U.S. and State averages in Clearwater and Idaho Counties. The unemployment rate is highest in Clearwater County. It is higher than State and national averages in Idaho and Lewis County but lower than the national average in Nez Perce County. It should be noted that the unemployment statistics for the Nez Perce Reservation vary greatly depending on the source of the data. The Nez Perce Tribal Planning Department cites an unemployment rate of 32% on the Reservation while the 2000 Census listed the rate as 4.1%. The Tribe's statistic has been used for purposes of this report because it is believed to be more current.

Table 8: Unemployment & Poverty Rate

Location	**Unemployment 2005 – Nov.**	**Poverty Rate 1999**
Clearwater County	9.1%	13.4%
Idaho County	5.7%	15.9%
Lewis County	5.1%	12.7%
Nez Perce County	3.9%	11.1%
Nez Perce Reservation	32%	14.2%
Idaho (State)	3.4%	11.7%
United States	4.8%	12.4%

Source: U.S. Census Bureau, Census of the Population & State of Idaho Dept. of Commerce

<u>3. Business Growth</u>

Over the last 10 years business growth has reflected the national economy. There was an expansion of businesses in all four counties from 1993 to 1998. During the economic slowdown, however, the number of businesses either stabilized or slightly declined.

Table 9: Number of Business Establishments

Location	**1993**	**1998**	**2003**
Clearwater County	267	275	269
Idaho County	391	445	447
Lewis County	125	133	131
Nez Perce County	1,189	1,224	1,161

Source: U.S. Census Bureau, County Business Patterns

4. Employment by Industry

The following employment data comparing employment by industry sector from 1990 to 2000 reveals a number of trends.

- Every county experienced job growth between 1990 and 2000. Nez Perce County had the highest rate of growth (25%) followed by Idaho County (17%), Lewis County (17%), and Clearwater County (8%).
- The manufacturing sector experienced a decline in employment in every county except Lewis County where there was no change. There was also decline in the wholesale industry in three counties.
- The service sector had the highest job growth.
- Every County experienced a decrease in Federal government jobs and an increase in State and local government jobs.
- Construction industries, retail industries, and finance/insurance/real estate (FIRE) also experienced significant job increases in all counties.
- Retail and service jobs comprise the largest portion of jobs in the four counties.

Table 10: Employment by Industry by County

	Clearwater		**Idaho**		**Lewis**		**Nez Perce**	
	1990	**2000**	**1990**	**2000**	**1990**	**2000**	**1990**	**2000**
Farm	227	222	831	988	246	257	524	611
Ag, Forest, Fish	119	206	98	308	50	50	240	263
Manufacturing	1,319	794	1,210	934	226	226	4,151	3,989
Mining	--	--	111	91	--	--	82	135
Construction	144	274	294	612	63	--	1,001	1,217
Transport, Util.	134	163	286	335	75	127	1,025	1,694
Wholesale	58	--	209	173	124	102	816	915
Retail	562	597	905	1,086	272	380	4,133	4,835
FIRE	122	--	225	481	73	133	1,341	2,073
Services	605	920	1,117	1,732	243	248	5,446	7,821
Federal Gov	379	306	687	520	77	53	470	558
State-Local Gov.	878	900	732	900	298	370	2393	3,001
Total	**4,370**	**4,718**	**6,705**	**8,161**	**1,751**	**2,046**	**21,622**	**27,112**

Source: U.S. Bureau of Economic Analysis and "County Profiles of Idaho" prepared by Idaho Department of Commerce & Labor

5. Top Employers

Table 10 lists top employers in the county seats and in the communities in the study area that employ over 20 people. Regional employers such as Federal and State governments, hospitals and educational institutions and larger employers are likely users of broadband services and can be targeted as a market group.

Table 11: Top Employers

Location	**Employer**	**# Employees**
Elk River	Northwoods Nursery	20
Pierce	Clearwater National Forest	10 in Pierce Office
Weippe	Weippe Schools Timberline Wood Products	60 20
Orofino	School District Clearwater National Forest Idaho Dept. of Health Welfare Clearwater Hospital Idaho Dept. of Corrections Konkolville Lumber Co. Clearwater Health & Rehab	267 60 in Orofino Office 125 110 78 70
Cottonwood	St. Marys Hospital School Dist. #242 Seuberts Excavators ID Dept. of Corrections Militec Defense Systems Pacific Cabinets	170 89 75 70 25 22
Riggins	Nez Perce National Forest Grangeville Joint Dist. #241	100 52
Grangeville (County Seat)	Grangeville School District Nez Perce National Forest Idaho County	300 250 150
Craigmont	Highland School District Lewiston Grain Growers	41 20
Nezperce	Nezperce School District Nezperce County Hillco	45 20 20
Culdesac	Culdesac School	36
Lapwai	Nez Perce Tribe Schwalss Screw Machine Products Bureau of Indian Affairs Valley Foods	270 70 33 31
Lewiston (County Seat)	Potlach Wood Products St. Joseph Regional Hospital Lewis – Clark State College Swift Transportation	2,100 808 720 430

Source: State of Idaho, Department of Commerce, “Community Profiles”

C. Geographic Analysis

1. Location, Terrain & Land Area

The four counties are located in the lower part of the Idaho panhandle in the north-central part of the State. Much of the area is characterized by mountainous terrain and rugged forest land intermixed with prairies. The Clearwater Mountains, the Selway-Bitteroot Wilderness, the Nez Perce National Forest and the Clearwater National Forest are in the study area. The Salmon, Selway and Lochsa rivers and numerous other rivers and streams cross through the four counties.

Of the four counties, Idaho County is the largest in land area with 8,485 square miles. Clearwater County has 2,461 square miles while Lewis County with 479 square miles and Nez Perce County with 849 square miles are considerably smaller. The combined area of the four counties equals 12,274 square miles, which is larger than the state of Vermont.

Figure 5: Location Map

2 Major Metropolitan Areas

The largest city in the four county area is Lewiston with an estimated 2004 population 31,028. The nearest major metropolitan area in the state is the State capitol of Boise with approximately 185,000 people. Riggins in the southern most part of Idaho County is 157 miles from Boise while Elk River in the northern most part of the study area is 325 from the State capitol. Spokane, WA, a city of just over 195,000, is located approximately 160 miles from the communities in the northern part of the study area.

3. Land Ownership

A large percentage of the land in three counties in the study area is in public ownership. Federal lands are comprised primarily of national forest and Bureau of Land Management (BLM) land. In Idaho County, 83.3% of the land area is Federal public land. Lewis County has the least amount of land area in Federal or State lands.

Table12: Land Ownership

	Federal	**State**	**Private**
Clearwater	53.4%	14.9%	31.5%
Idaho	83.3%	1.4%	15.2%
Lewis	2.6%	2.1%	95.2%
Nez Perce	6.2%	15.5%	77.4%

Source: Idaho Dept. of Commerce, County Profiles

4 Nez Perce Reservation

Phone: (208) 843-2253
PO Box 365, Lapwai, Idaho 83540

The Nez Perce Reservation overlaps with major portions of Idaho, Lewis and Nez Perce Counties. Of the cities in the study area, Lapwai, Culdesac, Reubens, Craigmont, Nezperce, Ferdinand, Peck and Greer are located on the Reservation. The 2000 population, including tribal and non-tribal members, on the reservation was 17,959. The 2000 Census indicated that the median household income on the reservation was $30,710. This is comparable to average income for the counties in the study area. The poverty rate of 14.2% in 1999 was slightly higher than the four counties. The unemployment rate on the reservation was 4.1% according to the 2000 Census and 32% according to the Tribe.

5. Transportation Corridors

There is no Interstate Highway that transverses the study area. U.S. Highway 95 runs north-south through the area and U.S. Highway 12 runs east-west through the area. Of the sixteen towns in the study area, eight are on these two highways. State highways that serve the area include State Hwys 13, 14, 62, and 11.

II. Existing Infrastructure Inventory

The sixteen communities in the study area are served by three local phone companies: Frontier, Qwest and Verizon. Frontier serves Elk City, White Bird, and Riggins. Qwest serves Lapwai, Culdesac, Reubens, Craigmont, Winchester, Nezperce, Ferdinand and Cottonwood. Finally, Verizon serves Peck, Greer, Weippe, Pierce and Elk River. The technologies used by the three companies to connect these communities together include traditional copper circuits, digital radio links and fiber optic cable. Figures 1 through 3 below provide illustrations of the three providers' networks. Following each Figure is a narrative description of the existing telephone company and other provider infrastructure in each of the sixteen communities covered by this plan. The availability of high-speed telephone company circuits into and within the community is detailed along with the available broadband resources and providers in each community. In the case of dedicated internet T-1 services, only the local telephone company is listed. There are many other providers (like AT&T and Covad, to name just two) who could provide the circuit using local telephone company circuits. Recurring and one time costs for the services, where available, are listed in the text or the accompanying tables.

Communities Served by Frontier Communications

Figure 6. Frontier Communications serves three study communities with three different backhaul technologies.

Elk City

Elk City, population 395, is located in the mountains east of Grangeville in Idaho County. The terrain surrounding Elk City is mountainous and heavily forested. The incumbent local exchange carrier (ILEC) for the area is Frontier Communications. Little information about the switch and service in Elk City was available from Frontier. It was learned that the town's telephone system is linked to the outside world via a digital radio link to Cottonwood. T-1 and DS-3 service within the town are possible, but the digital radio link does not have the capacity to backhaul them out of the community.

Broadband internet access in Elk City is only available from the three satellite providers. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Riggins

Riggins, population 410, is located in southern Idaho County along the U.S. 95/Salmon River corridor. The terrain is mountainous with the community located on the Salmon River valley floor. The incumbent local exchange carrier is Frontier Communications. Frontier did not identify the type of switch in Riggins, but reported that they do provide all types of POTS service. They also reported that T-1 and DS-3 service is available. Service in Riggins is backhauled via fiber optic cable to Boise.

It should also be noted that Riggins and White Bird are in Local Access and Transport Area (LATA) 652 while the remaining 14 communities are in LATA 960. This is significant for two reasons. First, telephone services crossing LATA boundaries are treated as long distance even if they do not cross a state boundary or travel any distance. InterLATA services are usually more expensive than IntraLATA services. Second, the backhaul for services in LATA 652 goes to Boise, while the backhaul for services in LATA 960 goes north to Moscow and Spokane.

The result of this architecture is that there are no connections, broadband or otherwise running between White Bird and Grangeville. Riggins customers, such as the local schools, requiring service across the LATA boundary are routed out through Boise to Spokane and back down to Grangeville. The number of parties involved in this indirect routing is one of the reasons that the services are more expensive. The lack of connectivity between Riggins/White Bird and Grangeville negatively impacts local government, school, and private communications costs and capabilities.

Broadband services are available in Riggins from three sources. The first source is a T-1 line leased from Frontier or other providers. The recurring monthly cost can not be determined without placing a formal order, but typically ranges from $700 to $1100 per month. The second source is DSL service from Frontier, which is reported to cost from $65 to $80 per month. Satellite internet service from DIRECWAY, StarBand, and WildBlue is also available in Riggins. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

White Bird

White Bird, population 196, is located in the canyons of White Bird Creek and the Salmon River along the U.S. 95 corridor 12 miles south of Grangeville in Idaho County. The terrain is typically steep-walled canyons with limited line of sight across the local community. The incumbent local exchange carrier is Frontier Communications. Service to the community is provided by a remote switch backhauled to Riggins by a copper T-1. There are no Frame Relay, T-1 or DS-3 services available in the community, nor is there any backhaul capacity to carry those services out of the community. A Frontier representative estimated that it would involve at least $1 million dollars worth of construction to bring T-1 services to White Bird.

Broadband internet access in White Bird is only available from the three satellite providers, DIRECWAY, StarBand, and WildBlue. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Communities Served by Qwest

Figure 7. The Qwest network serves eight communities in the study and links most of the central offices with fiber optic cable.

Cottonwood

The town of Cottonwood, population 944, is located in Idaho County along the U.S. 95 corridor. The town is located in rolling terrain with much of the central business district surrounded by hills that limit line-of-sight to outlying areas. The incumbent local exchange carrier (ILEC) is Qwest. The Qwest central office (CO) in Cottonwood is connected to the Qwest network by fiber optic cable. The switch in Cottonwood is a Nortel DMS-10. The switch is capable of supporting all grades of “plain old telephone service” (POTS). The switch can also support point to point T-1 circuits within the community to provide broadband service. Additional construction costs may apply to any new T-1 circuit, depending on the available capacity on the Qwest network between the end points of the circuit. Frame relay circuits are not available in Cottonwood. There is no outside plant (OSP) fiber optic cable serving customers within Cottonwood. DS-3 circuits can be provisioned in Cottonwood, but construction costs would be included. The cost of T-1 or DS-3 construction can not be determined until a formal order for the circuit is placed. These costs depend on the distance a circuit must travel and the capacity and condition of the existing telephone company infrastructure to be used. However, in previous projects by the consultant, these costs have ranged as high as $30,000. Qwest does not provide DSL service in Cottonwood.

Broadband internet is available in Cottonwood from three sources. The first source is a T-1 line leased from Qwest or other providers. The recurring monthly cost can not be determined without placing a formal order, but typically ranges from $700 to $1100 per month. Wireless service is also available from Connect Wireless (www.connectwireless.us) and MtIda.net (http://mtida.net). Connect Wireless reports they have 150 users in the Cottonwood area, all sharing a single AT&T provisioned T-1 circuit. They also report that average user throughput is 800Kbps. The actual throughput will depend on the number of users on the system at a given time, the quality of the wireless equipment being used, the distance of a user from the wireless base station, and other factors. Satellite service is available from DIRECWAY, WildBlue or StarBand. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. The monthly recurring costs for the satellite and wireless providers, as provided by their respective websites, are included in Table 12and 13. Actual costs may vary due to periodic service and installation sales.

Craigmont

The town of Craigmont, population 556, is located in Lewis County along the U.S. 95 corridor. The town is located in rolling terrain surrounded by hills that limit line-of-sight to outlying areas. The incumbent local exchange carrier (ILEC) is Qwest. The Qwest central office (CO) in Craigmont is connected to the Qwest network by fiber optic cable. The switch in Craigmont is a Nortel DMS-10. The switch is capable of supporting all grades of “plain old telephone service” (POTS). The switch can also support point to point T-1 circuits within the community to provide broadband service. Additional construction costs may apply to any new T-1 circuit, depending on the available capacity on the Qwest network between the end points of the circuit. Frame relay circuits are available in Craigmont, but again construction costs could apply. There is no outside plant (OSP) fiber optic cable serving customers within Craigmont. DS-3 circuits can be provisioned in Craigmont, but construction costs would be included. The cost of T-1 or DS-3 construction can not be determined until a formal order for the circuit is placed.

Broadband internet service is available in Craigmont from four sources. The first source is a T-1 line leased from Qwest or other providers. The recurring monthly cost can not be determined without placing a formal order, but typically ranges from $700 to $1100 per month. Connect Wireless provides wireless service in town that is backhauled via an AT&T internet T-1. The wireless system shares the full capacity of the T-1 between all active users. The provider reported that the actual average bandwidth available to an individual user is 1000Mbps. The actual throughput will depend on the number of users on the system at a given time, the quality of the wireless equipment being used, the distance of a user from the wireless base station, and other factors. MtIda.net is also offering wireless service in the Craigmont. Both wireless services require line of sight from the user to an existing transmitter location. Satellite internet service from DIRECWAY, StarBand, and WildBlue is also available in Craigmont. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite and wireless service are presented in Table 12 and 13. Actual costs may vary due to periodic service and installation sales.

Number of PC's	Monthly Pricing	Prepaid Monthly Pricing	Installation Cost
1-2	$39.95	$35.95	$290
3-5	$69.95	$65.95	N/A
6-10	$99.95	$95.95	N/A
11-15	$139.95	$135.95	N/A
16-20	$169.95	$165.95	N/A
21-25	$199.95	$195.95	N/A
26-30	$239.95	$235.95	N/A
31-35	$269.95	$265.95	N/A
36-40	$299.95	$295.95	N/A
41-45	$339.95	$335.95	N/A
46-50	$369.95	$365.95	N/A
50-100	$399.95	$395.95	N/A
100+	$479.95	$475.95	N/A

Table 13. Advertised Pricing For Connect Wireless Broadband Service. Prepaid pricing is effective if one year of service paid in advance. Installation costs were only available for a "typical home." (Source: www.connectwireless.us)

Culdesac

The town of Culdesac, population 378, is located East of the U.S. 95 corridor in Nez Perce County. The incumbent local exchange carrier (ILEC) is Qwest. The Qwest central office (CO) in Culdesac is connected to the Qwest network by fiber optic cable. Culdesac is served by the switch in Lapwai, which is a Nortel DMS-10. The switch is capable of supporting all grades of "plain old telephone service" (POTS). The switch can also support point to point T-1 circuits within the community to provide broadband service. Additional construction costs may apply to any new T-1 circuit, depending on the available capacity on the Qwest network between the end points of the circuit. Frame relay circuits are available in Culdesac, but mileage charges may apply to backhaul to the nearest frame relay switch. There is no outside plant (OSP) fiber optic cable serving customers within Culdesac. DS-3 circuits can be provisioned in Culdesac, but construction costs would be included. The cost of T-1 or DS-3 construction can not be determined until a formal order for the circuit is placed.

	DIRECWAY Professional	DIRECWAY Small Office	DIRECWAY Business	WildBlue Select Pak	WildBlue Pro Pak	StarBand 484 Small Office
Monthly Price	$69.99	$99.99	$199.99	$69.95	$79.95	$139.99
OTC	$599.98	$999.98	$999.98	$478.95	$478.95	$599.99
Max Download (Kbps)	1000	1500	2000	1000	1500	1000
Max Upload (Kbps)	200	300	500	200	256	256
Term (months)	15	24	24	12	12	36

Table 14. Currently Advertised Prices and Speeds for Satellite Internet Service (Source: Provider websites, December 2005)Note: Broadband service is defined by the FCC as a minimum 200Kbps upload and download speed. Available satellite services that do not meet this criterion are not considered within this study.

Broadband services are available in Culdesac from three sources. The first source is a T-1 line leased from Qwest or other providers. The recurring monthly cost can not be determined without placing a formal order, but typically ranges from $700 to $1100 per month. The second source is DSL service from Qwest. Satellite internet service from DIRECWAY, StarBand, and WildBlue is also available in Culdesac. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Ferdinand

Ferdinand, population 145, is located along the U.S.95 corridor in Idaho County. The town is located in rolling terrain but good line of sight is available from the central business to outlying areas. The incumbent local exchange carrier (ILEC) is Qwest. The Qwest central office (CO) in Ferdinand is connected to the Qwest network by fiber optic cable. Ferdinand is served by the Nortel DMS-10 in Cottonwood. The switch is capable of supporting all grades of “plain old telephone service” (POTS). The switch can also support point to point T-1 circuits within the community to provide broadband service. Additional construction costs may apply to any new T-1 circuit, depending on the available capacity on the Qwest network between the end points of the circuit. Frame relay circuits are not available in Ferdinand. There is no outside plant (OSP) fiber optic cable serving customers within Ferdinand. DS-3 circuits can be provisioned in Ferdinand, but construction costs would be included. The cost of T-1 or DS-3 construction can not be determined until a formal order for the circuit is placed. However, in previous projects by the consultant, these costs have ranged as high as $30,000.

Broadband services are available in Ferdinand from two sources. The first source is a T-1 line leased from Qwest or other providers. The recurring monthly cost can not be determined without placing a formal order, but typically ranges from $700 to $1100 per month. Satellite internet service from DIRECWAY, StarBand, and WildBlue is also available in Ferdinand. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Lapwai

Lapwai, population 1134, is located along the U.S. 95 corridor in Nez Perce County. The incumbent local exchange carrier (ILEC) is Qwest. The Qwest central office (CO) in Lapwai is connected to the Qwest network by fiber optic cable. The switch in Lapwai is a Nortel DMS-10. The switch is capable of supporting all grades of “plain old telephone service” (POTS). The switch can also support point to point T-1 circuits within the community to provide broadband service. Additional construction costs may apply to any new T-1 circuit, depending on the available capacity on the Qwest network between the end points of the circuit. Frame relay circuits are available in Lapwai, but again construction costs could apply. There is no outside plant (OSP) fiber optic cable serving customers within Lapwai. DS-3 circuits can be provisioned in Lapwai, but construction costs would be included. The cost of T-1 or DS-3 construction can not be determined until a formal order for the circuit is placed.

Broadband internet service is available in Lapwai from two sources. The first source is a T-1 line leased from Qwest or other providers. The recurring monthly cost can not be determined without placing a formal order, but typically ranges from $700 to $1100 per month. Satellite internet service from DIRECWAY, StarBand, and WildBlue is also available in Lapwai. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Nezperce

Nezperce, population 523, is located on rolling prairie and is the County seat of Lewis County. Line of sight to the surrounding area is excellent from the top of several large grain elevators in town. The incumbent local exchange carrier in Nezperce is Qwest. The switch in the central office is a Nortel DMS-10 and it is connected to the Qwest network via fiber optic cable. The switch is capable of supporting all grades of “plain old telephone service” (POTS). The switch can also support point to point T-1 circuits within the community to provide broadband service. Additional construction costs may apply to any new T-1 circuit, depending on the available capacity on the Qwest network between the end points of the circuit. Frame relay circuits are available in Nezperce, but mileage charges may apply to backhaul to the nearest frame relay switch. There is no outside plant (OSP) fiber optic cable serving customers within Nezperce. DS-3 circuits can be provisioned, but construction costs would be included. The cost of T-1 or DS-3 construction can not be determined until a formal order for the circuit is placed.

Broadband internet service is available in Nezperce from three sources. The first source is a T-1 line leased from Qwest or other providers. The recurring monthly cost can not be determined without placing a formal order, but typically ranges from $700 to $1100 per month. Connect Wireless provides wireless service in town that is backhauled via an AT&T internet T-1. The wireless system shares the full capacity of the T-1 between all active users. The provider reported that the actual average bandwidth available to an individual user is 1000Mbps. The actual throughput will depend on the number of users on the system at a given time, the quality of the wireless equipment being used, the distance of a user from the wireless base station, and other factors. Satellite internet service from DIRECWAY, StarBand, and WildBlue is also available in Craigmont. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite and wireless service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Reubens

Ruebens, population 72, is located on the rolling prairie lands of Lewis County. Line of sight to the surrounding area is excellent, especially from the top of any of several grain elevators in the community. The incumbent local exchange carrier is Qwest. Telephone service is provided out of the central office in Craigmont. As of the date of this report, Qwest has not provided any detailed information as to the services available in Reubens.

Without detailed service information from Qwest, we must assume that broadband service available in Reubens is limited to satellite service from DIRECWAY, StarBand, or WildBlue. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Winchester

Winchester, population 308, is located in Lewis County eight miles west of Craigmont off of the U.S. 95 corridor. The community is situated in rolling, intermittently forested terrain. The incumbent local exchange carrier is Qwest, which serves the community out of the Nortel DMS-10 switch in Craigmont. The full range of POTS services is available. Qwest can provide T-1 and DS-3 services, but not frame relay circuits. As usual, construction costs will apply to any T-1 or DS-3 circuit. There is no outside plant fiber within the community.

Broadband internet service is available in Winchester from two sources. The first source is a T-1 line leased from Qwest or other providers. The recurring monthly cost can not be determined without placing a formal order, but typically ranges from $700 to $1100 per month. Satellite internet service from DIRECWAY, StarBand, and WildBlue is also available in Winchester. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite and wireless service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Communities served by Verizon

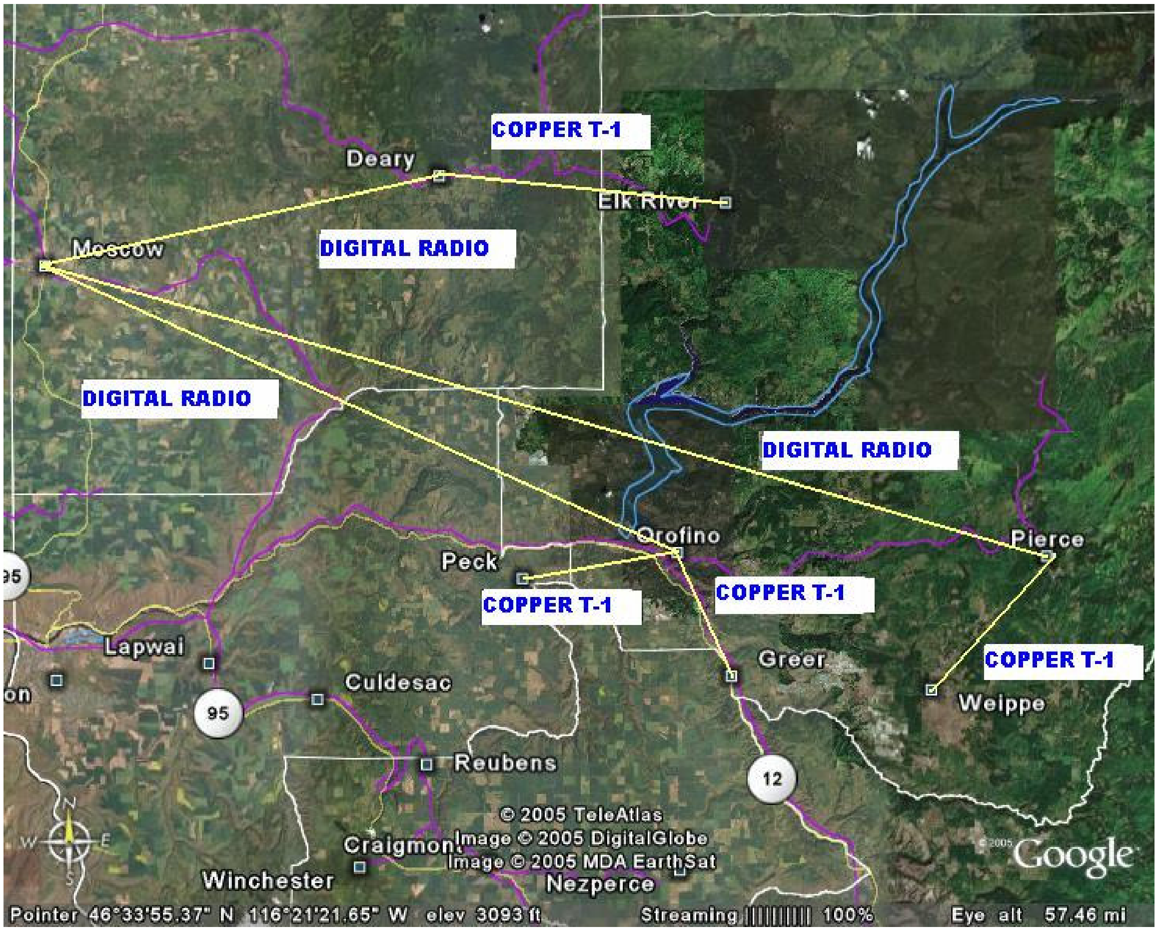


Figure 8. The Verizon backhaul network links five study communities via copper T-1 and digital radio to Moscow, Idaho.

Elk River

Elk River, population 156, is located in the mountains north of Orofino in Clearwater County. The terrain surrounding Elk River is mountainous and heavily forested. The incumbent local exchange carrier (ILEC) for the area is Verizon. Elk River has a Nortel DMS-10 digital switch that is backhauled by copper T-1 to Deary, then by digital radio to Moscow. All grades of POTS service are available. Point to point T-1's and DS-3's can be provisioned within the community, but there is no backhaul capacity out from the community. Construction costs would apply to any T-1 or DS-3 circuit order. Frame relay service is not available as the FR switch is located in Moscow.

Broadband internet access in Elk River is only available from the three satellite providers, DIRECWAY, StarBand and WildBlue. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Greer

Greer, estimated population 50, is located in the Clearwater River canyon east of Orofino in Clearwater County. The ILEC is Verizon. Service from Greer is backhauled via copper T-1 to Orofino and then by digital radio to Moscow.

Broadband internet access in Greer is only available from the three satellite providers. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Peck

Peck, population 186, is located in a canyon off the Highway 12/Clearwater River corridor in Nez Perce County. Line of sight to the surrounding area is limited by trees and the canyon walls. The incumbent local exchange carrier is Verizon, which provides all forms of POTS service from a Nortel DMS-10 digital switch. Service from Peck is backhauled by copper T-1 to Orofino and then by digital radio to Moscow. Point to point T-1, DS-3 and frame relay services are available in Peck, but construction costs will apply. The existing Verizon infrastructure does not have the capacity to backhaul a DS-3 out of Peck. There is no outside plant fiber distributed within the community.

Broadband internet service is available in Peck from two sources. The first source is a T-1 line leased from Verizon or other providers. The recurring monthly cost can not be determined without placing a formal order, but typically ranges from $700 to $1100 per month. Satellite internet service from DIRECWAY, StarBand, and WildBlue is also available in Peck. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Pierce

Pierce, population 617, is located in the rolling, forested land north of the Clearwater River in Clearwater County. Line of sight to the surrounding area is limited by trees and the rolling terrain. The incumbent local exchange carrier is Verizon, which provides all forms of POTS service from a Nortel DMS-10 digital switch. Service from Pierce is backhauled by digital radio to Moscow. Point to point T-1, DS-3 and frame relay services are available in Pierce, but construction costs will apply. The existing Verizon infrastructure does not have the capacity to backhaul a DS-3 out of Pierce. There is no outside plant fiber distributed within the community, although conduit for such fiber was being considered for inclusion in a town-wide public water project.

Broadband internet service is available in Pierce from three sources. The first source is a T-1 line leased from Verizon or other providers. The recurring monthly cost can not be determined without placing a formal order, but typically ranges from $700 to $1100 per month. The second source is QRO Wireless of Idaho, which deployed wireless service in Pierce in May 2006. QRO advertises two levels of service, 256Kbps service for $39.99 per month and 384Kbps service for $79.99 per month. Satellite internet service from DIRECWAY, StarBand, and WildBlue is also available in Peck. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales. A third broadband source, QRO Wireless, is reported to be establishing wireless service in Pierce. At last report, the company was awaiting a ruling on a conditional use permit by Clearwater County scheduled for January, 2006.

Weippe

Weippe, population 416, is located in the rolling, forested land north of the Clearwater River in Clearwater County. Line of sight to the surrounding area is limited by trees and the rolling terrain. The incumbent local exchange carrier is Verizon, which provides all forms of POTS service from a Nortel DMS-10 digital switch. Service from Weippe is backhauled by copper T-1 to Pierce, then by digital radio to Moscow. Point to point T-1 and DS-3 services are available in Weippe, but construction costs will apply. The existing Verizon infrastructure does not have the capacity to backhaul a T-1 or a DS-3 out of Weippe. There is no outside plant fiber distributed within the community.

Broadband internet access in Weippe is only available from the three satellite providers, DIRECWAY, StarBand, and WildBlue. Advertised download maximum speed ranges from 500Kbps to 2Mbps. Advertised maximum upload speeds range from 100Kbps to 500Kbps. The advertised cost for installation (equipment and labor) varies from $600 to $2000. Advertised monthly costs for satellite service are presented in Table 13. Actual costs may vary due to periodic service and installation sales.

Cellular Service

Cellular service in the study area is provided by Inland Cellular, headquartered in Lewiston, Idaho. Inland Cellular provides cellular service to all of the study area, as well as much of southeastern Washington. A coverage map is available at the following URL: www.inlandcellular.com/wireless/map.html.

Over the last several years, new technologies have enabled cellular telephone service providers to add data service to their existing networks. The early generations of this technology provided bandwidth equivalent to dial-up service. Third generation technology (3G) has achieved bandwidth that meets the broadband criteria established for this report. This 3G technology has been deployed by major cellular providers (Verizon, Alltel, Cingular, Sprint) in large, metropolitan areas across the country. Verizon, for example, has deployed wireless broadband in more than 60 of their largest markets. According to the firm's Owner, Inland Cellular is planning to deploy broadband data service in the study area. They are planning field trials of at least two candidate technologies in the very near future.

Author's Note: The 2006 Idaho Legislature authorized up to $5 million in matching grants to telecommunications providers for investment in broadband infrastructure in rural communities. Those funds were awarded to four telecommunications providers in July 2006. Among the communities receiving funds were Weippe ($10,975), Craigmont ($37,100), Cottonwood ($61,800), Lapwai ($46,900), and Nezperce ($22,700). Details on how those funds will be used are not available as of this writing.

III. APPLICATION ANALYSIS

Technology profiles of key user groups indicate existing demand for telecommunication services. The application analysis identifies potential broadband applications and gauges interest in various types of broadband strategies. This analysis also helps pinpoints growth areas, regional linkages, and population clusters where it might be possible to target services.

I. ELECTRIC UTILITIES

Electric utilities have become important players in the telecommunications environment. Traditionally, utilities and telephone companies have cooperated on pole agreements that allow telephone wire to be strung along electric poles. Many utilities also have towers and other facilities that can provide sites for the collocation of wireless equipment. Often the utilities' right-of-way is leased to telecommunication companies to install fiber optic cable. Some electric utilities operate their own fiber networks for meter reading and electric load management and sometimes lease extra bandwidth to telecommunication providers. In many states, rural electric cooperatives and municipalities have built fiber optic networks in order to offer broadband and cable services. Since electric utilities already have the right-of-way and customer billing systems in place it eases their entry into the telecommunications market. Some utilities are beginning to offer broadband over power line (BPL) services. Following is an overview of the electric utilities in the study area.

A. Bonneville Power Association

http://www.bpa.gov/corporate/
Telecommunications – Ken Johnston, (360)619-6006, kjohnston@bpa.gov
Idaho Falls Regional Office • 1350 Lindsay Blvd.
Idaho Falls, ID 83402 • (208) 524-8750

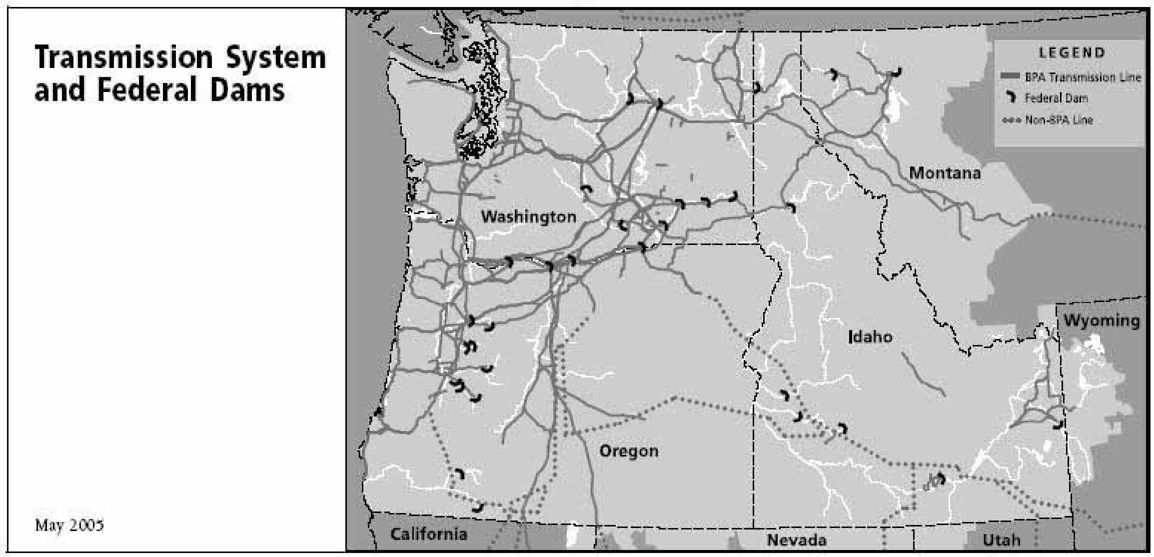
The Bonneville Power Administration is a federal agency under the U.S. Department of Energy. BPA serves the Pacific Northwest through operating an extensive electricity transmission system and marketing wholesale electrical power at cost from federal dams, one non-federal nuclear plant and other nonfederal hydroelectric and wind energy generation facilities.

BPA uses aerial fiber optics to monitor, control and instantly correct problems on the transmission grid. Fiber that is excess to BPA's current communication needs is available for lease.

The cellular, wireless internet and personal communication services (PCS) industry continues to look to existing transmission towers and communication towers to support their networks and expand coverage. To the extent feasible BPA, provides co-location services by sharing its sites and towers with wireless communication providers as a way of establishing a wireless communication infrastructure.

BPA facilities in the study area include generating facilities at Dworshak Dam and transmission lines that connect the dam to the rest of the grid. The Dam is located about 5.2 km northeast of Orofino in Clearwater County, Idaho.

Figure 1: Bonneville Power Administration Transmission System



Source: http://www.bpa.gov/corporate/about_BPA/Facts/FactDocs/BPA_Facts_2004.pdf

B. Avista Utilities

www.avistautilities.com
Spokane, WA
800-227-9187

Avista Utilities covers more than 30,000 square miles and serves nearly 325,000 electric customers in eastern Washington and northern Idaho. It operates and manages energy generation, transmission and distribution facilities. The system includes eight hydroelectric generating plants on two rivers, and coal, natural gas, and wood-waste combustion plants in Washington, Idaho, Oregon and Montana.

In the study area, the utility provides service to customers located within the city limits of Elk River, Lapwai, Culdesac, Cottonwood, Ferdinand, Craigmont, Nezperce, Pierce, Orofino, and Winchester. The utility does not have any fiber optic in the study area except for Lewiston. It does have joint use agreements with telephone providers for use of wire on the poles. It does not currently have wireless providers using their poles but would consider co-locating agreements for such equipment.

C. Clearwater Power Company

www.clearwaterpower.com
P.O. Box 997, Lewiston, ID 83501
888-743-1501

Clearwater Power Company is a rural electric cooperative. It has a service area of 5,000 square miles in eleven counties that include the four counties in the study area. The main office is located in Lewiston, ID. It primarily serves the rural areas that are primarily outside of city limits although it does provide service in the towns of Peck, Ruebens, and parts of Weippe. The company does not provide any telecommunication services in the study area although is does have pole agreements with telecommunication providers.

D. Idaho Power Company

www.idahopower.com
Twin Falls, ID
208-587-9778

Idaho Power is involved in the generation, purchase, transmission, distribution and sale of electric energy in a 24,000 square mile area in southern Idaho and eastern Oregon with an estimated population of 895,000. Idaho Power provides service in the southernmost portion of the study area and services the towns of Riggins and Pinehurst. Idaho Power has a telecommunications division that provides consulting, planning, engineering and design services. This division also installs and operates fiber optic cable, microwave antennas and fiber optic systems that utilize Idaho Power right-of-way.

E. Idaho County Light & Power

http://www.iclp.coop/
877-212-0424 in Grangeville or Cottonwood call 983-1610.

Idaho County Light & Power provides electrical distribution service to North Central Idaho. The cooperative is headquartered just east of Grangeville, Idaho on Highway 13. The cooperative serves over 3,000 homes, farms and businesses located in the mostly unincorporated areas of Idaho County and southern Lewis County. The Cooperative also serves the City of White Bird and sections of the City of Kamiah.

The company does not offer any telecommunication services. In 1996, the cooperative's Board of Directors approved the refinancing of the co-op's debt with funds from the private sector. This ended a fifty-seven year association with the Rural Electrification Administration and its successor the Rural Utilities Service thus allowing the opportunity to offer additional energy services and energy related services to the region.

B. EDUCATION

A. School Districts

Educational networks are an important part of the community's telecommunication inventory. Use of technology provides important skills for students and can be a valuable classroom resource to teachers. A commitment to technology and its integration into the curriculum is an important recruitment tool for businesses and families moving to the area. The computer labs are also a resource for adult education. Often the schools are technology leaders in the community and are key players in working with telecommunication providers to upgrade local services. The technology staff has expertise that rural communities can rely on to identify telecommunications issues and resources.

In the study area, the school districts have varying levels of service for connections to the Internet. A few schools are still relying on dial-up access and 56k Frame relay circuits. Although T-1 circuits provide access to the larger schools, in some cases the number of PCs on the network may slow the download speeds in the classroom and in computer labs. This would hinder use of high-speed applications and make any video applications unrealistic. Some districts are considering additional T-1 circuits to increase bandwidth but cost is a major deciding factor.

Every district provides Internet connections in the classrooms. The PC to student ratio, however, varies range from a 1:1 ratio to a 1:2.6. As equipment prices have declined, the nationwide trend is for a one to one ratio. There is no use of video-conferencing anywhere in the study area. High schools students are often accessing on-line courses especially for advanced placement classes. As these types of applications become more common, the demand for higher bandwidth will increase.

1. Culdesac Joint District #342 (www.culsch.org)

The Culdesac Joint District #342 is comprised on one campus for K-12. There are approximately 170 students in the district. The District gets Internet access through a T-1 line from Qwest. There is Internet access in every classroom. The elementary school has primarily Macs while the high school is primarily Windows based PCs. There are two computer labs in the high school. The ratio of computers to students is approximately 1:1. There is fiber optic cable between the main school and two modular classrooms. Future upgrades may include wireless video monitoring for security purposes. The District uses E-Rate to help offset the cost of the T-1 line and has Federal grant programs such as Goals 2000 to help fund equipment purchases. The district works with the University of Idaho to offer advanced placement classes on-line to high school districts. There is no video-conferencing.

2. Lapwai District #341 (Phone: 208-843-2622)

Lapwai has two campuses. There are about 350 students at the elementary campus and 300 students at the Jr./Sr High School. Each campus is served by a T-1 line to provide Internet access. There is Internet access in each classroom. The district uses all Windows based PCs in the classroom. The student to computer ratio is approximately 1.5: 1. The elementary school has some laptops that are connected through a wireless local area network for testing purposes. An ISDN circuit connects the two schools. The District participated in a distance learning consortium coordinated through Lewis and Clark State College that did involve some use of video-conferencing. They dropped out of the consortium about 3 years ago due to cost and under utilization of the facilities. The District does use E-rate to offset connection charges.

3. Orofino Joint District #171 (www.sd171.k12.id.us)

The Orofino District has the following campuses:

- Orofino Elementary School
- Cavendish Elementary School
- Orofino Junior/Senior High
- Pierce – Elementary School
- Peck Elementary School
- Timberline High School (between Pierce and Weippe)

All but two of the district schools are connected to the Internet through a 128k Frame Relay connection. Cavendish and Peck elementary schools have dial-up connections. The estimated enrollment for the whole district is 1360. There is Internet access in every classroom. The total number of computers connected to the network is approximately 650 PCs for a student to computer ratio of approximately 2:1. There is no video conferencing and not enough bandwidth available to consider this option. Students can access on-line courses. They do use E-Rate to offset connection costs.

4. Cottonwood Joint District #242 (www.sd242.k12.id.us)

Cottonwood Joint District has an elementary and middle school campus in Cottonwood and a high school campus about 3 miles outside of town. There are approximately 400 students in the district. A wireless WAN connects all of the school buildings and a T-1 line at the high school provides Internet access to the network. The School District uses E-Rate to offset connection charges. A T-1 would cost approximately $1100 a month without the E-Rate discount. There are approximately 270 windows based PCs on the network for a student to computer ratio of 1.5:1. There is Internet access in every classroom. A few teachers access the wireless network through laptops. The District is considering an additional T-1 circuit to increase bandwidth.

5. Grangeville Joint District #241 (www.jsd241.org)

The Grangeville District has the following school campuses located in the study area:

- Grangeville K-8 (Enrollment = 513)
- Grangeville High School (Enrollment = 246)
- Elk City K-8 (Enrollment = 31)
- Kooskia K-6 (Enrollment = 180)
- Kooskia 7-12 (Enrollment = 211)
- Riggins K-6 (Enrollment = 66)
- Riggins 7-12 (Enrollment = 81)
- White Bird K-4 (Enrollment = 12)
- Total District Enrollment = 1340

A T-1 line at the District office in Grangeville provides Internet access to the District network. The High School is located across the street from the District office and connects to the network via a fiber optic line. Grangeville elementary and the schools in Kooskia connect to the district office via a T-1 circuit. Elk City connects through a frame relay 56k circuit. The schools in the south part of the district are in a different telephone service area. The schools in Riggins connect directly to the Internet with T-1 circuits and the White Bird school has dial-up Internet access. The cost of a T-1 line in the north part of the district is approximately $1100 without the E-Rate discount. The south part of the district has even higher costs.

There are approximately 500 Windows based PCs on the network for a student to PC ratio of 2.68:1. Each classroom has Internet access and there are computer labs at the high school. There is no video-conferencing but distance learning through on-line classes is available.

6. Other School Districts

Following are the remaining school districts in the study area where only limited information was available.

- Kamiah Joint District #304 (www.kamiah.org) - The Kamiah Joint District has an elementary school, middle school and high school in Kamiah. The District has received several awards for the technology program which includes web page design, Cisco Certification, computer hardware and digital video classes. The School District has a partnership with Cottonwood Prairie High School to offer technology classes to their students.

- Highland Joint District #305 (www.sd305.k12.id.us) – Joint School District 305 serves Craigmont. The District consists of one elementary school and a combined junior high/senior high school. The Fall 2005 enrollment was 100 elementary students and 106 secondary students.

- Nezperce Joint District #302 - Nezperce Joint School District 302 services an approximate student population of 156 (Fall 2005) in pre-kindergarten through twelfth grade. With 18 full-time classroom teachers, the district's overall student/teacher ratio is 11.4:1. There are 2 schools associated with the agency, an elementary school and a combined junior high/senior high school.

B. Post-Secondary

Colleges and universities can contribute a number of technology assets to rural areas. They may have branch offices with video-conferencing capabilities, they may offer distant learning programs to high schools, and they offer curriculum to develop technology skills. Due to the large bandwidth needs for some of these applications, colleges and universities can be valuable partners in negotiating for services.

1. University of Idaho

www.uidaho.edu/extension/disrict.html

The University of Idaho is located in Moscow north of the study area. It does not have any branch campuses or distance learning facilities in the study area. Video-conference is not feasible due to lack of bandwidth, and there are not enough students to make it a cost-effective way to deliver classes. The University has some on-line classes but has limited on-line degree programs. The Cooperative Extension program is located at the University and there is a cooperative extension office in every county that is usually located at the courthouse. The University may be willing to participate in some technology training through the cooperative extension offices and would encourage high-speed connection for their county extension offices.

2. Lewis & Clark State College

http://www.lcsc.edu/

Lewis & Clark State College is based in Lewiston. The college offers advising and access to on-line courses through computer labs at its extended campuses. The Orofino campus also has some classes taught by adjunct faculty. The college has extended campuses at the following locations in the study area:

Orofino - Orofino High School Campus (56k Frame Circuit)
Grangeville - Avista Building (DSL Connection)
Kooskia - Kooskia City Hall and Technology Center (DSL Connection)
Lapwai – Partnership with Nez Perce Tribal Distance Learning Center They get Internet access through Northwest Indian College and share a video-conferencing site at the Kamiah Tribal center.

The center in Orofino does not have an adequate Internet connection. The 56k circuit is too slow for the number of computers connected to the network. The telephone lines serving the high school are not capable of carrying DSL and the wireless Internet services do not reach the high school due to line of site issues. The cable provider does not provide service to the building where the LCSC center is located. The High School has a T-1 line but can not share it with the center due to E-Rate restrictions. There is a new building being constructed on campus that will be a youth center, and it will be served by cable. The college has offered to pay for the cable Internet connection if they can connect the center through a wireless router.

C. LIBRARIES

Communities rely on libraries to provide access to computers and the Internet for underserved populations that may not have the technology at home or at work. Libraries also use technology to provide services, such as on-line catalogues, and often provide training to the public so they have the skills to use the technology offerings. The libraries in the study area are part of the on-line catalogue system of Valley Automated Library Network (VALNET) operated through Gonzaga University. Internet connections range from high speed satellite and DSL connections to some with only dial-up or 56k connections. Following is a summary of technology use at libraries in the study area.

1. Elk River Free Library District

203 Main, Elk River, ID 83827-0187
PO Box 187, Elk River, ID 83827-0187
Web Site: www.lili.org/clearwater/Elkriver.html#Elk River Free Library Di
Phone: (208)826-3539
elkrlibrary@turbonet.com

Elk River has four public Internet access computers and a computer lab with 10 computers. It has a satellite connection for Internet access that was just deployed in November, 2005. This replaced a much slower dial-up connection and they now get download speeds equivalent to a T-1 line. The monthly service costs for satellite also represents a savings of approximately $200 per month compared to having multiple dial-up accounts. The satellite connection was funded in part through a Gates Connection grant. They are applying for another Gates grant for additional hardware. They also have a wireless hot zone in the library and have received a USDA grant to create a city wide hot zone that will utilize a second satellite connection.

2. Clearwater County District Library

204 Wood St., Weippe, ID 83553
PO Box 435, Weippe, ID 83553
Web Site: www.lili.org/clearwater/wpl.htm
Catalog: www.valnet.org/
Phone: (208) 435-4058 | Fax: (208) 435-4374
weippelibrary@weippe.com

Clearwater County District Library has 12 public Internet access PCs and four staff PCs that are connected to the network. The network is connected to the Internet through a 56k frame circuit. They have funds through the Gates foundation to upgrade to a T-1 line but can not obtain a circuit through the local telephone provider. They are investigating satellite as an option and are also looking at partnering with a local ISP to offer DSL community wide through the library T-1 circuit.

3. Salmon River Public Library

126 North Main St., Riggins, ID 83549
PO Box 249, Riggins, ID 83549
Web Site: salmonriverlibrary.tripod.com/srpl

Catalog: salmon.ipac.dynixasp.com/
Phone: (208) 628-3394 | Fax: (208) 628-3792
srplinfo@ctcweb.net

The Library is part of the City of Riggins and is located at City Hall. It has four dial-up computers that are public access and two staff computers. DSL service is available in Riggins, but the City Hall and Library have elected not to subscribe to that service because of its higher cost relative to the existing dial-up service. This is an unfortunate choice for two reasons. First, the City and Library do not take advantage of the benefits available from Broadband internet connectivity, nor do they offer those benefits to citizen patrons. Second, if the City and Library subscribed to the service, they would widen the number of subscribers and possibly help reduce the cost to all users.

4. Prairie River Library District

Prairie River Library District is a taxing district that covers six towns in the study area. All the libraries have public internet access computers. They have used Gates Foundation grants for hardware and E-Rate to offset connection charges. Following are a list of libraries and the type of Internet connection they have.

Table 15: Prairie River Library District – Libraries in the Study Area

Prairie River Library District - Craigmont Branch
112 W. Main St., Craigmont, ID 83523
PO Box 144, Craigmont, ID 83523
Catalog: www.valnet.org
Phone: (208) 924-5510 | Fax: (208)924-5510

Internet Connection – Wireless

Prairie River Library District - Nezperce Branch
502 Oak, City Hall, NezPerce, ID 83543
PO Box 124, Nezperce, ID 83543
Web Site: www.lili.org/nezperce
Catalog: www.valnet.org/
Phone: (208) 937-2458
otiegs@camasnet.com

Internet Connection - Wireless

Prairie River Library District - Winchester Branch
314 Nez Perce, Winchester, ID 83555
PO Box 275, Winchester, ID 83555
Catalog: www.valnet.org
Phone: (208) 924-5164 | Fax: (208)924-5164

Internet Connection - Wireless

Prairie River Library District - Culdesac Branch
608 Main St., Culdesac, ID 83524
Catalog: www.valnet.org
Phone: (208) 843-5215 | Fax: (208) 843-5215
culdesaclib@lewiston.com

Internet Connection - DSL

Prairie River Library District - Lapwai
103 N. Main St., Lapwai, ID 83540
PO Box 1200, Lapwai, ID 83540
Web Site: www.prld.org/
Catalog: www.valnet.org
Phone: (208) 843-7254
prlibraries@lewiston.com

Internet Connection – Dial-up & Frame Relay

Prairie River Library District - Peck Branch
217 N. Main, Peck, ID 83545
PO Box 112, Peck, ID 83545
Phone: (208) 486-6161

Internet Connection – Dial-up

5. Other Libraries in Study Area

Prairie Community Library
NA, Cottonwood, ID 83522
PO Box 65, Cottonwood, ID 83522
Phone: (208) 962-3714

White Bird Community Library
NA, White Bird, ID 83554
P.O. Box 33, White Bird, ID 83554
(208)839-2357

D. COUNTY GOVERNMENT

County governments often have offices located throughout the County that may be connected through a wide-area network. Some counties are involved in economic development and are involved in broadband initiatives in order to provide better access to businesses in the county. Additionally, there are several public safety applications for the sheriff and emergency services departments that could require wireless network for mobile laptops in vehicles. Wireless networks could also be used for remote monitoring of public facilities and environmental monitoring devices.

1. Clearwater County (www.clearwatercounty.org)

The county seat is located in Orofino. There are four county buildings in Orofino and buildings in Pierce, Elk River, and Weippe. There is no wide area network connecting the offices. The County Courthouse has a DSL line with 70 users on the network. Elk River has a dial-up connection. The County does have communication towers for dispatching that could possibly be co-location sites for wireless equipment. If the bandwidth was available, the County may consider potential applications such as voice over IP if it would result in a cost savings. Potential applications for a wireless network could be laptops in sheriff's vehicles. The sheriff may have access to homeland security grants for a wireless network but due to security concerns, public use of the network likely would be limited. Such an effort would need to be coordinated with rural addressing that will be completed in 2007.

2. Idaho County (www.idahocounty.org)

The courthouse in Grangeville has a DSL connection with 65 users on the network. The Road Department in Kooskia has a dial-up connection and the attorney's office in Grangeville has a wireless connection. CompuNet, the wireless provider has co-located an antenna on top of the courthouse. Future applications, if there is a cost –savings, include voice over Internet (VoIP). If VoIP is adopted, it may enable the County to reduce telecommunications costs involved for calls placed between VoIP-enabled facilities.

3. Lewis County (www.lewiscountyid.org)

The courthouse in Nezperce has a T-1 connection that has 28 users on the network. There are no satellite offices in the County. Potential future applications may be VOIP, wireless laptops in public safety vehicles and possibly video-conferencing for the sheriff's office. CompuNet has a wireless antenna on the courthouse. There are dispatch towers in the county that may be potential sites for co-locating wireless equipment.

4. Nez Perce County (www.co.nezperce.id.us)

The county courthouse in Lewiston has high-speed access. All county buildings are located in Lewiston, and there are no outlying facilities. The new jail will have video-conferencing for arraignments. The Sheriff's office did experiment with laptops in vehicles but there were too many gaps in coverage. They may be interested in pursing this again if there was more complete coverage.

E. MUNICIPAL GOVERNMENT

Local governments play many roles in telecommunications policy. At the user level, technology helps local officials operate more efficiently with various e-government applications to deliver services. Such applications may include informational web pages, geographic information systems, and on-line permitting. Additionally, many of the State and Federal agencies that local governments work with now require on-line filing for reports and some forms are only available in electronic form. It is becoming increasingly important for local governments to have fast, reliable Internet access.

At the regulation level, a municipality may license or issue franchises to telecommunication providers (Idaho Code 50-329A), grant right-of-way permits, or enact zoning restrictions on communication towers. At the very least, permits and franchise agreements offer the community the opportunity to collect information on telecommunication infrastructure that is located in their right-of-way. As franchise agreements come up for renewal, they may also be used to offer incentives or negotiate for increased service levels. Often the term of the agreements are shortened to allow for more frequent review that would account for changes in technology. Non-exclusive agreements allow the potential for competitors to offer service.

At the service provider level, governments may partner with telecommunication providers to install fiber optic cable in the right-of-way or to identify public buildings that may be suitable for communication towers. Capital improvement projects that require trenching may offer an opportunity to work with providers that also need to open the streets to expand their fiber network. Beyond these partnerships, some municipalities have constructed networks and operate as a telecommunication provider.

With all these roles, municipalities and counties have the opportunity to influence the use of technology and the provision of services. The appropriate role depends on the needs of the community, the resources that they have available and overall community objectives.

In the study area, the City of Pierce has applied for a grant to design a fiber optic network for the downtown area. The grant was awarded in 2005 and the design and bidding for the project has been completed. Construction is anticipated to begin in early 2006. Following are excerpts from the grant application:

Excerpt from

An Application for an Idaho Gem Community Implementation Grant
By the Community of Pierce
To Provide an Engineering Plan for Telecommunication Infrastructure

This project will provide an engineering plan to install a high-speed telecommunication framework to the business district of Pierce. The plan will include designing the layout for the placement of conduit, distribution points and hand holes. This infrastructure will provide secure access throughout the downtown area for high-speed telecommunication fiber. The design engineering work is timely and prudent in helping Pierce be prepared for the new economy. An Idaho Community Development Block Grant (ICDBG) has been secured to replace the downtown water distribution system. Based on the projected work schedule, the City of Pierce will be able to have the telecommunications infrastructure engineered, procured and placed in the same ditch, which will be a significant cost savings.

This project will prepare Pierce to rapidly deploy a fiber network. The City has committed to do all it can to purchase the conduit and accessories necessary to implement the results of the engineering effort proposed by this project. The placement of conduit will be immediately adjacent to 20 existing business, and will assist in attracting new businesses to more than 12,000 sq./ft. of vacant or underutilized building space.

Technology Solutions of Nampa, Idaho has been contacted to provide a cost estimate to design the telecommunications-engineering plan. (See Appendix B: Proposal) Their plan will specify the placement of the 1.25" conduit, distribution points, and hand holes, in addition to itemizing the materials that will need to be purchased for the project.

The Clearwater County Economic Development (CCED) team, City of Pierce, Pierce Gem Community team and Pierce-Weippe Chamber of Commerce are working collectively to develop a more proactive approach to business retention and expansion.

F. STATE OF IDAHO

Local strategies should take into account initiatives by the state to determine if there are opportunities for collaboration and coordination.

1. State of Idaho Information Technology Strategic Plan

The State of Idaho adopted a strategic plan in 2004 with the following goals.

1. Simplify delivery of government services and information.

2. Manage information technology from an enterprise (statewide) perspective.

3. Protect the privacy and confidentiality of citizen information.

4. Promote collaborative relationships between federal and state agencies, public and higher education, and local governments.

5. Use ‘state-of-the-art’ procurement practices for acquisition of information technologies.

2. IDANET

http://www2.state.id.us/idanet/about.htm

(The following is excerpted from the State of Idaho web page)

IDANET, Idaho’s broadband digital telecommunications initiative, is the State's attempt to leverage its buying power. By aggregating existing dollars spent by State agencies and Higher Education -- and serving as anchor tenant -- the State hopes to encourage telecommunications carriers to deploy broadband telecommunications services in Idaho to not only serve State government but also serve the public at large.

The State’s bidding strategy is to bid and acquire services by Region. Public agencies will have access to any IDANET contracts. For the purposes of IDANET, the State is divided into six regions. They are outlined in the graphic to the right. The State believes a regional approach will foster more competition.

What is the Status of IDANET?

The backbone first, the counties next. All IDANET contracts have an initial term of five years with two 2-year options to renew. IDANET contracts are in place to provide statewide access to telecommunications services. The contracts can be used by State agencies, higher education, K-12, local government, and other public entities. The high-speed OC3c backbone has been operational since January 2003. This connects Coeur d'Alene, Lewiston, Meridian and Boise. When the demand warrants, high-speed connectivity (DS3 or better) will be extended to strategic locations in each county, in most cases the county seat where there is generally high demand.

How will we connect to the IDANET?

By the means that makes the most sense. Customers may use any of the services available on an IDANET contract to connect directly to the backbone or to a county seat. In the case of distance sensitive services like leased lines, it makes most sense to connect to the closest access point. If high performance is an issue, it may make more sense to connect directly to the backbone.

Will IDANET help with Last Mile Issues?

In some cases, yes. More often than not telecommunications carriers must install fiber optic cable to provision high capacity services (DS3 or better) to the customer. Some of the existing contracts allow the carrier to defray the cost of installing fiber optic cable. For example, a carrier may be obligated to pay the first $10,000 of an $11,000 special construction fee.

How will IDANET save us money?

By permitting institutions to do new things or to do existing things better. For example, access to the internet (commercial and Internet 2), video conferencing and distance learning, teacher training or on-line registration. IDANET may allow institutions to reengineer their operations to be more efficient or more effective.

G. HOSPITALS AND TELEMEDICINE

Hospital technology and telemedicine application work best when there is a high speed connection. Health institutions may have purchasing power and access to grants that will help make a business case for expanding telecommunication services in the community. Following is a description of telemedicine applications that require broadband connections.

1. Telehealth Applications

- *Tele-monitoring, Self-monitoring & Testing*

Telemonitoring includes the collection of clinical data and the transmission of such data between a patient at a distant location and a health care provider through a remote interface so that the provider may conduct a clinical review of such data or provide a response relating to such data. Self monitoring is the periodic and scheduled use of a device by the patient to obtain clinical data that is used by the patient to measure their own health status.

These services enable physicians and other health care providers to monitor physiologic measurements, test results, images, and sounds, usually collected in a patient's residence or a care facility. The close monitoring afforded by these approaches may allow better care through earlier detection of problems, and may therefore reduce costs. Many of the data can be transmitted over an analog phone line but ideally should be over a broadband connection of minimum DSL speeds.

- *Clinician-interactive/Video-Conferencing for consultation*

Interactive video-conferencing services are real-time clinician-patient interactions that, in the conventional approach, require face-to-face encounters between a patient and a physician or other health care provider. Examples of clinician-interactive services that might be delivered by telemedicine include online office visits, consultations, hospital visits, and home visits, as well as a variety of specialized examinations and procedures. Transmission for video conferencing should occur over broadband connections. Higher speeds can improve quality.

- *Store-and-forward*

Telemedicine services collect clinical data, store them, and then forward them to be interpreted later. These systems have the ability to capture and store digital still or moving images of patients, as well as audio and text data. It is usually employed as a clinical consultation (as opposed to an office or hospital visit). Teledermatology is the most common use of store-and-forward technology. Digital images are large files that should be transmitted over broadband connections.

- *Medication Management*

Medication management systems can assist patients with organizing and dispensing medications. A dispenser might be programmed to alert users when it is time to take certain medications. More advanced systems can monitor compliance and be connected to a care giver to alert them if a dosage has been missed.

- *Education*

Patient education about health conditions, nutrition, exercise, and other medical information is being recognized as an important element to treating chronic diseases and in helping patients manage their treatment. Telehealth education applications may include interactive websites, access to chat rooms with other patients with similar conditions, video-training, charting treatment progress, and diagnostic aids.

- *Electronic Records*

The American Medical Association notes that digital records will have significant benefits in health care for both practitioners and patients. Digital records include medical charts, electronic versions of x-rays and body scans, and test results. Doctors will have more complete medical histories to treat patients and patients will have increased access to their records and can become more active in their care. Broadband connections would facilitate access to these records in the home settings and allow uploading of data from the field.

2. Hospitals

There are four hospitals in the study area. They include:

- St Mary's (Cottonwood)
- Clearwater Hospital (Orofino)
- St. Joseph's Regional Hospital (Lewiston)
- Syringa General Hospital (Grangeville)

St. Joseph's in Lewiston indicated that they are investigating telemedicine using video-conferencing for mental health consultations. They are examining the feasibility of such an initiative in the Nez Perce and surrounding counties. Broadband accessibility would be necessary for this application.

H. Nez Perce Tribe

The following statement was provided by the Nez Perce Tribe to describe their support and involvement in this study.

"The Nez Perce Tribe encompasses parts of 5 counties in central Idaho, and many of the towns within the reservation are the most isolated with populations that do not entice or foster technology growth or competition. Because of the rural locations, the Tribe has made an effort to expand its own capabilities to serve the needs of government programs such as fisheries management, natural resources management and public safety. While this expansion has enabled the Tribal programs to connect at true broadband in locations where no other service is available, the costs of establishing this service have been substantial.

The participation in the Rural Broadband Task Force has been a way to develop relationships that could possibly enable services to the broader public in some areas this study covered. Involvement was a direct effort to foster partnerships and to identify areas where the Tribe could develop underserved areas in conjunction with the demand or need of an area.

From the participation, the Tribe's own growth has been aided and may continue to allow opportunities to branch into new areas of service that currently do not have access or only have limited access. Specifically, the utilization of surplus bandwidth for which the Tribe is able to identify, the Tribe is researching the opportunity to allow utilization of the surplus service as it exists currently in three communities identified in this study. There are future plans to include possibly two additional areas in the coming year. As these services become available and are fully developed, the Nez Perce Tribal Executive Committee will initiate public notification of the services made available.

The Tribe has already established working relationships and memorandums of agreement with several agencies in many towns or counties for human safety. These relationships are currently expanding service to non-Tribal entities at little or no cost and have been successful for everyone involved as well as the larger public. Although these partnerships are not widely known or advertised, the Tribe makes every effort to ensure that the needs of all entities are met.

I. Upper Clearwater Region – Telecommunications and Technology Assessment

In 2001, a telecommunications assessment was completed for the upper Clearwater region. The study area was centered on the communities of Orofino, Kooskia, and Kamiah. The study found that there was general dissatisfaction with slow Internet services. It also indicated that there was a low level of usage among businesses and residents in the area. It also indicated that organizations recognized that limited access to high-speed applications put them at a competitive disadvantage ant there was a sense of urgency to address these issues. The report recommended the following strategies:

- Working more closely with telecommunications and technology providers to increase the availability and affordability of advanced services.

- Form the Upper Clearwater Region Technology Council to coordinate telecommunications and technology initiatives in the area.

- Use the development of Community Technology Centers to leverage the availability of advanced telecommunication services to all sectors of the community, including the business community.

- Utilize the Networked World benchmarking tool as a community assessment tool and as a guide for measuring progress.

IV. BROADBAND BENEFITS

Broadband access is a rather new phenomenon throughout the country. While many forward-looking studies have hypothesized the benefits of broadband access to a community, only now have studies proven the benefits using real data. A 2005 study published in Broadband Properties magazine and conducted by researchers at Massachusetts Institute of Technology and Carnegie Mellon University proved the direct economic benefits of broadband access. Other anecdotal evidence can also be used to identify the financial, educational, and quality of life benefits of wide-spread broadband access. Rural communities can benefit from broadband related economic development because they already offer the quality of life desired by knowledge industry workers. This section offers a more complete description of the variety of benefits that broadband access will bring to the sixteen study communities in particular and to the North Central Idaho region in general.

1. Economic Development

The availability of a broadband network provides a competitive advantage in attracting and retaining businesses. More often, access to high speed, reliable, and redundant broadband networks is a critical factor in site selection and business retention. Several studies have found that communities with broadband networks realize significantly higher performance in a number of economic indicators when compared to similarly situated municipalities or counties without such networks. Economic benefits include:

a. Increase in Economic Activity (Sales, assessed values, job creation, ...)
b. Business Recruitment
c. Business Retention
d. Downtown Marketing
e. Tourism Promotion

2. Cost Efficiencies

Many municipalities, schools, hospitals and counties are paying thousands of dollars each month to lease T-1 circuits in order to provide connectivity for their facilities. Savings from a more cost efficient and faster network can equal or surpass any investment in implementing broadband strategies. Additionally, wireless networks can allow employees to remain in the field and remotely access the city's or county's data network. Some communities have reduced staffing costs due to more efficient use of employee's time. VOIP technology that uses high speed networks can also result in cost savings for voice services.

3. Digital Divide Issues

Rural areas are more likely than their urban counterparts to either lack broadband access, pay more for such access or to have no choice in broadband providers. This digital divide in rural America means Main Street businesses can not compete with their urban counterparts, youths leave their hometowns for better paying jobs and information and resources that are available on-line are difficult to download in rural areas. Promoting broadband networks has the following benefits to address these issues:

a. Provide Service to Underserved Areas
b. Offer Consumer Choice
c. Lower Rates for Consumers
d. Provide Redundancy
e. Improve Technology Literacy
f. Offer technology options for civic engagement

4. Improved Service Delivery

Public agencies that have access to broadband can develop applications that result in more efficient use of staff time and better service to constituents. With mobile laptops in patrol cars, officers can spend more time on the streets and file reports from the field. Public work employees, building inspectors, and parking enforcement staff or other employees who work in the field can use time more efficiently if they can remotely access the city's or county's data network. Benefits related to service delivery include:

a. Public Safety – Wireless laptops in vehicles
b. Public Works and Building Inspections – Access to city networks in the field
c. Distance Learning
d. Wireless laptops for students
e. Remote monitoring of public facilities

V. Analyze Demand

The demand for broadband connectivity is highly dependent on the users' knowledge of and dependence on broadband applications. Without broadband connectivity, users cannot become aware of or dependent on those applications. Attempting to predict the study communities' demand for bandwidth before they have access to it is extremely challenging. This challenge is not new. Similar challenges have been presented every time a major technology change happened. For example, following are some of the predications made by acknowledged leaders of the computer revolution:

- 'I think there is a world market for maybe five computers,' Thomas Watson, Chairman of IBM, 1943
- 'There is no reason why anyone would want a computer in the home,' Ken Olson, President, Chairman and founder of Digital Equipment Corporation, 1977
- "640K should be enough for anyone," Bill Gates, 1981

To design a broadband network to and throughout the study communities, we must make some assumptions about the expectations of users. In many cases, the users have not had sufficient exposure to broadband applications and services to provide an accurate gauge of a community's unmet demand for those services. There fore, it is important to study existing and emerging applications being used in broadband-enabled communities today and predict when and where those will be deployed in the study communities. Goals for broadband deployment in North Central Idaho can be derived from these observations.

1. The Users' Perspective

As a bare minimum, the study communities should have access to the services that users need today, at prices they can afford, without any concern for reliability or performance. The current user demand can be best summed up in three categories: individual and small business user needs, institutional user needs, and economic development needs.

Individual and small business users require reliable, affordable broadband internet access. For example, this access will be used for the following tasks:

- Selling merchandise or services in a larger marketplace (i.e. E-Bay, etc.)
- Buying goods and services in a larger market
- Tourism promotion, through internet advertising, web sites, etc.
- Electronic data interchange with remote employers or service providers

Institutional users include state and local government, school districts, higher education, and healthcare. These entities require broadband internet access and regional wide area networking capabilities. For example, these services will be used for:

- Linking hospitals and rural clinics and healthcare providers
- Linking schools on a district-wide broadband network
- Providing distance learning services at both the K-12 and higher education level
- Data exchange between state and local government agencies within the study region.

Communities and their economic development staff require the availability of broadband services in order to attract out of area businesses seeking to relocate. Many of these businesses include broadband connectivity in their go/no-go criteria for assessing potential relocation or expansion sites. It is also not uncommon for relocating businesses to require two independent sources of broadband connectivity to improve reliability. Affordable broadband availability is also required to enable existing local businesses to grow through access to the larger markets made available by the internet. Economic development officials also need access to broadband services to promote their communities through web sites and online advertising.

2. “Technical Expert’s” Perspective

Broadband enabled communities are quickly developing new applications and services. These services may promote those communities, support the residents, agencies, institutions and businesses in those communities, or enable new service delivery. Among the applications being developed are:

- Public safety mobile data: Many broadband enabled communities are developing broadband public safety mobile data applications. UHF/VHF radio based applications are limited to much less than 56Kbps data rates. Wireless data systems can deliver multi-megabit data rates to police, sheriff, fire and emergency medical responders. The difference between these two scenarios is the difference between broadcasting a text-based description of a suspect versus broadcasting a color picture or video of a suspect in the same time.
- Internet telephony: Services like Vonage and Skype allow broadband users to place voice calls around the world for little or no cost. This author currently uses the Skype service to call a daughter living in Beijing, China via DSL service. The call clarity and connection quality are equal or better than that of our incumbent telephone service provider, and the call is free.
- Internet-based video: Broadband users have had access to streaming video, such as the NBC Nightly News broadcast or sporting events, for several years. The logical direction for this service to grow is the broadcast of complete program content via broadband. In the future consumers will be able to select from the local cable TV provider or a video over broadband provider, if they live in a broadband-enabled community.
- E-government applications: Government services, including tax filing, building permit applications and many others, are increasingly being ported to the internet. In broadband-enabled communities, property ownership records including digital aerial photos are available online. Geographic information systems land use and management information to the general public that was never generally available before the advent of broadband services.

3. Broadband Goals

With the above observations as a starting point, the following broadband goals should be used to guide the development of the engineering plan to meet the telecommunications needs of the study communities over the nest ten years:

- By the end of 2006, establish a telecommunications consortium responsible for coordinating efforts to bring reliable and affordable broadband service to the entire region.

- By the middle of 2007, have at least one public access broadband point of presence in each community. At a minimum, this should consist of a satellite-based service providing 1Mbps down load and 500Kbps upload at the local library or community center.
- During 2006, execute a pilot project to evaluate the use of wireless mesh networks as a last-mile solution in one community in the study region.
- During 2006, initiate a program to promote broadband applications through community education.
- By the end of 2011, establish broadband backbone networks into the nine study communities that currently have no broadband service or are limited to high-cost T-1 or frame relay service.
- By the end of 2011, have last-mile service available to all businesses and residences within the "city limits" of a community.
- Over the next five years, support and promote private enterprise (non-ILEC) regional backbone network capabilities that promote redundancy and competitive pricing.
- Effective immediately, integrate fiber optic network facilities into public utility (power, sewer, water) and highway projects to provide long-term broadband backbone and last-mile capacity.
- Use state and local network procurements to encourage the development of regional backbone and last mile broadband capabilities. For example, revise proposal evaluation criteria to emphasize the use of regional providers instead of a single, state-wide provider. This approach will leverage government spending to support broadband development in the rural communities.
- Extend backbone facilities to provide each community with at least two independent service providers. These competitive services will foster competition, reducing prices and improving services to end-users. The redundancy will also provide additional public safety communications capabilities in the event one provider suffers a service disruption.

VI. Identify and Evaluate Potential Technologies

The preceding sections of this report provide the reader with a clear picture of the existing demographic, economic, geographic and infrastructure conditions of the sixteen study communities. These sections also identify the communities' unmet broadband needs. The following summary of those conditions and needs will serve as the starting point for the identification and evaluation of potential broadband solutions.

Summary of Existing Conditions

Sections I through III document the existing demographic, geographic, and economic conditions in the study communities, as well as the existing telecommunications capacities and services in those communities. These sections describe a region that is chronically underserved with respect to telecommunications services. In fact, many of the communities can be considered "unserved" as there is no existing capacity for broadband communications to those communities. The demographic details of these communities reveal small populations spread over large areas. In fact, the four counties cover an area larger than the State of Vermont, but have a population of less than 66,000 people. The population size is relatively stable. Some communities are showing modest growth and others slight decline. The median age is above the national average, while the median income is below the national average. More of the regional population has completed a high school education than the national average, but les have completed post-secondary degrees. The number of businesses is stable, showing little growth between 1993 and 2003.

The existing telecommunications infrastructure in each community is owned by one of three incumbent local exchange carriers (ILECs). Each ILEC enjoys monopoly status in its communities. The communities that are located on the U.S. Highway 95 corridor, except White Bird, are connected to their respective ILECs fiber optic network. The Verizon communities are connected by digital microwave, or copper T-1 to digital microwave, to the outside world. In general, the existing telecommunications infrastructure pre-dates the Internet Age and can only support a limited amount of broadband connectivity in a few, select communities.

In summary, the baseline from which this Plan must be built is a collection of deficits that can all be traced back to a lack of economic opportunity. Stable or shrinking populations reflect a lack of job opportunities to attract new residents. Minimal growth in the number of businesses reflects a region without the resources, particularly infrastructure, to attract or develop new businesses. The lack of a broadband capable telecommunications can be attributed to a belief that the investment required to build it can not be profitably recovered from the local economy. So how can a rational plan to build broadband infrastructure be written?

The first step in writing such a plan is to estimate the demand for services that exists, or lies nascent, in the study communities. Once the demand is understood, potential solutions that meet that demand can be evaluated for technical performance, capital cost and recurring costs. From the domain of possible solutions, those that best meet the region's needs and limited means can be identified. Once the most appropriate solutions are defined, funding sources can be sought to build them.

What makes a good solution?

The limited means available and lack of existing infrastructure in the study region dictate that any proposed solution have several key attributes. The first, and most obvious, is that it must be affordable. The proposed solution must be inexpensive to build, so as to maximize the limited private and public funds that may be available for construction. It must also be affordable to operate, so that any solution built can be operated successfully for many years.

The second feature of a successful solution will be scalability. The solution must be able to start small to meet the initial demand, but able to grow gracefully as demand and usage dictate. The study region has a low population density, and will continue to have such for the useful life of any system proposed herein. While that low density has posed an economic challenge for traditional solutions, new technologies hold the promise of bridging the gaps between users with far greater economy than that achieved by traditional telco methods. It is safe to assume that the solution proposed by this plan will not have the same out-year performance requirements as a similar system in Seattle or New York. The limited population in the region reduces the required growth capacity of the system and allows alternative technologies to be considered. The scaleability attribute of a successful solution will be the ability to start small (say 10Mbps per community) and be able to grow to modern service levels (possibly 100Mbps per community) as demand dictates.

The third attribute of a successful solution is that it must be simple to operate. Some of the study communities are so small and so remote that it is unlikely that dedicated commercial service representatives will be available for maintenance and repair services. The ideal solution should be simple "line replaceable units." In the event of a system failure, local semi-skilled personnel should be able to identify the discrepant unit and make a simple "plug and play" replacement. Traditional telco solutions have not demonstrated this capability. New technologies have demonstrated the possibility of just such simplicity.

Reliability is the final key attribute of a successful solution. As more users adopt broadband services in their homes and businesses, the importance of this service to business success will grow. Data systems in general have historically operated at lower levels of reliability than traditional telephone service. Many business owners would have agreed that an occasional data network failure was acceptable, but a telephone system failure meant lost revenue. Reliance on broadband communications has grown in importance with respect to business success to such a degree that broadband users now require the same high level of reliability typically reserved for telephony.

Estimating Broadband Demand

Simple mathematical models based on the numbers of homes and businesses in a community have been used to estimate the broadband needs of that community now, in five years, and in ten years. The immediate need model, shown in the table below, begins with the number of homes and businesses counted in the 2000 census. It then assumes that only 20% of those homes and businesses will subscribe to the service. This subscription level is consistent with the data from the Pew Internet Study cited in Section I. It further assumes that, of the 20% who do subscribe, only 10% are requesting network services at one time. Requesting network services means downloading a web-page or sending an e-mail. Finally, the model assumes a 256Kbps service to residential users and a 512Kbps service to businesses. These assumptions are combined to develop an estimate of the bandwidth required by each community

Table 16 Initial Bandwidth Demand

Community	**No. of Homes**	**% of Homes Subscribing**	**No. of Businesses**	**% of Businesses Subscribing**	**Bandwidth Required (Mbps)**
Clearwater County					
Elk River	133	20%	25	20%	0.9
Greer	38	20%	10	20%	0.3
Pierce	303	20%	50	20%	2.1
Weippe	196	20%	40	20%	1.4
Idaho County					
Cottonwood	383	20%	56	20%	2.5
Elk City	219	20%	6	20%	1.2
Ferdinand	64	20%	6	20%	0.4
Riggins	253	20%	16	20%	1.5
White Bird	72	20%	11	20%	0.5
Lewis County					
Craigmont	244	20%	13	20%	1.4
Nezperce	222	20%	30	20%	1.4
Reubens	32	20%	2	20%	0.2
Winchester	151	20%	5	20%	0.8
Nez Perce County					
Culdesac	176	20%	6	20%	1.0
Lapwai	391	20%	14	20%	2.1
Peck	101	20%	32	20%	0.8

A similar model was run to predict bandwidth demand in five years. A growth rate of 2% per year in the number of households and businesses was assumed, in keeping with the growth data presented in Section I. In addition the concurrent user ratio, the number of users seeking network services at any one time, was doubled to 20%. The number of households and businesses subscribing to the service was increased to 30% to reflect growth in popularity and changing attitudes regarding affordability and necessity of service. And finally, the typical household service was increased to 512Kbps and the typical business was increased to 1024Kbps. The resulting Year 5 bandwidth demand is shown in the table below:

Table 17. 5-year Bandwidth Demand

Community	No. of Homes	% of Homes Subscribing	No. of Businesses	% of Businesses Subscribing	Bandwidth Required (Mbps)
Clearwater County					
Elk River	146	30%	28	30%	6.2
Greer	42	30%	11	30%	2.0
Pierce	333	30%	55	30%	13.6
Weippe	216	30%	44	30%	9.3
Idaho County					
Cottonwood	421	30%	62	30%	16.7
Elk City	241	30%	7	30%	7.8
Ferdinand	70	30%	7	30%	2.6
Riggins	278	30%	18	30%	9.6
White Bird	79	30%	12	30%	3.2
Lewis County					
Craigmont	268	30%	14	30%	9.1
Nezperce	244	30%	33	30%	9.5
Reubens	35	30%	2	30%	1.2
Winchester	166	30%	6	30%	5.4
Nez Perce County					
Culdesac	194	30%	7	30%	6.4
Lapwai	430	30%	15	30%	14.1
Peck	111	30%	35	30%	5.6

A Year Ten forecast was created using the same methodology as noted above. In the Year Ten model, the community growth rate was kept at 2% compounded for the entire ten years. The concurrent user ratio was increased to 40% to account for the growing number of simultaneous users driven by real-time applications such as telephony or video streaming. The percent of households and businesses using the service was increased by 60% to reflect the increased adoption of the service by households and businesses in the community. The sixty percent adoption rate is similar to that experienced in other communities where broadband services have been available for several years.

Table 18. 10-year Bandwidth Demand

Community	No. of Homes	% of Homes Subscribing	No. of Businesses	% of Businesses Subscribing	Bandwidth Required (Mbps)
Clearwater County					
Elk River	162	60%	31	60%	31.2
Greer	46	60%	12	60%	10.2
Pierce	370	60%	61	60%	68.0
Weippe	239	60%	49	60%	47.5
Idaho County					
Cottonwood	467	60%	68	60%	82.7
Elk City	267	60%	7	60%	35.5
Ferdinand	78	60%	7	60%	12.3
Riggins	309	60%	20	60%	45.2
White Bird	88	60%	13	60%	15.8
Lewis County					
Craigmont	298	60%	16	60%	42.5
Nezperce	271	60%	37	60%	46.8
Reubens	39	60%	2	60%	5.7
Winchester	184	60%	6	60%	24.9
Nez Perce County					
Culdesac	215	60%	7	60%	29.1
Lapwai	477	60%	17	60%	64.9
Peck	123	60%	39	60%	29.6

These models may overestimate the demand for broadband service in the first year, but they likely underestimate the out-year requirements. Running a sensitivity analysis by manipulating the assumptions does not alter the final conclusion that broadband service needs exceed the capacity of existing networks in most of the study communities.

Potential Solutions

Backbone

Three different technologies are available to meet the broadband backbone needs of the study communities: fiber optic cable networks, wireless networks, and satellite service. Each of these technologies has its strengths and weaknesses and each must be evaluated against the unique needs of the sixteen communities.

Fiber optic networks link communities with optical cable, either buried underground or supported on utility poles. Optical networks have many significant advantages. The most significant advantage is the nearly unlimited bandwidth that optical fiber can transmit. The bandwidth capacity of an optical network is currently only limited by the capability of the transmitting and receiving electronics at either end of a circuit. Networks carrying 10 gigabits per second are now common

Optical networks have two fundamental disadvantages. Their first disadvantage is the relatively high cost to construct a fiber network, roughly $150,000 per mile. Small, rural communities separated by great distances and not located on major transportation corridors have not been linked to existing telecommunications carriers' optical networks because of the high initial cost of construction. The second drawback to optical networks is their point-to-point network topology. Fiber optic cable must be extended to each community individually, with limited ability to share infrastructure with other similarly remote rural communities.

Wireless backbone networks use radio signals to carry internet protocol signals between base stations, often using wireless repeaters to extend the range of the service. Wireless backbones have been in use in the rural United States for decades. Several of the study communities in this report are served by digital microwave backbones for their telephone service. More recent developments have greatly increased the bandwidth capacity of wireless backbones, as well as provided the ability to carry internet protocol (IP) traffic required broadband internet connectivity.

Wireless backbones have three distinct advantages over optical networks. First, the cost to deploy wireless backbones is one-fifth to one-half the cost of a similar optical network, depending on bandwidth required and terrain. Second, broadband wireless backbones are more scaleable to the needs of small, rural communities. Bandwidth can be scaled down to match the exact needs of a community with a similar reduction in construction and operation costs. Finally, wireless networks can share infrastructure with other existing wireless services in a community, including public safety radio, cellular telephone, and/or wireless television.

There are two significant drawbacks to wireless backbone networks. First, wireless backbones today are limited to roughly 100Mbps bandwidth over the ranges needed to serve the study communities. Second, wireless backbones can be subject to interference and line-of-sight limitations depending on whether licensed or unlicensed frequencies are selected for use.

Satellite backbone service is the newest technology available to the study communities. Three different providers, DirecWay, WildBlue and StarBand, currently are marketing satellite internet service throughout the North Central Idaho region. These services were originally intended for home, home office or small office use. Recently, however, two of the providers have been advertising backbone service for businesses. These services can also be considered for small communities. A few libraries and private sector businesses in the study region are already using satellite internet services.

The advantages of satellite internet service are two-fold. The first is the general availability of the service anywhere in the United States. An unobstructed view of the southern sky is the only qualification required for service eligibility. The other advantage to satellite internet service is the relatively low cost of service. Initial equipment and installation usually costs less than $2,000 and monthly service charges range from $70 to $200 per month.

There are at least two significant drawbacks to satellite internet service. The most commonly known is the high latency of the service. Latency is a measure of the time it takes a signal to travel from sender to receiver. This high latency is incurred because satellite service must travel to and from a satellite 22,000 miles in space, and then back and forth across the internet. This high latency makes satellite service a very poor candidate for applications including voice, live video, and other time-sensitive functions. The second drawback is the relatively low bandwidth available from a satellite service. The service packages listed in Section II of this report indicate that maximum download bandwidth is between 1Mbps and 2Mbps and upload bandwidth ranges from 200 to 500Kbps. It should be noted that these are best possible performance promises, not continuous performance guarantees. Somewhat higher bandwidth can be achieved by installing more than one ground station with an associated increase in installation, equipment and monthly service costs.

Last Mile

There are four common technologies used for last mile broadband service delivery: digital subscriber lines (DSL), cable modems, fixed wireless, and satellite. DSL and cable modem technology account for almost all of the broadband last mile connections in the United States, while fixed wireless and satellite account for less than ten percent. The four technologies and their associated advantages and disadvantages are noted below.

DSL service was developed to carry high speed internet traffic over existing telephones lines. DSL uses available bandwidth in existing telephone lines that is not used for carrying traditional voice traffic. Because DSL uses bandwidth not used by voice traffic, the two services can run simultaneously on one telephone line. DSL can provide bandwidths up to 9Mbps at distances up to 18,000 feet. Typical commercial DSL offerings provide up 1.5Mbps within 18,000 feet of the telephone company office.

DSL has several drawbacks that limit its applicability to small, rural communities. The first limitation is the cost of the central office equipment required to offer DSL service. A device called a DSL Access Multiplexer (DSLAM) must be installed in the telephone company's central office. All DSL circuits originate at the DSLAM and terminate in a DSL modem or router at the customer's premise. DSLAM's can be very expensive and may not be cost effective in a small community where a majority of the population lives outside the 18,000 foot service radius. DSL service also requires high quality, dedicated wires between the DSLAM and the customer premise. Many rural community telephone systems have old cabling systems which may be shared among premises through a technology known as line sharing. These lines can not be used for DSL.

Cable modem technology uses available bandwidth on existing cable TV systems to carry broadband internet service. Cable modem systems typically offer up to 3Mbps upload and download speeds. The popularity of cable modem systems has led to many cable providers offering telephone service (using voice over internet protocol technology) along with TV and internet access. Such bundled offerings are introducing new competition to the telephony market in major population centers.

There are several disadvantages to cable modem technology. Most obviously, a community must have cable TV service first before high-speed data service can be added to it. Such is not the case in most of the study communities. Cable modem service also has distance and quality of cable limitations similar to those noted for DSL. North Central Idaho communities that may have cable TV service most likely do not have the quality of cabling required for broadband data. A third shortcoming to cable modem service is the cost of "central office" equipment required to provide the service. A cable modem termination switch (CMTS) is required at the head end of the cable system to strip the data traffic off of the cable system and link it to a broadband internet source. Most of the study communities' populations are too small and too widely dispersed to make cable modem service a cost-effective broadband solution.

Fixed wireless broadband service, sometimes referred to as Wi-Fi (for wireless fidelity), has been in development for the last six years. The technology has been developed in parallel with wireless local area networks (WLANs), in some cases even using the same hardware and software. Fixed wireless broadband uses radios to carry service to users. The most popular types of fixed wireless services operate in two unlicensed frequencies, 2.4GHz and 5GHz. These systems typically conform to the IEEE 802.11 standard for wireless networking. Adherence to this standard has allowed for the mass production of equipment, significantly lowering the cost of the equipment. Fixed wireless systems can achieve bandwidths of up to 27Mbps (full duplex) without the costly equipment and cabling required by DSL and cable modem systems. The range of a typical fixed wireless system using the 2.4GHz band is about three miles. Commercial, off-the-shelf antennae can be used to extend the range of such systems. End user devices include built-in or external wireless network cards, external wireless modems, and wireless routers. Cost for these devices range from $40 to $400.

Fixed wireless systems can have some limitations which must be evaluated when considering their use. First, as noted above, many are based on the use of frequencies that are not licensed by the Federal Communications Commission. Because these frequencies are unlicensed, it is possible that interference may be caused by other applications in the same frequency band. Careful system design, including antenna and channel selection, may be required to build a successful system. The 2.4 and 5GHz systems also require clear line of sight between stations on the network. Again, careful system design, including the use of active repeaters, is required to overcome line of sight issues.

Summary

Analysis of the data compiled in this study reveals several infrastructure deficiencies that must be addressed in order to bring broadband telecommunications service to the study communities. Among these deficiencies are a lack of backbone capacity, a lack of last-mile solutions, no competition for customers, and low reliability because of a lack of network redundancy.

Conventional thinking would tell us that all of these deficiencies exist because of the lack of capital, or the ability to generate a return on capital, in the region. However, other rural regions are solving these types of problems through a combination of technical innovation, unconventional thinking, and regional coordination. In order to address the deficiencies noted above, a set of implementation strategies must be developed. Fundamental to the development of these strategies is the understanding of the technical solutions available and the implementation cost of each. For a solution to have a high probability of long term success, it must provide adequate capacity at an affordable price. Section VII following presents a cost assessment of the backbone and last-mile strategies presented above. With this information in hand a set of Implementation Strategies is presented in Section VIII.

VII. COST ANALYSIS

The sparse population and low median income statistics of the study region imply a limited economic means to pay for the broadband services recommended by this report. In fact, this limited economic base is frequently cited by incumbent telecommunications providers as the reason for their lack of investment in the region. However, the availability of affordable broadband is fundamental to the economic development of the region. In short, broadband availability is required for economic development, which is, in turn, required before broadband services can be afforded.

The solution to this conundrum lies in technologies which can provide adequate broadband capacity at an affordable initial cost. These solutions must also be able to grow as the demand for service grows. These three factors, adequate bandwidth, affordable implementation cost, and high scalability, must be present in any solution to ensure long-term economic viability.

Section II, Existing Telecommunications Infrastructure, details the lack of backbone and last-mile solutions in the study communities. Three technologies are available to address the backbone deficiencies in the region: satellite, terrestrial wireless and fiber optic networks. XXXX technologies are commonly used as last-mile solutions for broadband access, including satellite, wireless, cable modem, and DSL. This section will provide qualitative and quantitative cost assessments of the various options for backbone and last-mile solutions. These costs will be used to select technologies for recommendation in the Implementation Strategies to follow.

Backbone Solutions

The three backbone solutions commonly used for broadband service are fiber optic networks, terrestrial wireless networks (sometimes called microwave), and satellite service. Satellite service is by far the cheapest, with “enterprise” level solutions available for less than $3000 (one time cost) and under $300 per month in recurring costs. However, the bandwidth limitations of satellite links limit their ability to grow beyond 2Mbps maximum downlink and 500Kbps uplink. The high latency of satellite service, the time it takes traffic to transit the network, also makes them unsuitable for advanced applications such as voice or real-time video.

The two remaining backbone solutions, fiber and wireless, are the only available solutions with the bandwidth and scalability to meet the needs of the study communities. Fiber has relatively unlimited bandwidth but can cost up to $150,000 per mile to install. Wireless networks have somewhat limited bandwidth, typically 100-200 Mbps, but can cost as little as $5000 per mile in backbone applications. In summary, fiber networks provide the highest capacity, but wireless backbone networks can provide adequate bandwidth with room for growth at a much more affordable capital cost.

To evaluate the true cost difference between fiber and wireless backbones, two backbone networks were designed to meet the needs of the study communities. The construction costs for each of these networks were then estimated to provide a basis for recommending one solution over the other. Table VII-1 presents the fiber optic backbone network, broken down by link. The table shows that meeting all of the region’s backbone needs with buried fiber optic cable requires a construction investment of over $20,000,000.

The networks shown in the Table would provide broadband connectivity from the study communities to the nearest existing or planned fiber optic point of presence. In some cases this ignores the reality of the network monopolies in these communities and the regulatory boundaries between them. For example, running fiber from White Bird to

Grangeville would actually connect a community served by Frontier with a fiber network owned by Qwest. The regulatory and legal issues this raises are beyond the scope of this report. However, the fiber routes were chosen to minimize the cost of construction required to address the critical backbone infrastructure gaps in the study region.

Table 19. Construction Cost Estimate for Fiber Optic Backbone Networks

Route	Road Miles	Road Feet	Cost Conduit Only	Cost Complete w/ Fiber
White Bird to Grangeville	**17**	**89760**	**$ 1,122,000**	**$ 2,244,000**
Orofino to Greer	9	47520	$ 594,000	$ 1,188,000
Greer to Weippe	18	95040	$ 1,188,000	$ 2,376,000
Weippe to Pierce	11	58080	$ 726,000	$ 1,452,000
Total: Orofino to Pierce	**38**		**$ 2,508,000**	**$ 5,016,000**
Orofino to Peck	**13**	**68640**	**$ 858,000**	**$ 1,716,000**
Elk River to Bovill	**17**	**89760**	**$ 1,122,000**	**$ 2,244,000**
Elk City to Grangeville	**51**	**269280**	**$ 3,366,000**	**$ 6,732,000**
Winchester to Craigmont	**9**	**47520**	**$ 594,000**	**$ 1,188,000**
Reubens to Craigmont	**10**	**52800**	**$ 660,000**	**$ 1,320,000**
Total			**$10,230,000**	**$20,460,000**

Notes:
1. Conduit only estimated at $12.50 /foot.
2. Complete w/ fiber estimated at $25/foot.
3. These costs assume open trench installation with complete ground restoration.

Also, there is no existing fiber optic point of presence in Orofino, the termination point chosen for the Clearwater County communities and Peck. Orofino was chosen because of the likelihood that the Bonneville Power Administration (BPA) will bring fiber to Dworshak Dam within the next five years. Discussions with BPA have indicated that excess broadband capacity would be available and could be resold to the study communities. By the time the funding necessary to build this network could be raised, and the network built, the BPA point of presence should be available. If not, the network could be extended from Peck toward the Qwest network in Lewiston or Craigmont. Note again that this extension would link territories served by two separate incumbent telephone companies.

Wireless (microwave) backbone networks have been used by telephone companies for many years. In fact, they still provide the backbone network for several of the study communities. These microwave networks were chosen originally because they were more economical to build in rural, low traffic areas when compared to traditional copper voice networks. A new generation of wireless networks, capable of delivering broadband backbones into rural communities, shares this economical advantage.

Table VII-2 presents a construction estimate for the same network routes presented in Table VII-1. The wireless networks shown would provide two 150Mbps links between communities as well as the “base station” required in each community to provide broadband service to individual users.

Table 20: Wireless Network Construction Cost Estimates

Route	Road Miles	Backhaul Hops	Distribution Lateral	Distribution SIte	Cost
White Bird to Grangeville	**17**	**3**	**1**	**1**	**$ 686,500**
Orofino to Greer	9	3	1	1	$ 686,500
Greer to Weippe	18	4	1	1	$ 861,500
Weippe to Pierce	11	3	1	1	$ 686,500
Total: Orofino to Pierce	**38**				**$ 2,234,500**
Orofino to Peck	**13**	**3**	**1**	**1**	**$ 686,500**
Elk River to Bovill	**17**	**5**	**1**	**1**	**$ 1,036,500**
Elk City to Grangeville	**51**	**7**	**1**	**1**	**$ 1,386,500**
Winchester to Craigmont	**9**	**1**	**1**	**1**	**$ 336,500**
Reubens to Craigmont	**10**	**1**	**1**	**1**	**$ 336,500**
Total Cost					**$ 6,703,500**

Notes:
1. Number of hops required is estimated using one-fourth of the radio's actual range.
2. Costs shown are for a turnkey system offering voice and data service.
3. Backhaul links are redundant 150Mbps.

Several differences in the two network designs need to be understood to interpret the data in the Tables. As stated above, the fiber optic network can deliver significantly higher bandwidth than the wireless alternative. However, the fiber costs in Table VII-1 reflect ONLY the cost of installing the fiber. None of the costs for the active electronics to drive the network, nor any of the costs for equipment to distribute the signal within a community, are included. The wireless construction estimates include the backbone and distribution equipment in the community. So the 3:1 ratio of fiber to wireless construction costs ($20.5M vs. $6.7M) can be seen as a conservative estimate of the cost advantage of wireless backbones.

Last-Mile Solutions

Estimating the costs of last-mile solutions is more complicated than backbone solutions. In the case of backbone solutions, both the fiber and wireless solutions involved completely new construction. Some last-mile solutions may take advantage of existing cabling (telephone or cable TV) to reduce last-mile costs.

DSL: DSL service transmits broadband service across existing telephone lines to users located within 18,000 feet (3+ miles) of the telephone companies local office. A DSL access multiplexer (DSLAM) is installed at the telephone company central office (CO) and connects subscribers to a broadband backbone through a dedicated pair of copper wires from the CO to the user location. The ability to deliver DSL is also effected by the quality of the telephone lines used. The reality of many rural communities is that many users live too far from the CO, that dedicated pairs are not available, and that the existing lines are old and degraded. The cost of establishing cable modem service in a community typically includes the cost of the DSLAM and repairs and upgrades to the existing cabling.

Qwest and Frontier each provide DSL service in one of the study communities, Culdesac and Riggins respectively. The City of Riggins and the local Library reported that the monthly cost was the reason they had not adopted the service. It was also reported to the Consultant during the preparation of this report that residents in Culdesac view the DSL service there as unaffordable. The issue of affordability in these two communities reflects both the reduced economic means of community members and the need for providers to educate those community members on the benefits of broadband service.

Cable Modem: Cable modem service is similar to DSL in that it delivers broadband service to users through an existing cable. A device called a Cable Modem Termination System (CMTS) is installed at the “head end” of a cable TV system and connects users to a broadband backbone. Cable modem service is also distance limited and requires a high quality cabling system for best performance. The cost of establishing cable modem service in a community typically includes the cost of the CMTS and repairs and upgrades to the existing cabling. In larger communities, these upgrades can include the replacement of copper coaxial backbones with fiber optic backbones. In communities without cable TV service, which includes most of the study communities, establishing cable modem service is cost prohibitive.

Wireless: Community-wide wireless broadband service is being installed in many communities across the country. The service relies on radios to carry broadband signals from distribution points to user locations. Wireless services typically have lower fixed infrastructure costs than DSL or cable modem. Current wireless services have better range than DSL or cable modem, but require clear line of sight from the distribution point to the user location. User equipment can be as simple as a built-in wireless card in a computer ($50) or may require an external radio and antenna ($300) to improve reception. Wireless service is available in several study communities from MtIda.net and Connect Wireless. Published service costs for Connect Wireless are included in Section III.

Satellite Internet: Satellite internet service should also be considered a last-mile (as well as backbone) solution. The available providers, installation costs and service costs are presented in Section III.

VIII. STRATEGY ANALYSIS

This section reviews ten different strategies and how they may be applied to address issues in the study area. Ultimately, local officials may pursue a combination of these strategies or focus primarily on one option. Prior to undertaking any action, however, it is necessary to evaluate the strategies in terms of priorities, community resources, and likelihood of success. This section provides the background information that will allow community leaders to evaluate the options and determine the next step for proceeding.

The ten strategies are further broken down into three phases: Immediate Actions, Near Term Projects, and Long Range Projects. These three phases are used to demonstrate the priority of the action and the most likely time frame in which the project can be successfully concluded. Immediate Actions are tasks that form the organizational foundation of later efforts or are low-cost methods for bringing some form of broadband connectivity to communities that lack any service today. Near Term Projects are those efforts that require more time to get started but address the most critical gaps in infrastructure. Long Range Projects are follow-on tasks that can expand the reach of the Near Term tasks and improve the overall effectiveness of this plan.

Community support will be critical in sustaining any effort. Alternatives that require the investment of public funds or that require a long-term commitment must have strong backing from local leaders and among citizens in the communities that are involved in the effort. This may involve outreach efforts through public meetings, surveys, press releases, and demonstration projects.

Market concerns also influence the selection of strategies. Strategies must reflect a reasonable return on either public or private investment. Creating a public utility to construct a fiber network for example, is a costly effort that has experienced the most success where there is either enough population to support competing networks or the chance for a private market solution is remote. Public-private partnerships, however, are becoming more popular and reduce the financial liability for public entities participating in the effort. Additionally, public-private partnerships have generally not had issues regarding the legality of a municipality competing with commercial telecommunication providers.

Immediate Strategy 1 – Creating a Regional Telecommunication Consortium

1. Issue

Communities need high speed and affordable broadband options. Redundant connections are required for technology dependent industries that can not tolerate service outages. Often, however, rural communities do not have the full range of advanced services because they do not have the critical mass to provide a sufficient return on investment (ROI) for telecommunication providers. Throughout the study area there are limited options for high speed connections and often the pricing far exceeds rates found in other areas of the country. Even where there is fiber optic connectivity, it does not reflect a redundant path.

After several years of receiving no positive movement on these issues from private sector service providers, many rural communities have formed telecommunication partnerships or consortiums to take a pro-active approach to addressing these issues. The consortiums may take on a variety of roles from negotiating joint purchasing contracts, offering incentives, creating private-public partnerships to actually constructing and operating a utility.

2. Objectives

- Create an entity that is charged with addressing telecommunication shortcomings in the area and can implement the recommendations of this plan.
- Have an organization in place that can respond in a timely manner to opportunities that may arise to address telecommunication needs.
- Create an organization that can pursue grants and other funding opportunities for regional initiatives.

3. Description of Strategy

There are typically two methods for creating a telecommunication consortium.

- Intergovernmental Agreement – Participating governments approve an intergovernmental agreement to establish a consortium. The agreement addresses roles and responsibilities, financial contributions, decision making, organizational structure, and overall goals of the entity.
- Non-Profit – A separate non-profit is incorporated with the mission of pursuing telecommunication strategies. The non-profit may receive some funding from local governments but is also free to pursue grants and conduct fund-raising. The non-profit has an independent governing board.

4. Benefits

- Forming the organization is often a catalyst for change and can prompt existing telecommunication providers to upgrade service if they feel there may be a threat of competition.

- Having a consortium/organization in place will create a mechanism for pursuing options that may have a short window of opportunity.

- Creating an organization that is dedicated to implementing the telecommunication strategies will forestall efforts being diverted to other priorities.

- Formalizing an organizational structure now will be a hedge against potential anti-municipal telecommunication legislation that is being considered in Congress. Typically, such legislation will grandfather existing initiatives.

5. Cost Factors & Funding Options

The cost to create the organization is minimal. Staffing costs to sustain the effort is the biggest expense. These costs may be offset by in-kind staff assistance, revenue from telecommunication initiatives, or cost savings from joint purchasing agreements.

6. Partners

- Local city & county governments
- Economic Development organizations
- School Districts

7. Timeline

Task	**Timeline**
Determine non-profit or intergovernmental agreement model	Immediate
Draft agreements, by-laws, incorporation papers	6 months
Pursue funding & grant opportunities	6 to 12 months
Initiate projects	On-going following establishment of consortium

8. Resources & Models

See sample agreements in appendix

<u>Immediate Strategy 2</u> – Install Satellite Broadband in Libraries/Communities Centers of Unserved Communities

1. <u>Issue</u>

The communities included in this study were all defined as “underserved”, meaning they have limited access to high speed or broadband telecommunications capabilities. Among the sixteen communities are nine communities (Elk City, Elk River, Greer, Peck, Pierce, Reubens, Weippe, White Bird and Winchester) which must honestly be labeled as “unserved”. They must be considered as “unserved” because the existing backbone technology is either digital radio or copper T-1 circuits. In some of these “unserved” communities, including at least Elk City, Weippe, and White Bird, we have been told by the incumbent telephone company that there is <u>NO</u> existing capacity to bring broadband backbone services to the community.

2. <u>Objectives</u>

- Develop a local broadband access center using satellite-based high speed internet access. Public libraries, public schools, city halls and town community centers are ideal candidates for such a facility.

- Create or designate an organization to administer the facility. Said organization should be responsible for staffing the space and providing user support and training. This local organization should be responsible for supporting the regional telecommunications consortium (see Strategy 1.1 – Creating a Telecommunications Consortium) in planning and implementing near term and long range strategies.

3. <u>Description of Strategy</u>

This strategy can be implemented through the following steps:

- Identify a public facility or facilities within each underserved community that can serve as a community internet center. This facility or facilities should have room for a minimum of ten personal computers and should operate before, during and after working hours to provide the greatest flexibility in public access. The facility or facilities should have an unobstructed view of the southern sky. Install at least one satellite downlink into the selected facility providing at least 1.0Mbps peak download and 500Kbps peak upload speeds. Build a local area network and link at least 10 personal computers to the satellite service.

- Develop local expertise to manage the facility and train users through one-on-one or classroom instruction.

4. <u>Benefits</u>

- Creating a broadband center within each unserved community will provide the residents of that community with the opportunity to learn how to use the capability for personal and business use.

- Creating a broadband center using satellite technology provides an economical starting point for the infrastructure that will be required for wider distribution of broadband access throughout the community.

5. Cost Factors & Funding Options

A single satellite downlink will cost less than $2000 up front and less than $150/month in recurring costs. Management and administration of the facility can be accomplished by volunteers or staffed by a part-time position. Funding options include Gates Foundation grants, USDA Rural Development Community Connect grants, membership fees, and existing public funds.

6. Partners

- Local city & county governments
- Public libraries
- Economic Development organizations
- School Districts

7. Timeline

Task	**Timeline**
Identify local facility for broadband center	Immediate
Pursue funding for initial and monthly service costs	2-6 months
Initiate service	12 Months

8. Resources & Models

Satellite service providers include DirecWay, WildBlue, and Starband. Of these, DirecWay and WildBlue have the best downlink and upload bandwidth options.

Information regarding Community Connect Grants can be found at www.usda.gov/rus/telecom/commconnect.com

Information regarding Gates Foundation grants can be found at
www.gatesfoundation.org/Libraries/USLibraryProgram

<u>Immediate Strategy 3</u> – Wireless Mesh Network Pilot Project

1. Issue

Once broadband backbone service is brought to a community, a reliable and affordable method must be identified for delivering that service to each individual user. The most common means of distribution in broadband enabled communities are digital subscriber lines (DSL) or cable modem service. These two methods require some relatively expensive “head end” equipment and high quality cabling running to each user. The telephone and cable TV (where available) cabling in most unserved communities cannot support DSL or cable modem service. Further, the small size of these communities makes it difficult for commercial providers to justify the investment in head end equipment. Wireless mesh networks offer a less expensive, more scaleable alternative for broadband distribution in small rural communities. When linked to a satellite backbone connection, wireless distribution can be implemented for a fraction of the cost of DSL or cable modem. While the satellite/wireless system is still limited by the bandwidth and latency limits of the satellite service, it will provide a basic broadband presence in a community at a much lower entry cost than DSL and cable modem. Further, the technology can be installed and supported by local, grass roots organizations without incurring significant commercial provider costs.

2. Objectives

- Demonstrate the function of a wireless mesh network in an unserved community using a satellite service as the backbone link.
- Test the quality of coverage of the network in outdoor and indoor spaces.
- Evaluate the mesh density (spacing) required to provide broadband access to indoor and outdoor users. The goal shall be to insure that the bandwidth available to an individual user is only limited by the satellite connection, not by the wireless mesh network.
- Train local personnel to provide first level technical support for the wireless mesh network.
- Identify the total cost of deploying a wireless mesh network in similar communities.

3. Description of Strategy

This strategy can be implemented through the following steps:

- Identify an unserved community willing to host this pilot project.
- Identify, solicit and receive funding.
- Identify five or more public or private locations to install mesh network access points.
- Acquire and install mesh network access points on the selected poles or rooftops.
- Test network accessibility and level of service at multiple locations in the community.
- Define design and cost parameters for use in deploying mesh technology in other communities.

4. Benefits

- Economical deployment of broadband access across currently unserved communities.

- Ability to support standards-based wireless networking (IEEE 802.11a/b/g)
- Self-healing mesh backbone network increases reliability.
- Low-cost equipment, simple to operate.
- First level of technical support can be provided by local resources.

5. Cost Factors & Funding Options

Mesh access points will cost less than $2,000 installed, including antennas, cabling and lightning protection. The technology is new enough that manufacturers may be convinced to loan equipment for the duration of the pilot project in exchange for the right to publicize their contribution and advanced knowledge of further deployments. Client access equipment will include built in or external wireless network cards at a cost of $50 to $100. Clients in remote locations may require an additional antenna and cabling estimated to cost approximately $150.

6. Partners

- Local city & county governments
- Public libraries
- Economic Development organizations
- School Districts
- Local hospitality and dining businesses

7. Timeline

Task	**Timeline**
Identify mesh access point locations	COMPLETE
Identify Funding Sources	COMPLETE
Apply for USDA RUS Community Connect Grant	COMPLETE
Receive Grant Funding Award	COMPLETE
Construct Network and Ancillary Facilities	July 2007
Assess Network Performance	August 2007

8. Resources & Models

Mesh network technology is a recent development. Many vendors are now in production on the equipment, each with a slightly different architecture. Vendors that have proven their technology in field demonstrations are Proxim Wireless (www.proxim.com), Tropos (www.tropos.com), SkyPilot (www.skypilot.com) and Cisco (www.cisco.com).

Author's Note: In May, 2006 the Elk River Free Library applied for funding for a mesh network project through the USDA Rural Utilities Service Community Connect Grant Program. This funding would pay for the construction and operation of the mesh network for two years as well as for an expansion of the Library to house ten computers for public Internet Access. Approval of the application was received in September 2006. Construction of the network and facilities is expected to be completed by July 2007.

<u>Immediate Strategy 4</u> – Promoting Broadband Applications - Community Education, E-Commerce & Telework

1. Issue

In addition to efforts to improve telecommunication services, there needs to be strategies that focus on the capacity of the community to use these new technology tools. These strategies focus on marketing, work force skills, and developing new applications.

Marketing strategies help increase demand for technology services and create a strong market for future investment in telecommunications. One way to increase demand is through programs and events that increase awareness of technology benefits and facilitate the adoption of technology applications.

The growth in computer networking and rapid technological changes also create a need for work force training so organizations can adapt new technology. Training should include classes on network design and management, on-site troubleshooting, and information management. Organizations of all types and sizes will need staff with these types of skills or will need to contract with technicians who can provide these services.

Non-technical staffs in schools, public agencies, and businesses need training and resources to integrate technology into daily operations. Strategies need to help people understand the benefits of technology and overcome initial reluctance to adopt new procedures. Training might focus on software application, web design and other technologies.

With training and support systems in place, the area will be better positioned to recruit knowledge-based jobs and businesses will be able to expand markets outside of the region. The result will be an increase in demand for telecommunication services and a stronger market for investment in telecommunication infrastructure.

2. Objectives

- Provide businesses and residents with skills to use broadband applications and become more competitive.
- Create market demand for broadband applications to attract providers in underserved areas and to use the full capacity of existing infrastructure.
- Demonstrate benefits of broadband applications to businesses and residents in the area.

3. Description of Strategy

The Blandin Foundation in Grand Rapids, MN has published a guide, "Increasing Economic Vitality: A Community Guide to Broadband Development". The guide provides the following examples of events that can promote broadband applications.

- **Community Technology Fairs**. Software and hardware vendors, along with Internet Service Providers, may display and demonstrate their applications and equipment. Fairs should be located at a site that has broadband access. Special demonstrations may be scheduled at different times targeted toward individual market sectors. This event is similar to a miniature state or county fair.

- **E-Commerce Training.** Many communities have businesses, such as crafts, antiques and small manufacturers that may benefit greatly from electronic commerce to reach markets larger than their community. An introduction to e-commerce may be done in an evening, but to be successful, a series of classes should be held to design their Web sites and to assure that the sites function correctly. Similar businesses may be able to combine or link their Web sites to create greater appeal. Customized e-commerce training may be conducted in every community. Most colleges and universities offer e-commerce training in their degreed and non-degreed programs. For example, the Idaho Virtual Incubator (www.idahovi.org) at Lewis and Clark State College in Lewiston, offers "to prepare businesses for e-commerce, offer students "hands-on" experience, and foster participation for job creation, businesses expansion, and retention."

- **"Broadband Night".** Demonstrations may be held at schools, libraries or in other facilities where people may come and experience broadband speed and connectivity. Attractive Web sites may be bookmarked for each market sector. For example, the U.S. Small Business Administration has a series of interactive video lectures at its Web site (http://www.sba.gov/training/courses.html).

- **Lectures and presentations**. Many communities have community forums with guest speakers. Organizing committee members should be familiar with opportunities for speaking to specific groups (health care, retailers, seniors, and job seekers) about broadband telecommunications. Presentations may be tailored to specific audiences. While not generally as effective as hands-on experience, lectures and presentations may help generate interest and create a local "buzz."

- **Tutorials**. Like e-commerce training described above, live and electronic tutorials may help people understand how to perform the fundamental tasks on the Internet, such as IP Telephony, videoconferencing, virtual private networking, video on demand and telemedicine.

- **Public Relations**. Public relations activities may be conducted to promote general public awareness, including writing newspaper articles, appearing on local public cable access shows, volunteering to be a guest on call-in radio shows, and creating speakers group.

- **Telework** – More companies are outsourcing work to employees at remote locations. Employees need a broadband connection. A complimentary strategy to developing work place skills and building a market for broadband is to promote outsourcing opportunities. (See resources for web sites)

4. Benefits

- Cost savings for businesses that are using technology to operate more efficiently.
- More broadband subscribers equal more revenue stream to offset investment in technology.
- Increased sales from widespread use of e-commerce.
- Trained workforce more attractive to potential employers. Existing businesses can reduce recruitment costs by hiring locally.

5. Cost Factors

This is generally a low-cost strategy that relies primarily on volunteer and in-kind donations. Following are some cost factors.

- Staff time to organize the event or promotion is the biggest cost factor. Volunteers and in-kind staff from partner organizations is the most effective way to reduce this cost.
- Publicizing the event may include cost related to printing, ads, and mailings. Local newspapers often publicize the event through news stories at no costs. Including notices in newsletters and mailings of partner organizations is another cost effective method.
- Other costs may include equipment rental, meeting space rental, curriculum development, and broadband connections charges for the event.

6. Partners

- Lewis and Clark State College
- Chambers of Commerce
- School Districts
- Nez Perce Tribe
- Libraries
- University of Idaho Cooperative Extension
- State of Idaho – Dept. of Commerce

7. Timeline

Task	**Timeline**
Public Relations – Press Release, Tech Columns	Immediate – On-going
Lectures & Presentations	Coordinate with other meetings
Technology Fair – Broadband night	4 to 6 months to organize & publicize
E-Commerce Training	Coordinate with partners

8. Funding

- In-Kind support

- Government Grants (Dept. of Education – Technology Grants, Work-Force Development Grants, ...)
- Foundation Grants (Technology companies such as Micron, Intel, Gates Foundations, IBM, Verizon, ...)
- Sponsorships – Local providers and technology company may be willing to be a sponsor at events.

9. Resources & Models

- Small Business Technology Institute, http://www.sbtechnologyinstitute.org/

- The Montana Choice Project, Homesteading the Ecommerce and Telework Frontiers, http://lone-eagles.com/montana-choice.htm

- Nonprofit Technology Enterprise Network (N-TEN), http://www.nten.org/

- E-North Carolina (E-NC), Business Connections, "Using Technology to Build Successful Businesses – A Handbook for Business Connectivity"
  http://www.e-nc.org/pdf/final-e-commerce-manual.pdf

- Work at home websites include:
  www.GoWillow.com
  www.workathomeagent.com
  www.workingsolutions.com
  www.liveops.com
  www.callcenteroptions.com

- GCF Global Learning - Offering free, beginning computer courses and other learning opportunities. http://www.gcflearnfree.org/

- Washington State University – Center to Bridge the Digital Divide, E-Work & Rural Telework Initiative, http://cbdd.wsu.edu/initiatives/ework/communityres.html

10. Risks

The primary risk is not adequately publicizing the event and having a small turn-out for the time and effort that is spent by the organizers. Working with partner organizations to have them promote the activity and coordinating the event with other activities that might bring in additional traffic is one strategy to limit this risk. Examples of potential venues to piggy back a technology event include county fair, school open house or parent night, and chamber of commerce meetings.

<u>Near Term Strategy 1</u> – Create wireless backbone networks to connect communities not served by broadband networks to the nearest broadband point of presence. Where possible, link unserved communities together to aggregate traffic and leverage economies of scale available for backbone networks.

<u>1. Issue</u>

Nine communities in the study area are not served by fiber optic networks connecting them to the "outside world". The only options for broadband services are expensive T-1 lines or satellite. While satellite is recommended as a short-term solution, it can not be considered for the long term because of high latency and limited bandwidth.

The most critical of the gaps in service is the one between White Bird and Grangeville. All communications traffic between north and south Idaho must leave the state because of the gap at White Bird Hill. The lack of broadband connectivity across White Bird Hill provides communications challenges to state and local government, public safety and the public schools. Bridging gaps such as the one at White Bird Hill will also improve reliability for residents on North Central Idaho by providing redundant paths for communications into and out of the region.

The remote mountain communities of Elk City and Elk River are also not served by any broadband capable network. The existing digital radio links are limited in bandwidth and are a possible single point of failure for all communications into and out of these communities. The lack of redundancy alone must be viewed as a life safety risk as well as a threat to reliability. The absence of reliable broadband connectivity also increases the economic development challenges of these communities. Local businesses are not able to leverage the internet to expand their marketing reach. These communities will also have a difficult time competing with broadband-enabled communities for relocating or expanding businesses which are interested in all the communities' many other attributes.

The northern part of the study area includes the communities of Peck, Greer, Weippe and Pierce and is served by either copper T-1 lines or digital microwave that backhauls traffic on the Verizon network to Moscow, ID. The life safety and economic development issues of redundancy, bandwidth and reliability noted above for Elk City and Elk River also apply to these communities.

<u>2. Description of Strategy</u>

High bandwidth wireless networks have been demonstrated to be far less expensive to build than fiber optic networks and capable of delivering sufficient bandwidth to meet the needs of the study communities well into the foreseeable future. In addition, the infrastructure required for a wireless broadband network, principally towers and electrical power, can also be used to support other wireless applications such as cellular telephone service and licensed public safety broadband applications. This strategy can be implemented as a wholly public project or a partnership of public and private entities. This strategy is comprised of the following actions:

- Prioritize the order of implementation of the various legs of this network based on the potential benefit to be gained. The following order is recommended:

- Connect White Bird to Grangeville. This link will bridge the existing communications gap at White Bird Hill and link North Idaho to South Idaho for the first time without leaving the state.

- Connect Greer, Weippe, and Pierce to Orofino. This network will provide broadband to the bulk of Clearwater County and allow the aggregation of bandwidth demand at the County seat, which is a broadband enabled community. Aggregating demand at a single point of presence allows the cost of satisfying that demand to be shared by more users.

- Connect Peck to Orofino. This link will introduce broadband into northern Nez Perce County and extends the entire wireless network closer to Lewiston, where broadband services can be acquired in a competitive market. As above, the bandwidth demand for Peck can be added to that of Greer, Weippe and Pierce.

- Connect Elk River to Bovill. This link will enable broadband access at Bovill to be extended into Elk River. This link will establish communications redundancy and competition for services. It will also enable ancillary application such as cellular service and public safety mobile data.

- Connect Elk City to Grangeville. This link will enable broadband access at Grangeville to be extended into Elk City. This link will establish communications redundancy and competition for services. It will also enable ancillary application such as cellular service and public safety mobile data.

- Connect Winchester to Craigmont. This link will provide broadband capacity at Winchester beyond the limited Qwest T-1 availability. It will also enable competition for broadband services and enable ancillary services such as public safety mobile data.

- Connect Reubens to Craigmont. This link will provide broadband capacity at Reubens beyond the limited Qwest T-1 availability. It will also enable competition for broadband services and enable ancillary services such as public safety mobile data.

- Identify and acquire, through lease or purchase, sites for wireless towers. These can be spaced as far as 35 miles apart, but must have unrestricted line of sight to each adjacent tower in the network.

- If a Telecommunications Authority is created, this entity could negotiate with a private partner to build and operate the network. Incentives for a provider may include long term service contracts with public entities, access to towers for co-locating equipment, seed money to construct the network or right-of-way access to construct fiber route.

- To have redundancy, build a fiber connection to Dworshak Dam and lease bandwidth from the Bonneville Power Association (BPA) fiber network. BPA has indicated that they are tentatively scheduled to bring fiber to the Dam in 2011.

- Negotiate right-of-way to install the fiber connection to the Dam. Potential right-of-way could either be negotiated through pole agreements with Clearwater Power or could be included as part of water system project that will connect the City of Orofino with the Dam.

3. Objectives

- Develop a wireless network to connect unserved communities to the nearest broadband point of presence. Aggregate Clearwater County based traffic at a point of presence in Orofino.
- Provide a primary wireless high-speed Internet backbone to the towns of White Bird, Weippe, Peck, Greer, Pierce, Elk City, Elk River, and Reubens.
- Provide a reliable and redundant communications capability to communities served by a potential single point of failure.
- Provide basic infrastructure for ancillary applications such as cellular telephone or public safety mobile data.
- Extend the wireless network to Lewiston to enable access to competitively priced broadband service.

4. Applications

- Replace dial-up & 56k circuits with high speed access for Schools at lower costs
- Replace dial-up & 56k circuits for libraries with high-speed access at lower costs
- High speed access for Lewis & Clark State College for expansion of computer lab
- Provide a broadband backbone link to the proposed fiber network in downtown Pierce
- Telemedicine video consultations with St. Joseph Regional Hospital in Lewiston
- VOIP applications for sheriff and other public offices
- Mobile wireless applications for public safety using wireless network
- IP telephony to provide private voice services in competition with incumbent local exchange carriers

5. Benefits

- Provide high speed service to unserved areas
- Introduce competition to marketplace
- Introduce path and provider redundancy to the regional networks
- Provide infrastructure (towers, etc.) for use by other wireless services
- Wireless applications for public agencies
- Promote business retention and recruitment

6. Cost Factors

A study of the construction costs for buried fiber and wireless broadband backbones for the routes suggested above was completed as a part of this study. The results appear in the table below. When evaluating capital costs for projects such as these, it is often helpful to know the technical capabilities and operational costs of existing alternatives. When reviewing the data below, bear in mind that the existing alternative in most cases is a T-1 line which delivers 1.5Mbps and costs $1100 per month ($13200 per year).

ROUTE	>1000Mbps Buried Fiber Optic Network	Redundant 150Mbps Wireless Network
White Bird to Grangeville	$2,200,000	$700,000
Orofino to Pierce	$5,000,000	$2,200,000
Peck to Orofino	$1,700,000	$700,000
Elk River to Bovill	$2,200,000	$1,000,000
Elk City to Grangeville	$3,400,000	$1,400,000
Winchester to Craigmont	$1,200,000	$400,000
Reubens to Craigmont	$1,300,000	$400,000

7. Partners

- The North Central Idaho Forum for Information Technology (NCIFIT), an informal group of public officials, is investigating the possibility of pursuing a congressional appropriation to fund the wireless access points for the network.
- The City of Orofino is planning for a water project that would build a water line from Orofino to Dworshak Dam. It may be possible to include conduit for fiber with this project. This conduit could be used to interconnect the Peck-Orofino-Greer-Weippe-Pierce network with internet bandwidth at the Dam after 2011.
- Inland Cellular is currently developing plans to build a similar wireless network in its territory to deliver commercial broadband services to public and private clients. Coordination with state and local government and private efforts could significantly advance the schedule and reduce the costs for all involved.
- The Nez Perce Tribe may be able to provide towers for co-location of equipment or other resources. The extent of their statutory ability to participate is currently being evaluated by Tribal staff.

8. Timeline

Task	**Timeline**
Identify and secure tower sites	Year One
Coordinate efforts with Nez Perce Tribe	On-going
Telecom Authority identifies incentives & operating model to attract private partner	Year One
Funding for wireless network	Year One to Year Five
RFP to find private partner	Year 2 & pending positive outcomes on previous tasks
Network deployed	Pending successful response to RFP
Coordinate with BPA about connecting to fiber at Dworshak Dam in 2011.	Coordinate with Orofino water project

Determine feasibility of including fiber conduit with Orofino water project	Coordinate with water project planning
Contact Clearwater Power regarding pole agreements for fiber connection to Dworshak Dam	Pending outcome of BPA & Orofino water project discussions

9. Funding

- Congressional appropriation for wireless access towers
- Public safety grants for County & Tribe to fund mobile wireless applications
- Private partners fund network deployment in exchange for incentives
- In-kind donations of co-location sites for towers

10. Resources & Models

A similar wireless backbone providing voice and data services in a rural state is currently operated in Montana by TransAria, Inc. (www.transaria.com) The costs for wireless network deployment stated in this report are based on Transaria's actual experience. The assistance with this project is gratefully acknowledged.

Sample RFPs for Wi-Fi Networks (See Appendix)

Oakland County, MI - Wireless RFQ – www.co.oakland.mi.us/wireless

Chaska, MN – Wireless Network – www.chaska.net

Washtenaw Wireless Michigan - http://wireless.ewashtenaw.org/

Intel – Digital Communities Best Practices
http://www.w2idigitalcitiesconvention.com/digital_community_best_practices.pdf

www.muniwireless.com

Near Term Strategy 2 – Expand Wireless Mesh Networks to Other Unserved Communities

1. Issue

Once broadband backbone service is brought to a community, a reliable and affordable method must be identified for delivering that service to each individual user. The most common means of distribution in broadband enabled communities are digital subscriber lines (DSL) or cable modem service. These two methods require some relatively expensive "head end" equipment and high quality cabling running to each user. The telephone and cable TV (where available) cabling in most unserved communities cannot support DSL or cable modem service. Further, the small size of these communities makes it difficult for commercial providers to justify the investment in head end equipment.

Wireless mesh networks offer a less expensive, more scaleable alternative for broadband distribution in small rural communities. When linked to a satellite backbone connection, wireless distribution can be implemented for a fraction of the cost of DSL or cable modem. While the satellite/wireless system is still limited by the bandwidth and latency limits of the satellite service, it will provide a basic broadband presence in a community at a much lower entry cost than DSL and cable modem. Further, the technology can be installed and supported by local, grass roots organizations without incurring significant commercial provider costs.

When and if the wireless mesh network technology successfully completes the pilot project in Elk River, the same technology should be implemented in all other communities that have installed a broadband backbone (satellite or otherwise).

2. Objectives

- Expand the use of wireless mesh networks to other unserved communities to provide basic broadband coverage within the town limits.
- Evaluate the mesh density (spacing) required to provide broadband access to indoor and outdoor users. The goal shall be to insure that the bandwidth available to an individual user is only limited by the satellite connection, not by the wireless mesh network.
- Train local personnel to provide first level technical support for the wireless mesh network.

3. Description of Strategy

This strategy can be implemented through the following steps:

- Identify public or private locations to install mesh network access points. These locations can be power poles, rooftops, or similar locations with access to 110v AC power. Spacing between locations should be between 1000 and 2000 feet. One location must be the existing broadband point of presence. Additional locations should include other public buildings and willing local businesses.

- Design the mesh network required to provide broadband coverage to as many locations within a town as is feasible. Estimate the cost of implementation based on data from the pilot study. Identify sources of funding. Develop phased implementation plan to implement the network consistent with available funding.

- Acquire and install mesh network access points on the selected poles or rooftops consistent with available funding.

4. Benefits

- Economical deployment of broadband access across currently unserved communities.

- Ability to support standards-based wireless networking (IEEE 802.11a/b/g)

- Self-healing mesh backbone network increases reliability.

- Low-cost equipment, simple to operate.

- First level of technical support can be provided by local resources.

5. Cost Factors & Funding Options

Mesh access points will cost less than $2,000 installed, including antennas, cabling and lightning protection. The technology is new enough that cost per access point can be expected to decline steadily during the period of performance of this strategy.

Client access equipment will include built in or external wireless network cards at a cost of $50 to $100. Clients in remote locations may require an additional antenna and cabling estimated to cost approximately $150.

6. Partners

- Local city & county governments
- Public libraries
- Economic Development organizations
- School Districts
- Local hospitality and dining businesses

7. Timeline

Task	**Timeline**
Identify mesh access point locations, design network, estimate costs, plan implementation.	Year One
Acquire mesh equipment	Year 1 – Year 2
Install and operate equipment	Year 1 – Year 5

8. Resources & Models

Mesh network technology is a recent development. Several vendors are now in production on the equipment, each with a slightly different architecture. Three vendors that have proven their technology in field demonstrations are Proxim Wireless (www.proxim.com), Tropos (www.tropos.com) and Cisco (www.cisco.com).

Near Term Strategy 3 – Support New Private Backbone Initiatives

1. Issue

At least one private provider interviewed during this study has indicated that they are considering building a private wireless backbone and last mile service in the study region. Currently their implementation plan is based on sales to individual private clients and some small businesses. Without midsized and larger business participation, the full deployment of this capability can be delayed for years. State, county and local government agencies are some of the largest "businesses" in the study region, but their networking needs are carried mostly by incumbent telephone companies who have proven less than willing to expand broadband capabilities in small, rural communities.

2. Objectives

- Leverage the work of the North Central Idaho Forum for Information Technology (NCIFIT) to promote awareness of new private enterprise initiatives to deploy broadband services in unserved communities.

- Encourage public agencies to contract with new private enterprise efforts for broadband services when consistent with agency needs. Discourage the use of single, state-wide provider strategies that do not support the development of alternative resources.

3. Description of Strategy

This strategy can be implemented through the following steps:

- Identify emerging private enterprise solutions and promote their capabilities to potential users, public or private.

4. Benefits

- Leverages private investment to meet the broadband needs of the region.

- Promotes alternative solutions which may increase communications reliability and redundancy while reducing end user cost through competition.

5. Cost Factors & Funding Options

Ideally, this strategy will require no public funds up front. Private investors will build the capabilities expecting an adequate return from users of the service. To the extent that public agencies contract with private investors, public funds will participate in the cost recovery by the investors.

6. Partners

- Local city, county, state and federal government agencies
- Public libraries
- Economic Development organizations
- School Districts
- Hospital and health care providers

- Private entrepreneurs and users

7. Timeline

Task	Timeline
Identify emerging private enterprise broadband solutions	Ongoing
Promote use of such solutions to public agency and private users	Year 2 to Year 5
Assess success of private service offerings and identify additional opportunities for expansion into needy areas	Year 4 to Year 5

8. Resources & Models

Three examples of private, alternative service providers that have, or are considering, deployments in rural underserved rural regions are listed below.

- Transaria, Inc. www.transaria.com
- Inland Cellular www.inlandcellular.com
- Connect Wireless www.connectwireless.us

Funding for private broadband development is available from several sources. The most significant of these resources is the U.S. Department of Agriculture, Rural Development loan and grant programs. Specific programs include the Distance Learning and Telemedicine Grant/Loan Program and the Community Connect Grant program. Additional information can be found at www.usda.gov/rus .

<u>Long Range Strategy 1</u> – Integrate Fiber Optic Networks into Larger Public Works Projects

1. Issue

Over the long term, say beyond ten years into the future, only fiber optic networks can be guaranteed to provide the broadband backbone capabilities needed in the study region. As a separate project, building last mile or backbone fiber optic networks can be cost prohibitive (up to $150,000 per mile), especially to remote communities with small populations.

However, when telecommunications requirements are integrated into other public works projects, such as utility or highway construction, the marginal cost for adding conduit and fiber optic cable can be as low as $25,000 per mile. As a part of a federal or state highway project, such as is planned for U.S. 95 throughout Idaho, the cost of adding the conduit and fiber may only increase the total project costs by 1% to 3%. Governor Kempthorne's "Connecting Idaho Initiative" envisions just this kind of economical expansion of broadband capabilities throughout the State. Representatives of the Idaho Transportation Department who participated in this study also endorsed this leveraging of ongoing public infrastructure investments. Last mile telecommunications needs can also be integrated into public water supply or sewer projects for about the same cost impact.

Unfortunately, the integration of telecommunications needs and other public infrastructure needs is not commonplace today. During this study, two opportunities to incorporate telecommunications into water supply projects were identified. In Pierce, a project to replace the water supply will also include the placement of conduit for future fiber optic cabling. In Grangeville, the water supply project was too far advanced to incorporate any telecommunications capability. However, the water pipes that were taken out of service were left in the ground and have been identified as available for future use as telecommunications conduits. Reusing this old water pipe will significantly reduce the future cost of building a last mile fiber optic network in Grangeville.

2. Objectives

- Build economical backbone fiber optic networks by incorporating this work into other public infrastructure projects such as highway construction or utility construction

- Build economical last mile fiber optic networks by incorporating them into local public infrastructure projects such as water or sewer system construction or road construction

- Integrate telecommunications needs of underserved communities into federal, state, and local public works planning processes

3. Description of Strategy

This strategy can be implemented through the following steps:

- Identify upcoming public works projects that parallel the routes of telecommunications requirements for underserved communities.

- Develop long range plans for telecommunications networks that parallel the routes of planned public works projects. These plans should take into account the time phased nature of public works projects and the long duration from start to finish of such projects. Telecommunications plans should be designed for the capacity required at the end of construction, which may be many years out, plus some reasonable margin for growth.

- Identify stakeholders and responsible public agencies and establish working relationships to integrate telecommunications requirements into public projects.

- Begin dialogue between stakeholders and responsible agencies to establish plans for network ownership, maintenance, and use.

4. Benefits

- Leverages public investment to meet the broadband needs of the region.

- Over time, brings very high bandwidth capabilities to all communities.

- Promotes alternative solutions which may increase communications reliability and redundancy while reducing end user cost through competition.

5. Cost Factors & Funding Options

Integrating telecommunications networks into public works will significantly reduce the cost to the consumer for those networks. Broader funding options are available through local, state and federal highway, public water supply and public wastewater funding.

6. Partners

- Local city, county, state and federal government agencies
- Economic Development organizations
- School Districts
- Hospital and health care providers
- Private land owners and users

7. Timeline

Task	**Timeline**
Identify upcoming public works projects that parallel telecommunications network needs	Year One
Establish dialogue with public works agencies and define high payback opportunities for integration of telecommunications and public infrastructure	Ongoing
Develop time phased plans and specifications for incorporation into public works bid documents	Ongoing

8. Resources & Models

The model for this strategy is nothing new. Highway and street projects have incorporated power, telephone, water and sewer requirements for a very long time. The existing engineering processes are adequate if the design requirements for the telecommunications requirements can be defined. Design standards produced by the Telecommunications Industry Association (TIA) are available to guide public works engineers in the incorporation of broadband infrastructure into new and ongoing projects.

The challenge for this strategy is to define ownership, operating responsibilities and user rights for telecommunication infrastructure built with public funds. Backbone networks have traditionally been provided by the incumbent telecommunications providers in a region. Unfortunately, the business models used by incumbent carriers have resulted in the lack of affordable and reliable broadband connectivity seen in the study communities today. Public funding and ownership of infrastructure, which can then be publicly operated or leased to private operators, may be the only feasible means of extending true broadband service to the remote underserved communities in the region.

Long Range Strategy 2 – Coordinate State and Local Government Networking Procurement Policy to Support Broadband Development in the Region

1. Issue

One of the barriers most often cited to broadband deployment in rural, underserved communities is the lack of a "business case". In other words, incumbent carriers believe that the low population density of the region makes it impossible to deploy broadband in a for-profit scenario. This claim can be shown to be false when alternative technologies, principally wireless networks, are used to deliver broadband service. But even alternative technologies need a business base to justify investment.

One of the largest employers in the region are federal, state and local government agencies. The networking needs of these agencies can provide a solid foundation for alternative solutions if the procurements for such solutions are open to local or regional providers. Unfortunately, many agencies prefer to contract with a single provider for statewide network resources. One contract with a large provider is viewed as easier to manage. The incumbent providers have a proven track record for service delivery and reliability in the major population centers of the state. In rural regions, the agencies accept higher cost, lower performance network services (for example 56K frame relay) for the sake of a single contract with a known provider.

The effect of this procurement approach is that significant federal, state and local government funding is spent on the incumbent network providers. These are the very same providers who have declined to provide broadband service to the rural, underserved areas.

2. Objectives

- Utilize public agency telecommunications funding to encourage the development of regional network providers who are willing to expand broadband capabilities to rural, underserved communities through the use of innovative business models or alternative technologies

3. Description of Strategy

This strategy can be implemented through the following steps:

- Identify regional network providers who can provide for government agency network requirements and have demonstrated a willingness to expand their services into rural, underserved communities.

- Identify government agency network procurements that could be opened up to regional providers as well as state-wide or national providers. Consider also using a series of "small-business set asides" to procure public agency network resources in rural, underserved areas.

4. Benefits

- Leverages public funds to encourage the development of broadband resources through innovative business approaches and technologies.

- Enables innovative broadband providers to establish long term contracts as a foundation upon which to build commercial broadband services into the study region.

5. Cost Factors & Funding Options

This strategy uses existing public agency expenditures to encourage development of regional network providers in the study region. The development of such providers will foster competition in the region, leading to lower end user costs and higher product quality.

6. Partners

- Local city, county, state and federal government agencies
- School Districts
- Hospital and health care providers
- Private land owners and users

7. Timeline

Task	**Timeline**
Identify regional network providers that can provide network services for government agencies in rural, underserved communities	Ongoing
Identify public agency network procurements that could be sub-divided in such a way that regional carriers can successfully compete for these services	Ongoing
Define public agency policy changes required to open network procurements to regional providers	Ongoing

8. Resources & Models

Three examples of innovative technologies that could compete for public agency networking on a regional (local or multi-county) basis:

Inland Cellular Broadband Network www.inlandcellular.com
Transaria, Inc. www.transaria.com
Verizon Wireless Broadband Access
http://www.verizonwireless.com/b2c/mobileoptions/broadband/index.jsp

<u>Long Range Strategy 3</u> – Extend wireless backbone to promote competition and improve redundancy

<u>1. Issue</u>

Competitive pressure is the surest means of promoting affordability and reliability of broadband services. Small towns that have the benefit of competitive providers demonstrate lower cost, greater coverage, and higher reliability when compared to similar towns with only a single provider. Long Term Strategy 3 is designed to focus on the seven communities in the study that are currently served by incumbent carrier fiber optic networks and determine if the wireless broadband backbone network of Near Term Strategy 1 should be extended to them. This determination would be based on the cost, availability and reliability of broadband service in those seven communities beyond Year 5 of this plan.

<u>2. Objectives</u>

- Build wireless broadband backbone service into communities still needing a competitive backbone service provider

<u>3. Description of Strategy</u>

- Identify communities still served by only one broadband backbone provider.
- Evaluate costs of service from the single provider vs. cost of service in communities with competitive providers and communities serviced by wireless broadband backbone defined in Near Term Strategy 1. Identify communities with continuing issues on high cost or low reliability.
- Extend wireless backbone service into those communities which are still experiencing high costs or low reliability.

<u>4. Benefits</u>

- Provides reliability through redundant service

- Provides improved affordability and service by promoting competition for voice and data customers

<u>5. Cost Factors & Funding Options</u>

This strategy uses existing public agency expenditures to encourage development of regional network providers in the study region. The development of such providers will foster competition in the region, leading to lower end user costs and higher product quality.

<u>6. Partners</u>

- The North Central Idaho Forum for Information Technology (NCIFIT)
- Inland Cellular
- Transaria, Inc.
- Other wireless backbone providers

7. Timeline

Task	Timeline
Identify communities still served by a single broadband backbone provider	Year 6
Evaluate cost and quality of service. Identify communities that would benefit from competitive wireless backbone provider	Year 6
Extend wireless backbone to communities identified as still needing improvements in cost or reliability of service	Years 7 thru 10

8. Resources & Models

Three examples of possible wireless backbone providers, all of whom also provide last mile services as well, are:

Inland Cellular Broadband Network www.inlandcellular.com
Transaria, Inc. www.transaria.com
Verizon Wireless
http://www.verizonwireless.com/b2c/mobileoptions/broadband/index.jsp

2 Pages

Withheld in their entirety pursuant to FOIA Exemption 4 (5 U.S.C. § 552 (b)(4))

FORM CD-512
(REV 12-04)

CERTIFICATION REGARDING LOBBYING
LOWER TIER COVERED TRANSACTIONS

U.S. DEPARTMENT OF COMMERCE

Applicants should review the instructions for certification included in the regulations before completing this form. Signature on this form provides for compliance with certification requirements under 15 CFR Part 28, "New Restrictions on Lobbying."

LOBBYING As required by Section 1352, Title 31 of the U.S. Code, and implemented at 15 CFR Part 28, for persons entering into a grant, cooperative agreement or contract over $100,000 or a loan or loan guarantee over $150,000 as defined at 15 CFR Part 28, Sections 28.105 and 28.110, the applicant certifies that to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

Statement for Loan Guarantees and Loan Insurance The undersigned states, to the best of his or her knowledge and belief, that:

If any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the above applicable certification.

NAME OF APPLICANT	AWARD NUMBER AND/OR PROJECT NAME
First Step Internet, LLC	USDA/NTIA BIP/BTOP County Broadband project
PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE Kevin W. Owen - President	
SIGNATURE	DATE 08/13/2009

VIDEO SERVICES
SUBSCRIBER PROJECTS AND RATE PLANS
COMPLETE THE CHART BELOW FOR EACH PROPOSED FUNDED SERVICE AREA. FOR ALL OTHER SERVICE AREAS, PLEASE PREPARE A CHART THAT AGGREGATES THIS INFORMATION

SERVICE AREA NAME:_____5 County Broadband Project_____________

	Census Community	**Year 1**			**Year 2**			**Year 3**			**Year 4**			**Year 5**		
		Pkg 1	**Pkg 2**	**Other**	**Pkg1**	**Pkg 2**	**Other**	**Pkg 1**	**Pkg 2**	**Other**	**Pkg 1**	**Pkg 2**	**Other**	**Pkg 1**	**Pkg 2**	**Other**
1	No planned Video services															
2																
3																
4																
5																
6																
7																
8																
9																
10																
TOTAL																

Rates:

Package 1: (ex. 150 basic channels / $35)

Package 2:
(ex. 150 basic channels and Premium / $60)

Other (Specify):

Note: Complete a separate table for each service area. Column headings should be changed to reflect the name of the service package to be offered. Additional columns may be added for each year if more than three packages are offered.

SUBSCRIBER PROJECTION TABLE AND RATE PLANS
VOICE SERVICES

COMPLETE THE CHART BELOW FOR EACH PROPOSED FUNDED SERVICE AREA. FOR ALL OTHER SERVICE AREAS, PLEASE PREPARE A CHART THAT AGGREGATES THIS INFORMATION

SERVICE AREA NAME:__________5 County Broadband Project________

	Census Community	Year 1		Year 2		Year 3		Year 4		Year 5	
		Res	Bus	Res	Bus	Res	Bus	Res	Bus	Res	Bus
1	No planned voice services										
2											
3											
4											
5											
6											
7											
8											
9											
10											
TOTAL											

Rates:
Residential Service:
Business Service:
Other (Specify):

Note: Complete a separate table for each service area.

Certification Regarding Lobbying for Contracts, Grants, Loans, and Cooperative Agreements

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U.S. Department of Agriculture
Broadband Initiatives Program

We, _First Step Internet, LLC___________________ (the Applicant) the undersigned certify, to the best of our knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on our behalf, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant or loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, we shall complete and submit Standard Form-LLL, Disclosure Form to Report Lobbying, in accordance with its instructions. See http://www.whitehouse.gov/omb/grants/sflllin.pdf for Disclosure Instructions.

(3) We shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. § 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

08/13/2009____
(Date)

(Authorized Representative's Signature)

___Kevin W. Owen________________
Name:

___President___________________
Title:

Approved by OMB
0348-0046

Disclosure of Lobbying Activities

Complete this form to disclose lobbying activities pursuant to 31 U.S.C. 1352
(See reverse for public burden disclosure)

1. Type of Federal Action: a. contract _b__ b. grant c. cooperative agreement d. loan e. loan guarantee f. loan insurance	**2. Status of Federal Action:** a. bid/offer/application _a___ b. initial award c. post-award	**3. Report Type:** a. initial filing __a__ b. material change **For material change only:** Year ______ quarter ______ Date of last report__________

4. Name and Address of Reporting Entity: _x__ Prime _____ Subawardee Tier_____, if Known: **First Step Internet, LLC** **1420 S. Blaine St** **Moscow, Idaho 83843** **Congressional District,** ***if known*****:**	**5. If Reporting Entity in No. 4 is Subawardee.** Enter Name and Address of Prime: **Congressional District,** ***if known*****:**
6. Federal Department/Agency: NTIA	**7. Federal Program Name/Description:** **BTOP / Broadband Deployment** CFDA Number, *if applicable*: 11.557
8. Federal Action Number, ***if known:*** 0660-ZA28	**9. Award Amount,** ***if known:*** **$ 2,990,208**
10. a. Name and Address of Lobbying Registrant *(if individual, last name, first name, MI):* none	**b. Individuals Performing Services** *(including address if different from No. 10a)* *(last name, first name, MI):*
11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when this transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.	**Signature:** **Print Name: Kevin W. Owen** **Title: President** **Telephone No.: 208-882-8869 Date: 08/13/2009**
Federal Use Only	**Authorized for Local Reproduction** **Standard Form - LLL (Rev. 7-97)**

FORM CD-511
(REV 1-05)

U.S. DEPARTMENT OF COMMERCE

CERTIFICATION REGARDING LOBBYING

Applicants should also review the instructions for certification included in the regulations before completing this form. Signature on this form provides for compliance with certification requirements under 15 CFR Part 28, "New Restrictions on Lobbying." The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of Commerce determines to award the covered transaction, grant, or cooperative agreement.

LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 15 CFR Part 28, for persons entering into a grant, cooperative agreement or contract over $100,000 or a loan or loan guarantee over $150,000 as defined at 15 CFR Part 28, Sections 28.105 and 28.110, the applicant certifies that to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in conncection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying." in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into.

Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

If any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the above applicable certification.

NAME OF APPLICANT	AWARD NUMBER AND/OR PROJECT NAME
First Step Internet, LLC	NTIA/BTOP 5 county broadband project
PRINTED NAME AND TITLE OF AUTHORIZED REPRESENTATIVE	
Kevin W. Owen - President	
SIGNATURE	DATE
	08/13/2009

Equal Opportunity and Nondiscrimination Certification

U.S. Department of Agriculture
Broadband Initiatives Program

All loans and grants made under the Broadband Initiatives Program are subject to the nondiscrimination provisions of Title VI of the Civil Rights Act of 1964, as amended, (7 C.F.R. Part 15): Section 504 of the Rehabilitation Act of 1973, as amended, (29 U.S.C. 901 *et seq*; 7 C.F.R. Part 15b): and the Age Discrimination Act of 1975, as amended (42 U.S.C. 6101 *et seq.*; 45 C.F.R. Part 90), and Executive Order 11375, Amending Executive Order 11246, Relating to Equal Employment Opportunity (3 C.F.R. 1966, 1970).

All recipients of financial assistance from Rural Development, the prospective primary participant commits to carry out Rural Development's established policy to comply with the requirements of the above laws and executive orders to the effect that no person in the United States shall, "on the basis of race, color, national origin, handicap, or age, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under the Broadband Initiatives Program.

We ___First Step Internet, LLC______________________ (the Applicant) hereby certify that, as a prospective recipient under the said Broadband Initiatives Program, we will comply with the above referenced laws and executive orders.

____08/13/2009____________
(Date)

____
(Authorized Representative's Signature)

_________*Kevin W. Owen*____________________
Name:

____*President* ____________________
Title:

Certification Regarding Debarment, Suspension, and Other Responsibility Matters – Primary Covered Transactions

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U.S. Department of Agriculture
Broadband Initiatives Program

This certification is required by the regulations implementing Executive Order 12549, *Debarment and Suspension*, 7 C.F.R. § 3017.510, *Participants' Responsibilities*.

(1) We, ___First Step Internet, LLC______________ (the Applicant) (hereinafter the "Company") hereby certify to the best of our knowledge and belief that neither the Company, nor any of its principals:

(a) are presently debarred, suspended, proposed for Debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) have within a 3-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) are presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and

(d) have within a 3-year period preceding this Application had one or more public transactions (Federal, State, or local) terminated for cause or default.

(2) If we are unable to certify to any of the statements in this certification, we shall attach an explanation hereto.

__08/13/2009_______________
(Date)

____
(Authorized Representative's Signature)

___*Kevin W. Owen*_____________________________
Name:

________*President* ______________________________

6 Pages

Withheld in their entirety

pursuant to FOIA Exemption 4

(5 U.S.C. § 552 (b)(4))

U.S. Department of Commerce
Broadband Technology Opportunities Program

(i) I certify that I am authorized to submit this grant application on behalf of the eligible entity(ies) listed on this application, that I have examined this application, that all of the information and responses in this application, including certifications, and forms submitted, all of which are part of this grant application, are material representations of fact and true and correct to the best of my knowledge, that the entity(ies) that is requesting grant funding pursuant to this application and any subgrantees and subcontractors will comply with the terms, conditions, purposes, and federal requirements of the grant program; that no kickbacks were paid to anyone; and that a false, fictitious, or fraudulent statements or claims on this application are grounds for denial or termination of a grant award, and/or possible punishment by a fine or imprisonment as provided in 18 U.S.C. §1001 and civil violations of the False Claims Act.

(ii) I certify that the entity(ies) I represent have and will comply with all applicable federal, state, and local laws, rules, regulations, ordinances, codes, orders and programmatic rules and requirements relating to the project. I acknowledge that failure to do so may result in rejection or deobligation of the grant or loan award. I acknowledge that failure to comply with all federal and program rules could result in civil or criminal prosecution by the appropriate law enforcement authorities.

(iii) I certify that the entity(ies) I represent has and will comply with all applicable administrative and federal statutory, regulatory, and policy requirements set forth in the DOC Pre-Award Notification, published in the Federal Register on February 11, 2008 (73 FR 7696), as amended; DOC Financial Assistance Standard Terms and Conditions (Mar. 8, 2009); DOC American Recovery and Reinvestment Act Award Terms (April 9, 2009); and any Special Award Terms and Conditions that are included by the Grants Officer in the award."

8/12/2009
(Date)

(Authorized Representative's Signature)

Kevin W. Owen
Name:

President
Title:

Question 50.
Financial Assumptions - BIP

Please provide a table(s) that lists all assumptions used to produce the financials and a brief explanation of why each assumption is reasonable for your

Except for Grant Income, new income derived as a result of the grant, depreciation and interest expense, all income and expense items are left at a constant from the 2008 income statement.
Undepreciated assets are depreciated on the straight line method using an average of 10% depreciation rate
Amortization is the real amortization of goodwill at the amount of $4,335 per year
Principal Payments are being made by an estimated amount of $75,000 per year on current debt.
Project Costs are added as a separate line item in expenses on the income statement
The payment of "dividends" under the historical column in the cash flow statement shows the income received by the principal owners of this LLC. There is an amount of $500,000 added to "other operating expense" on the income statement in the forecast period to show this expense for this proposal
Interest expense shown on the Income Statement is calculated at a rate of 7.5% on Notes Payable
There are no income taxes paid by this entity. All income is passed through to the principles for income tax purposes.
The matching "loan" is calculated to be paid over a 60 month period with an interest rate of 4%
The "Grant Income" and "Loan Amount" are both calculated in this report as being received in year one of this project.

business case.

Question 50.
Financial Assumptions - BTOP

Please provide a table(s) that lists all assumptions used to produce the financials and a brief explanation of why each assumption is reasonable for your

Except for Grant Income, new income derived as a result of the grant, depreciation and interest expense, all income and expense items are left at a constant from the 2008 income statement.

Undepreciated assets are depreciated on the straight line method using an average of 10% depreciation rate

Amortization is the real amortization of goodwill at the amount of $4,335 per year

Principal Payments are being made by an estimated amount of $75,000 per year on current debt.

No new borrowing is in the proposal. Any negative cash flow will be made up by "matching funds" required by this proposal

The payment of "dividends" under the historical column in the cash flow statement shows the income received by the principal owners of this LLC. There is an amount of $500,000 added to "other operating expense" on the income statement in the forecast period to show this expense for this proposal

Interest expense shown on the Income Statement is calculated at a rate of 7.5% on Notes Payable

No "matching fund" amounts are used in these reports.

There are no income taxes paid by this entity. All income is passed through to the principles for income tax purposes.

business case.

DETAIL OF PROJECT COSTS

PLEASE COMPLETE THE TABLE BELOW FOR THE DIFFERENT CATEGORIES OF EQUIPMENT THAT WILL BE REQUIRED FOR COMPLETING THE PROJECT. EACH CATEGORY SHOULD BE BROKENDOWN TO THE APPROPRIATE LEVEL FOR IDENTIFYING UNIT COST

SERVICE AREA or COMMON NETWORK FACILITIES:		Eligibility (Yes/No)	Unit Cost	No. of Units	Total Cost	Support of Reasonableness
NETWORK & ACCESS EQUIPMENT						
Switching	Dell 5424	Yes	$600	45	$27,000	Interconnection points & network
Routing	Juniper Router w/Card	Yes	$80,000	1	$80,000	Primary POP connection to fiber
	Mikrotik RB1000	Yes	$700	28	$19,600	Network routing
	Mikrotik 450g	Yes	$150	71	$10,650	Network routing and handoff
Transport	Dragon Wave Horizon Compact	Yes	$21,500	22	$473,000	Core network backhaul
Access						
Other	DLI reboot switch	Yes	$120	31	$3,720	Remote power control
OUTSIDE PLANT						
Cables	CAT 5e	Yes	$140	10	$1,400	Network cable
Conduits						
Ducts						
Poles						
Towers	Rohn 100’	Yes	$40,600	6	$243,600	Core tower locations
	Rohn 50’	Yes	$14,908	4	$59,630	Secondary network locations
Repeaters						

DETAIL OF PROJECT COSTS

Other	Power Systems	Yes	$2,400	14	$33,600	Power for core locaction
SERVICE AREA or COMMON NETWORK FACILITIES:		Eligibility (Yes/No)	Unit Cost	No. of Units	Total Cost	Support of Reasonableness
BUILDINGS						
New Construction						
Pre-Fab Huts	Shipping containers	Yes	$9,000	6	$54,000	Equipment housing
	Exterior cabinets	Yes	$4,000	4	$16,000	Equipment housing
Improvements & Renovation						
Other						
CUSTOMER PREMISE EQUIPMENT						
Modems	Redline An-80	Yes	$8,000	47	$376,000	Anchor tenant connections
Set Top Boxes						
Inside Wiring						
Other						
BILLING SUPPORT AND OPERATIONS SUPPORT SYSTEMS						
Billing Support Systems	Platypus Billing package	Yes	$80,000	1	$80,000	Network enhanced billing/support
Customer Care Systems						
Other Support						

DETAIL OF PROJECT COSTS

SERVICE AREA or COMMON NETWORK FACILITIES:		Eligibility (Yes/No)	Unit Cost	No. of Units	Total Cost	Support of Reasonableness
OPERATING EQUIPMENT						
Vehicles	Toyota Tundra	Yes	$40,000	1	$40,000	Construction vehicle
	Yamaha Rhino	Yes	$20,000	1	$20,000	Remote tower access vehicle
Office Equipment/ Furniture						
Other						
PROFESSIONAL SERVICES						
Engineering Design	Access Consulting	Yes	$1,700	1	$1,700	Professional engineer
	Wireless Mapping	Yes	$20,000	1	$20,000	Census data mapping
	Hayden / Ross	Yes	$10,000	3	$30,000	Annual audit
Project Management	Project Manager	Yes	$70,000	1	$70,000	Responsible for project
	Palouse Hills	Yes	$49,200	1	$49,200	Project compliance
Consulting						
Other						
TESTING						
Network Elements						
IT System Elements						
User Devices						
Test Generators	FieldFox Cable Sweep test/gen	Yes	$7,500	2	$15,000	In field cable, RF and antenna testing
Lab Furnishings						
Servers/ Computers						
OTHER UPFRONT COSTS						
Site	Rathbun Communications	Yes	$2,000	10	$20,000	Tower site prep.

Detail of Project Costs

Preparation						
Other	Indirect cost	Yes	$360,000	1	$360,000	
	Labor	Yes	$789,336	1	$798,336	
	Other	Yes	$89,592	1	$89,592	

DETAIL OF PROJECT COSTS

PLEASE COMPLETE THE TABLE BELOW FOR THE DIFFERENT CATEGORIES OF EQUIPMENT THAT WILL BE REQUIRED FOR COMPLETING THE PROJECT. EACH CATEGORY SHOULD BE BROKENDOWN TO THE APPROPRIATE LEVEL FOR IDENTIFYING UNIT COST

SERVICE AREA or COMMON NETWORK FACILITIES:		Eligibility (Yes/No)	Unit Cost	No. of Units	Total Cost	Support of Reasonableness
NETWORK & ACCESS EQUIPMENT						
Switching	Dell 5424	Yes	$600	45	$27,000	Interconnection points & network
Routing	Juniper Router w/Card	Yes	$80,000	1	$80,000	Primary POP connection to fiber
	Mikrotik RB1000	Yes	$700	28	$19,600	Network routing
	Mikrotik 450g	Yes	$150	71	$10,650	Network routing and handoff
Transport	Dragon Wave Horizon Compact	Yes	$21,500	22	$473,000	Core network backhaul
Access						
Other	DLI reboot switch	Yes	$120	31	$3,720	Remote power control
OUTSIDE PLANT						
Cables	CAT 5e	Yes	$140	10	$1,400	Network cable
Conduits						
Ducts						
Poles						
Towers	Rohn 100’	Yes	$40,600	6	$243,600	Core tower locations
	Rohn 50’	Yes	$14,908	4	$59,630	Secondary network locations
Repeaters						

DETAIL OF PROJECT COSTS

Other	Power Systems	Yes	$2,400	14	$33,600	Power for core locaction
SERVICE AREA or COMMON NETWORK FACILITIES:		Eligibility (Yes/No)	Unit Cost	No. of Units	Total Cost	Support of Reasonableness
BUILDINGS						
New Construction						
Pre-Fab Huts	Shipping containers	Yes	$9,000	6	$54,000	Equipment housing
	Exterior cabinets	Yes	$4,000	4	$16,000	Equipment housing
Improvements & Renovation						
Other						
CUSTOMER PREMISE EQUIPMENT						
Modems	Redline An-80	Yes	$8,000	47	$376,000	Anchor tenant connections
Set Top Boxes						
Inside Wiring						
Other						
BILLING SUPPORT AND OPERATIONS SUPPORT SYSTEMS						
Billing Support Systems	Platypus Billing package	Yes	$80,000	1	$80,000	Network enhanced billing/support
Customer Care Systems						
Other Support						

Detail of Project Costs

SERVICE AREA or COMMON NETWORK FACILITIES:		Eligibility (Yes/No)	Unit Cost	No. of Units	Total Cost	Support of Reasonableness
OPERATING EQUIPMENT						
Vehicles	Toyota Tundra	Yes	$40,000	1	$40,000	Construction vehicle
	Yamaha Rhino	Yes	$20,000	1	$20,000	Remote tower access vehicle
Office Equipment/ Furniture						
Other						
PROFESSIONAL SERVICES						
Engineering Design	Access Consulting	Yes	$1,700	1	$1,700	Professional engineer
	Wireless Mapping	Yes	$20,000	1	$20,000	Census data mapping
	Hayden / Ross	Yes	$10,000	3	$30,000	Annual audit
Project Management	Project Manager	Yes	$70,000	1	$70,000	Responsible for project
	Palouse Hills	Yes	$49,200	1	$49,200	Project compliance
Consulting						
Other						
TESTING						
Network Elements						
IT System Elements						
User Devices						
Test Generators	FieldFox Cable Sweep test/gen	Yes	$7,500	2	$15,000	In field cable, RF and antenna testing
Lab Furnishings						
Servers/ Computers						
OTHER UPFRONT COSTS						
Site	Rathbun Communications	Yes	$2,000	10	$20,000	Tower site prep.

DETAIL OF PROJECT COSTS

Preparation						
Other	Indirect cost	Yes	$360,000	1	$360,000	
	Labor	Yes	$789,336	1	$798,336	
	Other	Yes	$89,592	1	$89,592	

General Overall Budget For Joint Applications Only: Please complete the following table only if you are submitting a joint BIP/BTOP Application. Please use the grid on Project Budget Tab in the online system for the BIP budget and then complete the table below for BTOP.

Equipment Category	Grant Request	Equity	Debt	Bonds	Other Funding	Total
Network & Access Equipment (switching, routing, transport, access)	$553,970	$60,000				$613,970
Outside Plant (cables, conduits, ducts, poles, towers, repeaters, etc.)	$338,230					$338,230
Buildings and Land – (new construction, improvements, renovations, lease)	$70,000					$70,000
Customer Premise Equipment (modems, set-top boxes, inside wiring, etc.)	$376,000					$376,000
Billing and Operational Support Systems (IT systems, software, etc.)	$80,000					$80,000
Operating Equipment (vehicles, office equipment, other)	$60,000					$60,000
Engineering/ Professional Services (engineering design, project management, consulting, etc.)	$150,900	$20,000				$170,900
Testing (network elements, IT system elements, user devices, test generators, lab furnishings, servers/computers, etc.)	$15,000					$15,000
Site Preparation	$20,000					$20,000
Other	$729,523	$518,405				$1,247928
Total Broadband System	$2,393,623	$598,405				$2,992,028