Community Broadband Planning Study

For

Accomack County
and the Towns of Chincoteague
and Exmore/Nassawadox, Virginia

Transmittal Letter

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Transmittal Letter

July 31, 2007

Ms. Barbara Schwenk
Economic Development Coordinator
Accomack – Northampton Planning District Commission
P.O. Box 417
Accomack, VA 23301

Re: Community Broadband Planning Study for:
Accomack County and the Towns of Chincoteague and Exmore, Nassawadox, Virginia
SSM Project #109263

Dear Ms Schwenk:

Spotts, Stevens and McCoy, Inc. (SSM) and Icon Broadband Technologies (IBT) are pleased to submit the final report of the Community Broadband Plans for Accomack County and the Towns of Chincoteague and Exmore/Nassawadox.

The plan provides all the essential data for consideration of whether the communities want to fund next phase implementation steps. It was advantageous in the analysis that the three (3) projects were looked at collectively, as well as independently, to assess the effect of approaching implementation as one large project or three (3) separate projects. The result of the analysis which leads to the recommendations in the Community Broadband Plans is that a phased approach is warranted.

Demographics such as population and housing density, combined with existing businesses and economic development initiatives like the Wallops Research Park in the northern area of Accomack County and in the Town of Chincoteague, highlight the northern fiber ring and Chincoteague fiber spur as the first priority. This region will be the most attractive to service providers willing to use the distribution network to expand their customer base. The Central and Southern Accomack County areas, as well as the Towns of Exmore and Nassawadox present a much more difficult business case to overcome before these phases become more attractive to potential service providers. Regardless, with the anticipated Mid-Atlantic Broadband Cooperative fiber network extension up the Eastern Shore, it may be only a matter of time before the Central and Southern Accomack areas and the Towns of Exmore and Nassawadox, change in the viability of a fiber solution.

The immediate concern in pursuing building an open access fiber distribution network is the apparent lack of interest, and willing investment, by service providers that would be needed to offer services to customers through an access network. The communities must first make a commitment to such an initiative, and the communities will then have to work at soliciting commitments from service providers.

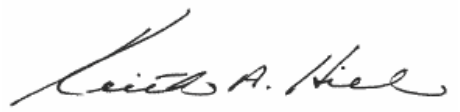
With the flat terrain of the Eastern Shore peninsula, combined with the ever increasing distance and speed capabilities of wireless technologies, a wireless solution warrants consideration for meeting bandwidth needs today while continuing to plan for a wireline solution in the future. Whatever the communities decide, the Community Broadband Plan will be a tool to assist with future broadband implementation projects, and the GIS data utilized for continued tracking of progress and changes.

The County of Accomack, town representatives and the Accomack-Northampton County Planning District Commission are to be commended in pursuing this regional initiative to research and analyze business, education, health care and residential demand for broadband communications services. Creating a comprehensive telecommunications plan to enhance usage and encourage broadband service expansion is a critical first step to achieving a state-of-the-art communication asset for economic development growth.

SSM and IBT appreciate the opportunity to assist in the community broadband planning. If you should have any questions or concerns, please do not hesitate to contact us.

Sincerely,

SPOTTS | STEVENS | McCOY



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Executive Summary

Synopsis

A telecommunications planning study has been completed for Central Accomack County, the Towns of Chincoteague and Exmore/Nassawadox that is designed to answer questions relating to the need for broadband infrastructure, options for providing connectivity and ways to organize potential networks. Detailed results of tasks required by the original grant requirements are provided in later sections.

Broadly speaking, the findings from this study are as follows:

- While DSL service is available in many areas, the quality of service is reported generally poor. Cable modem services are available to only a limited number in the Chincoteague area. The majority of users still utilize dial-up to access the Internet.
- Many businesses are unhappy with Internet access with slow speed the number one complaint. Schools, libraries and other governmental users are often limited to T-1 access at considerable cost and insufficient bandwidth.
- While many residents use the Internet, overall usage is curtailed by a lack of training, help and computers.
- Costs to build a fiber optic distribution network(s) are presented in Table ES-A (see Figure ES-E for a map of selected areas). These costs are for dark fiber only and could range from approximately $32,600 to $48,900 per mile or an average of $40,750, primarily aerial (mounted on power poles). The cost to build even this limited network to serve the majority of health care facilities, schools, major employers, and emergency agencies will stretch the ability of the local communities to fund this project directly. In addition, access networks would have to be built by the service providers.

Table ES-A: Dark Fiber Costs for Fiber Optic Distribution Networks

Project Component	Chincoteague and Northern Accomack County Area	Central Accomack Area	Exmore-Nassawadox and Southern Accomack County Area	All Three Areas		Chincoteague and Northern Accomack County Area without the Greenback and Saxis Spurs
Approx. Fiber Length	54 Miles	65 Miles	20 Miles	139 Miles		38 Miles
Fiber Design and Construction Costs (Millions)	$1.67 - $2.5	$2.1 - $3.2	$0.73 - $1.1	$4.5 - $6.8		$1.2 - $1.8
Per Subscriber Costs	$1,278 for 1,635 Subscribers	$1,647 for 1,617 Subscribers	$1,886 for 484 Subscribers	$1,517 for 3,736 Subscribers		$1,030 for 1,472 Subscribers

- The number of customers which could be served by a limited network is insufficient to economically support a private provider totally funding construction.
- Wholesale providers of Internet transport such as Mid-Atlantic Broadband Cooperative will soon be providing service to the area. This will benefit any future deployment by providing greatly reduced wholesale Internet costs to the Eastern Shore Area.
- The Chincoteague and Northern Accomack County Area without the Greenback and Saxis Spurs warrant the greatest near-term consideration. When adding in service provisioning and operating costs, the overall cost is still high for one entity to take on themselves, but if the cost was shared between two or more entities, the communities and service providers, the cost may be considered worth the investment to get a reasonable monetary return for the service provider, and an improved quality of life return, as well as a catalyst to retain and attract businesses to the area for the communities.

The findings of the study give guidance to Eastern Shore communities for future actions. Research performed in this study highlighted the lack of understanding of computer benefits and the lack of know-how among many residents. To address these problems, we would recommend the following actions:

- Promote to employers the benefits in productivity of computer literate employees.
- Provide information to citizens about low cost computer literacy training options available at ESCC and how they can translate to better jobs and pay.
- Promote training at local libraries by soliciting volunteers who can provide basic computer "how to" information to citizens.
- Develop a program to recycle or obtain recycled computers to assist low income individuals in the most basic computer learning skills.
- Consider other programs wherein computers are sold or provided to students in conjunction with school efforts. Consider the creation of "homework helpline" and other projects which will utilize technology to assist in student education

A powerful driver for broadband and economic development is web sites which allow citizens to interact with government or which promote local businesses outside of the area. Currently such sites in the Eastern Shore are limited in number and scope. To address this gap we recommend the following actions:

- Develop the Eastern Shore Portal into a powerful community intranet to disseminate news, promote businesses and highlight current events and training options.

- Develop and link these to local community web sites which provide more information about local school and municipal events.
- Utilize the Eastern Shore Portal to promote economic development initiatives, available sites and buildings, and highlight the communications infrastructure available.

Additional demand for Internet services will help support broadband networks, but ultimately the cost of providing the infrastructure must be borne by private or public providers. This research has shown hopeful signs of new providers, but also the high cost of building infrastructure. While this study has identified basic costs and potential numbers of customers, it was never intended to provide a detailed analysis and comprehensive business plan to provide broadband services. Based on this study's work, the following steps for providing broadband infrastructure are recommended.

- Acknowledge that at a minimum the infrastructure costs in Table ES-A will likely be borne by local communities in order to encourage a private provider(s) to offer services to each community.
- As a primary goal, look for partners who would deliver Internet and other services over a community owned dark fiber network likely utilizing Mid-Atlantic Broadband Cooperative (or Maryland Broadband Cooperative) for data transport. A Request for Interest (RFI) can be developed to accomplish this exploration. Ideally this network will provide direct connectivity to many schools, health care facilities, major business employers, emergency and municipal locations (Figure ES-E) with wireless connectivity outside of the immediate area.
- That primary goal should be incorporated into a master plan which would identify partners, solidify costs, examine available grant monies, and address the organization and governance of the network(s). It will likely include a wireless component in addition to a fiber optic network.
- Build the network only when private partner(s) have been identified and committed to the project to ensure that the dark fiber network will provide the desired services.
- Create a funding strategy that will not place the communities in a severe financial burden in the event of shortcomings, such as slower growth utilization of the network than expected. Examples include funding only the long-term service life components, i.e. fiber, that will be underwritten for longer term amortization and maintain a greater asset value so that in the communities have the option to sell the network if need be.

Background

Virginia Rural Broadband Planning Initiative[1]

Through the 2007 Appropriations Act, the Virginia General Assembly has committed to expanding rural access to broadband technology. Part of this commitment involves funding feasibility studies of solutions for rural areas of Virginia communities. The Virginia Department of Housing and Community Development has created the Virginia Rural Broadband Planning Initiative (VRBPI), a comprehensive telecommunications planning effort that allows communities to identify and develop all elements necessary to create a successful community broadband network.

- **VRBPI Goal:** To create strong, competitive communities throughout the Commonwealth of Virginia by preparing those communities to build, utilize, and capitalize on telecommunications infrastructure.
- **VRBPI Objective:** To ensure community sustainability and competitiveness in the global marketplace via comprehensive planning for broadband deployment.

Central Accomack County, and the Towns of Chincoteague and Exmore/Nassawadox were successful in obtaining funding through the Virginia Department of Housing and Community Development (VDHCD) to develop a Community Telecommunications Plan that includes:

1. *Needs Assessment and Asset Inventory* – To determine the need for, and nature of broadband infrastructure; the level of satisfaction or dissatisfaction with Internet connectivity options and services by both residential and business/institutional and other end-user entities; as well as to inventory what and where telecommunications' infrastructure exist and are needed.
2. *Broadband Education Development Strategies and End User Application Identification* - An analysis of current and future business and professional uses and applications. Also an assessment of community computer literacy and identification of technology education needs.
3. *Last Mile Connectivity Options* – To investigate options for achieving connectivity between the end-user and the Internet based on community needs and to tie-in the areas of economic development potential, education needs, and health care facilities that improve the overall quality of life when living and working in the communities.

[1] From a document of the Project Management Office of the Virginia Department of Housing and Community Development, 501 North Second Street, Richmond, Virginia 23219

4. *Preliminary Design and Cost Estimates* – To outline proposed routes or locations of a broadband telecommunications network, type technology (wireline or wireless), type architecture, type installation, ancillary issues such as right-of-way and design and specification considerations , and preliminary cost estimates for construction of proposed solutions.
5. *Organization and Network Operation Options* - The presentation of possible organizational/ownership models for the proposed networks including public-private partnerships and the willingness for such an arrangement by the private sector, lease-hold agreements, wholesale service networks, retail service networks, dark fiber or other wireline networks, and wireless networks. In addition operational issues are to be addressed including potential staffing needs, legal requirements and constraints, maintenance and repair, disaster recovery, capital and operational budget issues, business planning and marketing.
6. *Funding Strategies for Future Implementation Projects* – To provide information on the availability and relevance of potential funding sources for future implementation projects that may arise from the recommendations in the Plan.

The focus of the VDHCD grant program is to initially ensure high speed connectivity to businesses, education institutions, and health care facilities. In addition, the plan was to address from a strategic planning perspective recommendations for future implementation efforts to address the needs and provide opportunities for residential users to have access and choice for high speed broadband at competitive prices. Universal access was not to be the primary focus of the planning.

Arguments by for-profit companies against municipal involvement include:

1. Government competing against private sector
2. Subsidized competition and unfair and non-level playing field
3. Unequaled regulation compliance requirements
4. Inexperience and lacking technical know-how to operate a communications network
5. DSL and cable modem already exist to some degree in many rural areas

In order to mitigate such arguments, many communities (and some state legislation) address expansion of infrastructure and services with the following approach:

1. Have local government work in a public-private partnership with the private sector to build **open access networks** that remove the capital cost deterrent from expanding infrastructure;

2. Focus investment in next generation networks capable of providing 10-100 Mbps bandwidth for larger demand applications and the ability for adequate competition in all three areas of voice, video and data services;
3. Provide a "level playing field" by creating an open access network available to all service providers;
4. Implement a network governance plan that ensures non-discriminatory practices and fees; and
5. Outsource the operation of the network to a neutral third party with the technical know-how to manage the open access network.

Summary of Study Findings

Community Needs Assessment and Asset Inventory:

One objective of the Community Broadband Planning Study is to document the availability of communication technologies throughout the study area and to assess the amount of demand by residential and business end-users. Communication technologies include any form of Internet access, pay TV, and telephone delivered by any medium. Residential and business surveys were distributed randomly throughout the study areas and to all government offices; public school and higher education personnel were interviewed for more in-depth responses.

DSL service is currently available to a wide range of both residential and business consumers. Many of those located beyond DSL service areas indicate a desire to subscribe to service if it were available. Current DSL customers express frustration with unreliable service, citing network outages that last for days instead of hours. Although cable TV service is available to a large percentage of Eastern Shore citizens, cable modem Internet service is currently available only in the Chincoteague area and used by a small percentage of subscribers. Dial-up Internet access is in use by 32% of residents and 13% of businesses; the majorities indicate a desire to subscribe to higher speed service if it were available and affordable.

Figure ES-A: "Service Provider Facilities" which follows, highlights the wide availability of DSL on the Eastern Shore.

Figure ES-A: "Service Provider Facilities"

Businesses requiring higher speed access than is currently available account for 26% of respondents and nearly 62% of all businesses express some level of dissatisfaction with current providers. Although the majority of business users were unsure as to how much bandwidth they are currently receiving, the greatest amount of frustration (61%) is attributed to slow speed and a lack of bandwidth.

Price will be a limiting factor in decisions to purchase higher bandwidth. Of those businesses that are currently dissatisfied, 33% cite price as a reason. Of those businesses citing price dissatisfaction, 44% are currently paying between $30 and $50 per month for DSL service. This indicates significant pressure for new broadband access methods at pricing below current DSL service pricing.

Educational institutions exhibit the greatest bandwidth need, primarily to distribute distance learning resources among individual schools and to future planned learning sites such as the proposed Research Park. Current Internet connections (DS3, full and partial – 10-45 Mbps) are sufficient at this time for Internet access. Current T1 (1.5 Mbps) connections between each public school and the school district office are insufficient to utilize video conferencing and streaming video distance learning resources available to them. Future planned distance learning curriculum proposed for the Eastern Shore Community College (ESCC) site in the Research Park will require a high-bandwidth connection, beyond the capabilities currently available on the Shore.

The public libraries located in Chincoteague and Nassawadox are in need of Internet access in excess of current, affordable DSL services (maximum 3 Mbps) purchased by two of the libraries. The main library branch in the town of Accomac currently utilizes 1.5 Mbps over frame relay, and the bandwidth is strained. Beyond bandwidth for Internet access, the libraries are in need of updated, faster computers. The Chincoteague library is open during limited hours, and not year-round. This limits access by patrons who cannot afford a computer or Internet service at home, particularly job seekers and students who need the access to complete school assignments.

Municipal facilities currently need dedicated bandwidth between sites and including public safety, to enable a secure, cohesive network and Internet access for all locations. While Internet access is not currently an issue, connectivity between sites using current available technologies is slow and the bandwidth inadequate. Additionally, municipalities are currently unable to offer a number of e-government services that would improve service to the communities.

Nearly all healthcare providers subscribe to DSL or T1 Internet access. The majority state current access methods are adequate and most are satisfied with their current provider. A gap exists however, in that doctors do not have universal access from their homes as high-speed service is not available in all areas of the Shore. Without high speed service, a doctor that is roused at night to read an emergency scan must drive to the office where the service is available.

All survey participants were questioned as to their interest in wireless as an Internet access option; 82% of residents and 76% of businesses indicate they are very to somewhat likely to use wireless service if it was available and affordable.

Survey Response Mapping

Responses to the end-user surveys were geocoded based on address of respondent and mapped to analyze current computer and Internet use, methods of Internet access, voice and video service methods and expense, and satisfaction with current services. Spatially displaying responses to survey questions and overlaying with various demographic and economic mapping features resulted in identification of specific locations of need and consumer interest in acquiring higher speed access.

Figure ES-B: "Internet Connections, Survey Responses and Proposed Fiber Routes" which follows highlights the predominate use of DSL Internet connection. The large extent of dial-up use on the Eastern Shore is also noticeable.

Figure ES-C: "Internet Use, Satisfaction and Proposed Fiber Routes" identifies the extent of survey respondents that reported Internet use from home for work, and Internet use from home for school and/or job training. The number of dissatisfied residential and business Internet user, as well as somewhat dissatisfied businesses, highlights that end-users expect better service.

Figure ES-D: "Inadequate Speed, Wireless Interest, Survey Responses and Proposed Fiber Routes" overwhelmingly indicates the interest in wireless technology if available. All industrial parks, major employers, education and health facilities, Wallops Island Research Park, commercial/industrial zoning, and future commercial/Enterprise zones are shown as a solid blue color so as to easily identify the geographical location to the selected proposed fiber routes.

Figure ES-B.: Internet Connections, Survey Responses and Proposed Fiber Routes

Figure ES-C: Internet Use, Satisfaction and Proposed Fiber Routes

Figure ES-D: Inadequate Speed, Wireless Interest, Survey Responses and Proposed Fiber Routes

Broadband Education and End-User Applications

Numerous resources for training on technology and applications that function optimally with broadband service are available on the Shore. The majority of training is delivered by the Eastern Shore Community College (ESCC) through classes offered to the public or contracted directly through employers. Citizen interest has historically focused on entry-level application classes. There appears to be a lack of understanding on the part of employees as to the value of using advanced technology skills, and employers are beginning to contract for employee training on many business productivity applications.

Eastern Shore employers must be shown the value of adopting new technologies and Internet applications such as Voice over Internet (VoIP), video conferencing and online business marketing. Classes are available for businesses in these subjects either locally or online through VECTEC. Only 36% of businesses are currently using the Internet for advertising their product or service and only 15% are conducting online sales. Nearly 67% of businesses are spending in excess of $100 per month on regular telephone service, yet only 21% of business Internet subscribers are utilizing Voice over Internet service. Education is needed to introduce businesses to the cost-saving applications broadband Internet access offers.

Eastern Shore residents are not taking full advantage of the many valuable tools the Internet offers. While 32% of residents have downloaded or watched video online, only 17% have taken an online course, and only 15% have used the Internet to search for a job. A mere 10% have sold products or services over the Internet, indicating an excellent opportunity to educate citizens on how to become *producers* of information and services rather than just consumers. The libraries have had requests from patrons for training on how to sell products on eBay, indicating the interest is there but resources for training are not widely available or advertised.

In addition to training, attention should be given to addressing the numbers of families without computers. Current computer donation programs focus on GED students, but the numbers of families with younger children that do not have computers is not clear. School district personnel are the best resource for surveying families to identify need. Schools and libraries report the need to replace aging computer equipment, but funding is limited. Programs to accept, refurbish and redistribute donated computers could fill this need if funding for new computers cannot be acquired.

Help desk support is needed to support basic computing and Internet access questions not addressed by service providers directly. This need could be addressed by a column or page on a Community Intranet or Portal that is marketed by the Shore's chamber of commerce and the local communities. In addition, opportunities for training, upcoming seminars and workshops should also be prominently featured along with upcoming community events. This community site should be maintained by one entity, eliminating the need for each contributing source to possess the required technical capabilities. All Eastern Shore businesses should be represented, with the site serving as the entrance to the Economic Development information vital to those considering the Shore for a new business location.

Typically, the greatest obstacle to local governments in offering additional services to citizens is funding; in the absence of funding, volunteers and fiscal partners are critical. Community partners such as the Chamber of Commerce and key employers are stakeholders in the Shore's future, and may have resources to aid in implementing solutions to address training and funding gaps. Local networking groups should be encouraged and supported by a Community Intranet or Portal, available to provide direction and support to existing businesses, entrepreneurs or citizens new to the area.

Network Design, Last Mile Connectivity Options and Cost Considerations

Network Design

The focus and priority of the Rural Broadband grant program is to initially ensure reliable, high speed connectivity to businesses, education institutions, and health care facilities. Although not a priority focus initially, broadband infrastructure to address the needs of residential end-users in the more rural extremities of the Eastern Shore is needed. A fiber optic distribution network was investigated for connectivity to the priority end-users, which can also be used to support a wireless solution to reach the more rural areas. Fiber optics is considered one of the most future-proof technologies available to-day.

Since the program encourages an emphasis on collaborations with private-sector providers and to maximize the provision and affordability of services to the communities at large, an open access fiber distribution network provides the optimal architecture to support a variety of services and delivery methods.

Network Architecture

Network architecture is equally important in the decision-making process as to what kind of open access network to consider. The choice of technology is heavily influenced by local conditions such as terrain, outside plant cost factors, condition of legacy infrastructure, type of services being sought, community demographics, business environment, and much more. Types of open access network architecture include:

- Active Star Design
- Passive Star Design
- Home Run Design
- Wave Division Multiplexing (WDM)
- Passive Optical Network (PON) Design

Factors such as budget, desired competition for services, distance of the network, and number of premises to be served need to be considered when deciding what design to pursue. These factors also drive the type of infrastructure platform (Layers of Open Access Architecture) and the role of the network owner. The most common models include:

1. Building dark fiber to lease or unbundling the optical layer where each service provider transmits on its own wave length using coarse wavelength division multiplexing or dense wavelength division multiplexing;
2. Build optical fiber network and supply the electronics on the front-end and back-end;
3. An Internet Protocol (IP) service layer is provided over a basic network, such as a Hybrid-Fiber-Coax (HFC) network.

Many communities opt to build dark fiber to lease without the investment of supplying the electronics because the fiber has the longest service life while the electronics have the shortest. The fiber expense can be amortized over many years, while the electronics depreciate more rapidly with some replacement necessary every few years. Supplying network operating center (NOC) equipment on the front end and Network Interface Devices (NID) on the back end, along with service provisioning equipment and facilities can double the capital investment by the community.

Table ES-B: “Fiber Distribution Network Construction Cost Estimate” that follows, addresses the capital investment in building a dark fiber network. A cost estimate as to what the electronics and service provisioning equipment, as well as capital costs of an access network and installation to the customer can be found in Table ES-D to analyze the feasibility and sustainability of building the distribution networks.

Table ES-B: Fiber Distribution Network Construction Cost Estimate

Area	Segment	Field Data Total Mileage	Total Mileage used for Planning	Field Data Make Ready Work Cost	Field Data Cable Construction Cost	Soft Costs (Eng., advertising, admin., proj. mgm't, post const. records, loan prep., etc.)	Field Data Make Ready and Cable Construction Cost	Planning Purposes Total w/20% Variance
Chincoteague and Northern Accomack County Area	Fiber Ring	25.6	26.5	$141,325	$769,090			
	Greenback Spur Total	4.2	4.5	$26,448	$101,374			
	Saxis Spur Total	11.3	11.5	$76,275	$274,206			
	Chincoteague Spur Total	11.1	11.5	$40,692	$311,926			
Chincoteague and Northern Accomack County Area Field Data Cost Summary		52.2		$284,740	$1,456,596	$348,267	$2,089,603	
Chincoteague and Northern Accomack County Area Planning Cost Summary			**54**	**$285,000**	**$1,457,000**	**$348,000**	**$2,090,000**	**$1,672,000 - $2,508,000**
Central Accomack Area	Fiber Ring	57.9	58.5	$301,189	$1,743,943			
	Onancock Spur Total	1.1	1.5	$7,425	$26,693			
	Wachapreague Rd Spur Total	5.0	5.8	$23,625	$117,258			
Central Accomack Area Field Data Cost Summary		64.0		$332,239	$1,887,894	$444,027	$2,664,160	
Central Accomack Area Planning Cost Summary			**65**	**$332,000**	**$1,888,000**	**$444,000**	**$2,664,000**	**$2,131,200 - $3,196,800**
Exmore/Nassawadox Area Field Data Cost Summary	Fiber Ring	20.8		$134,325	$626,393	$152,144	$912,862	
Exmore/Nassawadox Area Planning Cost Summary			**20.0**	**$134,000**	**$627,000***	**$152,000**	**$913,000**	**$730,400 - $1,095,600**
Total All Three (3) Areas		137.0	**139.0**	**$751,000**	**$3,972,000**	**$944,000**	**$5,667,000**	**$4,533,600 - $6,800,400**
	*** = Adjusted for Rounding**						**$40,770 per Mile**	**$32,616 - $48,924 / Mile**

The estimated cost of $40,770 per mile of fiber build for the approximate 139 miles of network, or $5,667,000 is within industry ranges for typical fiber builds. Since these are preliminary designs and estimates, for planning purposes a range of 20% more or less was allotted for analysis purposes. As a result, the estimated cost range is from $32,616 to $48, 924 per mile which equates to $4,533,600 to $6,800,400 for constructing all three (3) networks. It is suggested that the average cost of $5,667,000 ± $1 million dollars be referenced for discussion purposes. A million dollar allowance for over-run or savings is reasonable when so many factors can affect final design parameters, such as:

- Topology
- Geotechnical Conditions (Rock vs. Soil)
- Market fluctuation in material costs from time of consideration to actual design and construction
- Labor rate increases from time of consideration to actual design and construction (Prevailing Labor rates)
- Unknown actual right-of-way/easement costs
- Potential legal obstacles or opposition/challenge
- Decision of extent to build, length, location, number of premises passed, etc.

If Built, Would the Network Be Able to Sustain Itself?

If the fiber distribution network was built, would its presumed use generate enough revenue to sustain itself and who would use the network? In order to answer these questions, a brief analysis was performed analyzing how much investment in building and operating an access network by a service provider would be required and the potential subscriber revenue generated from that access network. The first step in this analysis approach was to determine service areas.

The configuration of the fiber rings and its spatial relationship to the features of the study area helped define priorities of service areas. Obviously, those premises closest to the fiber could be connected and served with a wireline solution easier than those of greater distance from the fiber. The further away from the fiber, the more likely a wireless solution would prove to be the feasible access solution. Services provided on the network over a wireline solution differ from services likely offered over a wireless solution.

Priority Areas

Figure ES-E "Priority Service Areas and Network in Relation to Economic Development Features, Education Institutions, and Health Care Facilities" that follows graphically identifies where, why and in what priority the particular wireline and wireless technology should be pursued. The proposed fiber distribution network itself and the premises located within 0.1 miles (528 feet) along the route are being considered the "Primary Service Area". A direct fiber optic build to the premise is proposed as the access network technology solution. While fiber optic technology is proposed as the relied upon network, undoubtedly some of the same end-users may also subscribe to a wireless solution as a convenience technology to augment the fiber access.

Existing fiber and other delivery systems were considered to view the proximity to the planned developments and communities. In addition to reported growth corridors and urbanized areas, the areas between the 0.1 mile and one and one-half (1-1/2) miles of the distribution network route were identified as the second priority areas ("Secondary Service Area" location). Either a direct fiber optic build to the premise or a wireless solution is proposed as the access technology. Not one technology or the other is expected to be used throughout the Secondary Service Area, but both. For some locations and customers, it may not be cost feasible to have a direct fiber connection as the reliable network solution. If a wireless solution is used, it will most likely be augmented with some other form of existing wireline technology such as standard twisted-pair telephone lines to ensure emergency and other communication reliability exists in the event the wireless network encounters interference or goes down completely.

The third priority area for focusing efforts to enhance broadband access would be the more rural areas located more than one and one-half (1-1/2) miles from the distribution network ("Tertiary Service Area" location). A wireless solution is expected to be the more practical access network technology used. Again, it will most likely be augmented with some other form of existing wireline technology such as standard twisted-pair telephone lines to ensure reliability.

Figure ES-E: "Priority Service Areas and Fiber Routes in Relation to Economic Development Features, Educational Institutions and Health Care Facilities" that follows indicates the extent of coverage area for the 1-1/2 mile buffer beyond the fiber route (Primary and Secondary Service Areas), as well as the remaining Tertiary Service Area of the Eastern Shore beyond the 1-1/2 mile buffer. It should be noted that all the educational institutions, health care facilities and major employers provided to the consultants by the communities are located within the Primary and Secondary Service Areas.

Figure ES-E: Priority Service Areas and Fiber Network in Relation to Economic Development Features, Educational Institutions and Health Care Facilities

Now that the service areas and priorities have been established, the number of premises passed and anticipated market penetration (percentage of subscribers taking services, or take rate) estimates are developed. While premise classifications can be labeled residential, multi-dwelling or multi-unit, business, institutional, educational, recreational, agencies, etc., for simplification in the analysis only residential and nonresidential premises labels are referenced, except those non-residential premises identified specifically by the communities.

Table ES-C: "Estimated Primary, Secondary and Tertiary Service Area Premises Penetration**"** that follows is a summary of much more detailed Table 3.2-A "Service Area Features" found later in the report and the methodology and assumptions in calculating penetration rates.

Table ES-C: "Estimated Primary, Secondary and Tertiary Service Area Premises Penetration"

Economic Development Feature	Total Premises Within 1-1/2 Miles of Fiber Solution	Estimated Subscriber Take Rate for Fiber Solution	Estimated Subscriber Take Rate for Wireless Solution	Comments		Total Premises Passed by Wireless Solution
College	6	100% = 6	0			6
School	18	100% = 18	0			18
Fire Station	16	100% = 16	0			16
Library	3	100% = 3	0			3
Health Facility	16	40% = 6	5	5 No Service or Other		16
Police Station	9	100% = 9	0			9
Industrial Park	4	40-50% = 2	1	1 No Service or Other		4
Major Employers	18	40% = 7	5	6 No Service or Other		18
Est. Non-Residential Not Accounted For (Small Employers, Doctor Offices, Malls, etc.); say twice as many as those accounted for	180	40%=72	54	54 No Service or Other (Some additional Non-Residential Premises exists outside 1-1/2 miles of fiber; negligible) ►		180
Est. Residential	17,984	20%=3,597	(20%=3,597) +(40%=1,530)	9,260 No Service or Other		17,984 + 3,824
Total Premises	**18,254**	**3,736 20.5% Overall Take Rate (Based on 18,254 Premises)**	**5,192 28.4% Overall Take Rate (Based on 18,254 Premises)**	**9,326 Premises No Service or Other Provider = 51.1% (Based on 18,254 Premises)**		**22,078**

In order to determine whether service providers, cooperatives or some other entity would consider "lighting" and "riding" the open access network to provide services to these premises, access network costs such as length of fiber, installation and equipment, service provisioning and operating costs were projected. Section 3.0 of the report provides the details of how the total costs were developed. Table ES-D: "Summary of Fiber Distribution Network and Access Network Conceptual Cost" identifies the resulting estimate of such costs.

Table ES-D: Summary of Fiber Distribution Network and Access Network Conceptual Cost

(With the Communities owning the dark fiber and service providers lighting the fiber to provide services) Conceptual cost estimate for designing, constructing, servicing and operating a fiber network is summarized as follows:

Project Component	Cost	Average Costs	Cost Subtotal	Unit Price Range (Per Subscriber Potentially served via Fiber = 3,736)	Unit Price (Per Subscriber Potentially Served via Fiber = 3,736)
Northern PSA Fiber Capital Costs and Soft Costs	$1,672,000 - $2,508,000	$2,090,000		$448 - $671	$560
Central PSA Fiber Capital Costs and Soft Costs	$2,131,200 - $3,196,800	$2,664,000		$570 - $856	$713
Southern PSA Fiber Capital Costs and Soft Costs	$730,400 - $1,095,600	$913,000		$196 - $293	$244
Outside Plant transport infrastructure; labor/materials/make ready and Associated Soft Costs **Subtotal Fiber Capital Costs/Soft Costs**	**$4,533,600 - $6,800,000**		**$5,667,000**	**$1,214 - $1,820**	**$1,517**
Access Network Installation and Equipment Costs					
Subtotal Installation/Equipment Costs	**$10,898,600 – $14,269,895**		**$12,584,248**	**$2,917 - $3,819**	**$3,368**
Reoccurring Costs					
Service Costs	$998,976 - $1,570,464	$1,284,720		$268 - $420	$344
Operating Costs	$472,000 - $708,000	$590,000		$126 - $190	$158
Subtotal Reoccurring Costs	**$1,470,976 - $2,278,464**		**$1,874,720**	**$394 - $610**	**$502**
Total			**$20,125,968**		**$5,387**
			$20.125 Million **Budgetary projection**		
Cost per Subscriber (3,736)					**$5,387**

Feasibility Analysis

Fiber-to-the-Premise (FTTP) installation costs of around $2,700 or less per subscriber is typically the point at which most prospective service providers and municipalities begin to contemplate and discuss implementation. Therefore the near $5,400 cost per subscriber estimate is double what most entities would consider 'feasible'. If the communities were considering building a fiber to the premise (FTTP) network and providing retail services, the conclusion would be made that the project is not feasible. In this initiative however, the communities are not looking to be a service provider, but rather the communities and the State of Virginia are attempting to remove a portion of the cost barrier for service providers to expand or offer new services to the more rural areas of central and northern areas of the Eastern Shore. The cost of the distribution network is estimated on an average of $1,517 per subscriber for building dark fiber only, leaving approximately $3,870 per subscriber expense to the service provider utilizing the fiber network. Even if the fiber solution is overlaid with a wireless solution estimated at $800 per subscriber, private service provider business models would be unable to generate a return on investment within the typical expected period of 3-5 years. This determination is made based on the analysis of the feasibility of building all three fiber rings, passing all projected premises, and achieving the anticipated market penetration assumptions. While not shown on the maps, if 2 or 3 rings were built, the potential benefits of interconnecting the rings warrant further discussion and consideration.

An analysis of each of the proposed fiber rings (see sections 4.0, 5.0 and 6.0), the approximate cost of each of the fiber rings plus access network, installation and equipment, and service provisioning costs and operating costs based on the estimated number of customers served is:

- Northern PSA Fiber Capital Costs and Soft Costs is $5,171 per subscriber for 1,635 subscribers
- Central PSA Fiber Capital Costs and Soft Costs is $6,334 per subscriber for 1,617 subscribers
- Southern PSA Fiber Capital Costs and Soft Costs is $6,597 per subscriber for 484 subscribers

The estimated cost for the Chincoteague and Northern Accomack County Fiber Ring area is near $5,200 per subscriber. If fiber for the Greenback Spur and Saxis Spur were eliminated (these areas should be investigated to be served using a wireless solution), $573,963 (27.5% of total) is reduced from the total of $2,089,603 resulting in the total cost of the Fiber ring in Northern Accomack and Chincoteague Spur at $1,515,640 (72.5% of total). This results in the square mile area being reduced from 93.19 to 69.74, the overall population in the revised service area being reduced from 13,529 to 11,886, and the housing units being reduced from 7,984 to 6,996. The resulting change of housing unit density increases from 85.67 units per square mile to 100 .32 units per square mile and population density increasing from 145.18 to

170.42 people per square mile. While some potential fiber subscribers are eliminated, the majority of premises to be served are still within reasonable distance of the ring and Chincoteague Spur. Based on population and housing density distribution it is estimated that up to 90% of the original estimate of 1,635 premises passed (1,472 premises) could be served off the Northern Accomack fiber ring and Chincoteague Spur while reducing the distribution fiber run and estimated access network runs by approximately 30%. In addition, if a service provider already has a TV headend, installation crews, customer service representatives, marketing materials, billing clerks and software, equipment, etc., and is already purchasing bandwidth (and/or already paying for transport costs near this service area), it is estimated that many of these costs will be reduced by at least 50%. A revised total cost estimate is approximately $4,100 per subscriber. The access network costs would still apply, but the average distance of the fiber to the premise for the access network is anticipated to be less because of the increased housing density in Chincoteague.

The Central Accomack area fiber ring and spurs do not require an analysis of the effects of the Onancock and Wachapreague Spurs because the spurs account for only 7.8% of the total expense. There is no significant cost reduction by "trimming down" the extent of the fiber build by eliminating the spurs. The only alternative would be to eliminate portions of the ring, perhaps in combination with eliminating spurs.

No spurs were proposed for the Exmore-Nassawadox and Southern Accomack area. Therefore the only solution to reduce costs would be to eliminate portions of the ring.

Table ES-E: Summary of Costs Per Subscriber

Project Component	Per Subscriber Costs for the Chincoteague and Northern Accomack County Area (1,635 Subscribers)	Per Subscriber Costs for the Central Accomack Area (1,617 Subscribers)	Per Subscriber Costs for the Exmore-Nassawadox and Southern Accomack County Area (484 Subscribers)	Per Subscriber Costs for All Three Areas (3,736 Subscribers)	Per Subscriber Costs for the Chincoteague and Northern Accomack County Area without the Greenback and Saxis Spurs (1,472 Subscribers)
Fiber Capital Costs with Soft Costs	$1,278	$1,647	$1,886	$1,517	$1,030
Equipment and Installation	$3,358	$4,151	$3,976	$3,368	$2,666
Service Provisioning Costs	$355	$356	$555	$344	$312
Operating Costs	$180	$180	$180	$158	$90
Total Costs per Subscriber	$5,171	$6,334	$6,597	$5,387	$4,098

As can be seen, the cost per subscriber for the Chincoteague and Northern Accomack County Area without the Greenback and Saxis Spurs is significantly less than any of the other proposed scenarios. While the cost is still higher than what one entity would usually begin to consider feasible to take on themselves, if the cost was shared between two entities, the communities and service providers, the cost may be considered worth the investment to get a reasonable monetary return for the service provider, and an improved quality of life return, as well as a catalyst to retain and attract businesses to the area for the communities. It must be realized that state-of-the-art telecommunications infrastructure alone does not assure economic vitality, but is only part of the formula along with business friendly incentives such as reasonable property and business taxes, treated water and wastewater services, adequate transportation infrastructure and skilled labor force. In addition, because the distribution network is proposed to be an open access network, the cost burden can be shared with multiple service providers and services, including supporting wireless solutions.

Wireless Access Network Costs

A wireless network solution could overlay the fiber-to-the-premise (FTTP) solution, or in many locations stand alone if the FTTP solution is not pursued. Wireless providers can utilize dark fiber to reduce expenses, enhance quality of services and expand service area. Where there is dark fiber, time-to-market is drastically reduced. Wireless service providers can replace leased capacity from telephone networks and leased circuits with their own equipment utilizing the dark fiber to transport traffic over the network. Whether a wireless solution is overlaid to create a hybrid network solution or stands alone, more detailed analysis would be needed prior to consideration of implementation. There are a number of wireless solutions a provider may utilize. A few of the more common types include:

- Fixed Broadband Wireless (FBW)
- Satellite
- Mobile (e.g. Fourth Generation Mobile-4G), 3G and 2.5G
- WiFi
- WiMax
- WLAN (Wireless Local Area Network)
- Ultra Wideband (UWB)

Ultra Wideband is still primarily in the experimental phase. WiMax probably holds the greatest near-term solution for serving rural communities. A number of pilot test programs are underway and vendor

'packages' to implement for specific applications. WiFi is the latest "buzz" word being talked about for wireless downtown city initiatives. WiMax can serve WiFi systems, but WiFi is typically considered a Local Area Network (LAN) solution and not a Wide Area Network (WAN) solution because of distance limitations, interference, security concerns, etc. The 2,5, 3G and 4G (Generation) networks are mainly offered by cellular phone companies, but cellular service coverage on the Shore is described as unstable by survey respondents. Satellite service is already available to Accomack County, but at costs much higher than for DSL or cable modem service.

Phone companies offering mobile broadband technology are utilizing cellular towers. Fixed Broadband Wireless (FBW) technology would be most common technology for consideration, but as with most technologies, it too has limitations and drawbacks such as relatively short equipment use-time before upgrading. Additionally, results vary depending on vendor equipment used, topology, architecture design, etc. The communities should also investigate whether there is reasonable licensed radio frequency (RF) spectrum available through the education institutions that may entice a WiMax technology provider to offer services. Since licensed RF spectrum is expensive and difficult to obtain, a typical FBW installation project will be used for a wireless cost analysis.

Table ES-F: "Typical Fixed Broadband Wireless Solution Components and Costs"

Project Component	Cost	Average Costs	Cost Subtotal	Unit Price Range (Per Subscriber Potentially served via Wireless = 5,192)	Unit Price (Per Subscriber Potentially Served via Wireless = 5,192)
Capital Costs	Two types of radio systems would most likely be proposed; a Non-Line-of-Sight (NLOS) system for residential and small business customers (connection distance up to approximately 7 miles from tower) and a Line-of-Sight (LOS) for mid-to-large size commercial businesses, schools and government agencies (within a 12-15 mile radius of a tower depending on ground clutter). Until additional engineering studies are completed including propagation analysis, signal spectrum analysis and site surveys, an estimation of equipment quantity is difficult to project. Variables such as the number of transmission towers needed, number of antennas, number of enclosures, etc. must be addressed, therefore, industry average cost ranges for such a typical wireless solution are being used. The cost of other wireless solutions will vary, but this conceptual cost is adequate for analysis purposes. Just as with a wireline solution, existing service providers would probably be able to implement a wireless solution more cost effectively than a start-up company, municipality, etc.				
Non-Line-of-Sight (NLOS) system for residential and small business customer					
Line of Sight (LOS) system for commercial business, schools and government agencies					
Transmission Towers					
Enclosures					
Network Installation and Equipment Costs					
Network Installation					
Radio Equipment Installation					
Base Unit Equipment					
Subscriber Modems and Antennas					
Soft Costs					
Engineering Study and Project Management • Propagation Analysis • Signal Spectrum Analysis • Site Survey					
Network Engineering					
RF Engineering					
Service Provision Costs					
Transmission/Backhaul costs					
Leased Bandwidth					
Operating Costs					
Marketing Program Development and Materials					
Maintenance and Support Fees					
Spare Parts Kits					
Total Typical Cost Range		**$3,115,200 - $5,192,000**	**$4,153,600**	**$600 - $1,000**	**$800**
Average Cost per Scriber (using 5,192 subscribers)					**$800**

Typical Fees and Revenues

Open access network fees vary from one community project to the next. Examples of fees charged to service providers desiring to use an open access fiber optic network is provided in Appendix C for the Grant County, Washington Zipp® Network. For standard services Grant County uses the charges indicated on the left side of the table. In addition to these standard charges, there are additional charges for apartments and hotels, special VLANs, set-up fess of new service providers, special fiber construction, internet streaming, SONET point-to-point data paths and minimum monthly bills. On the right side of the table are the charges used for study analysis purposes:

Table ES-G: "Typical Charges to Service Providers for Use of an Open Access Network"

Service	Non-Recurring Charge	Monthly Charge		Charges Used for Analysis (w/NOC and NID Equip.)	Comments	Charges Used for Analysis (w/o NOC and NID Equip.)
Standard Service					These charges would apply if the fiber network was lit by the community. In other words, the service provider is paying for access to the customer through equipment owned by the community network.	
Residential Internet Service per Subscriber	-	$22.50		$20-$25		$7
Commercial Internet Service per Subscriber	-	$30.00		$25 -$30		$9
Video Service per Subscriber	-	$5.00		$5 - $10		$3
Phone Service (Per POTS port)	-	$5.00		$5 - $10		$3

Again the example must be viewed in the context of what is being offered. Because the community funded the expense of the NOC and NID equipment, the community needs to set fees adequate to recover this expense over a planned period of time. NOC and NID equipment can double the capital cost to a community over that of just building fiber. Therefore if the service providers are expected to fund these costs, the community will have to charge reduced fees so that the service provider can recover this expense within the period of time in their business model. Since communities typically are willing to amortized their debt over a much longer period of time, but generally lack the experience to provide services in competition with the private sector, the public-private open access network model can mitigate the obstacles faced by the other party.

To demonstrate further how the public-private model fee distribution might be allocated, the following example is provided:

- Average monthly fee residential for voice, video and Internet = $115
- Provider service/operating/debt service expense = 65% = $75
- Expected minimum profit by service provider = 20% = $23
- Needed access fee to FTTP transport = $13-15/mo. (11.5-13%)
- Possible net revenue to FTTP owner (Community) = $2-4/mo. (2-3.5%)
- Would probably want to allocate at least 3% annual increase in revenue and cost

While typically penetration take rates are not the same for voice, video and data services, creative marketing techniques such as discounted bundled pricing and levelized pricing can usually help capture a significant share customers willing to take all three services ("triple play"). Many businesses might only be interested in voice and data services. On the residential side, usually voice take rates grow slower (due to large use of cell phones) than television and Internet. Since this not a detailed analysis, assuming the majority of the fiber solution serves customers that would take all three services the community could collect approximately $247,296 per year from the 1,472 subscribers in the Chincoteague/Northern Accomack County service area (Avg. $14 x 1,472 x 12 months). Here again it must be realized that the network will not be serving all 1,472 subscribers from day one, nor all services to every customer and a more detailed analysis would have to take into consideration including progressive growth, delays in collecting fees, maintenance costs, managing costs etc. Therefore, actual net revenue would be much less.

If the fiber solution also supported a wireless data solution to the other estimated 5,192 subscribers in the Chincoteague/Northern Accomack County service area, significant additional revenues could be gained.

If the communities amortized the estimated debt service of $1.525 million for building the fiber network and closing costs over 30 years at an interest rate of 5.45%, the annual debt service would be approximately $104,000 $\pm$, or $126,500 $\pm$ over 20 years.

Organization and Network Operations

Network organization and operations models vary. Depending on state law, options include networks being owned and/or operated by the municipality, authority of the municipality, joint action agency, council of governments (COG), cooperatives, for-profit entities, etc.

In regards to municipal provision of communication services, Virginia does allow local governments to provide services but with restrictions. Section 7.0 of the report discusses the impact of Virginia Law in more detail, including allowances for public entities to provide "qualifying communication services". The following briefly addresses some of the restrictions and permissible roles of municipalities in relation to the focus of open access networks.

- A locality can build a network and provide services to its departments, boards, agencies, etc. and to adjoining locality's so long as the charges for equipment, infrastructure, and/or services do not exceed the cost of providing same. Dark fiber can be leased by any locality, electric commission or board, industrial development authority, or economic development authority. Under no circumstances can the locality or authority be involved in marketing or promoting the services of the lessee or purchaser.
- The Virginia Wireless Services Authority Act authorizes a locality to "convey or lease to [an] authority, with or without consideration, any systems or facilities for the provision of qualifying communications services" and "contract, jointly or severally, with any authority for the provision of qualifying communications services." Localities are still held to the requirements of the "qualifying communication services" and service gap provisions (not more than three providers). This legislation provides the method by which projects can be financed by an authority.

Communities that want to provide a catalyst for service expansion and an enticement to service providers, but do not have the expertise in-house to manage and operate a network and want to limit their investment in a network, will invest in the dark fiber only (no equipment). If services are to be provided to municipalities and other political subdivisions or agencies only, then they will also contract with another entity to manage and operate the network. This approach minimizes the extent of staff and training needed by the municipality.

In order to provide retail services across a network, staff requirements would typically include a customer service representative/sales representative, billing clerk, technical field personnel, technical office personnel to manage the Network Operating Center (NOC) equipment, and probably a system manager.

In addition other costs would include marketing materials, software and invoices, office and facility space with equipment and furnishings, and training costs. Municipalities that are already providing other services such as public power (electric) and water and wastewater treatment services are in a much better position to provide telecommunications services.

Funding Resources

Funding concerns for such an initiative are usually categorized into at least two (2) investigations; capital expenses and sustainability of operating and maintaining the network. Capital expense funding is usually addressed by analyzing long-term amortization borrowing opportunities with interest rate impact, as well as potential subsidized funding through grants, against the ability to generate sufficient revenue to meet the annual debt service obligations. Often, capital funding obligations are met by long-term contracts (often associated with providing services to businesses and large bandwidth users) while annual network sustainability funding is paid for through services provided to residential customers and shorter-term contracts.

Usual capital funding for municipal projects include revenue or general obligation bonds. Other creative financing models include buying shares in a for-profit operating entity, customer ownership through a cooperative, forming a legal public-private partnerships, etc. Given that the historical charter for local government units is to be non-profit entities and not venture capitalists, it is recommended the more traditional methods of government funding be pursued such as federal and state grants and low interest loans, issuance of bonds, or incurring authority debt. Advantageous approaches within these resources can be investigated such as “wrap-around” debt and refinancing existing debt. Continuing to investigate forming cooperative and sharing costs among the owners who are the customers also has merit. Input from the Lower Shore Broadband Cooperative is recommended to learn more about the pros and cons of a cooperative structure.

Section 8.0 “Funding” of the report provides discussion on capital costs versus operational costs, assets, potential partners, funding success stories and funding resources.

Conclusions and Recommendations

The telecommunications industry is a competitive and ever changing environment. New service applications are developed, pricing changes, access requirements vary, bandwidth demand is growing and regulations restrict or allow roles to be played by various entities.

Municipal and non-profit telecommunication initiatives have different objectives than private, for-profit providers. Communities generally enter into telecommunication initiatives with the intent to improve government services, maximize teaching and learning opportunities, improve economic development conditions to attract or retain businesses, increase the tax base and employment opportunities, create an additional revenue source for funding community services, and improve the overall quality of life for families and businesses who call the community home. In many instances, the for-profit business model results in service providers not making capital investment in building infrastructure into more rural areas where less aggregation of demand makes it difficult to recover the investment in the expected timeframe. Unlike the private sector business model, communities typically do not expect to recover their investment in a short three to five years, but rather seek to cover expenses and investment so as to not place a financial burden on the community.

The most viable and feasible network investment to be made at this time by the Eastern Shore communities is the proposed Northern Accomack County ring and Chincoteague spur. A fiber connection to the Wallops Island facility and the proposed Research Park is critical to economic development activities currently underway. The high-bandwidth users located in these areas are and will be attractive to service providers, justifying investments in equipment. This fiber network can be the first phase project and lessoned learned will help evaluate the viability of the other two proposed rings and accompanying spurs.

The most likely business model to pursue is where the communities would build and own the dark fiber of an open access distribution network and service providers would need to build an access network and provide services to the end-use customers. Such a public-private partnership will help remove the capital cost deterrent from expanding infrastructure. The communities would need to contract with a neutral third party to manage the network and develop a network governance plan that ensures non-discriminatory practices and fees.

The most likely funding mechanism will be some assistance from federal and state funding, but mostly through the issuance of a long-term, amortized bond.

Business and residential interest in wireless as a community access solution is strong, and each of the communities should encourage local service providers to deploy a wireless solution to reach as many subscribers as feasibly possible. Impediments to private provider wireless network deployments are often the cost of access to community assets for equipment placement, and the approval and permit process. These impediments should be removed by the municipalities to encourage wireless services, and municipalities themselves can serve as anchor tenants for services to connect facilities and Internet access.

Probably the most important next step to take in continuing to explore the feasibility of proceeding with the recommended phased-in approach of first building the Chincoteague and Northern Accomack fiber ring, and subsequently further assessing the feasibility of the Central Accomack County and Exmore/Nassawadox Southern service from the model of the northern service area, is to continue to explore private partnership interest and commitment, as well as continued coordination efforts and discussions with Mid-Atlantic Broadband Cooperative, as well as Maryland Broadband Cooperative and Lower Shore Broadband Cooperative. The Exmore/Nassawadox Southern Accomack service area may become more feasible if approached in combination with serving further south in Northampton County, especially with Cape Charles. Without buy-in from service providers that would use the open access network(s), the community would be funding an expensive, but underutilized off-ramp from the main network that could easily become a debt burden to the community.

Efforts are underway by multiple parties to bring high speed connectivity, bandwidth and Internet Protocol (IP) based voice, video and data services to the Eastern Shore of Virginia. While there is a general understanding of how these multiple initiatives and parties might be integrated, there is no known master comprehensive plan, schedule and overall project management services available to help ensure success and unnecessary duplication of infrastructure and associated expense. Such a master plan should be developed and used to coordinate efforts.

Lastly, it must be understood that only conceptual estimates and design considerations were used to determine if the initiative is something the communities and service providers would support. The community broadband plan can only provide the information necessary to make an informed decision. Only the communities and service providers can make that decision. If the decision is favorable to

proceed, before going full blown into a design and implementation effort, the master plan discussed above, and a more detailed supplemental analysis should be completed using actual charges and fees from Mid-Atlantic Broadband Cooperative and getting agreement from service providers on the main issues of the business model.

1.0 Community Needs Assessment and Asset Inventory

1.1 Background

One objective of the Community Broadband Planning Study is to document the availability of communication technologies throughout the study area and to assess the amount of demand by residential and business end-users. Communication technologies include any form of Internet access, pay TV, and telephone delivered by any medium.

The use of a mailed survey allowed for a greater percentage of the population to be polled, including those that would potentially be reluctant to respond to telephone solicitations for surveying. The overwhelming popularity of the national Do Not Call list and the increasing use of caller ID to screen out unwanted calls substantiate use of a written survey as the preferred means to obtain community input from the largest number of respondents.

In addition to validating service availability by geographic area, end users provided valuable input to calculate demand for advanced technologies such as higher speed and wireless Internet access and phone service that uses the Internet as a transmission medium. This information is valuable to service providers contemplating the deployment of new services or to areas not presently served. Government leaders can use this knowledge as a tool for measuring how their community compares to others in relation to technology adoption by citizens, and for developing broadband education strategies.

Comments were solicited as to what changes or improvements to the current communication technology on the Eastern Shore would best meet citizen's needs. Local leaders can use this knowledge to expand the reach of government services and prioritize implementation efforts. Through the survey process, citizens have been recruited as stakeholders in their community's future.

1.2 Survey Methodology

Residential address lists for the study area were purchased, from which a total of 3,000 residential surveys were distributed. Addresses provided by the Eastern Shore Chamber of Commerce were used as the basis for a distribution list for businesses. This list was augmented by businesses culled from a list provided by the Virginia Employment Commission (VEC). A total of 873 business surveys were distributed across the study area. Public school district officials and higher education personnel were interviewed via telephone for more detailed responses.

Residential and business input was provided from both mailed and on-line surveys. A two-page survey (see Appendix A, Section 7.0) polled basic demographic data, Internet usage habits, method of access (e.g. dial-up, DSL, cable modem), satisfaction with current providers, and monthly cost of access to the Internet. The survey could be completed and returned postage-paid with a minimum of effort for the user. The mailed survey was augmented by an online version of the survey. The domain name www.VAbroadbandstudy.com was purchased and used to make an exact replica of the mailed survey available for easy online entry. The results of the online survey have been combined with the mailed survey results.

A survey response rate of 10% was targeted, returning a statistically valid sample size at a 95% confidence level. Response to the Eastern Shore surveys was much higher, however, resulting in return rates of 19% (558) residential and 23% (200) business. Participation via the online survey was high as well; of the returned surveys, 27% of residents and 7% of businesses chose this method. The local school district and the ESCC were proactive in encouraging students and teachers to participate in the process.

1.3 Residential Use and Unmet Demand

Internet Access

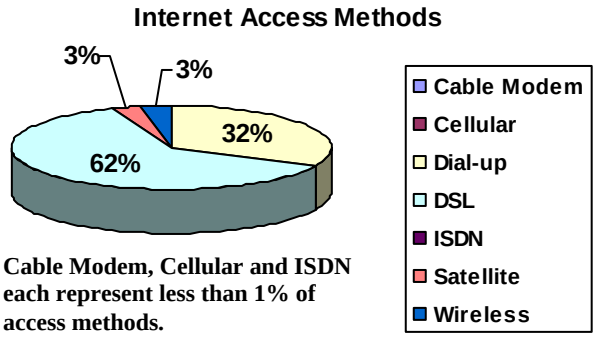
Subscription Internet access is available to all residents via dial-up service providers at pricing as low as $9.95 per month from national providers. Local providers such as ESVA.net, Delmarva Online, and Continental VisiNet offer dial-up access on a set number of hours or unlimited access at pricing from $16.95 to $25.00 per month. Access via Digital Subscriber Line (DSL) and cable modem is available in areas of Accomack and Northampton counties at prices ranging from $17.99 to $51.99 per month for residential service. Additionally, access via satellite provider HughesNet is available to all residents and businesses on the Eastern Shore at pricing starting at $59.99 per month plus costs for equipment in the hundreds of dollars. Satellite provider Wild Blue has just recently begun accepting applications for new service on the Eastern Shore; pricing for the highest speed Internet product is $79.95 per month plus costs of $299 for equipment.

Residential survey respondents ranged in age from 20 to over 65 years old. Over 54% of responses represented working age adults in the 20 to 59 age range. Response from citizens aged 60 and above was high, and it should be noted that 92% of respondents aged 60 to 64 and 73% of those aged 65 or older are actively accessing the Internet from home.

Responses from families with children at home represented 27% of the survey group. The ages of children are represented as follows:

Under 5	5 – 17	18 or older
25%	62%	22%

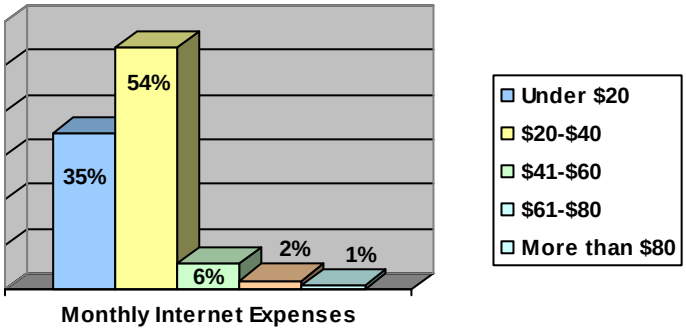
Computers are in the homes of 89% of survey respondents with 84% of respondents subscribing to Internet access. The majority are accessing at faster than dial-up speeds via Digital Subscriber Line (DSL). The numbers of individuals using dial-up access is in line with national estimates. The breakout by Internet access method is as follows:



Cable Modem, Cellular and ISDN each represent less than 1% of access methods.

Residents were asked to assess their Internet access speed as Adequate, Inadequate, or More than Needed. The majority (60%) described it as Adequate; 37% stated it is Inadequate. The majority of those dissatisfied with the speed of their Internet connection are using dial-up for access. Of considerable interest however, are the 24% of DSL subscribers who describe their speed as inadequate. These respondents have Internet speeds widely described by incumbent providers as adequate for most current needs. They would be likely to subscribe to higher speed alternatives.

A majority (75%) of dial-up subscribers is interested in moving to a faster-speed service, but believes services are not available to them. Cost is also a limiting factor however, as 16% claim higher speed services are too expensive. The results of the survey show the average cost for service is $27.58 per month.



Monthly Internet Expenses

Internet access to the home is important to the overwhelming majority of residents; 66% rate access as Very Important and another 20% describe it as Somewhat Important. This importance is quantified as

over one-third of residents use the Internet to work from home and to complete school or job training course work.

Using the Internet for Work or School	
	% of Internet Users
Use the Internet to Work From Home:	32%
Internet Access Required to Complete Coursework for School or Job Training:	32%
At least once per Week	60%
At least once per Month	40%

The many activities that residents are performing online underscore the high value placed on access, and the desire for higher-speed access methods. Email has long been the most frequently used Internet application by citizens of all ages. In more recent years activities such as obtaining driving directions, researching purchases, and performing financial transactions have increased in popularity. Activities that influence social and economic changes such as online learning, job search, and access to health and medical information are steadily gaining in popularity as more Americans are exploring the Internet's vast reach. Large majorities of residents on the Eastern Shore are turning to the Internet for access to news and community information.

Residential Online Activities in the Past 6 Months	
Activity	% of Residents
Purchased products or services	72%
Visited a news website	72%
Searched for travel related information	69%
Searched for health or medical information	68%
Visited a state or local government website	59%
Researched a major purchase	55%
Performed a financial transaction with a bank	50%
Searched for info related to school work	33%
Downloaded or watched video online	32%
Took an online course	17%
Searched for a job	15%
Communicated with a teacher	14%
Sold products or services	10%

Wireless Internet access is becoming more widespread with increasing consumer awareness of the service. Where once wireless service could be found only in retail locations such as coffee shops, hotels,

airports, and some libraries, wireless wide area networks are becoming more common. Additionally many new computers (both desktop and laptop) are equipped with standard wireless network cards, facilitating wireless usage. A large number of consumers have adopted the use of wireless home networks as an alternative method to reach computer work stations, and for using laptops anywhere in the home. Eastern Shore residents were questioned as to their likelihood of subscribing to an affordable wireless high-speed Internet service if it were available to them, and the response was overwhelmingly positive; 64% indicated they are Very Likely and 18% Somewhat Likely to subscribe.

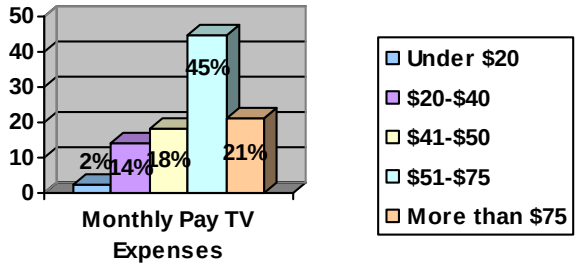
1.32 Pay TV Services

Nationally, approximately 85% of households subscribe to a pay TV service. Cable's share is estimated at 59.2% according to the National Cable and Telecommunications Association industry statistics. Subscribers located in areas with population densities of 20 homes per mile or less are typically not served by cable systems and therefore are more likely to subscribe to satellite services such as DirecTV. The local cable provider Charter Communications has a franchise agreement to serve the Counties, but does not serve all households. Of the residential survey participants, 88% report subscribing to a pay TV service, primarily via satellite.

Pay TV Subscribers	
Pay TV Method of Access	**% of Responses**
Cable	24%
Satellite	76%

The majority of pay TV subscribers (54%) are receiving expanded basic programming which provides local off-air channels and several channels of cable programming. Minimum basic programming consists typically of local off-air channels; public, education and government channels; and shopping networks with perhaps a cable channel such as The Weather Channel. Many of the residents complained of the inability to receive local Richmond stations off satellite and of poor TV reception via cable. The percentage of respondents with cable television service who also receive Internet access via cable modem is very low, reflecting the advanced age and low capability of the existing cable providers system.

Monthly expenses for Pay TV service are much higher than for Internet access. Survey results show the average cost for service is $59.35 per month.



1.33 Voice Services

Voice communication services include regular wired service (also known as 'plain old telephone service' or POTS), cellular, and the newer voice service using the Internet (Voice over Internet Protocol or VoIP). Nationally, more Americans are dropping regular wired service in favor of one or both of the other services presumably as a way to reduce monthly expenditures. The adoption of VoIP services is an important issue, as currently Universal Service Fees and fees for e911 are not mandated on calls made over the Internet. Residential subscriber percentages and monthly rates for voice services are reported as follows:

Voice Communication Methods and Spending						
Voice Service	% With Service	% Without Service	Monthly Expenditure			
			No Charge	Under $35	$35 to $75	More Than $75
Regular (Wired)	99%	1%	-	29%	56%	11%
Cellular	79%	21%	-	19%	55%	26%
Voice over Internet*	18%	82%	19%	62%	19%	-

*Includes responses from faster-than-dial-up Internet subscribers only.
Service percentage based on numbers of Internet subscribers only.

Industry estimates of VoIP penetration vary widely, but analysts do agree that this form of voice communication is expected to increase in popularity at a rapid rate. One of the more aggressive estimates is the prediction that VoIP will be used in 62% of broadband households by 2010[2]. Because of the availability of access at no charge using the Internet only (calls do not ever touch the telephone network) the exact numbers of subscribers are not known. Hybrid varieties of VoIP that pass calls using the Internet and then connecting to the switched telephone network are becoming more widely adopted as cable and telephone companies roll out new packages of fixed price service for unlimited local and long distance calls. Verizon VoiceWing VoIP service is available on the Shore to anyone with a broadband connection, with unlimited calling for $24.95 per month. This charge is in addition to the charge for the broadband connection, but offers an attractive alternative to typical local and long distance costs for regular 'wired' phone service.

[2] IDC, subsidiary of International Data Group; *IDC Anticipates 34 Million More Residential VoIP Subscribers in 2010*; Press Release 13 June 2006; http://www.idc.com/getdoc.jsp?containerId=prUS20211306

1.34 Overall Communication Satisfaction

Overall, residents on the Shore are satisfied with their current voice, video, and Internet providers; however, the 46% of respondents dissatisfied with current Internet providers or *services available* cannot be ignored. Numerous comments echoed frustration with not having a choice of providers for any of the communication technologies – voice, video or broadband Internet.

	Satisfaction with Current Providers		
	Telephone	Video	Internet
Satisfied	65%	46%	54%
Not Satisfied	22%	36%	46%
No Opinion	11%	18%	-

In response to the last survey question **"What changes or improvements to communication technology on the VA Eastern Shore would best meet your needs?"**, 56% of the residential survey group offered comments. A complete list of the comments is included in the Appendix section of this report. In general, the majority of comments addressed the following issues:

- Desire for high-speed Internet access
- Poor cell phone reception on the Shore
- Poor cable TV reception
- High cost of all services
- Desire for bundled service offerings (telephone, Internet, TV, and cell for one price)
- Desire for local TV stations on satellite
- Frustration with a lack of competition

1.4 Business Use and Unmet Demand

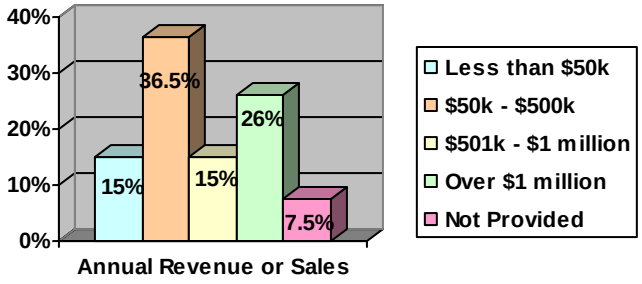
1.41 Internet Access

Subscription Internet access is available to all businesses via local and national dial up service providers at pricing similar to residential access. Costs to business customers for faster-then-dial up service are typically higher than that offered to residential customers because of increased support and quality of services agreements. DSL access is often used by small businesses that have few users and are not 'data intense', primarily because of lowers cost. Businesses that must have bandwidth available at all times and with service guarantees pay a higher price for services.

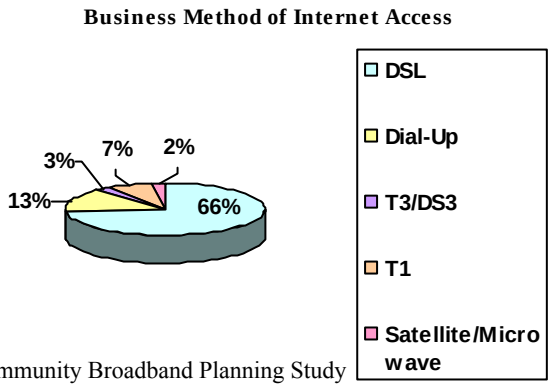
Many medium to large (and even some small) businesses can satisfy their needs with a full or partial T1 line that they can apportion between voice and data services. Bandwidth amounts required depend on the services utilizing the connection. Depending upon the number of telephone lines and frequency of use, voice traffic may use a relatively small percentage of bandwidth. Greater amounts of bandwidth are required for transferring data files, frequent Internet use and connecting branch offices. T1 lines are available throughout most areas of the County at costs typically ranging between $500 and $1000 per month, or as a partial T1 providing 256 Kbps to 512 Kbps at reduced pricing. Service is provisioned over Verizon's copper lines, although service agreements and Internet access may be provided by other providers such as AT&T and Delmarva Online. Customers can purchase the amount of bandwidth or portions of a T1 to satisfy their needs. Very high bandwidth needs (e.g. greater than 10 Mbps) can be met currently by a full or partial DS3 (45 Mbps) at rates well above $1500 per month.

Respondents to the business survey are primarily small businesses, employing 1-4 persons with annual revenue or sales of $50k - $500k per year. The size and type of responding businesses are represented in Table 1.4-A on the following page.

The majority of businesses are generating revenue or sales of between $50,000 and $500,000 annually although a substantial minority report revenues in excess of $1,000,000 annually.



The Internet is in use by 90% of all businesses; the largest group, 64% report 1 to 5 workstations have access to the Internet. Digital Subscriber Line (DSL) is the most commonly used method of access among all businesses, regardless of annual revenue or numbers of employees. Current DSL bandwidth/speed is considered adequate to meet the needs of 82% of businesses. No businesses reported cable modem as an access method. Access methods in use by all businesses are as follows:



Dial-up access is still in use by 13% of businesses; these businesses employ no more than five persons. This method of access does not meet the needs of 73% of those businesses – connection speeds are too slow and do not provide enough bandwidth.

Table 1.4-A: Businesses by Type and Number of Employees

% of Response	Business Type	Number of Employees* None	1-4	5-9	10-19	20-49	50-99	100-249	250 or more	Total
7.0%	Accounting/Architectural/Engineering		4 4.7%		1 3.7%					5
7.0%	Agricultural/Forestry/Mining	1 9.1%	3 3.5%	4 10.5%	2 7.4%	3 10.0%	1 25.0%			14
13.5%	Business and Personal Services	3 27.3%	18 21.2%	3 7.9%	2 7.4%	1 3.3%				27
2.5%	Communication/Technology		5 5.9%							5
10.0%	Contractor or Construction		12 14.1%	5 13.2%	2 7.4%	1 3.3%				20
7.0%	Education		5 5.9%	1 2.6%		5 16.7%	2 50.0%		1 50.0%	14
7.0%	Finance/Insurance/Real Estate	1 9.1%	6 7.1%	4 10.5%	1 3.7%	2 6.7%				14
4.0%	Government		1 1.2%	1 2.6%	3 11.1%		1 25.0%	1 33.3%	1 50.0%	8
7.5%	Healthcare	2 0.0%	5 2.4%	3 13.2%	3 11.1%	3 10.0%		2 66.7%		15
8.0%	Non-classified	2 18.2%	6 7.1%	4 10.5%	2 7.4%	2 6.7%				16
26.5%	Retail Trade	3 27.3%	21 24.7%	9 23.7%	10 37.0%	10 33.3%				53
4.5%	Wholesale Trade	1 9.1%	2 2.4%	2 5.3%	1 3.7%	3 10.0%				9
	Total:	**11**	**85**	**38**	**27**	**30**	**4**	**3**	**2**	**200**
		5.5%	**42.5%**	**19.0%**	**13.5%**	**15.0%**	**2.0%**	**1.5%**	**1.0%**	

***Percentage vertically (not bold) are for each size employer. For example, 4.7% of employers with 1-4 employees offer Accounting/Architecture/Engineering services. A total of four such employers provided a survey response.

Access to the Internet is considered Very Important or Critical to 60% of businesses surveyed. Overall, the majority state their current method of Internet access is adequate to meet their needs, yet 26% assess their current Internet access as inadequate. Although many view their current access speed as adequate, many do not know the actual speed or bandwidth available. It is important to note that those businesses whose current Internet bandwidth is inadequate are primarily located in Central Accomack County. Immediate bandwidth shortages are reported as follows:

- Chincoteague/Wallops Island – 3 businesses in Chincoteague, 4 businesses in Wallops Island (23% of respondents)
- Accomack County – 37 businesses in all other Accomack County (26% of respondents)
- Exmore/Nassawadox/Willis Wharf – 3 businesses in Nassawadox only (12% of respondents)

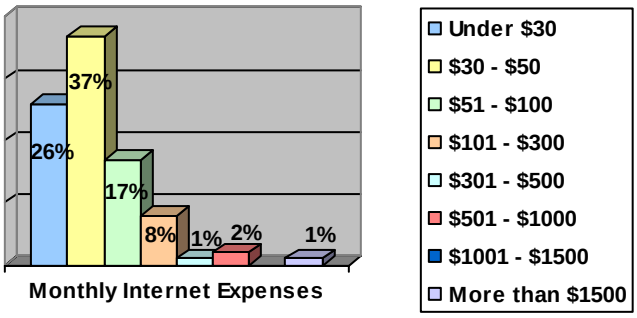
Less than one-third of all businesses are Very Satisfied with their current provider; all others express various levels of dissatisfaction.

Satisfaction with Current Providers	
	% of Internet Users
Very Satisfied	29%
Somewhat Satisfied	51%
Somewhat Dissatisfied	11%
Very Dissatisfied	7%

Dissatisfaction is primarily with connection speed and lack of bandwidth. The majority is subscribing to service from local incumbent Verizon, and many comments indicated frequent network issues and an overall perceived lack of provider support.

Reasons for Dissatisfaction with Current Providers	
	% of Internet Users
Poor connection speed, not enough bandwidth	**42%**
Price too high	23%
Poor customer service	16%
Service is unreliable	11%
Problems with Email	8%

Businesses that currently have no Internet access or do not subscribe to faster-than-dial-up service indicate that availability of services is the primary reason. Nearly 9% of the entire business survey group is not interested; a smaller percentage of respondents state higher speed services are too expensive.

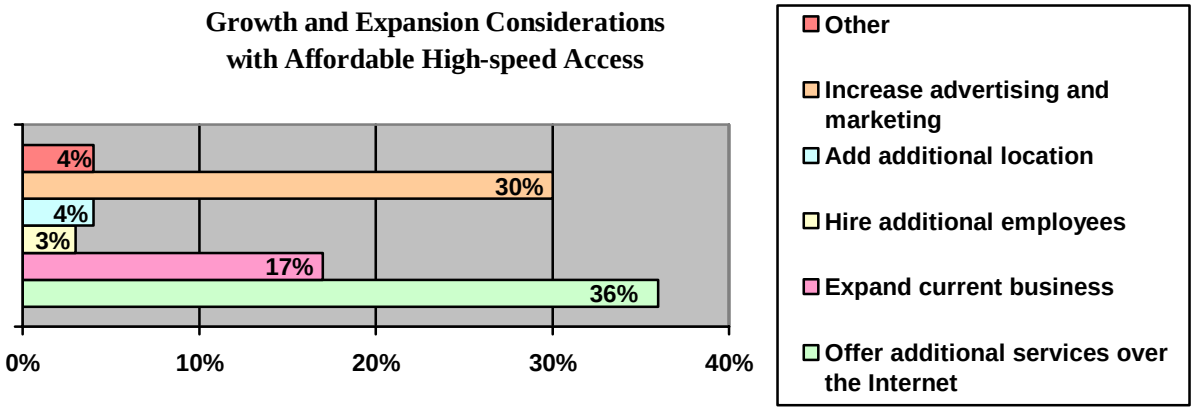


Current monthly expenses for Internet access do not exceed $50 per month for the majority (63%) of businesses. The average cost of services for this group is $31.55 per month. Only 5% of all businesses report Internet expenses in excess of $300 per month.

Although 90% of all businesses currently have Internet access and consider access important, it appears many Eastern Shore businesses are not taking full advantage of all the Internet has to offer. Business use of many Internet applications is lower on the Shore than that reported in other areas of the country. Some businesses in the Counties have incorporated the Internet into the daily operation of the business beyond just communicating with employees and customers through email. Tasks such as accounting and banking that can be conducted via online access save the business time and creates efficiency. These efficiencies contribute to the importance of cost-effective and dependable Internet access. The table that follows illustrates how Eastern Shore businesses are using the Internet – currently and expected future use. The applications targeted for future use and the percentage of businesses that anticipate incorporating these additional uses into their operations are indicators of the incremental speed, bandwidth and reliability that will be required in the near future.

How Businesses Are Using the Internet Current and Future Interest of Respondents		
Internet Use	**Current Use**	**Anticipated Future Use**
E-Mail	63%	3%
Research	53%	5%
Purchasing materials or services	51%	6%
Customer service	42%	14%
Accounting/Banking	41%	7%
Advertising	36%	13%
Hosting your web site	34%	**17%**
Transferring data files	34%	7%
Training	22%	**15%**
On-line sales	15%	**18%**
Distance Learning	13%	15%
Communication	6%	4%
VPN connections	5%	7%
Video-conferencing	4%	**17%**
Telemedicine	2%	6%
Voice service	2%	14%

In contrast to lower-than-expected use of Internet applications, 69% of all business survey respondents identified one or more growth opportunities their business would consider if an affordable high-speed Internet service were available to them. The higher percentage of businesses that would consider offering services over the Internet indicates future growth of e-commerce on the Shore. Additionally, it appears a strong percentage of businesses understand the value of Internet marketing. Growth and expansion opportunities identified are as follows:



Other opportunities offered by respondents include:

- Increase productivity
- Save time
- File claims electronically
- Deliver current services faster
- Improve remote office options
- Attract more customers

Wireless Internet access has been a rapidly evolving technology with new standards released well ahead of consumer adoption. Until recently, uncertainty existed among consumers as to the security of using this technology to transmit sensitive data. Businesses are beginning to view wireless access as a cost-effective means of connecting branches and accessing the Internet. A majority of all business survey respondents (76%) indicate they are very to somewhat likely to use wireless high-speed Internet access service if it was available to them. Of businesses that state current Internet speeds and bandwidth is inadequate, 91% are interested in high-speed wireless access to meet their needs.

1.42 Voice Services

Businesses were surveyed about the phone services they are using and their monthly expenditure for each. Most businesses maintain regular telephone lines (99% overall), the majority spending between $101 and $300 per month for service.

Business Voice Communication Methods and Spending						
Voice Service	% With Service	% Without Service	Monthly Expenditure			
			No Charge	Under $100	$100 to $300	More Than $300
Regular (Wired)	99%	1%	-	33%	39%	28%
Cellular	84%	16%	-	52%	41%	7%

Most businesses also subscribe to cell phone service. While just over one-half are spending less than $100 per month, the rest are spending considerably more. End-users provided numerous comments that expressed frustration with poor cellular coverage on the Shore and high dissatisfaction with their provider.

Business Voice Communication Methods and Spending							
Voice Service	% of Internet Subscribers with Service	% Without Service	Monthly Expenditure				
			No Charge	Under $35	$35 to $45	$46 - $100	Over $100
Voice over Internet	21% of Internet subscribers	79%	13%	34%	19%	29%	5%

The greatest advancement in the use of technology for businesses to date is voice over the Internet (VoIP) phone service. Voice traffic is digitized and transported along with data, greatly reducing per call spending. Incumbent telephone providers realize savings as well, and service is available to businesses from local and national providers. Only 21% of businesses with Internet access have adopted this method of voice service.

Like residential VoIP, service is available in a variety of ways. Service for voice calling using only the Internet and never entering the public switched telephone network (PSTN) is available from national providers at no charge (e.g. Vonage, Skype). A number of plans are available from these and other providers offering reduced monthly charges for calling plans that include a combination of Internet and PSTN use for voice service. Small businesses utilizing DSL for Internet access can also subscribe to this service from Verizon (Verizon VoiceWing), using their Internet connection for making voice calls.

Businesses are under increasing pressure to reduce monthly spending on voice communication as most are subscribing to mobile (cellular) service in addition to fixed service at the business's physical location. Business adoption of VoIP nationwide is expected to increase exponentially as a method of reducing high communication costs. Service is increasingly available from facilities-based providers offering higher levels of security and the support that businesses demand.

In response to the last business survey question **"What changes or improvements to communication technology on the VA Eastern Shore would best meet your needs?"**, 39% of the business survey group offered comments. A complete list of the comments is included in the Appendix section of this report. In general, the majority of comments addressed the following issues:

- Desire for increased Internet access speeds, more bandwidth needed
- "Broadband" access specifically requested
- Affordable access options
- DSL or cable modem availability to more areas
- Better cell phone coverage

1.5 Healthcare and Education Use and Unmet Demand

When taking steps to attract new businesses into an area, family quality of life issues will typically weigh-in equally as important as an attractive business climate. In addition to recreation and cultural entertainment, two other major considerations are a community's quality of health care and education.

Education

While education institutions design their academic/vocational programs to meet state and industry wide mandates and certifications, many higher institutions also offer some degree of customized curriculum and/or internships to meet local community employer needs. The specialized training programs of the Eastern Shore Community College (ESCC) in nursing, and public/private partnerships for industrial training are examples of the approach on the Eastern Shore. One objective of such initiatives is to help prevent what is often referred to as "brain drain" - the departure of young people leaving the area to pursue careers elsewhere. Again, not only is the education component a factor, but young professionals and craftsman will consider other quality of life issues when making a decision on where to live and work.

It is common for higher institutions to make an effort to integrate with the local community, partnering to some degree, on mutually beneficial initiatives. Because of the aggregated demand for bandwidth in a campus setting, higher institutions are usually targeted customers of service providers. In addition, most colleges/universities and vocational schools have full time information technology staff whose responsibilities include ensuring that the institution's technology needs are met.

K-12 schools and higher education institutions are eligible to obtain Internet access through NetworkVirginia at state-negotiated rates with local service providers. The ESCC purchases a full DS3 (45 Mbps) Internet connection for distance learning and wired Internet access by students and faculty on campus. A separate Digital Subscriber Line (DSL) is used for wireless (Wi-Fi) access in the lounge and some areas of the library. Currently, the College is not making full use of the bandwidth available, primarily due to the use of compressed video downloading instead of live video streaming. Future plans for increasing distance learning and web applications, particularly with the addition of the Business Development Center, will consume much more of the available bandwidth. Should the College implement streaming video courses for training, bandwidth will be constricted.

Each Accomack County Public School, including two Badger Vocational School locations, are connected to the District's network via T1 (1.54 Mbps) lines. The District office then connects via a partial DS3 (25 Mbps) through Verizon to Internet Service Provider (ISP) WHRO in Norfolk for access to the Internet. The Internet connection is used for accessing distance learning programs such as NovaNet; for State Standards of Learning (SOL) testing by students; and for Internet access by students and staff. Fees for Internet access total approximately $28,200 yearly after a significant eRate discount. Wireless access is available in all schools for use with teacher laptops and mobile computer labs. Currently, distance learning programs are used primarily for the Youth at Risk programs and general equivalency diploma (GED) completion. Teachers are taking advantage of distance learning programs that instruct on implementing technology into lesson plans. A significant technology investment has been made to equip teachers with tools for presentation and instruction. Students have access to computer stations and labs in the classroom. School district personnel estimate nearly 40% of students have no computers in the home; it is essential that teachers provide class time for computer access to complete assignments.

Homework Help programs and Parent Connect have not been implemented by the School District due to bandwidth constrictions and a lack of funding for the network equipment such programs would require. Streaming video would be a powerful tool for the school district to implement, particularly for sharing

classes between schools to address teacher shortages, but current bandwidth limitations rule out this option for delivering instruction. The Accomack Public Schools could greatly leverage learning opportunities through technology with an increase in bandwidth at affordable pricing.

Northampton County Public Schools share the same concerns and access limitations as Accomack. Current Internet bandwidth limits the amount of distance learning options available to the individual school sites. The percentage of students receiving free or reduced meals is lower in Northampton than Accomack, further reducing spending power and access to Universal Service Fund discounts for technology expenditures. The Northampton County schools desire access to higher bandwidth at pricing in line with the school district's technology budget to implement additional learning opportunities for students and teachers.

Survey responses from the Education sector of the business community represented 7% of the survey group, with most purchasing T1 (1.5Mbps) or partial T3/DS3 (10Mbps) in bandwidth. The majority state this amount of bandwidth is inadequate to meet their needs, with Internet access available to 50 or more workstations at each location. Teachers have been trained in implementing technology into their classrooms and are ready to utilize additional resources for educating students should the bandwidth become available to them. School district personnel report their concern that many teachers do not have broadband access at home, making it difficult for them to complete distance learning courses.

Figure 1.5-A: "Education, Public Safety and Select Verizon Facilities, and Proposed Fiber Routes" which follows identifies these facilities locations in relation to the proposed fiber routes.

Figure 1.5-A: "Education, Public Safety and Select Verizon Facilities, and Proposed Fiber Routes"

Healthcare

Shore Health Services has embraced technology and use of the Internet to benefit doctors and patients. Patient medical records are now available electronically, allowing doctors instant access to vital information. Using the Internet, lab results and scans can be sent to other hospitals and doctors for online collaboration and second opinions. Doctors need only access to the Internet, but at speeds beyond a 56 Kbps dial-up connection for transferring high-resolution images. In addition to doctor's offices, rural healthcare providers traveling throughout the Shore to see patients would benefit from a wireless Internet service to access records and upload case files. Shore Health is a technology leader in the community that will serve as a catalyst for technology adoption by other health care providers on the Shore.

Healthcare providers represented 7% of the business survey group, and nearly all subscribe to DSL or T1 Internet access. The majority state current access methods are adequate and most are satisfied with the current provider. A gap exists however, in that doctors do not have universal access from their homes as high-speed service is not available in all areas. Without high-speed service, a doctor that is roused at night to read an emergency scan must drive to the office where the service is available.

With the rapid interest and advanced applications in telemedicine and distance learning, the adoption of new applications by large healthcare systems and local health providers will provide incentive for providers to bring higher bandwidth access to the region.

Figure 1.5-B: "Health Care Facilities and Major Employers" which follows identifies not only the location of the facilities and employers, but identifies name and address.

Figure 1.5-B: "Health Care Facilities and Major Employers"

2.0 Broadband Education Development and Strategies

2.1 Local Technology Training and Resources

The State of Virginia recognizes the value of reliable, cost-effective high speed communication technology and the resulting impact on economic development and quality of life for Virginia residents. Technology is a focus in all areas of State oversight, and opportunities abound for incorporating technology into the daily lives of citizens. Aside from setting standards for technology use within government, technology training standards are a core education requirement in Virginia public schools. Adults seeking to become proficient in using computers and technology applications have many choices for learning, with flexible programs aimed to reduce potential barriers such as distance, time, and cost.

2.1.1 K-12 Schools

The Standards of Learning (SOL) for Virginia Public Schools include computer/technology as a core standard, with the goal of producing "Technology Literate" students that "possess technology skills that support learning, personal productivity, decision making, and daily life."[3] The skills learned during childhood lay the foundation for continuous learning and encourages adoption of new technologies and applications throughout adulthood.

Introduction to computer applications and Internet research are introduced early in grammar school years, integrated in all content areas rather than one specific course. Students are tested are various grades to ensure competency. By the end of grade 5, students should understand computer principles and technology, be able to process, store, retrieve, and send electronic information, and communicate using software. By the end of grade 8, students should become more skilled at communication using computer software, networks, and telecommunications; and practice processing, storing, retrieving, and transmitting electronic information. Throughout high school, students are expected to use technology and computer applications to collaborate with peers, express ideas and present work, perform Internet research, and possess an understanding of basic technology operations and concepts. Upon graduation from high school, students will be prepared to enter college or the workforce skilled at using technology for research, problem-solving, decision-making, and communication.

High school students have additional opportunities for study through State and District-approved online classes. Online classes, completed during students' time outside of normal school hours, allows for

[3] *Six-Year Educational Technology Plan for Virginia, 2003-2009; Computer/Technology Standards of Learning*

college-credit courses (Advanced Placement) to be completed prior to graduation for students that have the aptitude for advanced learning. This provides students with the flexibility to advance studies while taking a full schedule of college or tech prep courses offered at the local high school. A low percentage of students in Accomack Public Schools are attending online AP classes. A greater number of students are completing courses online for GED completion and programs designed for youth at risk (i.e. dropouts).

Teachers have access to online courses at home and through the school district providing instruction on implementing technology into classroom learning. Teachers are proficient in basic computer knowledge and classroom applications, and have been provided technology tools for presenting material to students and measuring comprehension. Nearly all teachers have completed basic technology instruction courses and could continue to receive further instruction using online resources. Video streaming – the ability to broadcast a live class session to another location - is not used by the school district because of a lack of available bandwidth.

NASA is a community partner with the Accomack public school district and offers a specialized program to students at Arcadia Middle School. The school district encourages other businesses in the community to become involved in the schools as well. Several years ago the school district offered computer training to the community through the vocational centers and received good response. Since the ESCC began offering instruction to the community, the school district discontinued efforts on their part and focused directly on students and teachers.

2.1.2 Higher Education

Accomack and Northampton County citizens seeking higher education opportunities have the advantage of the Eastern Shore Community College (ESCC), conveniently located near the middle of the peninsula in Melfa. Some credit courses are now being offered at a new instructional site in Cape Charles. ESCC is a two-year higher education institution offering four tracks of study:

Transfer Programs (Associate Degrees) – serve as the freshman and sophomore years of study for transfer to four-year institutions and completion of Bachelor's Degrees.

Occupational and Technical Programs – provide training and certification for specialized occupations, preparing students to enter the workforce.

Developmental Studies Programs – provide developmental studies for students who are not completely prepared for occupational-technical or college transfer curricula.

Web-based Instruction and Distance Learning Programs – provide access to courses not available through traditional onsite instruction, and allow flexibility for students to incorporate higher educational attainment with other life demands.

Distance-learning classes that utilize the Compressed Video Network (CVN) of the Virginia Community College System are available at the main campus. Distance learning provides the opportunity for students to complete courses not available through traditional instruction at the college. Courses taught using the CVN are interactive, allowing two-way video and audio instruction and collaboration between the instructor and students at two or more sites. Another option for completing coursework is taking online classes that are web-based and require independent study. This method requires access to the Internet and basic technology skills such as an understanding of computer fundamentals, web browsing, email use, and use of a word processing application. Anyone not possessing these basic skills should complete Fundamentals of Computer Information Systems offered at ESCC. Virginia Public School graduates should already possess the technology proficiency necessary for online course completion. The Virginia Community College System offers an extensive variety of courses available through online access.[4]

Distance learning is critically important for allowing students to complete degree programs, while remaining close to family and work. Too often students are forced to leave their communities to pursue higher education, and unfortunately many do not return to apply their knowledge locally. The out-migration of young adults reduces a community's ability to maintain a skilled, 'technology-literate' workforce and attract new businesses to the area.

2.1.3 Workforce Training and Continuing Education

The ESCC is a community partner in workforce training and continuing education, offering on-site classes as well as online and distance-learning programs to students and adults. Additionally, the ESCC works with local businesses providing specialized occupational training and certification to meet company needs. Local employers such as Blue Crab Bay, Perdue Farms, and Shore Bank have utilized these resources, as well as the Accomack County Schools for training teachers in ways to maximize the District's investment in technology. Flexibility is key to delivering effective training programs and the ESCC Workforce Development staff offers customized and onsite training to meet the needs of the business. Technology-focused workforce training offered includes:

[4] The Virginia Community College Online Resource for Students, http://www.vccs.edu/vccsonline/index.html

- Basic to Advanced Computer Applications Training
- Web Site Design
- Email Communication
- Business Uses of the Internet
- Accounting Software
- Database Software
- Programming & Networking
- CISCO Routing

Technology is also used to provide workforce training for specialized industrial trades such as forklift safety, contractor and building trades, and HVAC certification among others. For these specialized trades, training programs are two-fold; the student completes a review of materials via CD at a computer, followed by hands-on instruction at either the student's place of business or a community business partner's site. Several local businesses are partnering with ESCC to provide equipment and space to complete job training, as stakeholders in the community's future.

In the near future construction will begin on a new Business Development and Workforce Training Center located on the ESCC campus. This facility will allow an expansion of the current workforce training programs to include an increased use in distance learning technology. The Center's vision includes implementing training focused on higher skill and wage employment opportunities in aerospace, biomedical, telecommunications and maritime trades. Additionally, plans are forming to include training facilities for these additional trades in the proposed Wallops Island Research Park. High bandwidth access will be critical for these two locations. Currently, the ESCC has a 45 Mbps (DS3) Internet connection and is not experiencing bandwidth constraints. The future Business Development Center will be located on the ESCC campus and connected via fiber optics to the College's current network, and will increase the amount of bandwidth currently consumed by College activities. A high bandwidth connection will be necessary in the Wallops Island Research Park to facilitate the use of technology for implementing distance learning training, as the College will need to access the higher skilled programs from the online learning center of the Virginia Community College System (VCCS).

As the community partner, ESCC is positioned to respond to unique community needs. An excellent example is the Fall 2006 addition of a course directed to local businesses in preparation of the Jamestown 2007, America's 400th Anniversary events. "Attracting Jamestown 2007 Tourists to Your Business" aims to educate businesses on how to earn their share of the coming tourist dollars by marketing their services and products. A key component of marketing tools covered by this course includes the importance of web marketing. Businesses previously hesitant to adopt Internet marketing may embrace the opportunity to venture onto the information highway; entrepreneurs can take advantage of the Shore's exposure to

launch a new service or product. A tourism event of this magnitude and the proactive outreach to businesses by ESCC, could effectively stimulate e-commerce on the Eastern Shore for years to come.

Technology, along with a strong public/private partnership arrangement with the local Chambers of Commerce and the ESCC Foundation, enabled local businesses to attend a powerful seminar at ESCC in November 2006. Entitled "Leading at a Higher Level", this seminar featured legendary business leaders presenting strategies for building successful business organizations – delivered to the College via satellite. Due to the enormous expense required for satellite downlink fees, this opportunity would not have been feasible for the College alone to present. The Chambers and ESCC Foundation provided financial help in support of the program to benefit local businesses. The event was well-attended by business leaders on the Shore, and included workbook materials for follow-up use.

Another example of ESCC meeting the needs of all Eastern Shore citizens is the Continuing and Community Education programs offered at the ESCC campus, Cape Charles instructional site and Nandua High School. These classes are designed to attract residents of all ages and at all skill levels. Introductory classes include:

- How to Buy Your First Computer
- How to Protect Your PC
- Computers for Senior Citizens
- Introduction to Computers

Classes are offered for Microsoft Office applications such as Word, Excel, PowerPoint and Access for basic to advanced users, and an introduction to Quick Books. Proficiency in using these applications can be applied in the home, operating a business, or seeking new employment. Two additional classes – Doing Business on eBay, and Basic Business Contracting – are especially useful in jumpstarting entrepreneurial endeavors. Pricing is reasonable ranging from $30 to $130 for classes ranging in length from 3 to 18 hours, offered on days and at times convenient for working adults. Attendance is good for most basic computer and Microsoft application classes, especially those designed for senior citizens. In the past, intermediate and advanced Microsoft application classes poorly attended. Recent trends indicate employers are showing increased interest in contracting these training classes for employees in an effort to raise skill levels and increase productivity at the workplace.

2.1.4 Additional Resources

The State of Virginia has numerous resources available to businesses for growing and competing digitally. One-on-one assistance is available from local agencies such as the Virginia Employment Commission, the Accomack and Northampton Cooperative Extensions, and the Eastern Shore of Virginia Regional Partnership. Additionally, small/medium businesses and individuals have access to many online resources for e-commerce education and financial assistance through the Virginia Electronic Commerce Technology Center (VECTEC) located in Newport News. Another example of Virginia's pro-business focus is the Virginia Department of Business Assistance (VDBA). This department's goal is to connect businesses with the resources they need to meet challenges and realize market opportunities. "Since almost 99% of Virginia businesses are defined as small and they create the majority of new jobs, there is a special emphasis on building the capacity of these bold entrepreneurs."[5] The State maintains a resource directory for businesses at business.virginia.gov. Additional resources for technology education and implementation are available from the Virginia Center for Innovative Technology (CIT). CIT's mission is to accelerate Virginia's next generation of technology and technology companies.

Virginia Cooperative Extension offices are located in both Accomack and Northampton Counties. The Extension offices seek to spur economic and social change throughout the Shore by offering many training and informational workshops at low cost to participants. Training for businesses is focused on building entrepreneurial and managerial skills, with a strong focus on e-commerce. The Northampton County Extension office is leading an initiative to build and strengthen the Eastern Shore Portal as an economic development marketing tool. As envisioned, the Portal will be a voice of the community and a one-stop-shop for information on the Shore. Marketing efforts will include educating the business community on the benefits of being included on the Portal. The Extension offices also have computer workstations available for use by the community, some with Internet access. As training needs are identified and communicated, the Extension is a key partner in providing training – either directly or by networking with other community resources.

2.1.5 Public Libraries

Citizens without home access and visitors to the Shore can access the Internet and Microsoft Office applications at no charge through the local libraries in Accomac, Chincoteague and Nassawadox. Each location also has a wireless (Wi-Fi) network open to users with wireless-enabled laptops. Demand has

[5] Louisa M. Strayhorn, Director, Virginia Department of Business Assistance, *Connecting Businesses with Resources;* http://www.dba.state.va.us/about/default.asp

been steadily increasing. Local library patrons are the most frequent users, but out of town visitors commonly use the libraries' connection to access email while traveling. Patrons must have a current library card and not owe any money for overdue books. Exceptions are made for Shore visitors who need only present a driver's license to use a computer station. Many business travelers frequent the libraries to use the wireless (Wi-Fi) Internet connection. Station use is limited to one hour per person and access is being used for many functions. These include leisure activities such as surfing the Internet and email, to more critical job-search related functions such as working on resumes, researching job opportunities, and applying for jobs advertised by national databases such as Monster.com. It is becoming common practice for companies to require job applications be submitted only through an online process.

The Internet access connections at each of the libraries are shared between public users and staff. Staff access to the library circulation system is web-based. Patrons and staff have often complained about slow access, which may be caused by several factors such as the numbers of users accessing a single Internet connection, the types of web applications being accessed (e.g. streaming video) or the slow processing capabilities of aging computers.

Computer classes are offered at the Cape Charles library at no cost to patrons. The primary focus of training has been aimed at senior citizens. The Accomac library has offered classes on two occasions and interest was high. The libraries are unable to fund a training position and must rely on community volunteers. There is interest from patrons at all library locations for basic computer and application classes, and a particularly high number of requests for classes providing direction for selling on eBay.

The ESCC provides access to their library at no cost to the public. Approximately ten (10) computer stations are available but access is shared with students and limited to thirty (30) minutes per user. Separate computer stations are available for access to Microsoft Office applications such as Word and Excel. There is high demand at nearly all times for access and becoming more popular with the general public as an option for free Internet access. A wireless (Wi-Fi) network covers the lounge and most areas of the library, but signal strength is not ubiquitous. The wireless access is via a Digital Subscriber Line (DSL) and not part of the ESCC main network.

Library Location	Number of Public Computer Stations	Average Number of Users per Month	Method of Internet Access
Accomac (Main)	12 + Wi-Fi	700	Frame Relay
Chincoteague	3 + Wi-Fi	300-400	DSL
Nassawadox	6 + Wi-Fi	500	DSL
Eastern Shore Community College	10 + Wi-Fi	Unknown	DS3 and DSL

2.1.6 Public Safety Education Resources

APCO (Association of Public Safety Communication Officials) offers extensive training courses for public safety and emergency personnel. Training options consist of traditional instructor-led classes hosted by public safety agencies to convenient online courses and web seminars. Through a partnership with Jacksonville State University and the Institute for Emergency Preparedness, public safety employees can receive certification and degrees without leaving the Shore. Numerous other training courses are available online through agencies such as FEMA, Department of Homeland Security, US Fire Administration, and the Virginia Department of Emergency Management. To complete online courses, a student need only be skilled with basic computer knowledge to go online and use a web browser such as Internet Explorer. Accessing mission-critical training online seeks to close the preparedness gap between rural and urban public safety entities.

2.2 Current and Future Education/Resource Gaps

Training Classes

Eastern Shore residents and businesses currently have many fee-based options to receive training on computer use; basic word processing, database and presentation applications; and specialized industrial training and certification. All of the aforementioned courses can be applied immediately in the workforce, either to acquire a new job or for promotion with a current employer. Because training on the Eastern Shore is primarily provided through the ESCC as a community service, pricing for training is not unreasonable compared to private training firms. Additionally, financial assistance is available for employment training services to those that meet eligibility requirements under the Workforce Investment Act.

Education and training is readily available on the Shore to anyone desiring to improve skills using information technology. What is lacking is an understanding of the value of using advanced technology skills and many new applications of the Internet. Job seekers and current employees will complete training when required by employers. It is the Eastern Shore employers who must be shown the value of adopting new technologies and Internet applications.

Libraries are a significant resource for low to no-cost training. Library personnel report many citizens have expressed interest in obtaining access to computer training classes through their local branches. A majority of requests are for learning how to use online auctions such as eBay, both selling and buying.

Libraries must rely on volunteers to offer and conduct training, and there is a lack of both volunteers and space for adding additional computer stations to accommodate classes. Currently, there is no drive to solicit volunteers to conduct training. Budget shortfalls preclude purchasing additional workstations and space is a limiting factor specifically in Chincoteague. Additionally, the Chincoteague library is not open year-round and has limited business hours.

Help Desk Support

Residents and small businesses that consider themselves computer literate and are using the Internet are less inclined to seek training on specific applications, knowing enough to 'get by'. A significant number of both residents and businesses express frustration with service provider customer service. There is a need for a local help desk to provide immediate support for issues that may not require action on the part of service providers.

Computer Equipment

Income levels vary, and some residents simply cannot afford to purchase computers. Accomack Public School officials estimate as many as 40% of students may not have access to computers at home. For these students, free Internet access at a local library or community center is critical. Programs for donating used computers should be specifically targeted to families with children. Current computer donation programs are targeted towards GED students, but not families with younger school-age children. Dial-up Internet access can be obtained for as little as $9.95 per month if the household receives local telephone service, but the up-front cost of acquiring a computer is prohibitive for many low-income families.

Funding

All local sources contacted for input into this study exhibit an understanding of the necessity of affordable training options and the importance of marketing those options to the community. Nearly all are confined by a lack of available funding resources. Grant opportunities do exist but require extensive research and preparation beyond current staffing capabilities.

2.3 Broadband Education Development Strategies

Computer Refurbishing and Redistribution

The majority of residents and businesses participating in the end-user surveying process has computers and are using the Internet. Accomack Public School personnel estimate nearly 40% of students may not have computers at home. The public schools are the most likely resource for validating computer ownership by families, and the Districts should be encouraged to survey students for this information. Current computer donation programs that supply refurbished computers to GED students should be expanded to include families without computers, particularly to those with younger school aged children for early intervention. Federal computer donation programs should be reviewed[6], and local drives to encourage large employers to donate computers are suggested. Besides the ESCC, the Technical Schools are excellent resources for refurbishing donated computers. Microsoft is a partner in computer refurbishing and redistribution, providing license transfer of Windows software and support. Many computer vendors such as Dell encourage equipment recycling and provide support for redistribution to low-income families and non-profit groups. The States of Maine, Maryland and California have legislatively recouped funds from computer manufacturers to support recycling programs, keeping dangerous elements out of landfills while putting usable computers into the hands of those that can use them.

Computer Purchase Program

The City of Quincy, Florida was proactive in assisting families with children to purchase computers. The County School District cited telecommunications as a necessary tool for increasing student scores on State mandated competency tests. Working with the Dell Corporation and a local credit union, the City offered a program whereby families could purchase computers and dial-up Internet access. The NetQuincy purchase program and a Homework Helpline established with the School District enabled parents and students to utilize technology in their own homes. Subsequent Florida Comprehensive Assessment Tests (FCAT) required for graduation, resulted in high pass rates for students who participated in the City's Homework computer lab, proof that the program was achieving its objective. The City of Quincy is currently implementing a fiber optic network throughout the city limits as technology adoption by residents and businesses has resulted in a need for access at broadband speeds.

[6] Computers for Learning, EO 12999; http://www.computers.fed.gov/public/aboutProg.asp

Community Intranet

According to local sources, information is still most commonly communicated on the Shore by word-of-mouth, followed by radio. While this is typical for small towns in years past, it is inadequate today. The current Eastern Shore Portal (www.easternshorevirginiaportal.com) is a promising start to a community intranet, whereby Eastern Shore residents can access community information. All municipalities should be encouraged to participate and update information frequently. Citizens should be encouraged to utilize the Portal as their start page, where they can get instant news and information. Opportunities for training, seminars and workshops should be prominently featured along with upcoming community events. Key to the Portals success are links to the school districts, community health providers, online learning sites, and local businesses, enticing users to explore and frequent the site. In addition, this site should serve as the entrance to Economic Development information vital to those considering the Shore for a new business location.

The Portal should be maintained by one entity, eliminating the need for each contributing source to possess the required technical capabilities. All Eastern Shore businesses should be represented and links to business web sites provided. Marketing is a critical component of the Portal's success – locally and beyond.

e-Government

A large number of Eastern Shore residents are turning to the Internet for news; in the past six months, 72% have visited a news website and 59% a state or local government site. This represents an opportunity to promote e-government services to citizens, saving time and increasing productivity. All municipalities should have a web presence, accessible from the Portal and providing access to forms, online payments when possible, council meeting minutes, and contact information.

e-Commerce

The Eastern Shore is isolated geographically from the rest of Virginia and does not have the benefit of commerce from those 'passing through'. It is critical for Shore businesses to be proactive in marketing their products and services. The Internet offers a tremendous opportunity to reach those who may never happen upon their business. The Portal would provide a starting point for businesses to begin advertising online, with additional efforts aimed at educating businesses on the value of having their own website with a link from the Portal. Home-based businesses should also be included in the business listings on the Portal. In this manner, the Portal itself operates as a business incubator.

Training on Internet Use

The majority of residents and businesses are using the Internet, without realizing the full advantages the Internet offers. There is sufficient interest among both residents and businesses to support training classes on selling goods and services on the Internet. Training should include hands-on workshops whereby students actually place an item for sale on an online auction such as eBay. Additional training should be aimed at businesses as to where and how to market their business online.

A variety of computer and technology job skill training is available today at very low costs compared to private training providers. Entry level training on the Shore should continue to be low to no-cost to encourage as many as possible to participate, and to reach as many segments of the population as possible. Without funding options, libraries should organize opportunities for training classes that are Internet specific such as selling online and using search engines to conduct research. Volunteers are a critical component to filling training needs in the libraries or community centers, and municipal support is needed to advertise for trainers.

Lead by Example

Local businesses that have established websites, are conducting commerce via the Internet, and have embraced technology are the perfect spokespersons for educating others on the advantages of technology. Opportunities for business leaders to assist can be organized by the Chamber of Commerce, promoted through economic development workshops and marketed through the Portal. Local networking groups such as BusiNet provide support for business success, and additional groups should be encouraged throughout the Shore. Networking groups are becoming popular in many large cities, especially among young business people who have become accustomed to social networking.

The Broadband Experience

Those who are subscribing to a broadband method of Internet access such as DSL could not imagine going back to dial-up. Many residents were first introduced to the Internet at the workplace, and adopted Internet access at home primarily for email communication with family and friends. Many moved beyond applications such as email, to transferring digital pictures, and now online video. As the applications continue to evolve and more information becomes readily accessible, a greater value is placed on the speed of the connection.

Municipalities who have led the way by building fiber optic networks in their communities have made kiosks available for their citizens to see, feel and experience 'broadband'. Community venues include city halls, local shopping mall exhibits, chamber of commerce events, and public works buildings.

Encourage Local Provider Service Marketing

Too many businesses on the Shore do not understand the value of Internet applications beyond email and research. Nearly one-third are spending in excess of $300 per month for regular phone service, and presumably long-distance toll charges account for a large portion. Many commented that phone service is too expensive, yet Voice over Internet service offers an affordable alternative and only 21% of businesses with Internet access are taking advantage of this service today. Only 14% indicated any interest in using this service in the future. Too many businesses are presumed to be unaware of the security feature of using VPN (virtual private network) for remote access to their networks and sensitive information; only 5% are currently using this, and only 7% indicate interest in future use. A larger percentage of businesses are interested in video conferencing, an application that functions optimally with a broadband connection. All of these applications are available for use today, and local Internet providers offer services to support their use. Service providers should tailor marketing of these products towards Eastern Shore businesses, with emphasis on the value these applications can potentially provide to the business.

3.0 Network Design, Last Mile Connectivity Options and Cost Considerations

3.1 Open Access Networks

The definition of open access networks varies in meaning to different stakeholders in a community. Some examples include:

Customer Perspective: The end-user can choose to receive service from any number of multiple service providers offering comparably priced and quality of services over a common last mile infrastructure.

Local Government Perspective: A ubiquitous communication system that provides abundant and affordable bandwidth as an attraction to companies to locate or stay in the community for economic development gain, jobs and increased tax base.

Service Provider Perspective: A network for wholesale access consistent within new regulatory framework of electronic telecommunications capabilities and rules of competition.

3.2 Service Area Determination

Once the base map of boundaries for Accomack County and the Towns of Chincoteague and Exmore/Nassawadox was overlaid with the study data collected such as economic development data including major employers, industrial/commercial parks, growth corridors, zoning data, schools, health care facilities, municipal service buildings, public safety agencies, etc., as well as existing service provider data such as Central Office Locations and other facilities and infrastructure, the proposed preliminary fiber route locations were laid out to provide direct connectivity to the targeted end-use customers of business, education institutions and health care facilities.

In addition, by overlaying the study area with population and housing density data, an idea of the population that could be served and premises passed could be estimated. The areas most feasible for consideration to be served by fiber became more apparent. Figure 3.2-A addresses the population for the study area, and Figure 3.2-B breaks down the housing units per square mile for the study area.

After the proposed preliminary routes were laid out, a network specialist spent approximately one (1) week in the field determining if the preliminary route on paper maps was the most cost feasible route location or if modifications to the route needed to be made to take advantage of pole lines, easier access, avoidance of boring or excavating, etc. In addition, the network specialist conducted a "make-ready" assessment (existing utility infrastructure movement, replacement or other modification that would be needed to accommodate new additional infrastructure in compliance with National Electric Code requirements), to be used in developing a cost estimate for build-out of the outside plant.

Figure 3.2-A: Population

Figure 3.2-B: Housing Density per Square Mile

The proposed fiber distribution network itself and the premises located within 0.1 miles (528 feet) along the route are being considered the "Primary Service Area". This area is being targeted as where a direct fiber connection would be pursued.

The areas within one and one-half (1-1/2) miles of the distribution network route were identified as the second priority areas ("Secondary Service Area" location). The technology for connectivity in this service area may be a wireline solution for some premises or a wireless solution, depending on whether there is a pole line or available conduit, extent of make ready work, and many other obstacles and cost factors.

The third priority area for focusing efforts to enhance broadband access would be the more rural areas located more than one and one-half (1-1/2) miles from the distribution network ("Tertiary Service Area" location). A wireless solution is expected to be the more practical access network technology used. The characteristics of this rural area make consideration of a fiber solution unfeasible to consider at this time.

The following data was used to determine residential penetration estimates:

Estimated Primary and Secondary Service Area Residential Penetration:

36,106 people Primary & Secondary Service Area / 17,984 Housing Units =

2.0 people /Housing Unit ◄ Reasonable

Say 40 % Take Rate = 0.40 x 17,984 Homes = 7,194 Homes

Say 50% wireline (fiber solution) and 50% wireless solution

0.50 x 7,194 Homes = 3,597 Homes Fiber Solution and 3,597 Homes Wireless Solution

Estimated Tertiary Service Area Residential Penetration:

6,801 people in Tertiary Service Area / 3,824 Housing Units =

1.8 people/Housing Unit ◄ Reasonable

Say 40 % Take Rate = 0.40 x 3,824 Homes = 1,530 Homes

Say 100% Wireless Solution = 1,530 Homes Wireless Solution

Estimated Primary, Secondary and Tertiary Service Area Residential Penetration:

3,597 Homes Fiber Solution and 5,127 Homes Wireless Solution

Table 3.2-A that follows provides detailed information and distribution across the three networks.

Table 3.2 – A: Service Area Features

Features	Northern Fiber Network					Central Fiber Network					Southern Fiber Network					Total						
	Primary Service Area (Within 0.1 Mile of Fiber)	**Secondary Service Area** (Between 0.1 Mile and 1-1/2 Miles)	**Total**	**Estimated Subscriber Take Rate for Fiber Solution**	**Estimated Subscriber Take Rate for Wireless**	**Primary Service Area** (Within 0.1 Mile of Fiber)	**Secondary Service Area** (Between 0.1 Mile and 1-1/2 Miles)	**Total**	**Estimated Subscriber Take Rate for Fiber Solution**	**Estimated Subscriber Take Rate for Wireless**	**Primary Service Area** (Within 0.1 Mile of Fiber)	**Secondary Service Area** (Between 0.1 Mile and 1-1/2 Miles)	**Total**	**Estimated Subscriber Take Rate for Fiber Solution**	**Estimated Subscriber Take Rate for Wireless**	**Primary Service Area** (Within 0.1 Mile of Fiber)	**Secondary Service Area** (Between 0.1 Mile and 1-1/2 Miles)	**Tertiary Service Area** (Beyond 1.5 Miles from Fiber)	**Total**	**Estimated Subscriber Take Rate for Fiber Solution**	**Estimated Subscriber Take Rate for Wireless Solution**	**Estimated No Service or By Other Providers**
Economic Dev. Feature																						
College	0	1	1	1	0	3	1	4	4	0	1	0	1	1	0	4	2	0	6	6	0	0
School	4	1	5	5	0	1	9	10	10	0	1	2	3	3	0	6	12	0	18	18	0	0
Fire Station	5	1	6	6	0	7	1	8	8	0	2	0	2	2	0	14	2	0	16	16	0	0
Library	1	0	1	1	0	1	0	1	1	0	1	0	1	1	0	3	0	0	3	3	0	0
Health Facility	4	0	4	2	1	4	2	6	2	2	4	2	6	2	2	12	4	0	16	6	5	5
Police Station	1	0	1	1	0	6	1	7	7	0	1	0	1	1	0	8	1	0	9	9	0	0
Industrial Park	0	1	1	1	0	2	1	3	1	1	0	0	0	0	0	2	2	0	4	2	1	1
Major Employers	1	4	5	2	1	5	3	8	3	3	2	3	5	2	1	8	10	0	18	7	5	6
Subtotal			24	19	2			47	36	6			19	12	3				**90**	**67**	**11**	**12**
Estimated Penetration																						
Estimated Non-Residential Not Accounted For (Small Employers, Doctor Offices, Malls, etc.); say twice as many as those accounted for				19	15				38	28				15	11				**180**	**72**	**54**	**54** (Some additional Non-Residential Premises exists outside 1-1/2 miles of fiber; negligible)
Est. Residential Served Fiber				1,597					1,543					457		3,597 Residential Fiber			**3,597**	**3,597**		
Total Premises Served via. Fiber Solution				**1,635**					**1,617**					**484**						**3,736**		
Est. Residential Served Wireless					1,597					1,543					457	3,597 Residential Wireless		1,530 Residential Wireless	**5,127**		**5,127**	
Total Premises Served by Wireless Solution					**1,614**					**1,577**					**471**	3,662		1,530 Residential Wireless			**5,192**	
Total Premises				**3,249**					**3,194**					**955**				**1,530**				

Served																			**Residential Wireless**				
Total Housing Units Premises Passed Not Served or Served By Others		4,790				4,631					1,369								**9,260**			9,260
Total Non Residents Premises Passed Not Served or Served By Others		17				33					16					**7,251**	**1,563**		**18,254**	**3,736**	**5,192**	**9,326**
Premises Passed in Tertiary Service Area Not Served or Served by Others (Divided using same percent as Primary and Secondary Areas not served or served by others)		1,016				985					293							1,530	**3,824**			
Total Premises Passed Not Served or Served By Others		5,823				5,649					1,678											
Total Premises Passed Served and Not Served or Served By Others		9,072				8,843					2,633							1,530	**22,078**			
Demographic Data	**Primary and Secondary Service Areas** (Within 1-1/2 Miles of Fiber)					**Primary and Secondary Service Areas** (Within 1-1/2 Miles of Fiber)				**Primary and Secondary Service Areas** (Within 1-1/2 Miles of Fiber)						**Primary and Secondary Service Areas** (Within 1-1/2 Miles of Fiber)		**Tertiary Service Area** (Beyond 1-1/2 Miles)	**Total**			
Square Miles	93.19					131.17				38.04						262.40		208.48	470.88			
Population	13,529					17,566				5,011						36,106		6,801	42,907			
Pop. Density	145.18					133.92				131.75						137.60		32.62	91.12			
Housing Units	7,984					7,717				2,283						17,984		3,824	21,808			
Housing Units Density	85.67					58.83				60.02						68.54		18.34	46.31			

3.3 Access Network Installation and Equipment Costs

To estimate installation costs for those premises located within 1-1/2 miles of the fiber distribution network that are intended to be served through a direct fiber optic connection, for conceptual purposes the average of two (2) methods was used. The first uses an estimated average length per premise based on total premises passed and total length of roads. The second method calculates the estimated fiber length using 40% penetration assuming equal distribution of premises along net length of road arrived at by subtracting the distribution network route length from the total road length. For conceptual design estimating purposes, the resulting average fiber length appears reasonable.

Table 3.3-A: Estimated Access Network Fiber

Route	Length of Primary Roads within Primary and Secondary Service Area (within 1-1/2 miles of fiber)	Fiber Distri-bution Route Length	Remain-ing Road Lengths	Estimate of Total Premises Passed	Estimate of Total Premises Passed within Primary and Secondary Service Areas	Average Length per Premise Based on Total Premises Passed and Total Length of Roads		Number of Premises Estimated to be Served by Fiber	Estimated Minimum Fiber Length of Access Network	Estimated Fiber Length (Using 40% Penetration assuming equal distribution of premises along road)	Average Fiber Length	Estimated Fiber Access Network Costs @ $25,000 - $35,000 per mile (primarily aerial)
Northern Accomack County/ Chincoteague Fiber Route	282 Miles	54 Miles	228 Miles	9,072 Primary and Secondary + 677 Tertiary = 9,748	9,072	164 Feet		1,635	51 Miles	91 Miles	71 Miles	$1,775,000 - $2,485.000
Central Accomack County Fiber Route	430 Miles	65 Miles	365 Miles	8,843 Primary and Secondary + 658 Tertiary = 9,501	8,843	257 Feet		1,617	79 Miles	146 Miles	113 Miles	$2,825,000 - $3,955,000
Southern Accomack County / Exmore/ Nassawadox Fiber Route	117 Miles	20 Miles	97 Miles	2,633 Primary and Secondary + 196 Tertiary = 2,829	2,633	235 Feet		484	22 Miles	39 Miles	31 Miles	$775,000 - $1,085,000
Total	**829 Miles**	**139 Miles**	**690 Miles**	**22,078 Premises**	**20,548 Premises**			**3,736 Premises**				**$5,375,000- $7,525,000**

The average lengths per premise is less for the northern Accomack County/Chincoteague Fiber route (164 feet per premise) than the central Accomack fiber route (257 feet per premise) and southern Accomack fiber route (235 feet per premise) because of the greater housing density per square mile attributed to the Chincoteague area. These distances represent an average in which some premises would require less and some would require more. Fiber installation costs for the Access Network is estimated to range from $25,000 to $35,000 per mile because it is believed service providers using their own poles and construction crews (non-prevailing wage rates) can construct the network at less cost than the average $40,770 per mile of the community's distribution network. In addition, portions of the access network will be drops to the premises which are relatively inexpensive compared to pole-line, trench or buried construction.

3.4 Installation and Equipment Costs

In addition to fiber runs, there will be Network Operating Center (NOC) costs, the initial installation cost, network interface device (NID) terminals at the demarcation point, incremental NOC equipment and if not existing, probably IPTV headend costs. Many municipal owned and run networks elect not to invest in telephone (voice) equipment and services because of being more demanding regulations to comply with. If not provided by another provider switching equipment would also be an expense.

Table 3.4-A: Installation and Equipment Costs

Project Component	Cost	Average Costs	Cost Subtotal	Unit Price Range (Per Subscriber Potentially served via Fiber = 3,736)	Unit Price (Per Subscriber Potentially Served via Fiber = 3,736)
Access Network Fiber Run Up to 1-1/2 Miles (215 Miles @ $25,000 - $35,000 per Mile; primarily aerial)	$5,375,000 - $7,525,000	$6,450,000		$1,439 - $2,014	$1,726
NOC and Equipment (Data & Video)	$870,205 - $1,055,355	$962,780		$233 - $283	$258
Installs	$1,259,020 - $1,536,745	$1,397,883		$337 - $411	$374
Outside NID Terminal (ONT)	$1,666,350 - $2,036,650	$1,851,500		$446 - $545	$496
Incremental NOC Equipment	$648,025 - $796,145	$722,085		$173 - $213	$193
IPTV Headend and NOC	$1,080,000 - $1,320,000	$1,200,000		$289 – $353	$321
Subtotal Installation/ Equipment Costs	**$10,898,600 – $14,269,895**		**$12,584,248**	**$2,917 - $3,819**	**$3,368**

3.5 Reoccurring Service Provisioning and Operating Costs

In addition to equipment and installation costs, there are reoccurring service provisioning and operating costs. Most service providers that would construct a fiber-to-the-premises network will need to offer multiple voice, video and data services in order to collect sufficient revenue to pay for the capital investment and ongoing costs. There will be service provisioning costs to transport content across the community's distribution network, bandwidth costs to run applications, and content costs to offer potential subscribers.

If the access network is constructed by a new provider or represents a significant increase in operations for an existing provider, operating costs may include additional staffing needs such as customer sales and service representatives, billing clerks, and technical field people, in addition to facility, equipment and materials costs such as office/garage space, utility billing software, computers, and invoice/bill materials. Training cost for personnel is also an operating cost. Depending on the decision to outsource or company policies, other costs might include bucket trucks, OTDR (fiber testing) equipment, connection tools and much more.

Table 3.5-A: "Fiber Distribution Network Reoccurring Service Provisioning and Operating Costs" that follows touches on some of the big ticket items, but not all assuming some outsourced services would be utilized (which would be additional operating costs) or perhaps an existing service provider could serve new customers utilizing some existing equipment. If a decision was made to continue pursuing any of the distribution networks, a much more detailed analysis would need to be performed.

Table 3.5-A: Fiber Distribution Network Reoccurring Service Provisioning and Operating Costs

Project Component	Cost Range	Average Costs	Cost Subtotal	Unit Price Range (Per Subscriber served = 3,736)	Unit Price Average (Per Subscriber served = 3,736)
Service Provisioning Costs					
Dark Fiber Lease/Transport (1x costs included in NOC Costs)	$120,000 - $240,000	$180,000		$32 -$64	$48
Bandwidth Purchase (Wholesale scalable) (1x costs included in NOC Costs)	$72,000 - $120,000	$96,000		$20 -$32	$26
TV Content Purchase	$806,976 - $1,210,464	$1,008,720		$216- $324	$270
Subtotal	**$998,976 - $1,570,464**		**$1,284,720**	**$268- $420**	**$344**
Operating Costs					
Customer Service Representatives/Sales (2)	$72,000 - $108,000	$90,000		$20 -$28	$24
Marketing Materials	$24,000 - $36,000	$30,000		$6 - $10	$8
Billing Clerk/Software/Invoices	$128,000 - $192,000	$1600,000		$34 - $52	$44
Technical Field Personnel (2)	$80,000 - $120,000	$100,000		$22 - $32	$26
Technical Office Personnel (System Manager and Assistant)	$96,000 - $144,000	$120,000		$26 - $38	$32
Office & Garage Lease/Equipment/Furnishings	$48,000 - $72,000	$60,000		$12 - $20	$16
Training Costs	$24,000 - $36,000	$30,000		$6 - $10	$8
Subtotal	**$472,000 - $708,000**		**$590,000**	**$126 - $190**	**$158**
Total	**$1,470,976 - $2,278,464**		**$1,874,720**	**$394 - $610**	**$502**
Cost per Subscriber (3,736)				**$502**	

3.6 Last Mile Connectivity Solutions

This study was funded under grants from the State of Virginia whose primary objective is to ensure community sustainability and competitiveness. The grants mandate a focus on healthcare, education, emergency services and business needs with an emphasis on collaborations with the private sector. While this may appear to minimize the needs of individual residents, practically the planning used in this work can be useful as part of a roadmap to a more general deployment.

A close reading of the previous sections of this report provides the basis for the types of technologies which should be considered. With some exceptions the communities are relatively rural. Many areas are served with DSL and some areas have cable television. The predominant means of receiving cable service, however, is via satellite highlighting the older technology and lack of data capabilities of the incumbent. The DSL service, while offering much more bandwidth than dial-up services and at generally affordable prices, is reportedly unreliable with frequent, extended outages.

Traditionally, highly reliable data services are available from the incumbent telephone provider (e.g. T1 lines at 1.5 Mbps) but at pricing which are stagnant. Similar services in more competitive areas are offered at much lower prices which continue to decline. Businesses who must afford themselves of these services—e.g. hospitals—are priced out of very high bandwidth solutions which would allow them to better communicate to other locations with better resources. Entrepreneurial businesses for which affordable high bandwidth services are critical but who are not tied geographically to this area will simply chose to locate elsewhere.

Several additional points concerning the three service areas are also germane to this study. Perhaps the most important is the expected expansion of Mid Atlantic Broadband Cooperative (MAB) from the southern portion of the State of Virginia up Highway 13 from the Chesapeake terminating at least initially at Federal facilities on Wallops Island. MAB is a not-for-profit whose mission is to provide broadband infrastructure which will bring affordable data access to rural areas of Virginia. They do not provide retail service, but rather work with incumbents and other providers to provide low cost, wholesale data communications at prices comparable to that in urban areas of the country. As a practical matter this means that a local ISP (Internet Services Provider) or municipality providing broadband services could use the MAB fiber optic network to transport data outside (long haul) of the eastern shore. The availability of such a service is one critical aspect in providing affordable broadband to any more rural area. Federal and State funds to design this new portion of the network were recently obtained with

preliminary layout of the network route begun in March 2007. In the earlier MAB network built in southern Virginia, network access points were provided at numerous industrial parks, colleges and some hospitals. It has not been announced as to which, if any, such connection points will be installed along the Eastern Shore. At a minimum their data signals must be amplified (regenerated) approximately every thirty miles. At those locations, sometimes called "Points of Presence" or POPS there will be the potential for other private networks to make connections to the long haul carriers. Depending on agreements to be developed, the "regen" facilities may be collocated at facilities owned by incumbent providers or in small facilities built by MAB for that purpose. In the later case a typical installation would include a portion operated only by MAB with a separate area in which a local provider might lease space to install network equipment to connect to the long haul carrier.

Another network is being developed by the Maryland Broadband Cooperative (MBC), founded to provide similar broadband services to rural areas of that state, but terminating on its southern end at the Wallops Island Flight Facility. This would provide an additional communications path and additional competition for long haul data transport into and out of the Eastern Shore.

Another important variable in the development of broadband on the eastern shore is the importance and seasonal nature of its tourist industry. Many of the structures on the more urban areas (e.g. Chincoteague) do not have year around residents. With the high infrastructure cost of some broadband solutions, a constant and not seasonal customer base is important.

A final point important to economic development is the lack of transportation routes through the area. With only one major artery running north and south and none in the east-west direction, broadband services could play a more important role in the economy than in areas with more land communications options.

The components of broadband service beyond the "back-haul" MAB or MBC network are the local transport within each community (if any) and the last-mile or final connections to the end user. The simplest and least expensive solution for local communities is to rely on private providers to make all connections to the "back-haul" network. MAB offers to provide lateral connections from their network POPs to locations such as an ISP network center. In this case the cost of paying for the lateral would be borne by the purchaser with MAB providing only the transport of data between the ISP and a Tier 1 Internet provider with connections made in Atlanta or Washington. From the ISP network center, the

Last-mile connection would be the responsibility of the ISP and could be a fiber optic connection to one or many users, or more likely a wireless or POTs line or (P)lain (O)ld (T)elephone, the telephone service provided by the incumbent telephone company. The local community might also connect to MAB in the same way operating as an ISP to residents or providing wireless services internally for municipal uses or public safety.

A second solution is for the local communities to install some fiber optic cable and install a network over which they or other providers might connect to end users. This approach has the benefit of pushing fiber optic cable farther into the community, connecting directly important locations such as schools and hospitals while facilitating an end use partnership with a private provider to reach smaller businesses and residents. If constructed first as a public service network, it may qualify for funding from RUS (Rural Utility Service) or some other Federal or State agency. It can also facilitate the reliable, low cost, high bandwidth connections needed by hospitals, schools and municipal centers. This second approach was utilized during the costing phase which follows and is discussed throughout the report. One or more completely redundant ring was provided in each study area.

A third network architecture extends the network to every home and business passed by network fiber. Sometimes called Fiber to the Premise (FTTP). While the solution can be implemented in only the more densely populated areas, the expense per home is still quite high in addition to the cost of the installation of fiber ($30-$50k/mile). This is the architecture used in municipal deployments such as Bristol, VA and installed in some urban areas by incumbent providers such as Verizon.

3.7 Wireless Solution Consideration

There are a number of wireless solution technologies that a provider might implement. The following are the more popular technologies being used or experimented with.

Fixed Broadband Wireless (FBW) Access

Originally called “wireless cable”, FBW often refers to LMDS (local Multipoint Distribution Service), as well as MMDS. LMDS operates in the 28Ghz and 31Ghz bands with theoretical data rates up to 1.5 Gbps to 2 Gbps downstream; more realistic speeds average around 38 Mbps. Generally, frequencies above 10 GHz are known as LMDS. MMDS operates in the 2.5 GHz band, reaches speeds up to 27 Mbps over

unlicensed channels or 1 Gbps over licensed channels. Other frequencies are the 24Ghz, 26 GHz, 38 GHz and 39 GHz bands.[7]

Satellite

While not always referenced as a wireless solution with other wireless land based solutions, satellite has advertised maximum speeds of 400 Kbps, but because of shared networks, the average data throughput may be significantly less. Receiving equipment needed by users cost about $400. Speeds are low compared to cable and DSL, though within the next generation of KA-band satellites and spot-beam technology is being launched, providing speeds over 1 Mbps.[8] Data transmission and reception over satellite is not new; very small aperture terminal (VSAT) providers have been providing data connections to businesses, such as banks, for many years. What is relatively new is the adaptation of this technology for consumers. Internet access via satellite is much more costly than either cable modem or DSL and as such is usually the last choice for urban users but possibly the only choice for rural consumers.

Satellite Internet access is available to New York residents from DirecTV and Dish Network and Wild Blue. DirecTV offers Internet access via two-way satellite dishes. This service is titled 'DirecWay' and promises upload speeds of up to 128 Kbps and download speeds up to 400 Kbps. This "always on" Internet connection does not require a phone line. DirecWay offers a dish capable of receiving the DirecTV signals as well, so although a more costly investment is required, only one dish is necessary. Dish Network does not offer Internet access directly; StarBand™ is a satellite communication system that interfaces with Dish Network's satellite television service. Advertised as "10 times faster than dial-up"; download speeds advertised as up to 500 Kbps (targeted minimum speeds in excess of 150 Kbps). Current DishNetwork customers that wish to add Internet access must purchase a StarBand dish; however, the StarBand system can be configured to receive the television service from DishNetwork as well as the Internet access. Wild Blue is a new entry into the satellite Internet arena. They offer a variety of packages up to 1.5 Mbps downstream with 256 Kbps upstream. Pricing between the three is fluid and competitive.

[7] Source of information: Moving Towards Broadband Ubiquity in U.S. Business Markets, April 2001, Cahners In-Stat Group 2001.
[8] Source of information: Moving Towards Broadband Ubiquity in U.S. Business Markets, April 2001, Cahners In-Stat Group 2001.

Mobile (e.g. Third Generation Mobile – 3G, 2.5G and 4G)

Unlike DSL, Cable and fixed wireless, which are still relatively computing-centric, Third-Generation (3G) wireless combines high-speed data access with the mobility of handsets. 3G provides over 384 Kbps of bandwidth and the promise of streaming video and videoconferencing. 3G technologies include CDMA2000 and Wideband CDMA (W-CDMA). CDMA2000 is digital spread-spectrum cellular standard with data rates ranging from 384 Kbps for mobile applications to well over 2 Mbps for stationary applications. W-CDMA is the evolutionary path for GSM, the standard with the majority of worldwide cellular subscribers. W-CDMA data rates compare to CDMA2000, 384 Kbps – over 2 Mbps. Both CDMA2000 and W-CDMA are shared resource technologies, meaning that these transmission levels are shared across all users within one RF carrier per sector.[9]

Fourth-Generation (4G) systems will provide an end-to-end IP solution where voice, data and streamed multimedia can be served to users on an "Anytime, Anywhere" basis at higher data rates than previous generations. The following are just some of the 4G objectives defined by the Working Group:

- A nominal data rate of 100 Mbits/s while the client physically moves at high speeds relative to the station, and 1 Gbit/s while the client and station are in relatively fixed positions,
- A data rate of at least 100 Mbits/s between any two points in the world,
- Smooth handoffs across heterogeneous networks,
- Seamless connectivity and global roaming across multiple networks,
- High quality of service for next generation multimedia support (real time audio, high speed data, HDTV video content, mobile TV,
- Interoperability with existing wireless standards.[10]

Optical Wireless (Free-Space Optics)

Optical wireless technology or free-space optics facilitates broadband communication through the atmosphere using line of sight optical signals up to distances of a few kilometers. Compared to optical fiber and fixed microwave systems, optical wireless is an inexpensive solution which is quick and easy to install.[11]

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[9] Source of information: Moving Towards Broadband Ubiquity in U.S. Business Markets, April 2001, Cahners In-Stat Group 2001.

[10] 4G - Wikipedia @ http://en.wikipedia.org/wiki/4G

[11] Future Delivery of Broadband in Ireland, September 19, 2002, Office of the Director of Telecommunications Regulation, Dublin Ireland

Wi-Fi

Wi-Fi is short for *wireless fidelity* and used generically when referencing any type of 802.11 network. 802.11 refers to specifications developed by IEEE, and accepted in 1997, for wireless technology. An 802.11 network specifies an over-the-air interface between a wireless end-user and a base station or between two wireless end-users. There are several specifications that applies to wireless LANs (Local Area Networks) which includes 802.11 which provides 1 or 2 Mbps transmission in the 2.4 GHz band (using frequency hopping spread spectrum or direct sequence spread spectrum); 802.11a which is an extension to 802.11 and provides up to 54 Mbps in the 5 GHz band (using orthogonal frequency division multiplexing encoding); 802.11b which is an extension to 802.11 and provides 11 Mbps transmission with a fall back to 5.5, 2 and 1 Mbps in the 2.4 GHz band (uses only direct sequence spread spectrum); and 802.11g provides 20+ Mbps in the 2.4 GHz band.

WiMax

WiMax is an acronym for Worldwide Interoperability for Microwave Access. roducts are certified if passing compatibility and interoperability tests for IEEE 802.16 standards, specializing in point-to-multipoint broadband wireless access (BWA) networks. 802.16 wireless connection technology is expected to enable multimedia applications with a range of up to 30 miles. There is a wireless industry coalition to advance IEEE 802.16 standards and develop and certify devices for the industry.

WLAN (Wireless Local Area Network)

WLAN uses high-frequency radio waves between nodes rather than wires to communicate.

Ultra Wideband (UWB)

UWB transmits ultra-low power radio signals with very short electrical pulses across all frequencies at once. Ultra Wideband is a wireless technology that can transmit data at speeds between 40-60 Mbps, eventually up to 1 Gbps. Ultra Wideband spans license and unlicensed frequencies and can be used indoors and underground.

Problems with Wireless Solutions Using existing Infrastructure

Most existing subscriber loops cannot support an acceptable level of digital transmission. Most rural telephone loops are engineered to support analog voice (3-4 kHz) and very low speed data service (up to 9.6 kb/s). The estimated cost of upgrading existing telephone non qualified loops to support an acceptable level of digital transmission (featuring load coils, non-filled cable, etc.) is anywhere from $50-$2,000 per subscriber. The monthly cost deploying a rural broadband network is estimated to be between $92-$132 a month per line depending upon the period for deployment (10-20 years). [12]

Another technique for providing broadband telecommunications to rural areas is through upgrading the existing rural coaxial cable system with fiber optic trunk lines and interconnecting to the public switched telephone network. In Accomack County, the majority of customers subscribe to satellite delivered television.

For rural areas where too expensive for improved loop architecture, alternative choices include satellite, point or multipoint radio and cellular radio. Again, cellular connectivity appears to be an obstacle in Accomack County. Many complaints were voiced regarding poor cellular service and dependability.

[12] TVA Rural Studies "Improving Rural Telecommunications Infrastructure" by Bruce L. Egan, Columbia University; http://www.rural.org/workshops/rural_telecom/egan/6.htm

4.0 Chincoteague & Northern Accomack County (Northern Fiber Distribution Network) Data

Table 4.0 – A: Chincoteague and Northern Accomack County Make Ready Work Field Data

	Mileage								
Chincoteague and Northern Accomack County Area	**No-Make Ready**	**Typical Make Ready**	**Buried**	**Total**	**Estimated Poles**	**Application Fee for No Make Ready Poles**	**Avg. Make Ready Cost**	**Total Estimated Make Ready**	**Calculated Make Ready Cost/Pole**
Fiber Ring	3.5	20.3	1.8	25.6	643	$4,300	$137,025	$141,325	$220
Greenback Spur Total	0.1	3.9	0.2	4.2	108	$123	$26,325	$26,448	$245
Saxis Spur Total	0.0	11.3	0.0	11.3	46	$0	$11,475	$11,475	$250
Chincoteague Spur Total	6.2	4.9	0.0	11.1	300	$7,617	$33,075	$40,692	$136
Chincoteague and Northern Accomack County Area Total	**9.8**	**40.4**	**2.0**	**52.2**	**1097**	**$12,040**	**$207,900**	**$219,940**	**$213**

Table 4.0 – B: Chincoteague and Northern Accomack County Cable Construction Field Data

Chincoteague and Northern Accomack County Area	Aerial Routing Mileage	Buried Routing Mileage	Total Routing Mileage	Total Mileage for Planning	Fiber Cable Size	Routing Cost	Soft Costs	Field Data Make Ready and Cable Construction Cost	Planning Purpose Total w/20% Variance
Fiber Ring	23.8	1.8	25.6	26.5	144	$769,090			
Greenback Spur Total	4	0.2	4.2	4.5	96	$101,374			
Saxis Spur Total	11.3	0.0	11.3	11.5	96	$274,206			
Chincoteague Spur Total	11	0.1	11.1	11.1	96	$311,926			
Chincoteague and Northern Accomack County Area Field Data Cost Summary	50.1	2.1	52.2	54		$1,456,596	$348,267	$2,089,602	
Chincoteague and Northern Accomack County Area Planning Cost Summary				**54**		**$1,457,000**	**$348,000**	**$2,090,000**	**$1,672,000 - $2,508,000**

Table 4.0-C: Chincoteague and Northern Accomack County Fiber Distribution Network Costs

Project Component	Cost	Average Costs	Cost Subtotal	Unit Price Range (Per Subscriber Potentially served via Fiber = 1,635)	Unit Price (Per Subscriber Potentially Served via Fiber = 1,635)
Northern PSA Fiber Capital Costs and Soft Costs **Outside Plant transport infrastructure; labor/materials/make ready and Associated Soft Costs** **Subtotal Fiber Capital Costs/Soft Costs**	**$1,672,000 - $2,508,000**		**$2,090,000**	**$1,023 - $1,534**	**$1,278**
Access Network Fiber Run Up to 1-1/2 Miles (71 Miles @ $25,000 - $35,000 per Mile; primarily aerial)	$1,775,000 - $2,485,000	$2,130,000		$1,086 - $1,520	$1,303
NOC and Equipment (Data & Video)	$380,955 - $462,705	$421,830		$233 - $283	$258
Installs	$550,995 - $671,985	$611,490		$337 - $411	$374
Outside NID Terminal (ONT)	$729,210 - $891,075	$810,143		$446 - $545	$496
Incremental NOC Equipment	$282,855 - $348,255	$315,555		$173 - $213	$193
IPTV Headend and NOC	$1,080,000 - $1,320,000	$1,200,000		$661 – $807	$734
Subtotal Installation/Equipment Costs	**$4,799,015 – $6,179,020**		**$5,489,018**	**$2,936 - $3,779**	**$3,358**
Service Provisioning Costs					
Dark Fiber Lease/Transport (1x costs included in NOC Costs)	$60,000 - $120,000	$90,000		$37 -$73	$55
Bandwidth Purchase (Wholesale scalable) (1x costs included in NOC Costs)	$36,000 - $60,000	$48,000		$22 -$37	$30
TV Content Purchase	$353,160 - $529,740	$441,450		$216- $324	$270
Subtotal	**$449,160 - $709,740**		**$579,450**	**$275 - $434**	**$355**
Operating Costs					
Customer Service Representative/Sales (1)	$36,000 - $54,000	$45,000		$22 -$33	$27

Marketing Materials	$12,000 - $18,000	$15,000		$7 - $11	$9
Billing Clerk/Software/Invoices	$64,000 - $96,000	$80,000		$39 - $59	$49
Technical Field Personnel (1)	$40,000 - $60,000	$50,000		$24 - $37	$31
Technical Office Personnel (System Manager)	$48,000 - $72,000	$60,000		$29 - $44	$37
Office & Garage Lease/Equipment/Furnishings	$24,000 - $36,000	$30,000		$15 - $22	$18
Training Costs	$12,000 - $18,000	$15,000		$7 - $11	$9
Subtotal	**$236,000 - $354,000**		**$295,000**	**$143 - $217**	**$180**
Total	**$7,156,175 - $9,750,760**		**$8,453,468**	**$4,377 - $5,964**	**$5,171**
Cost per Subscriber (1,635)				**$5,171**	

5.0 Central Accomack County (Central Fiber Distribution Network) Data

Table 5.0 – A: Central Accomack County Make Ready Work Field Data

	Mileage								
Central Accomack Area	**No-Make Ready**	**Typical Make Ready**	**Buried**	**Total**	**Estimated Poles**	**Application Fee for No Make Ready Poles**	**Avg. Make Ready Cost**	**Total Estimated Make Ready**	**Calculated Make Ready Cost/Pole**
Fiber Ring	13.3	42.2	2.4	57.9	1,556	$16,339	$284,850	$301,189	$194
Onancock Spur Total	0.0	1.1	0.0	1.1	30	$0	$7,425	$7,425	$250
Wachapreague Rd Spur Total	0.0	3.5	1.5	5.0	95	$0	$23,625	$23,625	$250
Central Accomack Area Total	**13.3**	**46.8**	**3.9**	**64.0**	**1,681**	**$16,339**	**$315,900**	**$332,239**	**$231**

Table 5.0 – B: Central Accomack County Cable Construction Field Data

Central Accomack Area	**Aerial Routing Mileage**	**Buried Routing Mileage**	**Total Routing Mileage**	**Total Mileage for Plannin**	**Fiber Cable Size**	**Routing Cost**	**Soft costs**	**Field Data Make Ready and Cable Construction Cost**	**Planning Purpose Total w/20% Variance**
Fiber Ring	55.5	2.4	57.9	58.5	144	$1,743,943			
Onancock Spur Total	1.1	0.0	1.1	1.5	96	$26,693			
Wachapreague Rd Spur Total	3.5	1.5	5.0	5.8	96	$117,258			
Central Accomack Area Field Data Cost Summary	60.1	3.9	64.0	65		$1,887,893	$444,026	$2,664,158	
Central Accomack Area Planning Cost Summary				**65**		**$1,8888,000**	**$444,000**	**$2,664,000**	**$2,131,200 - $3,196,800**

Table 5.0 - C: Central Accomack County Fiber Distribution Network Costs

Project Component	Cost Range	Average Cost	Cost Subtotal	Unit Price Range (Per Subscriber Potentially Served via Fiber = 1,617)	Unit Price (Per Subscriber Potentially Served via Fiber = 1,617)
Central Accomack County Fiber Costs and Soft Costs **Outside Plant transport infrastructure; labor/materials/make ready and Associated Soft Costs** **Subtotal Fiber Capital Costs/Soft Costs**	**$2,131,200 - $3,196,800**		**$2664,000**	**$1,318 - $1,977**	**$1,647**
Access Network Fiber Run Up to 1-1/2 Miles (113 Miles @ $25,000 - $35,000 per Mile; primarily aerial)	$2,825,000 - $3,955,000	$3,390,000		$1,747 - $2,446	$2,096
NOC and Equipment (Data & Video)	$376,761 - $457,611	$417,186		$233 - $283	$258
Installs	$544,929 - $664,587	$604,758		$337 - $411	$374
Outside NID Terminal (ONT)	$721,182 - $881,265	$801,224		$446 - $545	$496
Incremental NOC Equipment	$279,741 - $344,421	$312,081		$173 - $213	$193
IPTV Headend and NOC	$1,068,837 - $1,304,919	$1,186,878		$661 – $807	$734
Subtotal	**$5,816,450 - $7,607,803**		**$6,712,127**	**$3,597 - $4,705**	**$4,151**
Service Provisioning Costs					
Dark Fiber Lease/Transport (1x costs included in NOC Costs)	$60,000 - $120,000	$90,000		$37 -$74	$56

Bandwidth Purchase (Wholesale scalable) (1x costs included in NOC Costs)	$36,000 - $60,000	$48,000		$22 -$37	$30
TV Content Purchase	$349,272 - $523,908	$436,590		$216- $324	$270
Subtotal	**$445,272 - $703,908**		**$574,590**	**$275 - $435**	**$356**
Operating Costs					
Customer Service Representative/Sales	$35,574 - $53,361	$44,468		$22 -$33	$27
Marketing Materials	$11,319 - $17,787	$14,553		$7 - $11	$9
Billing Clerk/Software/Invoices	$63,063 - $95,403	$79,233		$39 - $59	$49
Technical Field Personnel	$38,808 - $59,829	$49,319		$24 - $37	$31
Technical Office Personnel (System Manager)	$46,893 - $71,148	$59,021		$29 - $44	$37
Office & Garage Lease/Equipment/Furnishings	$24,255 - $35,574	$29,915		$15 - $22	$18
Training Costs	$11,319 - $17,787	$14,553		$7 - $11	$9
Subtotal	**$231,231 - $350,889**		**$291,060**	**$143 - $217**	**$180**
Total	**$8,624,153 - $11,859,400**		**$10,241,777**	**$5,333 - $7,334**	**$6,334**
Cost per Subscriber					**$6,334**

6.0 Exmore/Nassawadox and Southern Accomack County(Southern Fiber Distribution Network) Data

Table 6.0 – A: Exmore/Nassawadox and Southern Accomack County Make Ready Work Field Data

	Mileage								
Exmore/Nassawadox Area	**No-Make Ready**	**Typical Make Ready**	**Buried**	**Total**	**Estimated Poles**	**Application Fee for No Make Ready Poles**	**Avg. Make Ready Cost**	**Total Estimated Make Ready**	**Calculated Make Ready Cost/Pole**
Fiber Ring	0.0	19.9	0.9	20.8	537	$0	$134,325	$134,325	$250
Exmore/Nassawadox Area Total	**0.0**	**19.9**	**0.9**	**20.8**	**537**	**$0**	**$134,325**	**$134,325**	**$250**

Table 6.0 – B: Exmore/Nassawadox and Southern Accomack County Cable Construction Field Data

Exmore/Nassawadox Area	Aerial Routing Mileage	Buried Routing Mileage	Total Routing Mileage	Total Mileage for Plannin	Fiber Cable Size	Extended Cost	Soft Costs	Field Data Make Ready and Cable Construction Costs	Planning Purpose w/20% Variance
Fiber Ring	19.9	0.9	20.8	20	144	$626,393			
Exmore/Nassawadox Area Field Data Cost Summary	19.9	0.9	20.8	20		$626,393	$152,144	$912,862	
Exmore/Nassawadox Area Planning Cost Summary				**20.0**		**$627,000**	**$152,000**	**$913,000**	**$730,400 - $1,095,600**

Table 6.0 - C: Exmore/Nassawadox and Southern Accomack County Fiber Distribution Network Costs

Project Component	Cost Range	Average Cost	Cost Subtotal	Unit Price Range (Per Subscriber Potentially Served via Fiber = 484)	Unit Price (Per Subscriber Potentially Served via Fiber = 484)
Exmore/Nassawadox and Southern Accomack County Fiber Capital Costs and Soft Costs **Outside Plant transport infrastructure; labor/materials/make ready and Associated Soft Costs** **Subtotal Fiber Capital Costs/Soft Costs**	**$730,400 - $1,095,600**		**$913,000**	**$1,508 - $2,264**	**$1,886**
Access Network Fiber Run Up to 1-1/2 Miles (31 Miles @ $25,000 - $35,000 per Mile; primarily aerial)	$775,000 - $1,085,000	$930,000		$1,601 - $2,242	$1,921
NOC and Equipment (Data & Video)	$112,772 - $136,972	$124,872		$233 - $283	$258
Installs	$163,108 - $198,924	$181,016		$337 - $411	$374
Outside NID Terminal (ONT)	$215,864 - $263,780	$239,822		$446 - $545	$496
Incremental NOC Equipment	$83,732 - $103,092	$93,412		$173 - $213	$193
TV Headend and NOC (Standard, Not IPTV)	$319,924 - $3,90,588	$355,256		$661 – $807	$734
Subtotal	**$1,670,400 - $2,178,356**		**$1,924,378**	**$3,451 - $4,501**	**$3,976**
Service Provisioning Costs					
Dark Fiber Lease/Transport (OC3) (1x costs included in NOC Costs)	$60,000 - $120,000	$90,000		$124 -$248	$186
Bandwidth Purchase (Wholesale scalable starting	$36,000 - $60,000	$48,000		$74 -$124	$99

at 6 Mb) (1x costs included in NOC Costs)					
TV Content Purchase	$104,544 - $156,816	$130,680		$216- $324	$270
Subtotal	**$200,544 - $336,816**		**$268,680**	**$414 - $696**	**$555**
Operating Costs					
Customer Service Representative/Sales	$10,648 - $15,972	$13,310		$22 -$33	$27
Marketing Materials	$3,388 - $5,324	$4,356		$7 - $11	$9
Billing Clerk/Software/Invoices	$18,876 - $28,556	$23,716		$39 - $59	$49
Technical Field Personnel	$11,616 - $17,908	$14,762		$24 - $37	$31
Technical Office Personnel (System Manager)	$14,036 - $21,296	$17,666		$29 - $44	$37
Office & Garage Lease/Equipment/Furnishings	$7,260 - $10,648	$8,954		$15 - $22	$18
Training Costs	$3,388 - $5,324	$4,356		$7 - $11	$9
Subtotal	**$69,212 - $105,028**		**$87,120**	**$143 - $217**	**$180**
Total	**$2,670,556 - $3,715,800**		**$3,193,178**	**$5,516 - $7,678**	**$6,597**
Cost per Subscriber					**$6,597**

7.0 Organization and Network Operation Options

7.1 Common Models

A Managed Services Model (sometimes referred to as a public-private partnership), is where a public entity such as a local government unit would partner with a private entity, such as a private service provider. Typically the private entity owns and manages the network. The service provider would charge for services, but often the local government unit can connect to the network for no cost or reduced fees.

In Wholesale Model approach, the municipality owns and manages the network. Typically, the municipality would not only use the network for its own purposes, but may provide services to the constituents, as well as negotiate with service providers for use of excess bandwidth. Obviously, this model gives the local government unit the most control.

A Hybrid Model is one in which the municipality would own the network, but outsources most of the day-to-day operations to a third party, typically a service provider or systems integrator. This model still provides a reasonable amount of control to the municipality, but relies on the expertise of others to efficiently manage the network and services.

Business Models for Funding Community Wireless Networks

While most communities want the convenience of high-speed wireless broadband networks, the issues of sustainability need to be addressed. Sustainability of a network encompasses many different issues such as maintenance, expansion, backhaul connection to the Internet and providing technical support. Some research into creative proposals found the following business model concepts.[13]

Single-Payer Municipal Model: Local government assesses a small increase in property taxes to finance technical support, maintenance and repair and management of the network. Local government employees could be hired or contracted out to a firm with the expertise to provide these services.

[13] (UPDATE 2) Business Models for Community Wireless Networks: Sat, 2005-02-19 16:02; http://www.saschameinrath.com/2005_02_19_17_02_update_2_business_models_for_communities_wireless...

Free Access / Fee-for-Service: Free Internet access is offered to all residents, but use of extra services by residents, businesses, and/or government, such as email accounts, server space, web hosting, or higher capacity use would have fee charged for that service.

Free Residential/Fee for Commercial-Government: The rate paid by business and government broadband users for wireline services is divided in half and this becomes the rate for access to the wireless network.

Off-Peak vs. Peak: Since most use of a broadband network takes place on weekdays during business hours, using the network between certain hours such as 9 AM and 5 PM, Monday through Friday would incur a fee.

Not-profit ISP: If a municipality has no interest in running a network, but has a one-time sum sufficient to establish a foundation for a local wireless network, the municipality could contract out a private enterprise to serve as the community's ISP. The ISP would charge for service to generate revenue for maintenance, expansion, etc., but be limited to a pre-set profit margin.

Cost and Bandwidth Sharing: Another business model being explored is a three-way partnership in which the RF spectrum provided to an institute of higher education is being utilized to implement a WiMax solution with costs being shared by the local government for emergency and public facility uses, private service provider to reach and offer retail services to outlying rural areas, and revenue income and overall enhancement to the educational institution.

7.2 Impact of Virginia Law

Virginia is a Dillon Rule state, whereby the State must explicitly grant powers to municipalities. As stated in the Executive Summary, Virginia does allow local governments to provide communication services but with restrictions. The following briefly outlines the restrictions and permissible roles of municipalities in regards to community broadband networks with notation of the applicable VA Code:

- As previously stated, a locality can build a network and provide services to its departments, boards, agencies, etc. and to adjoining locality's so long as the charges for equipment, infrastructure, and/or services do not exceed the cost of providing same. The network infrastructure and equipment can be sold, and the locality may receive communication services

from the purchaser (to be used solely for internal use) in full or partial consideration for the sale. Dark fiber can be leased by any locality, electric commission or board, industrial development authority, or economic development authority. Under no circumstances can the locality or authority be involved in marketing or promoting the services of the lessee or purchaser. (§ 15.2-1500)

- The Virginia State Corporation Commission (SCC) allows "any county, city, town, electric commission or board, industrial development authority, or economic development authority" to provide "qualifying communication services" only as long as there are not more than three separate private businesses making "functionally equivalent" telecommunications services generally available in the community. Qualifying communication services do not include cable TV and video services. Pricing for services can not be lower than any incumbent provider of a functionally equivalent service. (§ 56-484.7:1)
- Municipal electric utilities (does not apply to counties or other political subdivisions) are permitted to become certificated municipal local exchange carriers (MLEC) and offer all communications services. In doing so they are prohibited from cross-subsidizing services, must impute costs that private sector providers typically would incur, and must comply with procedural, financing, reporting and other requirements. (§§ 15.2-2108, 15.2-2160, 56-265.4:4, 56-484.7:1)
- As indicated in the Executive Summary, the Virginia Wireless Services Authority Act authorizes a locality to "convey or lease to [an] authority, with or without consideration, any systems or facilities for the provision of qualifying communications services" and "contract, jointly or severally, with any authority for the provision of qualifying communications services." Localities are still held to the requirements of the "qualifying communication services" and service gap provisions (not more than three providers). This legislation provides the method by which projects can be financed by an authority. (§15.2-5431)

Communities that want to provide a catalyst for service expansion and an enticement to service providers, but do not have the expertise in-house to manage and operate a network and want to limit their investment in a network, will invest in the dark fiber only (no equipment). If services are to be provided to municipalities and other political subdivisions or agencies only, then they will also contract with another entity to manage and operate the network. This approach minimizes the extent of staff and training needed by the municipality.

In order to provide retail services across a network, staff requirements would typically include a customer service representative/sales representative, billing clerk, technical field personnel, technical office personnel to manage the Network Operating Center (NOC) equipment, and probably a system manager. In addition other costs would include marketing materials, software and invoices, office and facility space with equipment and furnishings, and training costs. Municipalities that are already providing other services such as public power (electric) and water and wastewater treatment services are in a much better position to provide telecommunications services than those that do not own any other enterprise utility system.

8.0 Funding Strategies for Future Implementation Projects

8.1 Capital costs versus operational costs

Capital costs for outside plant fiber infrastructure vary from as little as $20,000 per mile (aerial, low count fiber, no make-ready) up to as much as $150,000 per mile (urban, directional bore, concrete repairs) depending on many factors. Representative numbers for some of the major items for outside plant and central office are shown in the table below:

MAJOR INFRASTRUCTURE ITEMS	COST PER UNIT
Make-Ready pole repairs	$3000-$4000/mile typical
Loose tube fiber optic cable-12 count	$.24/foot
Loose tube fiber optic cable-144 count	$1.25/ft
Underground hardware (conduit, vaults, etc.)	$2.00-$3.00/ft on average
Pole hardware and Strand	$.30-.40/ft
Splice Closures	$150-450 each
Underground Fiber Installation, Directional Bore	$12-$14/foot
Underground Fiber Installation, Missile Bore	$7-$9/ft
Aerial Fiber and Strand Installation, Communications Zone	$1.00-1.25/ft
Central Office Building (Without Land)	$180./sq ft
Network Interface Device (at end user)	$500-$1500/user
CO Network Interface (Optical Line Terminal)	$100-$150/user
Fiber Splicing and Testing	$35-$40/splice
Concrete Removal and Repair	$20/sq ft.

Operational costs for fiber networks also vary widely based on the type of network, number of users served and type of services provided. In addition to administrative fees (billing, accounting, marketing, insurance), the costs can be generally divided into content and transport fees, other network fees and staffing.

Depending on the type of network content and transport, fees would consist of:

- Video content ($20-$25 per customer for maximum content)
- Internet access $30-$50 per Mbps per month
- Transport costs to move data and possibly video into or out of an area. These costs vary widely depending on what carriers are available. Typical costs would be $50-$150 Mbps per month.

Other network fees would include pole charges (as much as $20/pole per year) for leasing space on utility owned poles, central office utilities and equipment maintenance. A cable television headend might have 20 Kilowatt of heat rejection from equipment while a municipal network might have as little as

1 Kilowatt. Central office total utilities costs for the maximum case would run approximately $2000 per month on average in the Eastern Shore area.

Staffing will also vary depending on the extent of the network. While outside plant maintenance for fiber optic networks is greatly decreased over other types (e.g. HFC), staffing requirements for other than outside plant will be unchanged. A small municipal network might be handled by one or two employees combining their workload with other duties. For a full service retail network, typical numbers of employees might be:

- Customer Service: If required 24 hours a day, a minimum of six employees; otherwise the number will depend on the size of the network.
- Provisioning: two or more employees depending on size.
- Technical Support and operations: two or more depending on size.

The total required for a small city, full service network including marketing and management might run to 25 employees.

8.2 Look at Assets within Reach

- Leveraging funding from other projects
- Public safety and telemedicine grants
- Opportunity to leverage assets and investments, such as community Right-of-Ways and fiber optic network of Mid Atlantic Broadband Cooperative.
- Reallocation of current communications spending per department
- Local information technology talent, system integrators

8.3 Seek Potential Partners

- Interested service providers, local stakeholders
- Key stakeholders offering assistance such as economic development organizations (such as the Chamber of Commerce)
- Security companies (private)
- University/Colleges
- Neighboring Cities/States (Maryland)
- State Agencies (example social agencies, workforce training programs)

- County
- Libraries
- Large local businesses
- Local hospitals
- Emergency Response Agencies

8.4 Funding Success Stories

- Examples of funding vehicles used by other communities include:
  - Homeland Security
  - Interoperability grants
  - COPS
  - Dept of Energy
  - Libraries, e-rate
  - Partnerships between police, fire, hospitals
  - Partnerships with utility operations
  - Dollar savings using new technologies
  - Rural and downtown revitalization
  - Community redevelopment funds (innovative crime prevention and/or low income access)
  - National Science Foundation grants
  - Economic Development Association
  - Criminal Forfeiture funds (make criminals pay!)
  - Private ISP – resale services over municipal fiber network
  - Private for profit companies (security firms, ambulatory)
  - Non-profit organization use (schools, higher ed, county orgs)

- Small funding opportunities
  - Video surveillance - homeowner associations, theme parks, casinos
  - Bill and Melinda Gates Foundation – (low income areas, libraries, community technology centers)
  - Federal – community technology centers

8.5 Federal Funding Sources

In the past few years, Congress has appropriated funding in support of community redevelopment initiatives, aimed at increasing the use of technology and investing in technology infrastructure. One example of funding can be found through the U.S. Department of Commerce Economic Development Agency (EDA). Public Works and Economic Development Act of 1965 is the EDA's authorizing statute. On October 27, 2004, President Bush signed into law the Economic Development Administration Reauthorization Act of 2004 (Pub. L. 108-373), which reauthorizes EDA's economic development assistance programs through fiscal year 2008. Approximately $250,000,000 in funding has been appropriated across all of the varied programs under this agency in 2006. In 2005, individual grants varied from $70,000 to $4,000,000. Eligible applicants include virtually all government entities, Indian tribes, special purpose Units of local government engaged in economic or infrastructure development, institutions of higher learning, and public or private non-profits acting in cooperation with a political subdivision of the state. A synopsis of each of the available programs is as follows[14]:

Public Works and Economic Development Program

Public Works and Economic Development investments help support the construction or rehabilitation of essential public infrastructure and facilities necessary to generate or retain private sector jobs and investments, attract private sector capital, and promote regional competitiveness, including investments that expand and upgrade infrastructure to attract new industry, support technology-led development, redevelop brownfield sites and provide eco-industrial development.

Economic Adjustment Assistance Program

The Economic Adjustment Assistance Program provides a wide range of technical, planning and infrastructure assistance in regions experiencing adverse economic changes that may occur suddenly or over time. This program is designed to respond flexibly to pressing economic recovery issues and is well suited to help address challenges faced by U.S. regions and communities.

Research and National Technical Assistance

The Research and National Technical Assistance Program supports research of leading, world class economic development practices, and funds information dissemination efforts.

[14] www.eda.gov

Local Technical Assistance

The Local Technical Assistance Program helps fill the knowledge and information gaps that may prevent leaders in the public and nonprofit sectors in economically distressed regions from making optimal decisions on local economic development issues.

Planning Program

The Planning Program helps support planning organizations, including District Organizations and Indian Tribes, in the development, implementation, revision or replacement of comprehensive economic development strategies (CEDS), and for related short-term planning investments and State plans designed to create and retain higher-skill, higher-wage jobs, particularly for the unemployed and underemployed in the nation's most economically distressed regions.

University Center Economic Development Program

The University Center Economic Development Program is a partnership between the Federal government and academia that helps to make the varied and vast resources of universities available to economic development communities.

Trade Adjustment Assistance for Firms Program

EDA administers the Trade Adjustment Assistance for Firms Program through a national network of eleven Trade Adjustment Assistance Centers to help manufacturing and production firms, which have lost domestic sales and employment due to increased imports of similar or competitive goods, become more competitive in the global economy.

Applications for funding are competitively evaluated on their ability to meet or exceed the following investment policy guidelines, outlined on the Agency's website:

Be market-based and results-driven. An investment will capitalize on a region's competitive strengths and will positively move a regional economic indicator measured on EDA's Balanced Scorecard, such as: an increased number of higher-skill, higher-wage jobs; increased tax revenue; or increased private-sector investment.

Have strong organizational leadership. An investment will have strong leadership, relevant project management experience, and a significant commitment of human-resources talent to ensure a project's successful execution.

Advance productivity, innovation, and entrepreneurship. An investment will embrace the principles of entrepreneurship, enhance regional clusters, and leverage and link technology innovators and local universities to the private sector to create the conditions for greater productivity, innovation, and job creation.

Look beyond the immediate economic horizon, anticipate economic changes, and diversify the local and regional economy. An investment will be part of an overarching, long-term comprehensive economic development strategy that enhances a region's success in achieving a rising standard of living by supporting existing industry clusters, developing emerging new clusters, or attracting new regional economic drivers.

Demonstrate a high degree of commitment by exhibiting:

- High levels of local-government or nonprofit matching funds and private-sector leverage.
- Clear and unified leadership and support by local elected officials.
- Strong cooperation between the business sector, relevant regional partners, and local, state, and federal governments.

Figure 8.5-A: Table of Funding and Information Resources

Source of Funding or Info	Program	Description	Additional Information	Contact Information
Federal Funding	USDA: Rural Broadband Loan & Loan Guarantee Program	Billions in loans to provide broadband services to rural communities; to facilitate deployment of new & innovative technologies to provide 2-way data transmission of or more in communities with populations up to 20,000	Loans must be $100,000 or More; State Reserve Funding Application Deadline: Jan 31;National Reserve Funding Application Deadline: July 31	USDA – RUS :STOP 1590 1400 Independence Ave., SW, Rm 5151 Washington, DC 20250-1590 Jacqueline M Ponti, Assistant Administrator (202) 720-9554 Jacki.ponti@usda.gov
Federal Funding	National Telecommunications And Information Administration (NTIA);The Grantsmanship Center	Public Telecommunications Facilities Program-Grant program to help broad-Casting, stations, state and local government, Indian Tribes and non-profit organizations Construct facilities to bring educational and Cultural programs to the American Public Technology Opportunities Program	Matching Grants; Also Funds programs to assist in the delivery of health care and public health services.	U.S. Department of Commerce 1401 Constitution Ave., N.W. Washington, D.C. 20230 (202) 482-5802 ptfp@ntia.doc.gov also FedWorld.gov www.scitechresources.gov/
Federal Funding	Federal Communications Commission	Universal Service Program – Schools and Libraries	Must meet eligibility criteria; Discount Matrix provided; Universal Service Fund used by schools and library to acquire any telecommunication service – all equipment that is necessary to transport information all the way to individual classrooms	Irene Flannery or Mark Nadel Common Carrier Bureau Federal Communications Commission 2100 M Street Rooms 8922, 8916 Washington, DC 20554 (202) 418-7383 (202) 418-7385
Federal Funding	Rural Telephone Bank, Rural Utilities Service	Loans for improvement, expansion, Construction, or acquisition of Telecommunications facilities in rural areas	Loans to Telecom Companies in rural areas; Long-term loans for purpose of supplying and improving telecommunications services in rural areas	Assistant Governor, Rural Telephone Bank, Dept. of Agriculture Washington, DC, 20250 (202) 720-9554 http://www.rurdev.usda.gov.

Source of Funding or Info	Program	Description	Additional Information	Contact Information
Federal	U.S. Department of Education	Community Technology Centers (CTC) Program-Community service, social action, and/or educational facilities that uses computers, the Internet and other information technology tools to provide a range of vital services for those who typically lack such opportunities.	Grants; CTC provides access to free or low-cost computer-based/digital applications, hardware, networks, tech-neology training and support programs; Funds programs that demonstrate the educational effectiveness of technology in urban and rural areas and economically distressed communities	CTCNet 372 Broadway Street Cambridge, MA 02139 (617) 354-0825
Federal	Community Development Block Grant Program - Federal U.S. Dept. of Housing And Urban Development money administered by the state and often distributed through the counties	Many Different Programs Community Development Block Grant (CDBG) - provides annual grants on a formula basis to states to develop viable urban communities by providing decent housing and suitable living environment, and by expanding economic opportunities, principally for low-income and moderate-income persons. Community Renewal Program- Initiative for Renewal Communities/Empowerment Zones/ Enterprise Communities (RC/EZ/EC), offers innovative approach to revitalization. Section 108 Loan Guarantee Program- loan commitments often paired with Economic development Initiative (EDI) or Brownfield economic Development Initiative (BEDI)	Grantees must give maximum feasibility priority to activities which benefit low- and moderate income persons. A grantee may also carry out activities which aid in the prevention or elimination of slums or blight. Section 108 Loan Guarantee Provisions allows Transformation of a small portion of CDBG funds into large federally guaranteed loans; local governments must pledge their current and future CDBG allocations to cover the Loan amount as security for the loan.	

Source of Funding or Info	Program	Description	Additional Information	Contact Information
Federal Funding	Office for Advancement of Telehealth, Dept. of Health & Human Services	Promotes the uses of telehealth technologies for health care delivery, education, and Health information services	Different Grant Programs Available	Office for the Advancement of Telehealth 5600 Fishers Lane, Rm. 11A-55 Rockville, MD 20857 (301) 443-0447
Federal Funding	US Dept of Commerce Economic Development Association	Funding and technical assistance programs in support of the Public Works and Economic Development Association Act. Looking specifically for strong leadership support, actionable plans, and utilization of community stakeholders such as higher education institutions.	Many different programs available to support economic development in communities experiencing economic distress or changeover. Focus on generating and/or retaining jobs.	www.eda.gov .
Local	Municipal Resources	Most local government has a number of potential resources for funding initiatives through federal, state and county sources including CDBG, Cable Franchise Fees, bond issuance, special taxing authority, and enterprise fund activity revenues.	Must confirm legal authority for intended use of the funds; Receive local government approval; Some funding may require credit rating, borrowing capacity determination, insurance underwriting, etc	Contact local applicable Government unit.
Miscellaneous	Grants R' Us	Grant writing information and funding links to Federal, State, and Foundation sites.		http://groups.msn.com/GrantsRUs
Note: Much of the information displayed in the above tables was taken directly from the associated web sites of the source and the web site and/or representative listed should be contacted for credit information of the content.				

9.0 Next Steps

A significant step forward has been taken towards achieving the goals of the Eastern Shore Broadband initiatives by collecting enormous volumes of information, analyzing the data for relevancy and delineating areas within the counties as priority areas for current and future emphasis. Suggestions as to what to do next include:

1. Solicit a Request for Interest (RFI) from service providers regarding interest of use of an open access distribution network on the Eastern Shore, willingness to construct access networks (wireline and wireless), and under what business model (ownership, maintenance, operation, fees, etc.). Any telecommunications player who is willing to participate in developing connectivity solutions warrants consultation.
2. Pursue developing a master comprehensive plan with the Commonwealth of Virginia, Mid-Atlantic Broadband Cooperative, Maryland Broadband Cooperative, Lower Shore Broadband Cooperative, and local service providers, to bring high speed connectivity, bandwidth and Internet Protocol (IP) based voice, video and data services to the Eastern Shore of Virginia. Such a master plan should be developed and used as a tool for overall management of the projects, scheduling, avoiding unnecessary duplication of infrastructure and overall coordinate efforts.
3. Assuming there is some level of interest by an entity based on the outcome of the RFI, seek commitment from the communities for funding the public portion of the solution and modify the plan as need be to fit the commitment level (take a phased-in approach). In other words, perhaps only a portion of the Chincoteague Spur and Northern Accomack County fiber ring is feasible for the initial first phase. Local government at the municipal and county level is best positioned to determine what is financially manageable and to establish the order of implementation for the priority areas.
4. Do not commit extensive funding towards further design and construction until service providers are committed to using an open access network and all business and governance obligations are secured.
5. Once comfortable with moving forward, seek the best source of funding that would not place a financial burden on the communities if a final business plan does not become implemented within expected time frames. The funding strategy of the business plan should have a fall back position to mitigate such a potential financial burden such as the ability to sell the network and recover investment costs if need be.
6. Develop a business plan that would be difficult to challenge under Virginia Law pertaining to the permissible role of municipalities in communication networks.

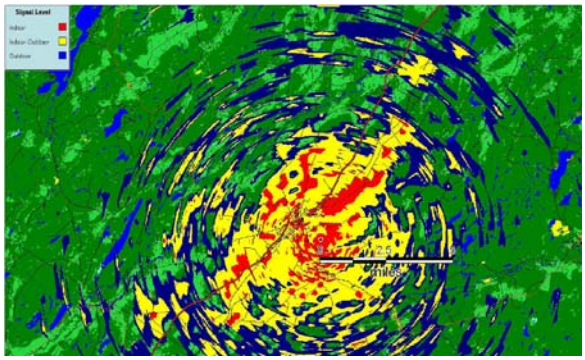
7. Work with service providers to develop last mile access models to determine best solutions. Last mile connectivity models (to link users with broadband and advanced services) are varied and continually evolving. When exploring possible scenarios, analysis should take into consideration the relationship between policy approaches, technology options and business models. Often common objectives in developing the models include:
    - Fostering innovation
    - Increasing competitiveness for local access
    - Helping to develop and promote industry-wide standards, such as voice coding and compression algorithms
    - Evaluating cost feasibility
8. Continue to educate local government constituency and elected officials of the contributing role broadband plays in economic development considerations, educational opportunities and overall improvement of quality of life.
9. Continue investigating and reviewing popular business models that the communities of the Eastern Shore would be comfortable with. Appendix D provides case studies of "Forward Thinking Communities that Have Taken the Lead".
10. Keep the momentum moving forward; once stalled, it is difficult to get moving again and difficult to rekindle support.

Hopefully the Commonwealth of Virginia recognizes the investment made thus far in the Eastern Shore Community Broadband initiatives and continues to fund future phases. In addition, as provided under Section 8 "Funding Strategies for Future Implementation Projects" there are numerous federal and state resources, some limited local sources and specialized interest funding opportunities (such as telemedicine applications) that can be pursued.

9.1 Access Modeling Tools

Some steps that can be taken to investigate the feasibility of access models include:

- Wireless signal propagation modeling: Used for testing likely signal transmission strength, distance, coverage and potential application; precedes radio frequency engineering study.



- Field Construction Feasibility Investigation: If a location is being considered for construction of network land line infrastructure, the amount of pole and/or trenching work is a major cost factor in considering feasibility. Numerous tools can be used to explore pole options vs. trench options such as:
  - *Make Ready Pole Assessment:* Preliminary assessment can be completed utilizing firms that specialize in outside plant investigations using tools such as Global Positioning System (GPS) equipment, hand-held computer recording devices, drive-by visual inspection, etc.
  - *Desk Top Geologic Surveys:* Numerous resources are available including the Commonwealth of Pennsylvania Geologic Survey containing geologic maps of the area, county soil maps, and USGS Topography Maps.
  - *Geophysical Testing:* Uses non-intrusive field techniques to develop profiles and collect data within the test area.
  - *Intrusive Field Testing:* Direct borings can be taken to investigate actual field conditions.

9.2 Other Options to Reach Additional Residential Areas in Future

Regardless of the decision on whether to build distribution networks or not at this time, there are a number of steps the communities can take to enhance the potential for more residential areas to be served in the future.

One of the major impediments to bringing broadband service competition is the high cost of infrastructure. The underground installation of fiber in a developed downtown area can easily reach $25 per foot of fiber installed. The cost drops dramatically when the conduit and fiber can be placed as part of

other projects such as the installation of water lines, repairs to streets or new construction. When the needs for fiber optic communications are catalogued, the work can be accomplished much more economically as part of a long term plan.

The recommendations in this plan are designed to increase choices for the citizens and government while minimizing costs. The benefits of a widely deployed fiber optic infrastructure will have beneficial effects on economic growth and revenues. Following the suggested strategies will provide payoffs for years into the future.

Feedback from service providers on other community telecommunications studies as potential impediments to enhancing telecommunications' services include the following:

- *Cable TV Franchise Requirements:* It is not uncommon for the local TV franchise fees to vary on terms and conditions, calculation of fee owed to the city, components that are used in that calculation, etc.

- *Permitted Antennae Attachment Locations:* Different regulations and attachments for water tower locations. Service providers want cities to be open to wireless technology, especially where antennas can be located.

- *New Building Requirements:* New building design standards that address communication services conduit, cabling, construction, etc., should be uniform and consistent among all the communities where possible.

- *As-Built Plan Requirements:* Contractors or owners should be responsible for providing to the communities as-built plans, survey descriptions, etc. that will aid in identifying future parties the locations of communication facilities and infrastructures.

- *Building Co-Location Permitting:* Where reasonable, zoning ordinances should allow the local government to grant a variance or permit for communication facilities to be located in municipal building and other likely co-location areas.

- *Street Opening Permits:* Many community street opening permits typically required for trenching in public right-of-ways usually require varying degrees of repair. Depending on the extent of trenching, some ordinances may require complete overlay and deterring expense.

- *Underground Utility Marking:* In building new or retrofitting an area with underground communications cabling, typically underground utility identification must be completed prior to excavation and/or boring. Many communities that provide municipal utility services perform this underground utility identification marking and usually require no less than 3 days notice. While such notice is reasonable, some redesign of networks may be avoided if communities had more accurate and accessible GIS mapping of existing utilities that could be used as part of the planning and design process.

- *Construction or Building Permit Inspections:* While under some circumstances a construction or building permit may be required, a typical impediment is a usually uncertain or time delay inspection of the work.

- *Communication Tower Location:* Historically, land subdivision and development plans took several months to go through the municipal review and approval process. Not could this significant expense, but time delay in providing services. Many communities now preplan and identify in their zoning and subdivision regulations where these towers can be located, as well as required provisions. In addition, co-location of facilities should be strongly encouraged where possible.

- *Public Easement/Right-of-Way Language:* While some public easement and right-of way language may need to be specific for a particular utility, where possible and agreed upon by the municipal solicitor, language that is more general in permitting all utilities as approved by the local government unit should be used to avoid additional legal and land surveying expense, as well as time delays in having to modify existing easements and right-of-ways to now accommodate placement of fiber as an example.

- *Inter-municipal Agreements:* Where possible adjacent communities should investigate putting in-place inter-municipal agreements that would allow services to originate in one community and extend over into other communities without significant obstacles such as service franchise areas, restrictions on sharing of data, different service requirements such as billing language referencing local taxes, etc.

9.3 Closing Comments

Today, both business and residential connectivity solutions are in a state of considerable turmoil. The incumbent telephone (telco) and cable providers have major investments in infrastructure which they are attempting to more effectively utilize to maintain profit margins in an increasingly competitive industry. Until the last few years, cable providers were unable to offer data or voice services, and the telco infrastructure was insufficient for offering cable services. The industry began to change when cable providers began to offer Internet service using cable modems and the Direct Broadcast Satellite (DBS) providers (e.g. DirecTV) began to offer high quality video without the cost of installing new outside plant infrastructure. The loss of customer base and low profit margins have forced the cable providers to look for additional services such as Voice over Internet Protocol (VoIP) which has in turn impacted the business model of the telephone providers. The telcos are now trying to leverage their existing infrastructure to provide cable television service to retain market share. This and other factors have forced them to begin to abandon the traditional Sonet rings with their rigidly defined signaling and limited flexibility in favor of simpler IP networks. Along the Eastern Shore, there is the absence of competition between the cable company and telephone companies. A direct fiber-to-the-premise where feasible, and wireless services will bring competitive pressure to the telephone companies. Telephone providers are or

will shortly be using multiservice provision platforms (MSPPs) to provide all services to all customers. Whether the provider selects a passive optical network, fiber to the node or some other technology, there will be massive changes in the industry wherein they will be forced to allocate funds based on best return on investment (ROI).

While the future direction of the Internet can be debated, as well as what business model makes the most sense, more and more technology users and service providers believe **bandwidth access of 100 Mbps or more will become the norm** in the future. The aggregated demand and pressure brought onto service providers by community initiatives for better service typically are more effective than splintered efforts.

Virginia law does allow local governments to provide services but with restrictions. It is recommended to continue to work with the Commonwealth of Virginia who funded the study, and pursue models that compliment what they are willing to fund in the future, which should help avoid legal challenges if being partially funded by the Commonwealth.

The consulting team truly values our relationship with the Commonwealth of Virginia and has become an integrated partner with the communities that call Virginia home. Continued pursuit of construction of the fiber optic networks on the Eastern Shore will help ensure Virginia remains a leader in the United States who meets the needs of its constituency.

10.0 Appendices

Appendix A: End-User Surveys

Residential End-User Survey

Central Accomack County and the Towns of Chincoteague, Exmore and Nassawadox desire to be forward-thinking on behalf of residents, businesses, and those considering a move to the Virginia Eastern Shore. Their goal is to lead in developing economic assets for future growth on the Eastern Shore.

A critical component of economic development is state-of-the-art communication technology. High-speed (broadband) Internet access, digital television programming, and affordable options for telephone service are available today in *some* areas of the Eastern Shore. The Accomack-Northampton Planning District Commission is assisting with a study to determine what services are available in our communities and most importantly, what services our citizens desire. This study will be used to develop strategies for bringing those services to our communities.

You have been selected to participate in this study. Spotts, Stevens and McCoy (SSM), a private consulting firm, is conducting this survey as part of the communications study. They will collect these questionnaires and compile the data. Your answers are confidential and will be used in a report only as summaries in which no individual's answers can be identified. Only your street address will be used for geographical planning purposes. Your privacy will be respected. The survey should be completed by a head of the household, 18 years of age or older.

Please lend us *your voice* and take part in this study. We realize your time is valuable and sincerely appreciate your assistance. Please take a few minutes to complete this questionnaire. When finished simply drop it in any mailbox. No return postage is necessary. **Time is of the essence and we ask that you return this survey right away.** Your opinion DOES matter – improving our communities is everyone's business. Thank you for your support.

Questions? Please call the Accomack-Northampton Planning District Commission at (757) 787-1247 x115

This survey is also available online at **www.VABroadbandStudy.com**

Residential demographic data is collected for documenting statistics of the survey pool and to comply with state and federal grant guidelines. Your individual responses will not be shared.

1. Please indicate the municipality located closest to your residence.

☐ Accomac ☐ Atlantic ☐ Belle Haven
☐ Chincoteague ☐ Exmore ☐ Melfa
☐ Nassawadox ☐ Onancock ☐ Onley
☐ Tasley ☐ Wallops Island ☐ Willis Wharf

If your mailing address is a PO Box, please enter your street address for geographical locating purposes:

_____ _____ _____
House # Street Address Zip Code

2. What is your age? ☐ Under 20 ☐ 20-24 ☐ 25-34 ☐ 35-44 ☐ 45-54 ☐ 55-59 ☐ 60-64 ☐ 65 or Over

3. Do you have children living at home? ☐ Yes ☐ No *If yes, please indicate age groups:* ☐ Under 5 ☐ 5-17 ☐ 18 or Over

4. Does your household have a personal computer? ☐ Yes ☐ No

5. Which of the following best describe the type of Internet service you subscribe to at home?

☐ No Internet at home ☐ Satellite
☐ Dial up on telephone line ☐ Cellular
☐ Wireless ☐ DSL
☐ ISDN ☐ Cable Modem

6. What is the name of the company that provides your Internet connection?

_____
☐ Not Sure ☐ No Internet Access

7. How would you assess your current Internet bandwidth (speed)?
☐ Adequate ☐ Inadequate ☐ More Than Needed

8. To the best of your knowledge, how much are you currently paying per month just for Internet access? ☐ Under $20 ☐ $20-$40 ☐ $41-$60 ☐ $61-$80 ☐ More than $80

9. If you do not subscribe to an Internet service or high-speed (faster than dial-up) Internet service at home, why not?
☐ Not available in my area
☐ Too expensive
☐ Not interested in this service
☐ Using high-speed elsewhere

10. Does anyone in your household use the Internet to work from home? ☐ Yes ☐ No

11. Does anyone in your household use the Internet to complete school or job training course work?
☐ Yes, at least once per week
☐ Yes, at least once or twice per month
☐ No

12. How important is Internet access to you or your household?
☐ Very Important ☐ Somewhat Important
☐ Not Important ☐ No Opinion

13. In the past 6 months, which of the following activities have you performed online?
☐ Searched for travel related info
☐ Searched for health or medical info
☐ Purchased products or services
☐ Sold products or services
☐ Visited a news website
☐ Visited a state or local government website
☐ Searched for info related to school work
☐ Researched a major purchase
☐ Performed a financial transaction with a bank
☐ Communicated with a teacher
☐ Searched for a job
☐ Took an online course
☐ Downloaded or watched video online

14. If affordable ***wireless*** high-speed Internet access was available in your community, how likely would you be to subscribe to this method of Internet access?
☐ Very likely
☐ Somewhat likely
☐ Not likely

15. Do you subscribe to a pay TV service?
☐ Yes, cable ☐ Yes, satellite
☐ No

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16. Please indicate the level of cable or satellite TV service you currently subscribe to:

☐ Minimum basic ☐ Digital service
☐ Expanded basic ☐ No pay TV service

17. To the best of your knowledge, how much are you currently paying for cable or satellite service each month? *Do not include Internet Access.*

☐ Under $20 ☐ $20-$40 ☐ $41-50
☐ $51-$75 ☐ More than $75 ☐ Not Applicable

18. Please indicate the phone service(s) you subscribe to and your total monthly expenses for each:

Regular telephone service (wired): ☐ Yes ☐ No
☐ Under $35 ☐ $35-$75 ☐ More than $75

Cell phone service: ☐ Yes ☐ No
☐ Under $35 ☐ $35-$75 ☐ More than $75

Internet phone service: ☐ Yes ☐ No
☐ No Charge ☐ Under $35 ☐ $35 or More

19. Are you satisfied with the current voice, video and Internet services available to you?

Internet: ☐ Satisfied ☐ Not Satisfied
Video: ☐ Satisfied ☐ Not Satisfied
Telephone: ☐ Satisfied ☐ Not Satisfied

Comments—Suggestions

20. What changes or improvements to communication technology on the VA Eastern Shore would best meet your needs?

Your opinion is very valuable—thank you for your time and support. Individual responses to survey questions are confidential.

TO RETURN SURVEY: Simply fold the survey flap to display the return address, tape, and drop it in the mail today. Thank you!

SSM, Inc. On Behalf of the
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Business End-User Survey

Central Accomack County and the Towns of Chincoteague, Nassawadox, and Exmore desire to be forward-thinking on behalf of residents, businesses, and those considering a move to the Eastern Shore. Their goal is to lead in developing economic assets for future growth on the Eastern Shore.

We know that as a business owner and operator you understand the value and necessity of cost-effective communication options. To ensure the economic health and vitality of our business community, municipal leaders are working to ensure that the services you need are available and competitively priced. The Accomack-Northampton Planning District Commission is assisting with a study to determine what services are available on the Eastern Shore and most importantly, what services our business community needs. This study will be used to develop strategies for bringing those services to our communities.

We believe it is important to know what communication services your firm requires to grow and prosper. That is why we are asking for **your** assistance in a survey of the communication needs of our business community. Your business has been selected to participate in this survey. Spotts, Stevens and McCoy (SSM), a private consulting firm, is conducting this communications survey. SSM will collect these questionnaires and compile the data. Your answers are confidential. No information will be published by name without your permission and the privacy of your firm will be respected. The survey should be completed by the business owner or the person responsible for purchasing communication services for your business. Only your business address will be used for geographical planning purposes.

Please lend us *your voice* and take part in this business survey. We realize your time is valuable, and sincerely appreciate your assistance. Please take a few minutes to complete this questionnaire. When finished simply drop it in any mailbox. No return postage is necessary. **Time is of the essence, and we ask that you complete and return this survey right away.** Your opinion DOES matter – improving our communities is everyone's business. Thank you for your support.

Questions? Please call the Accomack-Northampton Planning District Commission at (757) 787-1247 x115
This survey is also available online at **www.VAbroadbandstudy.com**

Business Demographic Data: This data is collected for documenting statistics of the survey pool and to comply with state and federal grant guidelines. Individual responses will not be shared.

1. To which one of the following municipalities are you most closely located? *Please check only one even if business has multiple branch offices.*

☐ Accomac ☐ Atlantic ☐ Belle Haven
☐ Chincoteague ☐ Exmore ☐ Melfa
☐ Nassawadox ☐ Onancock ☐ Onley
☐ Tasley ☐ Wallops Island ☐ Willis Wharf

If your mailing address is a PO Box, please enter your street address for geographical locating purposes:

_____ _____ _____
Number Street Address Zip Code

2. How many employees work at this location?

☐ None ☐ 1-4 ☐ 5-9 ☐ 10-19
☐ 20-49 ☐ 50-99 ☐ 100-249 ☐ 250 or more

3. Which of the following best describes the type of business conducted at this location? *Check one.*

☐ Accounting/Architectural/Engineering
☐ Agricultural/Forestry/Mining
☐ Business and Personal Services
☐ Communication/Technology
☐ Contractor or Construction
☐ Education
☐ Finance/Insurance/Real Estate
☐ Government ☐ Healthcare
☐ Retail Trade ☐ Wholesale Trade
☐ Non-classified: _____

4. What is this location's annual revenue/sales?

☐ Less than $50k ☐ $50k-$500k
☐ $501k+ -$1 million ☐ Over $1 million

5. How many computers at this location have Internet access? ☐ None ☐ 1-5 ☐ 6-10
☐ 11-19 ☐ 20-50 ☐ 51-100 ☐ Over 100

6. How does this location connect to the Internet?

☐ No connection ☐ Satellite or microwave
☐ Dial-up ☐ Wireless
☐ DSL ☐ T1 line
☐ Cable modem ☐ T3/DS3 line
☐ ISDN line ☐ Access via optical fiber

7. What is the name of the company that provides your Internet/bandwidth connection?

_____
☐ Not Sure ☐ No Internet Access

8. To the best of your knowledge, how much are you currently paying per month for Internet access?

☐ Under $30 ☐ $30-$50 ☐ $51-$100
☐ $101-$300 ☐ $301-$500 ☐ $501-$1000
☐ $1001-$1500 ☐ Over $1500

9. What is your current Internet bandwidth or connection speed?

☐ Less than 200Kbps ☐ 200Kbps to 512Kbps
☐ 512+Kbps to 1.5Mbps ☐ 1.5+Mbps to 3Mbps
☐ 3+Mbps to 5Mbps ☐ 5+Mbps to 10Mbps
☐ Greater than 10Mbps ☐ Not Sure

10. How important is Internet/bandwidth access to your business?

☐ Very Important or Critical ☐ Somewhat Important
☐ Not Important

11. How would you assess your current Internet bandwidth (speed)?

☐ Adequate ☐ Inadequate ☐ More Than Needed

12. How would you describe your satisfaction with your current Internet service?

☐ Very Satisfied ☐ Somewhat Satisfied
☐ Somewhat Dissatisfied ☐ Very Dissatisfied

13. What are your reasons for any dissatisfaction with your current Internet service?

☐ Price too high ☐ Connection too slow
☐ Service is unreliable ☐ Poor customer service
☐ Problems with Email ☐ Not enough bandwidth

14. If you do not subscribe to an Internet service or a higher speed Internet service, why not?

☐ Not available ☐ Too expensive
☐ Not reliable or secure ☐ Not interested

15. If an affordable **wireless** high-speed Internet service were available to you, how likely would you be to utilize this access method for your business needs?

☐ Very to Somewhat Likely ☐ Not Likely

16. If an affordable high-speed Internet service were available to you, which of the following growth and expansion opportunities would your business most likely consider?

☐ Offer additional services via the Internet
☐ Expand current business
☐ Hire additional employees
☐ Add additional location
☐ Increase advertising/marketing efforts
☐ Other_____

→

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17. For what purpose(s) does this location currently utilize or plan to utilize an Internet connection? *Check all that apply.*

Purpose	Current Use	Future Use	No Interest
Advertising	☐	☐	☐
Communication	☐	☐	☐
Customer service	☐	☐	☐
E-Mail	☐	☐	☐
Hosting your web site	☐	☐	☐
On-line sales	☐	☐	☐
Purchasing materials or services	☐	☐	☐
Research	☐	☐	☐
Voice service	☐	☐	☐
Distance Learning	☐	☐	☐
Telemedicine	☐	☐	☐
Training	☐	☐	☐
Transferring data files	☐	☐	☐
Accounting/Banking	☐	☐	☐
Video-conferencing	☐	☐	☐
VPN connections	☐	☐	☐

18. Please indicate the phone service(s) used at this location and your total monthly expenses for each:

Regular telephone service (wired): ☐ Yes ☐ No
☐ Under $100 ☐ $100-$300 ☐ More than $300

Cell phone service: ☐ Yes ☐ No
☐ Under $100 ☐ $100-$300 ☐ More than $300

Internet phone service: ☐ Yes ☐ No
☐ No charge ☐ Under $35 ☐ $35-$45
☐ $46-$100 ☐ $101-$300 ☐ Over $300

19. What changes or improvements to communication technology on the Virginia Eastern Shore would best meet your needs?

_____

_____

_____

Thank you for your time and support! Please complete and return this survey right away.

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Appendix B: End-User Survey Comments

Residential

Response to Survey Question 20 – Comments/Suggestions

"What changes or improvements to communication technology on the VA Eastern Shore would best meet your needs?"

1. wireless high-speed to home for under $40/month
2. Fast internet, period. A phone service where the extra features don't cost extra.
3. Faster broadband
4. DSL access
5. higher speed and more capacity on the internet
6. Increase cell phone area coverage at the end of the Necks. Improve cell service when the phone lines and power are out and increase the reach into the Bay for boating safety. SBA Communications has an operational tower (VA07445-A)at the SW end of Occohannock Neck off Va Rt 163. They are advertising for tenants. Verizon continually refuses to locate on their tower even though they acknowledge poor cellular service in this area. Verizon is way overdue for some stiff competition.
7. Government should not get involved. It is not right for government to sponsor or compete with private enterprise
8. wireless broadband
9. Faster and better service, plus reliability
10. Reliable cellular service at my home. Wireless Internet service at my home.
11. It would meet my needs to make DSL available to people in my area. The best we can get is dial-up. It is too slow and we are unable to get DSL from Verizon.
12. BB access to our "remote" site. Verizon is not capable of providing this service:3 mi west of Rt13
13. High speed internet and cell phone service where they send the bill to.
14. faster internet service
15. "Better Cellular service, larger bandwidth for computer, alternative to sat. TV."
16. Cable TV needs to improve drastically. I am very dissatisfied with Charter Cable.
17. I wish it was more accessible and that there was more of a variety of services offered.
18. broadband service for a home based business
19. No changes necessary
20. Greater and affordable broadband access for my community college students.
21. "Better cell phone service. Faster internet service. Packaged service for telephone, internet, and cell phone"
22. High Speed internet needs to be made available to all on the ESVA. Trying to run a business, build a website, etc. are tedious with dial up service.
23. I do not have internet service at home because I cannot get high speed service. I would definitely have it if broadband was available.
24. Cell phone connection--we cannot use our telephones within three miles of our home.
25. Bring DSL or High Speed Internet to 23407
26. increased competition in cell, internet and TV
27. To get high speed internet I must subscribe to satellite, at a cost of over $110 per month. In my opinion both Verizon and Charter provide less than optimal service. Charter provides horribly substandard service both in its lack of internet delivery as well as its TV service. It would do the people of the county well for the board of supervisors to revoke Charter's franchise as soon as possible to allow another company the opportunity to provide superior service.

28. I am in an area that does not have broadband capabilities. I want and need broadband capabilities. I do online banking, schooling, shopping, and business activities.
29. I am in an area that does not have broadband capabilities. I want and need broadband capabilities. I do online banking, schooling, shopping, and business activities.
30. substantially improved cellular service, higher speed DSL, replace cable company it is atrocious
31. HDTV stations
32. To get with the program. It's frustrating that there is still dial-up. It's not worth it anymore to be behind the times.
33. THAT A TOWER OR WHATEVER NEEDS TO PLACED AROUND HERE SO PEOPLE AROUND HERE COULD GO WIRELESS WITH NOTEBOOKS WHAT'S THE POINT OF BUYING A WI-FI CARD IF YOU STILL CAN'T GO WIRELESS AROUND HERE AND IT'S MESSED UP SO SOMEBODY SHOULD GET ON THAT ASAP.
34. High speed is certainly needed. Dial up nowadays is virtually useless online other than for sending emails. It's only going to get worse as websites become more and more graphic and video reliant.
35. I would like DSL service
36. Expanded DSL/Broadband/T1, increased options for teleworking. Expanded capabilities which would allow certain types of low impact businesses requiring this service to locate here.
37. to improve economic & standard of living conditions
38. I would like to have a faster and reliable serve to help me and my family to log on the internet
39. The fastest internet possible
40. Services are disconnected and each has so many connection fees and taxes. local channels for television using the repeater are poor
41. affordable high speed internet, improved access to local television stations
42. It would be nice if more areas were able to receive DSL and wireless dial up
43. Lower cost and higher speed.
44. FASER INTERNET SERVICE, INSTALLATION OF FIBER OPTICS
45. I would change the high speed internet service to Fios
46. Get prices down into affordable ranges and merge services to a single source as is the case in many major areas.
47. More options for high-speed internet, also more affordable options.
48. High speed broad band internet service and decent affordable cable TV is definitely needed in Accomack County.
49. competition to lower prices, add more services
50. Bundled communications services for Internet, Phone and TV. I'd consider $120/month to be reasonable for 250 TV channels 40 of which are High Definition on 3 TV sets, 5 MBps Broadband Internet, and unlimited local phone service
51. Higher, faster, and cheaper internet service...
52. Price! High Speed Internet is expensive here if you want dependable fast connections.
53. "High speed internet(Broadband)
54. Internet &phone service through cable"
55. Affordable and able to work are the two important needs of our own personal residence
56. Need something affordable
57. Broadband technology (Verizon FiOS would be great).
58. More options for high speed internet or phone service. There is only one phone provider and only one high speed internet service
59. Better cell phone service at my house and stronger radio signals so I could receive public radio at my house also.
60. More affordable services!

61. I need cheaper, faster internet service. I am a teacher and paying $80 per month for satellite internet that is barely adequate and is getting old.
62. PLEASE MOVE THE RURAL AREAS OF THE EASTERN SHORE OF VIRGINIA INTO THE 21ST CENTURY.
63. >50Mbps internet access
64. Low/no-cost, high-bandwidth internet access from our residence in Greenbush, VA
65. Make DSL available for the REST of the community so they will quit using mine.
66. To have the ability to choose from different phone companies. Also to have broadband available all over.
67. I want faster more affordable high speed.
68. To be able to go on and do what you need to do in an appropriate amount of time. Mine is so slow, I don't even want to go on. High Speed would be GREAT...
69. Reliable service. Verizon is terrible with frequent disruptions they are unable to repair without long delays and a tremendous amount of time required to work with several technicians
70. a higher speed internet that would allow me to be online and still use the phone would meet my needs.
71. Better coverage with cell phone and internet.
72. Accomack County Public School District needs to get better internet access, however, I don't believe they would pay money for it
73. better, faster, cheaper broadband service
74. Anything would be an improvement over the service we now have.
75. Higher speed internet and more reliable cell phone service
76. internet faster and readily accessible
77. Internet, phone and TV all in one
78. Even though we have DSL, it still seems slow, as compared to my school service.
79. Affordable competitive internet service and cellular service
80. I would like to be able to connect with the internet at any time of the day. Sometimes at night I cannot get on line.
81. high speed internet - not dial-up - available in all areas
82. high speed internet available in my area
83. Better cell phone service in dead spots like where I live.
84. Would really like to have high speed Internet. Verizon says coming to my area soon - told me that a year ago.
85. We need options other than Verizon - hate Verizon!
86. Need better service for less expense
87. Need lower priced satellite and internet services
88. better internet security is needed and less expensive service in all areas of communication
89. Need more wireless towers!
90. We need broadband, especially for businesses!
91. Need a more affordable satellite TV, phone, DSL and cell plan
92. need better reception
93. high speed internet access to this area would meet my needs
94. More competition needed for cable and telephone
95. I would be very interested in a total package of phone, video and DSL. An all in one at a set price
96. Please bring DSL to our road soon. If not we plan to get connection via satellite. All of my neighbors want high speed, too.
97. Need better dependable and clearer cable TV
98. need affordable choices
99. more reliable cell service; faster internet connections

100. I think that it's ridiculous that less than 1/2 mile down my road houses are allowed DSL & I am still waiting-still paying for dial up & slow internet services & freezing up. I can't ever get any work done on it. It would be very nice to get another service in here to compete with them & be able to actually provide for customers that actually want it & need it. It is funny that some customers are known that can pay a lot of money to get wires run thru Verizon DSL come first.
101. Local stations on Satellite TV Lower costs!!
102. Broadband wireless so my business is always connected
103. Need very affordable DSL - dial up is too slow
104. Curtail commercial advertising over the telephone
105. Technology moves so fast - our communities must keep in stride with it or lose opportunities for clean economic growth!
106. Allow a competitive cable provider to outbid Charter (terrible) for local cable license.
107. Less expensive satellite and DSL, better quality phone service with updated lines and equipment.
108. Better local TV
109. Just get better regular telephone service
110. Cheaper service would be nice in this economically depressed area
111. We need an affordable high speed Internet or DSL available in our area. Our dialup is very slow and we are always being disconnected.
112. Higher speed internet, DSL or broadband available to everyone
113. Though Internet through Verizon is OK, I do not like all the unsolicited email
114. We need to be able to call a local service number and local repairmen to service our technology needs
115. Need higher bandwidth
116. Need more options for high speed Internet, electric power, and local telephone services
117. Better cable access - Charter is horrible
118. Too much repetition of TV programs and too many ads on TV
119. Having high speed internet access would be a big benefit and having a lower cost telephone service both wired and wireless.
120. Definitely need more access to high speed Internet options!
121. Phone lines very sensitive to water. Heavy rain causes static on the line.
122. Faster internet
123. Eastern Shore should have broadband available - but not subsidized
124. Encourage competitive cable TV availability to ultimately replace present unacceptable provider (Charter)
125. Need better cell phone reception. Wireless Internet slow many times
126. Bring in Verizon DSL
127. Less expensive options for the same level of service or better
128. Would like a choice of companies offering high speed Internet services. Verizon is the only company offering this service on the Shore.
129. Inexpensive cable TV
130. Get rid of the Internet everywhere in the world!
131. Faster Internet to allow smoother video calls with webcam
132. Better cell phone coverage at home (none at all now)- Occohannock Neck, Silver Beach area
133. Need local TV stations without charge. Better Internet connections with online help for solving problems
134. Some areas still cannot get DSL - my daughter has tried
135. Need DSL to all towns and rural areas
136. Not satisfied with cable service - not able to have Dish service due to tree locations
137. Adding the Food Network channel to cable

138. Very Important - need better cell phone coverage over the entire Shore - especially away from Rt 13
139. Would like wireless Internet access
140. Need wireless broadband
141. Can you lower the cost of phone and Internet? Way too expensive.
142. For what one gets from satellite TV we feel it is not worth what one has to pay at all!
143. Video costs are too high and there is no consumer input on selection of channels. Would like a choice of video and phone providers.
144. Need higher speed Internet access and better cell phone coverage.
145. Tax payers should not subsidize the communications business or be in the communications business.
146. Would like to receive the Food channel and Court TV from cable provider. Cable TV service personnel not reliable.
147. Need better telephone lines and the availability of cable
148. Need more towers for cell phone coverage. DirecTV is overpriced.
149. Need High-speed Internet to all areas
150. Government should not compete with private enterprise
151. Need better cell phone coverage - too many dead zones
152. Our DSL provider needs to keep our Internet from shutting down 2-5 times per day
153. We need better internet access so we can be a viable player for more industry.
154. Internet service that has more speed than a dial-up. With dial-up in this area we lose connections frequently.
155. Telephone more affordable, cell phone better reception and price, better cable--bad!!!
156. Affordability is the most important and reliable service.
157. High speed Internet availability in the form of cable or DSL connections.
158. I would like to have wireless internet more available in public places
159. alternative to cable TV -- other than satellite
160. options very limited, the DSL we can get, the service is very, very, very poor
161. "1.Provision of county-wide Wi-Fi would be ideal. Or providing easily accessible hotspots for public access would be a step in the right direction. 2. Increase cell towers. I have had to change providers due to lack of access and I still have to stand at the road to make a cell call. 3. Increase satellite service availability."
162. we need Verizon broadband in Bloxom
163. Get rid of dial up because it is way to slow.
164. Broadband in the $35-$50 price range offering throughput of 6 Mbps or better
165. Faster internet speed for the money.
166. A service that would combine phone, satellite and internet services & bill for these services together.
167. Need high speed internet.
168. Bring us up to the rest of the country, fast communications.
169. Being able to use my cell phone everywhere, especially at my home.
170. Broadband access needed. Improved phone lines and telephone competition.
171. ES of VA should have DSL or high-speed available to everyone.
172. Need better digital reception for cell towers. Fiber optic internet connections needed.
173. Improved video service through competition (also telephone wire improvement).
174. Would like DSL or digital cable Internet service provider in Hallwood!
175. Would love to have another choice other than Verizon, who is fine if there are no problems, but try to talk to an actual person!
176. I am cautious of wireless due to security concerns. Verizon DSL has terrible customer service. Verizon Wireless pretty good but spotty coverage even right in Onancock.

177. Wireless WAN would be attractive assuming price was reasonable.
178. I would like the idea of a fiber and wireless system. It would be very beneficial to my husband's business.
179. Everyone on the Shore should have access to DSL.
180. Verizon voice mail has "glitches" too often. Need cheap fast Internet for video conferencing.
181. High speed internet needs to be available to all.
182. Wireless service please that would integrate phone, TV and internet.
183. DSL or High-speed fiber line to house, or broadband to house,
184. Disappointed in cable, both cost and poor service (dropout signal, channels down, lack of selection for channels). DSL is a monopoly but can't get in my area.
185. Need more choices.
186. Need high speed
187. Need DSL in our area.
188. Internet - we plan to get faster service this year. Video - paying a lot of money! Cell phone - BAD signal!
189. Would like faster, reasonable internet service to do genealogy research.
190. Work with the county to enforce the current cable company to service all over the county. VA Broadband needs to work with Verizon.
191. DSL or Broadband to rural customers. Local channels (Norfolk) on satellite (DirecTV).
192. Better cell phone service
193. Need to be able to get local channels (Norfolk) in Accomack County on DirecTV.
194. Cable TV is very expensive. Would like TV, Internet all in one package.
195. Need less expensive cell and landline phone service.
196. Improved cell phone service. Internet options (other than only dial-up)
197. High speed at a lower price.
198. To back to when we had better services. Call now for repairs--we get connected to the mid-west and say/twill be a week for repairs.
199. reasonably priced service
200. Better cell service away from Rt. 13 and cheaper.
201. Receptor towers (TV) should be continued and improved (especially for elderly and poor)
202. cable television especially on the eastern shore is extremely poor
203. Combine services at a more affordable price.
204. Wireless coverage that works in my home--Verizon and Cingular--both work in certain places but not inside my house in Onancock
205. Broadband would be good for shore in general
206. Whose crazy idea was this?
207. Get a decent cable company or get internet access greater than 40 mbps
208. Affordable internet service may persuade me to by a PC for home use.
209. Price reduction in all
210. None!
211. Same company for internet/TV
212. Improved cell phone reception in Cashville. Affordable satellite/cable that have more varied programming.
213. Our needs are met
214. better cell phone coverage
215. Better cell phone coverage
216. Broadband
217. Local network feeds, stations, HD TV. High Speed Internet - faster downloads with fiber optic to the house, not 1 mile away- get rid of copper wire--Dark ages

218. Cable service is too expensive. All technology services on the eastern shore are too expensive as compared to other cities I have lived in.
219. faster and more reliable
220. Take down translator TV towers. Help provide affordable internet access.
221. Satisfied
222. More cell towers, more/better high-speed internet access for a fair price ($20 or less).
223. Probably none because where I live there aren't enough people in this area to warrant any communication technology. We're the last to get anything done here.
224. would like to get local TV stations through satellite
225. high speed internet service digital TV service cell phone tower in northern Accomack
226. Availability of better high speed internet access and cable television. I dislike DirecTV, lack of any local stations and the satellite signal is affected by heavy rain, wind, ice--you name it. Same for the internet. Both services are much more expensive that what I was paying in Bucks County, PA prior to moving here.
227. High speed internet Cable TV
228. Charter cable.. Not to my satisfaction for $ spent Would like to see Comcast
229. Lower costs. Better service.
230. Need DSL for high speed internet services in more areas.
231. Verizon DSL was great at first now it takes as long as dial up because they don't take in consideration how many will be using the router and it is over worked.
232. Make high speed internet available in more areas.
233. Make high speed internet available in more areas.
234. I am very interested in Broadband. I have been trying to get if for over a year. My dial up services limits me very much, that is why I want Broadband so me and my son can enjoy the internet
235. Would like to have the newest fiber optic service available to the shore.
236. Better service most places do not receive cell phone service. Better prices & more DSL options besides Verizon. DSL services are less expensive elsewhere.
237. Better TV cable reception. Better cell phone reception, we are in a dead area.
238. A cable co. that is competitive and easy to reach by phone without getting Canada to fix local problem. Competitive cost without breaking our bank.
239. Free internet services--and cheap cable television services.
240. I need high speed technology for communication and financial sustainability for all our medical centers and remote sites.
241. Allow access to local sat TV stations in Accomack Co.
242. Faster internet service--DSL--Cable--either one made available at my address.
243. More affordable home phone, cell phone, DSL, and satellite service… $170/month is ridiculous
244. DSL or wireless
245. Need internet high speed service
246. Reliable wireless broadband service
247. Would like DSL for business purposes. Also need choices and competition to hold prices reasonable.
248. We definitely need more high speed internet options. Less than 3/4 mile down my same road they are allowed high speed DSL yet my home is still not available on the same road.
249. High speed internet service DSL
250. We need high-speed ASAP!!
251. Less dependency on satellite--other options.
252. more choices
253. Problems with cable outage are not always promptly repaired--no contact with local repairmen--too expensive.

254. Wireless
255. Satellite service should cost less and telephone should cost less than what I'm paying. Looking for Internet provider but too expensive.
256. DSL....
257. More cellular towers are needed. Cellular reception in the Savageville and Wachapreague areas is spotty. Other areas too.
258. Faster internet service online.
259. High-speed internet access and cable TV--these should be available to everyone in this day and age.
260. DSL....
261. We are retired Soc. Security and part-time only total yearly income is below a VA or federal taxed income.
262. Get local channels on Direct TV in Accomack County
263. None.
264. too expensive--limited choices
265. More reliable service relationship - a non-monopoly mentality - a total package for TV, phone, Internet and cell
266. Faster speed needed - current DSL limited to 1.5 meg and I would like 3 meg service that is available in other areas
267. We need other telephone companies to choose from
268. I have to buy a new computer but I really need a wireless Internet service for the convenience
269. Need high speed internet service at my residence
270. Need competitive prices for high speed internet services
271. "being able to stay online-always jumping off-disabled person "
272. Need wireless service
273. Bring Broadband! DSL speed varies all the time.
274. Need less expensive telephone service
275. Live in a rural area. there is more than a need for DSL service
276. Reduction in state/local fees which are defacto taxes.
277. Need high speed internet to assist with my business and personal needs
278. If the Eastern Shore is to be competitive in the 21st century we need the latest in technology and communication.
279. Put lines underground so that storms, wind etc. do not affect us so much. Also - need more knowledgeable repair people.
280. if DSL was available in this area I would have a computer
281. Need better reception for NBC and Comcast Sports channels. Better response when cable reception is lost or faulty.
282. We are hoping Congress will pass an ala carte bill with a specified minimum. Who would want all the junk now available?
283. The cable company needs to upgrade their service - local stations are not always clear and sometimes are out completely. Their monthly service fee is outrageous for their service, which is poor.
284. Higher speed internet would be most welcome!
285. Cell phone reception improvement needed.
286. Fix the cable company! Check channels 3-10; have been fuzzy for 10 years!
287. I have a Verizon/AOL link that provides all the Internet I need. I do not need any extended TV programming.
288. Better cell phone reception from Verizon in the ocean deli to Atlantic corridor
289. cheaper high speed access
290. Eliminate dropped calls on cell phones.

291. I want Charter cable on Chincoteague to offer food channels. I would prefer having cable over dish.
292. We are not full-time residents and maintain minimum communication services at this location. Our primary residence is in MD
293. Need affordable landline phone - need affordable high speed internet
294. More economical pricing would be nice!
295. Need faster Internet - Need reliable Internet - Need affordable Internet!
296. Wireless TV service or digital TV other than cable
297. need better cell coverage
298. Cut or outlaw loud noises in cars and trucks on highway and public roads.
299. If we want the services we are forced to accept higher prices because there is not competition between companies. We have to feed the monopoly.
300. better high speed internet service and video services
301. Combine all services into one cost-effective service. Cell phone provider needs to eliminate dead zones.
302. Make DSL available to ALL areas of the Eastern Shore. I have many family members on the Shore who still have to use dial up.
303. Not satisfied with Verizon cellular and poor signal in neighborhood.
304. Include Broadband
305. I would like to be able to get local channels on satellite
306. We need DSL or high speed cable service rolled out to everyone, not just those that live on Rt13 or within 3 miles of Verizon. Tried to complete survey online but had internet problems!
307. choice of telephone service provider
308. DSL internet service"
309. need broadband internet access and improved cell phone coverage
310. High-speed internet service and local TV stations available from satellite
311. Would like an ala carte menu from the cable TV company
312. cell phone service for NASA and surrounding areas
313. It would be nice to upgrade our infrastructure
314. lower costs
315. Love to see prices come down and get it all on one bill

Business
Response to Survey Question 19 – Comments/Suggestions

"What changes or improvements to communication technology on the VA Eastern Shore would best meet your needs?"

1. Lower Cost, Faster Speed, Bigger Bandwidth
2. Large file transfer at high speed and affordable cost
3. "Better cell phone services we have too many dead spots where service is spotty."
4. Adequate and reliable bandwidth.
5. "Faster internet service - during the working day any communication is extremely slow."
6. Make high speed Internet available
7. An option to Verizon service for phone/cell phone
8. High Definition broadcast from Cable TV provider needed
9. Free Wi-Fi
10. An affordable internet service with faster speed
11. We need to get new technology faster
12. Wireless, everywhere!
13. cheaper and more reliable service, fewer disconnects
14. call if can help 757-787-8865
15. broadband is necessary to growth of businesses and attraction of new biz on Eastern Shore
16. Need high speed DSL service in our area
17. Affordable prices, easy wireless access and complete coverage of the Shore
18. Improved high speed access ports
19. Need better cell communication on the northern end of Eastern Shore
20. Elimination of 'dead' areas for cell phone service - social workers need to be able to contact agency when investigating protective service cases.
21. Wireless service is seldom accessible
22. Cheaper telephone rates for small businesses
23. Need better cell coverage
24. Faster service
25. Higher speeds at lower cost
26. Wireless broadband is the only answer for this area!!! Verizon equipment and lines are "JUNK" i.e. faulty underground lines that have been that way for 10 years and little or no movement to DSL service to areas that need service. We on the Shore are being left behind.
27. Another telephone service provider besides Verizon.
28. Need broadband for the entire shore - do not have at home and I am an attorney.
29. Not a tech geek, so have no idea but need faster Internet!
30. Faster, more consistent and affordable services. Why is business phone and DSL so much more expensive than residential?
31. Need stronger signals in weak areas.
32. Looking forward to better broadband!
33. More selection for faster internet services.
34. Need broadband at home where we do most of our work (Gargatha Landing)
35. Bundling of internet, phone, and cable TV services at a good price for my business.
36. Better cell digital connection (towers). Another high-speed Internet connection that is hard-wired (cable). High definition TV.
37. Nextel service would be great.
38. More people need DSL at home so they can view my website!
39. Need better cell coverage.

40. We need reliable phone & DSL service - each time our DSL has gone down, we have been without Internet services for 3-5 days. It's unacceptable. Our business depends on the Internet. The phone company never wants to take responsibility for poor customer service.
41. DSL currently meets our needs. More bandwidth and/or higher speeds seem desirable for future growth.
42. Signal stability
43. Better wireless support off Rt. 13.
44. We need DSL or cable modem
45. Need more reliable services.
46. We need DSL
47. Improved cell phone service - VERY poor service with respect to voice mail.
48. Need faster, more reliable internet access.
49. Need lower cost services.
50. We need VoIP service - more choices for high speed internet
51. Fiber connections between our schools and central office would best assist our school system.
52. Need broadband at my home
53. Fiber optics to the home.
54. Better cell coverage.
55. We use the DSL at home for business. We feel no need to pay for Internet access at two locations.
56. Broadband at my home
57. We need to have the fastest Internet service.
58. Better pricing, better customer service.
59. Competitively priced choices
60. Higher bandwidth internet service and better cellular coverage is needed.
61. We need high speed availability
62. Availability of true high-speed access that is reliable and affordable. I am so unhappy with the service I have now and it is too expensive for a one-person, home-based consulting business.
63. Need wireless hubs - please help us. Verizon needs some good competition.
64. Better Internet connections with lower prices
65. We are very satisfied with our current services and feel taxpayer supported changes are improper.
66. Broadband availability
67. Broadband to our area
68. More options other than Verizon DSL for fast internet connection.
69. I strongly support broadband for the Eastern Shore.
70. Need cell phone coverage at home - currently don't have any.
71. Need broadband or at least DSL
72. DSL or broadband wireless to rural customers.
73. Reduced pricing for services
74. We need broadband to bring more jobs to this area. Better technology supports more businesses.
75. Better cell phone coverage and higher-speed, more advanced Internet options.
76. Connectivity to off site clinics with higher bandwidth.
77. Affordable high bandwidth

Appendix C: Example of Open Access Network Fees and Charges

PUBLIC UTILITY DISTRICT NO. 2 OF GRANT COUNTY, WASHINGTON
RATE SCHEDULE 100
FIBER OPTIC NETWORK SERVICE

AVAILABLE: To service providers desiring to use the District's Zipp® fiber optic network. District reserves the right at its sole option to discontinue services listed in this rate schedule at any time.

EFFECTIVE: These rates will be effective January 1, 2005 and shall remain in effect until superseded by the adoption of a Commission resolution revising the same.

BILLING RATES: Use of the Zipp® Network shall be billed in accordance with the charges listed below.

Service:	Non-Recurring Charge	Monthly Charge
Standard Services:		
Residential Internet Service Per Subscriber*	-	$22.50
Commercial Internet Service Per Subscriber*	-	$30.00
Video Service Per Subscriber	-	$5.00
Phone Service (Per POTS port)	-	$5.00
*Upstream not included		
Connections For Apartments and Hotels:		
LE-22 or equivalent equipment	-	$3.00 per port, minimum of $25.00 per building
LE-211 or equivalent equipment	-	$2.50 per port, minimum of $28.00 per LE-211
Special VLANs:		
Set Up Fee Per Port	$50.00	-
Monthly Fee (10 Mbps) Per Port	-	$30.00
Monthly Fee (100 Mbps) Per Port	-	$200.00
Monthly Fee (1,000 Mbps) Per Port	-	$1,200.00

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PUBLIC UTILITY DISTRICT NO. 2 OF GRANT COUNTY, WASHINGTON
RATE SCHEDULE 100
FIBER OPTIC NETWORK SERVICE
CONTINUED

Service:	Non-Recurring Charge	Monthly Charge
Set Up of New Service Provider	$500.00	-
Collocation of Customer Equipment in District Facilities (When space and appropriate facilities are available. Prices are for single 19" rack):		
Without UPS or Backup Generation	-	$200.00
With UPS and Backup Generation	-	$300.00
~~Dark Fiber~~ - per strand per mile - (Limited to fiber availability. Capacity planning will reserve fiber for future District use that will not be available for Dark Fiber use.) Rate Deleted Effective 8/1/06 per Resolution 7994. See Rate Schedule 120 for Current Rate		~~$30.00~~
Special Fiber Construction to any location other than to the electric meter inside a released hub area or all construction required to provide service outside of a released hub area	Prepayment of 100% of estimated District cost	-
Upstream Internet Service (if a service provider desires to purchase upstream Internet transport from the District the following options are available):		
1. Fixed - charge per 1Mbps - (Under this option, the service provider chooses the amount of upstream bandwidth that they wish to purchase to serve their customers and the District will lock down the service provider's port so that no more than the chosen bandwidth will be available.)	-	$250.00
2. Metered - charge per 1 Mbps of average metered use - (Under this option, the service provider's port will NOT be locked down or capped and the service provider's customers can burst to the total amount of bandwidth available to the PUD. These charges are based on the monthly average megabits per second use and are calculated as follows. (1) District equipment will take readings every five minutes of the bits traveling outward and inward over the customer's connections to the District's equipment, (2) The inward readings shall be averaged to calculate an inward monthly Mbps average, (3) The outward readings shall be averaged to calculate an outward monthly Mbps average, and, (4) The higher of the inward or outward monthly averages will be used for billing.)	-	<7 Mbps avg - $350.00 7.1-10.0 Mbps avg - $290.00 10.1-25.0 Mbps avg - $280.00 25.1-50.0 Mbps avg - $260.00 50.1-100.0 Mbps avg - $250.00

PUBLIC UTILITY DISTRICT NO. 2 OF GRANT COUNTY, WASHINGTON
RATE SCHEDULE 100
FIBER OPTIC NETWORK SERVICE
CONTINUED

Service:	Non-Recurring Charge	Monthly Charge
Each STS-1 SONET Pt-Pt Data Path (sold in increments of STS-1, but provisioned using T-1, OC-3, OC-12, OC-48, & OC-192 line rates. Non-Recurring Charges for equipment may apply. The District will determine the demarcation point)	Prepayment of 100% of estimated District cost	$400.00
Use of District-Owned Video Head End - per video subscriber		$3.00
Use of Video Encoder for Public Access Programming		$55.00 per month or $10.00 per day
Set Top Box Lease - per box		$5.00
Use of Myrio Middleware - per video subscriber		$2.00
Use of shared TV Data Contract on Myrio Middleware - per video subscriber		$0.50

SERVICE: Service under this Schedule is subject to the terms and conditions in the District's Telecommunications Policies, as the same may be amended from time to time.
TAX ADJUSTMENT: The amount of any tax levied by any governmental entity, in accordance with the Laws of the State of Washington, will be added to the above charges.

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PUBLIC UTILITY DISTRICT NO. 2 OF GRANT COUNTY, WASHINGTON
RATE SCHEDULE 100
FIBER OPTIC NETWORK SERVICE
CONTINUED

Minimum Bill:
After a six month initial startup period, service providers will be charged a minimum monthly bill according to the following timeline. Existing providers will go through the same steps starting August 1, 2004.
1-6 Months No Minimum
7-18 Months $500.00 Minimum
18+ $1,000.00 Minimum

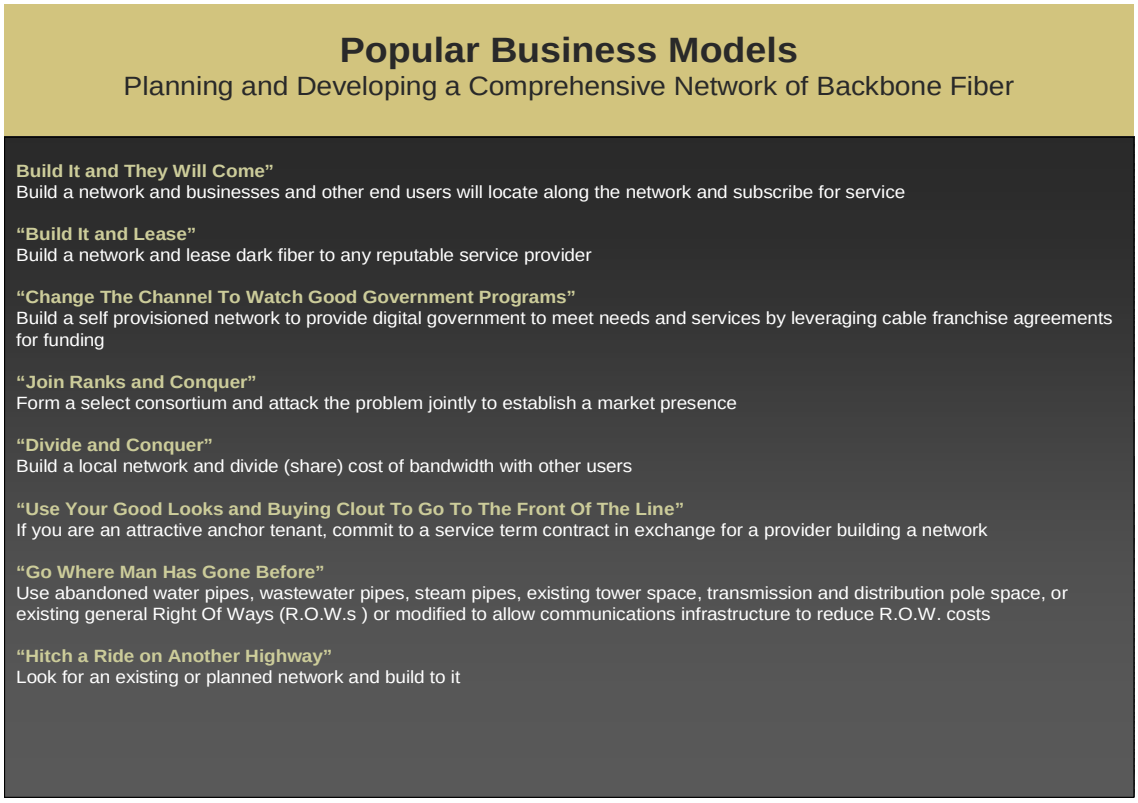
Late Payment Charges:

Bills that remain unpaid 25 days after the billing date shall be assessed a late payment charge on the unpaid balance. The late payment charge shall be applied on the 26th day after billing and will be calculated using the US Prime Lending Rate as determined by the Federal Reserve and published in the Wall Street Journal as of the preceding March 15, divided by four (4), rounded to two digits and applied as a monthly percentage interest rate to the accrued outstanding balance. The applicable monthly percentage rate will be adjusted each March 15th based on this same formula. If March 15 falls on a non-business day, the District will use the prime rate published in the Wall Street Journal on the next business day. In no event however shall the minimum monthly late payment charge amount be less than $50.00. Late payment charges shall continue to accrue until such time as the bill and all accumulated charges have been paid in full.

Appendix D: Case Studies – Forward Thinking Communities That Have Taken the Lead

For many communities, the lack of choice for Internet service has resulted in high costs to the citizens. This lack of choice has served to motivate many communities that have built their own networks and have offered service themselves or partnered with service providers.

Popular Business Models for Planning and Developing a Comprehensive Network of Backbone Fiber and Enhancing Telecommunications



Many cities are taking charge of their community's future by taking a proactive approach to encouraging broadband deployment. Regardless of the business model approach – wholesale vs. retail, municipally-owned, or public/private partnership – these cities have decided not to 'wait and see' when and if advanced services would become available to their citizens.

Municipally-Owned and Operated:

Municipal electric utilities have the distinct advantage of owning the pole infrastructure that can be utilized for deploying a network throughout their service territory. Typically these utilities also have a

solid history of serving citizens with good service, and are visible in their communities. Fiber optics has been in use by electric utilities for several years, enabling sophisticated SCADA (supervisory control and data acquisition) monitoring of critical infrastructure such as the electric grid and water systems. It is these experienced municipal utilities that have taken the lead in deploying government owned and operated fiber optic networks throughout their communities bringing high-speed Internet and advanced services to their residents and businesses.

One municipal example can be found in the City of Dalton, Georgia. Dalton is a small city known for its numerous carpet mills. Dalton Utilities maintains close contact with these large business owners, and listened when the mills expressed a need for high bandwidth connections that would enable real-time pricing for services. City leaders recognized the city's vulnerable position should even one of these large mills leave town. Dalton Utilities has deployed a state-of-the-art fiber to the premise network and offers high bandwidth voice, video and data services to all businesses within the city limits. An extension of this network into the surrounding county is underway. Today, should a large employer leave the area Dalton is well positioned to attract another large manufacturer or any other industry requiring fiber optic connectivity.

Municipally-Owned, Private Operators

"Utopia" Project, City/Municipal Consortium including Salt Lake City, Utah - Model where city members build the information highway and Fiber-To-The-Home (FTTH) delivery system and lease access to service providers.

UTOPIA (the Utah Telecommunication Open Infrastructure Agency) is an inter-local government agency specifically formed to fund, build, and manage a high-speed fiber telecommunications network. (Under Utah law, municipalities can band together to form inter-local agencies for the purpose of delivering a particular service and benefit to their communities.) Stretching from Tremonton in northern Utah to Cedar City in southern Utah, the UTOPIA project area includes Salt Lake City and 17 surrounding cities that encompass nearly 250,000 households and 35,000 businesses. As such, UTOPIA is one of the largest, fiber-to-the home (FTTH) and fiber-to-the-business (FTTB) projects launched to date. This community-backed agency will operate the network and provide wholesale network services to service and content providers.

The UTOPIA network will deliver 100/1000 Mbps edge connectivity over a multi-terabit-per-second distributed core switch fabric. The network will allow content and service providers to take advantage of an extremely advanced network without investing the capital costs to create one. Where possible, Utopia will also seek to take advantage of existing fiber and other third-party infrastructure assets as part of network deployment. This access network has attracted interest from the carrier community to buy wholesale bandwidth and gain access to Utopia's end users. Each service and content provider will have a connection directly to the customers. Residents and businesses served by the UTOPIA network will benefit by gaining access to affordable state-of-the-art services and content from their choice of private sector providers.

A good example of citizens benefiting from competition is found in Tacoma, Washington. Tacoma is one of the pioneers of municipally-owned fiber optic networks, building the Click! Network that began providing Internet services to citizens in December 1999. The Click! Network is an open access model; the City itself does not offer Internet services. Three ISP's provide service via cable modem on the city-owned network. This network consists of 670 miles of fiber and coax along every street within the city limits of Tacoma. Construction to expand the network into an adjacent city commenced in February 2003, with two more city expansions planned for the future.

Prior to the City of Tacoma constructing this network, the citizens of the City had only one choice for cable TV or cable Internet (AT&T) and one choice for DSL in limited areas of town (Qwest). By building this network and opening the system to competing providers, citizens in Tacoma now have provider choice and competitive pricing for Internet service, enabling more families to make the move to high-speed service. The table below illustrates the effects of competition in Tacoma. This city-owned network has brought competitive pricing, and more importantly, choice to citizens of Tacoma.

Effects of Competition in Tacoma - Pricing is for Internet service alone – cable TV customers receive discount off these advertised prices.

Bandwidth Offered Ranked by Increasing Bandwidth	Method of Access	Tacoma Competing Providers and Pricing				
		NetVenture (incl. ISP)	HarborNet (incl. ISP)	Advanced Stream (incl. ISP)	Comcast* (incl. ISP)	Qwest (does not incl. ISP)
256 Kbps/256 Kbps	DSL					$21.95
500 Kbps/128 Kbps	Cable Modem					
640 Kbps/256 Kbps Residential	DSL					$31.95
640 Kbps/256 Kbps Business	DSL					$55.00
640 Kbps/640 Kbps	DSL					$66.00
1 Mbps/128 Kbps Residential	Cable Modem	$29.95	$29.95	$29.70		
1 Mbps/128 Kbps Business	Cable Modem	$39.95	$39.00	$33.95		
1 Mbps/200 Kbps	Cable Modem					
1.5 Mbps/256 Kbps	Cable Modem				$55.95	
1 Mbps/400 Kbps Business	Cable Modem					
1.5 Mbps/512 Kbps						
1 Mbps/1 Mbps	DSL					$88.00
2 Mbps/256 Kbps	Cable Modem	$49.95	$49.00	$39.95		
2 Mbps/384 Kbps	Cable Modem	$69.95	$69.00	$48.95		
3 Mbps/512 Kbps	Cable Modem	$129.95	$135.00	$100.00		

Aggregating Municipal Demand

Montgomery County, Maryland is building a self provisioning network to provide digital government services to meet the needs of public safety communications; delivery of E-government services; basic business applications such as health care, finance, human resources and permitting.

The County links over 170 facilities into a fully redundant network for traffic management and to meet the need for high speed data, voice, and video (cable television-PEG channels) network services. Currently 125 of 175+ facilities are connected by fiber by leveraging cable franchise agreements for funding and access to dark fiber. The network takes advantage of both leased and owned infrastructure, provides 100 Mbps to all municipal sites, and is scalable for future needs. By leveraging assets and aggregating bandwidth access, the system saves about $2.7 million per year in reoccurring leasing expenses.

Another example of aggregating demand is for municipal entities to build a local network and divide (share) cost of bandwidth with other users. The Georgia Public Web (GPW) was formed in 1998 as a non-profit corporation by thirty-two of the forty-nine public power communities that make up the Municipal Electric Authority of Georgia. GPW provides broadband services to the public and operates a network that interconnects statewide with other broadband networks.

Georgia has one of the largest and most expansive networks of municipal electric utilities in the country. As such they were able to use their transmission network as a highway over which they built their fiber optic infrastructure. GPW currently has over 1200 miles of fiber and offers cost-effective fiber optic Internet, private line and web solutions.

Collaborations between cooperative electric utilities and the private sector or non-profits can serve two purposes. Some of the fiber can be devoted to the internal needs of the electric utilities while excess fiber can be used for other purposes. Using this model, GPW currently offers dramatic savings in the costs of data transport, on the order of seventy-five percent or more over pricing from the traditional incumbent voice providers.

The lower pricing allows small municipalities throughout the region to partner with regional ISPs such as Tri-State Broadband (www.trisbb.com) to implement wireless solutions with higher bandwidth and lower costs than are currently available.

Municipal Commitment for Services

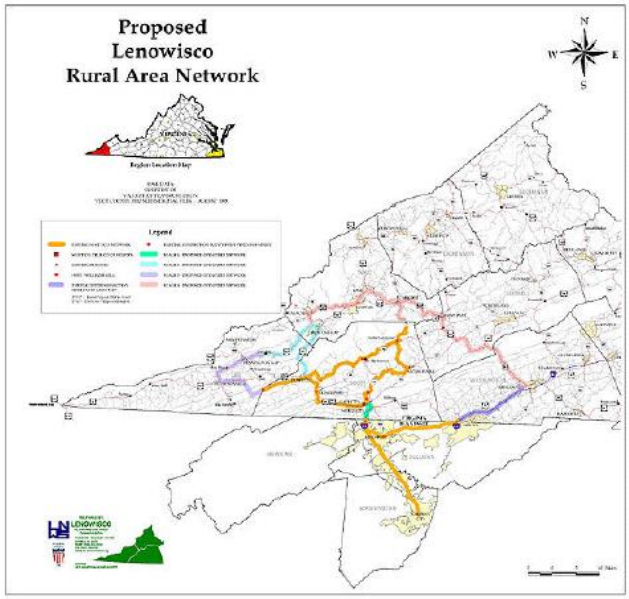
The "CivicNet" Project of the City of Chicago, Illinois involves the city and agencies to become aggregated anchor tenants on a city-wide, high-performance digital network through contributed physical resources (fiber optic cable, duct & conduit, Right-of-Ways, space for Node locations) and joint procurement documents. The city is not the provider. While the city did not want to be in the position of competing with the private sector, the city did want to take steps to promote development of high-speed communications. The city can leverage its purchasing power to make sure all communities within the network infrastructure have an opportunity to connect. In addition, small to multi-national corporations will benefit. The project is also seen as a catalyst for economic development initiatives.

The network is based on best combinations of fiber optic and wireless technologies with existing infrastructure. The system is to be managed by private firms and supported with a 24x7 high-quality communications operations center. The system uses an open architecture based on international standards.

Leveraging Existing Infrastructure

Use of abandoned water pipes, wastewater pipes, steam pipes, existing tower space, transmission and distribution pole space, or existing general Right-of-Ways (R.O.W.s) can be modified to allow communications infrastructure deployment to reduce Right-of-Way (R.O.W.) costs.

Located in Southwest Virginia, the Lenowisco Planning District is comprised of the counties of Lee, Norton, Wise and Scott. The Planning District and members of the Virginia Tobacco Indemnification and Community Revitalization Commission have plans to install fiber-optic infrastructure at the same time new water lines are put in for newly announced water projects. The Tobacco Commission has been charged with distributing Virginia's share of the $200 billion being paid by big tobacco companies to settle a lawsuit filed by several states seeking to recoup the cost of treating sick tobacco users. Part of the money is to be used to promote economic development.



Virginia Tech has been working with Lenowisco to develop the technology standards for the next-generation Internet. The fiber-optic system the planning district wants to install would support high-speed broadband access to a new level of the Internet not available anywhere else in the nation. Scott County Telephone Cooperative is a participant in the broadband project, utilizing their existing network in conjunction with the new fiber optic lines to deliver services directly to rural homes and businesses.

This new industry, in its infancy, combines leading edge optical technologies with very high capacity wireless networks and advanced features of the Internet protocol to enable an extraordinary advantage in cost and communications power

LENOWISCO proposes to put the world's most advanced communications infrastructure within reach of every business and citizen in the LENOWISCO area within 10 years. The overriding goal of the program is to act as a catalyst in creating substantial economic, educational and health care improvement opportunities for citizens of the region and competitive advantage for its businesses through the

development of extremely high speed, reliable network infrastructure at a fraction of currently available prices. This infrastructure will be private sector based as a means of ensuring its sustainability and economic viability, and will enable the emergence of the newly developing communications and network industry in southwest Virginia.

Leveraging State Purchasing Power

The Key-Net Alliance in Pennsylvania was a cooperative venture between the Commonwealth and service provider Adelphia Business Solutions to move all state facilities to a new public network to provide digital transport of voice, video and data. In addition to state-owned government and university facilities being connected, the Alliance provided opportunities for local community facilities, such as hospitals, businesses, schools and local government located within reasonable distance to the network to apply for connection. The Commonwealth mandated that priority be given to underserved and disadvantaged rural and urban communities. While it has been reported that the Key-Net Alliance program has been discontinued in its original status, significant accomplishments were made in meeting the objectives of this initiative. Certainly what has been accomplished through the Alliance will continue to play a role in future initiatives to continue to deploy broadband in Pennsylvania.

"Connecting Arizona" is an example of a state-wide initiative in the formative process[15]. The ATIC, a strategic planning organization under the direction of the Arizona Governor, has chronicled the state of broadband Internet deployment in that state, and developed a number of recommendations to accelerate broadband deployment. These include:

- Leveraging of State purchasing power via the State carrier services contract
- Encouraging community-level demand aggregation to engage telecom carriers on local issues including broadband deployment

Their recent document makes the case for enhanced middle mile deployment—the data connection between the Internet Service Provider in a rural community and an Internet backbone provider some distance away. One of their major points is that enhanced middle mile infrastructure reduces the transport costs that make wireless networks attractive in rural areas. They also cite the importance of redundancy in telecommunications infrastructure highlighting the effects of 9/11. Damage to local infrastructure near the World Trade Center complex severely degraded widely dispersed communications because of the lack

[15] Connecting Arizona: Ensuring Broadband Access for all, Arizona Telecommunications and Information Council (ATIC), Fall 2002.

of redundancy in the system. A system of middle mile fiber optic cable providing multiple paths by which data can travel is critical to maintaining communications during emergencies or disasters.

The Council also recommended a series of initiatives requiring legislative or local government action to implement. These included:

- Income tax credits for equipment purchase or installations of new fiber optic deployments or infrastructure to rural or underserved communicates. Credits would apply to items such as microwave point-to-point links and points-of presence (POP) on existing fiber. The credits would only be applicable if Internet services or transport were made to end-users in the local communities.

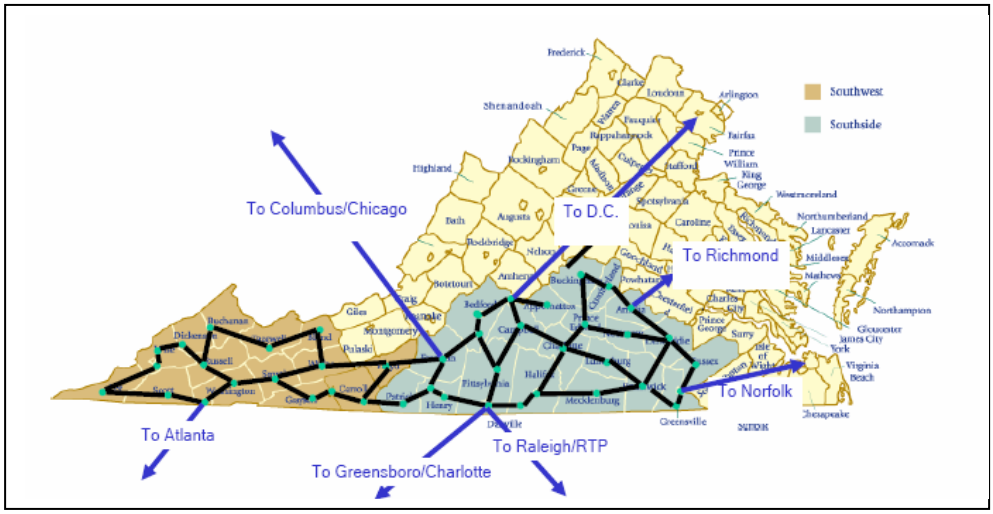
- Expedited right-of-way permitting process including coordination with State and Federal rights-of-way to minimize the costs of infrastructure development, expansion of the Universal Service Fund to finance deployment of advanced broadband services, encourage establishment of public/private partnerships to enable broadband development

Perhaps just as important, the Council developed a vision statement for the deployment of broadband throughout the state: *"By 2010, Arizonans should be able to benefit from the use of broadband in the same manner as those living in what are currently classified as the 'most wired cities in the world.' Such broadband access will allow them to be healthier, more informed, more educated and more productive."*

The ATIC felt that it was important that a time frame of approximately eight years be included in the vision statement.

Leveraging State Funding

An innovative use of state funds has advanced broadband deployment in south side Virginia. Through collaboration between the State and Virginia Tech a task force was formed to build an advanced network infrastructure, developed as a product of Virginia Tech's eCorridors Program. Their objective is to work with communities, private-sector and municipal partners to facilitate rapid development of advanced fiber optic, wireless and "next generation" Internet infrastructure across the southern Dan River region of Virginia.



The area has nearly 100 rural communities spread east to west across the state. Current fiber optic long haul infrastructure exists, but runs north to south bypassing most communities. The area is part of the tobacco belt farming region which is gradually losing a large part of the traditional crop. These communities have been hard hit economically and are desperately struggling for survival. The area was chosen by the e-Corridors program in conjunction with the Virginia Tobacco Indemnification and Community Revitalization Commission (VTICRC) as a prototype region for implementation under the e58 Task Force (Highway 58 runs east to west across Virginia)

The e58 Task Force goal is to 1) funnel and shape regional public funding for economic revitalization, and 2) influence private investments in advanced network infrastructure, service, and applications so that any community in the region can participate in the information economy. [16]

The initial development was funded by two million dollars from the VTICRC and consisted of several elements including the creation of intercommunity next generation optical links (Danville-Chatham), gigabit gateways and multimedia services access points (MSAPs). Their business plan was to connect the Dan River Region to Tier 1 Internet backbone.

With the help of a non-profit organization, the Future of the Piedmont Foundation, they issued a request for collaborators, culminating in a meeting in October 2001 with approximately seventy-five private companies attending. Proposals were accepted from interested parties and several were funded including

[16] Virginia Tech's eCorridors Program, Overview, http://www.ecorridors.vt.edu/papers/eCorridors-Overview-2002-8-29.pdf.

new fiber connecting several of the communities. Space was provided by the communities to house collocation space for service providers. Representatives of the eCorridors team and local communities partnered to address public relations, intercommunity fiber builds and rights-of-way issues. Some of the fiber was installed by local communities for their own internal uses (electric utility) with a number of fibers deeded to the eDan project for fiber connectivity.

Important to the overall plan is the development of the mesh structure of middle-mile fiber to provide redundancy in the connection plan. No specific timetable was established for implementation of the entire network, but rather it was envisioned that portions of the network would be built as VTICRC or local funding became available. Even without such funding, each bit of additional infrastructure supports an overall deployment. For example, the City of Danville took advantage of the fiber network by implementing a MAN, a metropolitan area network, to serve their internal needs. They will install fiber optic cable between their equipment collocated in the local MSAP to tier 1 providers. Over this pathway data can be routed from surrounding locations over fiber installed as part of the pilot project from Danville to the surrounding smaller communities (Danville-Chatham). The local MSAP was developed in a formerly Sears-Roebuck location acquired by the City of Danville and converted to a school. Space for the MSAP was donated by the City. This investment by the City of Danville allowed the County schools to replace their unreliable network connections between schools and to the Internet. The school district pledged their support as an anchor tenant, solidifying funding for the network's implementation.

Appendix E: Technology Glossary

ACRONYM / TERM	DEFINITION
Access Charge	Charge paid by all carriers interconnecting with a local telephone company for switched and dedicated services. Reflects the costs of originating and terminating traffic.
Access Line	The physical telecommunications circuit connecting an end user location with the serving central office (CO) in a local network environment
Actives	Refers to powered transistors such as amplifiers, power supplies or converters.
Access Rate	The transmission speed of the physical access circuit between the end user location and the local network. This is generally measured in bits per second (bps)
ADSL	Asymmetric Digital Subscriber Line. Utilizes existing copper phone lines. Under proper circumstances may provide 6 Mbps downstream delivery of data. Called Asymmetric (or Asynchronous) because upstream data travels at a much slower rate than downstream.
Algorithm	Specifications that define a specific method for transmitting video, audio, and/or data. Also referred to as format or protocol. "Standard Algorithms" (H320) is a universal language
Analog	Voice, video or data signal transmission and/or switching that is not digital
Architecture	Term applied to the overall structure, logical components, and the logical interrelationships of a computer, its operating system, and a network.
Asynchronous Transmission	Data transmission one character at a time to the receiving device, with intervals of varying lengths between transmittals and with start bits at the beginning and stop bits at the end of each character to control the transmission. In generic digital subscriber lines (XDSL) and in most dial up modem communications, asynchronous communications are often found in internet access and remote office applications.
ATM	Asynchronous Transfer Mode provides a single network interface for audio, video, image and text. Designed to support multiple applications, guarantee bandwidth and define quality of service.
Audio Bridge	Equipment that mixes multiple audio inputs and feeds back composite audio to each station after removing the individual station's input. Also called a mix-minus audio system.
Audio Conferencing	Employs voice communications, traditionally accomplished using

ACRONYM / TERM	DEFINITION
	standard telephone lines along with new technologies such as Internet and integrated services digital networks (ISDN). When more than two locations are involved, multipoint network bridging equipment or Internet-based software is used.
Audio Graphics Teleconferencing	Interconnects graphic display devices, such as computer monitors, located at sites separated by distance. This technology generally allows participants to view the same still-frame visual at each site. Sophisticated systems even allow collaboration where sites work together to develop a file or document based on one computer.
B Channel	The ISDN circuit-switched bearer channels, capable of transmitting 64Kbps of digitized information
Backbone	The master network that links all the networks of structures, computers or geographic areas. Various types of wide area networks (WAN) or local area networks (LAN) may be attached to the backbone so that any single node may communicate with any other node regardless of the protocol used.
BONDING	Bandwidth On-Demand Interoperability Group. A standard that allows different vendor inverse multiplexers (IMUX) to subdivide a wideband signal into multiple channels for delivery and then recombine them into a single high-speed signal at the receiving end.
BRI	Basic Rate Interface. A cable that carries two usable channels
Bridge	Equipment that facilitates communications of three or more sites into a single conference; also referred to as multipoint control unit (MCU).
Broadband	A general term for applications and communications that take place at speeds faster than a million bits per second (Mbps).
Brownfields	Generally defined as abandoned or underused industrial or commercial properties.
Business Television	Corporate communications tool involving video transmission of information via videoconferencing. Common uses include meetings, product introduction and training.
Cable Modem	A modem that allows a user to access the Internet at substantially higher speeds than conventional analog modems by making use of a fiber rich cable TV system.
CAP	Competitive Access Provider
Cascade	Linking two or more video bridges for larger multipoint videoconferencing.

ACRONYM / TERM	DEFINITION
CAT-3	Category 3 Cabling- a rating for twisted pair copper cabling that is tested to handle 16 Megahertz (MHz) of communications. Handles 10Mbps of LAN traffic
CAT-5	Category 5 Cabling- a rating for twisted pair copper cabling that is tested to handle 100 MHz of communications. CAT-5 is generally required for higher speed data communications.
CATV	Cable TV: Acronym originally meant *Community Antenna Television.*
CCITT	Consultative Committee for International Telegraphy and Telephony. The forerunner of the ITU's Telecommunications Standardization Section (TSS).
CDPD	Cellular Digital Package Data: A wireless transmission technology that sends packetized data over the analog cellular network during the time that voice channels are free. PDA's and many cellular telephones use this technology to send and receive data.
CLEC	Competitive Local Exchange Carrier: refers to a carrier that provides local phone service in competition with the established local phone provider.
CO	Central Office- A circuit switch that terminates all local access lines in a particular geographic serving area. Also a physical building where the switching equipment is housed.
CIF	Common Intermediate Format (CIF) A video format defined by the H.261/H.320 standard as 288 lines of 360 pixels.
Clear Channel	A digital transmission path that has all 64Kbps bandwidth available for information exchange.
COAX	Coax cable- type of cable with a central conductor surrounded by insulation over which an outer conductor is installed.
Contract Path	The most direct physical transmission tie between two interconnected entities.
Data Compression	Reducing the size of a data file by reducing unnecessary information
DR	Data Rate- the measurement for bandwidth in bits per second. In general the higher the DR the higher the video quality
Dial In	Conference in which the sites initiate the connection. You dial in.
Dial Out	Conference in which the service provider initiates the connection
Digital	A method of representing information using a sequence of ones and zeros for storage and interpretation by a computer. In digital transmission, analog signals originally in a continuous form are

ACRONYM / TERM	DEFINITION
	converted to discrete signals of ones and zeros for transmission.
DS-0	Digital Signal 0- defines transmission speed at 64Kbps
DS-1	Digital Signal 1- speed of 1.544Mbps. A DS-1 is composed of 24 DS-0 signals. This term is often used interchangeably with ***T1.***
DS-3	Digital Signal 3- speed of 44736 Mbps. Interchangeably with ***T3.***
DSL	Digital Subscriber Line- general term for any local network loop digital in nature, utilizing ordinary copper telephone lines to transmit digital signals.
DSLAM	Digital Subscriber Line Access Multiplexer: A device usually located at the central office, where individual DSL circuits (local loops) are time-division multiplexed and then connected via a high-speed digital link to a packet-switched network such as the Internet.
Downstream	The communication flow from the network towards the customer premises.
DTMF	Dual Tone Multi-Frequency- touch tone dialing
EOS	Economies of Scale- where industry exhibits decreasing average long-run costs with size.
Ethernet	Defined at layer one (physical) and layer two (data link). Ethernet works by simply checking the wire before sending the data. If two stations send over a LAN at precisely the same time Ethernet detects the potential collision and retransmission is attempted.
Extranet	A private closed user group on a LAN for exchanging information with key stakeholders.
FCIF	Full CIF- number of lines and pixels used to form an image on a monitor.
FTTB	Fiber-to-the-Business: Refers to a fiber optic cable network connected directly to the commercial customer premises.
FTTC	Fiber-to-the-Curb: Refers to a fiber optic cable network that transfers to coaxial cable at boxes (nodes) serving six to eight homes.
FTTH	Fiber-to-the-Home: Refers to a fiber optic cable network that connects directly to the residence (no transfer to coax).
FTTN (No Actives)	Fiber-to-the-Node, No Actives (powered electronics): Refers to a fiber optic backbone that transfers to coaxial cable at a node that is within 1500 feet of every home served. When the node is brought that close to

ACRONYM / TERM	DEFINITION
	the subscriber, no electronics are required, minimizing maintenance requirements. Each node typically serves no more than 100 homes.
FTTU	Fiber-to-the-User
Fiber Optic Cable	A telecommunications cable in which one or more fibers are used as the propagation method. Consists of a light source (laser or light emitting diode) at the transmitting end and a light detector at the receiving end.
Firewall	A collection of hardware, software procedures that create a security wall against unauthorized sources gaining access to computers on a LAN.
Franchise	A contract between a cable television company and a municipal government authorizing the company to install cable and offer cable television service within the community.
GK	Gatekeeper- an H-323 entity that provides address translation, control access and bandwidth management to the LAN for H323 terminals, gateways and MCUs.
GW	Gateway- An H-323 entity that provides real-time, two way communications between H-323 terminals on the LAN and other ITU terminals on the WAN or to another H-323 gateway
Greenfield	Newly-built residential communities.
HDSL	High Bit rate Digital Subscriber Line. Allows single twisted-pair copper telephone lines to operate at speeds comparable to T1, yet less expensive than a T1. Symmetric service providing equal bandwidth in both directions. As such, is slower than ADSL.
HDTV	High Definition Television- emerging standard for digital TV with high levels of resolution with layered services such as text and data.
Headend	A central network control device that provides centralized functions such as remodulation, diagnostic control and access to a gateway.
HFC	Hybrid Fiber/Coax: Refers to a combination of a fiber optic cable backbone with coaxial cable branching off to serve individual subscribers.
IBT	Icon Broadband Technologies
ILEC	Incumbent Local Exchange Carrier: Refers to the established local phone provider.
IMUX	Inverse Multiplexer

ACRONYM / TERM	DEFINITION
Infrastructure	In information technology and on the Internet, refers to the physical hardware used to interconnect computers and users.
INTELSAT	The International Telecommunications Satellite Organization
IXC	Inter-Exchange Carrier-long distance telecommunications provider
Internet	Loose aggregation of thousands of computer networks
Intranet	A private internal network for employees based on IP protocol
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunications Union
IXC	Inter Exchange Carrier- a long distance company
JPEG	Joint Photographic Experts Group- developed standard for still image compression
Kbps	Kilobits per second- One thousand bits per second
LAN	Local Area Network: A network of linked computers and peripheral devices such as printers or modems.
LATA	Local Access and Transport Areas
LEC	Local Exchange Carrier
Local Loop	A communications channel from a switching center to a user. In telephone systems, a pair of wires from the central switching office to a subscriber's telephone.
LOTO	Lock-out/Tag out
LNA	Low Noise Amplifier
LNB	Low Noise Block Downconverter
MAC	Multiplexed analog component color video transmission system
Make Ready	Refers to physical alterations that must be made prior to commencing construction of a network or cable system. An example is having lines moved on a utility pole to make room for new cable.

ACRONYM / TERM	DEFINITION
MAN	Metropolitan Area Network: A network, larger than a LAN but smaller than a WAN created through the connection of smaller networks. Generally refers to the interconnection of networks within a city to create a larger network.
MBONE	Multicast Backbone
Mbps	Megabits per second-One million bits per second
MCU	MultiPoint Control Unit- bridges multiple video sites
MHz	Mega Hertz – One million hertz per second
MPEG	Motion Picture Experts Group- developed standards for coded video and audio
MPEG1	Compression scheme for full motion video
MPEG2	Higher resolution standard
Multiplex	A method of sending two or more messages on a single communications link by using a device called a multiplexer to combine the individual signals at the transmitting end of the circuit and divide them at the receiving end. Analog signals use frequency-division multiplexing (FDM); Digital signals use time-division multiplexing (TDM). In optical communications, the equivalent of FDM is referred to as wavelength-division multiplexing (WDM).
MUX	Multiplexer- divides a digital transmission into two or more subchannels
NIC	Network Interface Card
Node	Point in a CATV system that interconnects traditional coaxial cable and fiber optics. The place where an optical signal is converted to a RF signal or vice versa.
Outside Plant	All cables , conduits, poles, towers, etc. located between the central office and the customer premises.
Overbuilder	A company that overbuilds an incumbent telecommunications operator and offers customers a competitive alternative, generally with fiber-optic networks.
Packet	A series of bits containing data and control information, including source and destination addresses.
PON	Passive Optical Network: A fiber optic network that requires no external source of power for it to function.

ACRONYM / TERM	DEFINITION
PPV	Pay-per-View: Pay TV programming for which cable subscribers pay a separate fee for each program viewed.
PBX	Private Branch Exchange
PIP	Picture In Picture- allows both ends of a videoconference to be viewed simultaneously.
Pole Attachment	When CATV systems use existing poles maintained by utilities, an attachment contract must be negotiated between the parties of interest. Pole Attachment Fees are commonly paid to pole owners.
POP	Point-of-Presence: The point where the inter-exchange carrier's responsibility begins and the local carrier's responsibility ends. Location of a communication carrier's switching or terminal equipment. "Gateway to the Internet".
POTS	Plain Old Telephone System.
PSTN	Public Switched Telephone Network
QoS	Quality of Service: A measure or standard of the level of service provided by the common carrier.
RBOC	Regional Bell Operating Company
SONET	Synchronous Optical Network: An optical interface standard to transport digital signals that allows inter-working of transmission products from multiple vendors. Defines optical carrier signals.
T1	A 1.544 Mbps high-speed digital transmission system that is subdivided into 24 channels, each with a bit rate of 64Kbps.
T3	Communicates at 45.304 Mbps
TELCO	Generic term for telephone company
TW	Time Warner Cable Company
Twisted-Pair Cable	A cable made up of one or more separately insulated twisted-wire pairs, usually made of copper. Category 5 Cable is twisted-pair cable used to connect most LANs.
UDP	Unreliable networking layer
Upstream	The communication flow from the customer premises to the Headend or gateway.
VDSL	Very high-bit rate Digital Subscriber Line

ACRONYM / TERM	DEFINITION
V-Span	Provider of virtual meeting management services
VOD	Video on Demand: Allows the subscriber to select at any time movies or programming they wish to view from a large selection of titles stored on a remote server. Service may also provide VCR functionality, (stop, pause, rewind, etc.) which allows the subscriber to control the "play back" of the server from the remote control.
VoIP	Voice over Internet Protocol: The technology that turns voice conversations into data packets and sends them out over a packet-switched Internet Protocol (IP) network, bypassing the public switched telephone network either entirely or for part of the transmission path. Also known as IP Telephony.
WAN	Wide area network: A network that connects local area networks (LANs) that are geographically distant.
WET	Web-enhanced teleconferencing
Wireless	A transmission system that employs radio frequency (RF) through the air as the medium, as opposed to fixed wires. Mobile systems are all wireless systems.
XDSL	A generic term for the suite of DSL services where the X can be replaced with any number of letters, including A, H, S., etc..

Appendix F: Project Credits and Acknowledgements

The Accomack-Northampton County Planning District Commission, Spotts, Stevens and McCoy, Inc., Icon Broadband Technologies and Communications Consulting Services, would like to thank the following parties who contributed to the completion of the Community Broadband Plans:

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- Northampton County School District
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The following papers, reports and other references and information were used to some extent for the completion of the project and/or development of the study and strategic action plan:

U.S. Census Bureau 2000, http://www.census.gov/index.html

Eastern Shore of Virginia Economic Development Commission; http://www.easternshore.org/edc.html

Northampton County Strategic Plan 2002

Onancock Town Plan 2004

Onley Comprehensive Town Plan 1999

Respecting the Past, Creating the Future: The Accomack County Comprehensive Plan 1997

Town of Chincoteague Comprehensive Plan 2002

Virginia Economic Development Partnership;
http://virginiascan.yesvirginia.org/Admin/CommunityProfiles/Profiles/VirtualVirginiaRegion22.pdf

Every attempt has been made by SSM and IBT to accurately represent content and other data of reports, papers, survey results and other information resources used in the study, however much of this information was provided through second or third hand parties and SSM and IBT is not responsible for any errors in this document. Information contained in this report is subject to change without notice and should be viewed as supporting reference materials used to formulate subjective observations and generalizations for the strict application of this report only.

While every effort has been made to identify and express appreciation to those parties, and give credit towards those papers, reports and other references and information that contributed towards the completion of the Community Broadband Plans, Accomack and Northampton County, SSM, IBT and CCS sincerely apologize for any omission and oversight.