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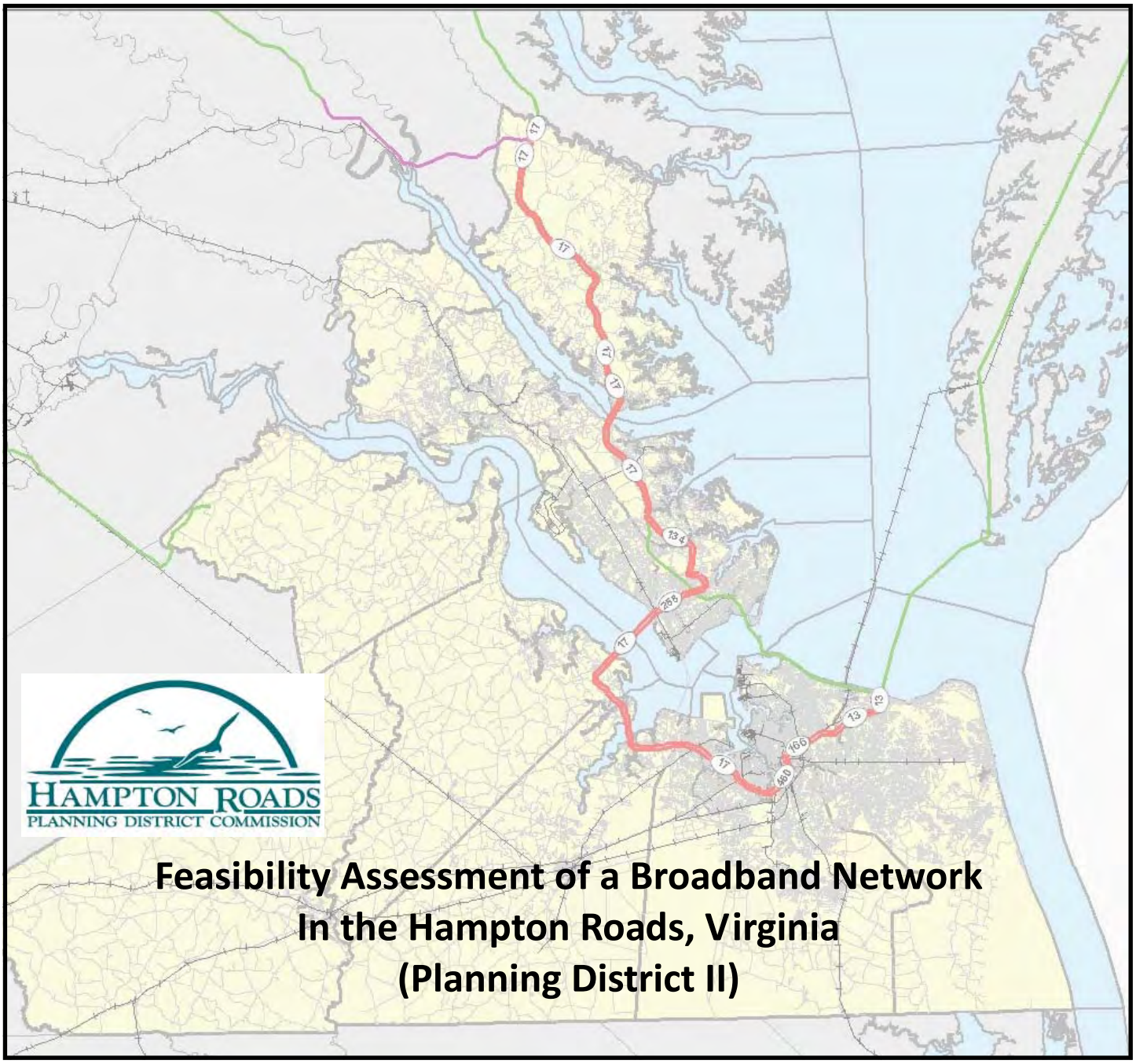

Feasibility Assessment of a Broadband Network In the Hampton Roads, Virginia (Planning District II)

Submitted to

Virginia Dept. of Housing and Community Development

November 17, 2008

ICON BROADBAND TECHNOLOGIES
A DIVISION OF ICON ENGINEERING, INC.

November 17, 2008

Mr. Todd Christensen
Virginia Department of Housing and Community Development (VDHCD)
Project Management Office
501 North Second Streets
Richmond, Virginia 23219

Re: **Feasibility Assessment for the Implementation of a Broadband Network for Hampton Roads (Planning District II), Virginia**

Dear Mr. Christensen:

Icon Broadband Technologies (IBT) and Consulting Gateway Corporation (CGC) are pleased to submit this report on the feasibility assessment for the implementation of a Broadband Network for Hampton Roads (Planning District II), Virginia. This assessment report provides the Hampton Roads Planning District Commission and their sixteen (16) local government units with a base upon which to develop future needs assessment and implementation planning for community-based or private distribution networks and service provider access networks at the County or Regional level.

In accordance with the language provided from the State's projects budget, the feasibility assessment is intended to initially address two (2) issues; (i) an estimate of the project's costs, and (ii) the availability of funding to implement the proposed network from federal, state and other sources. This purpose is underscored by the fact that the study report is to be submitted by The Secretary of Commerce and Trade to the Chairman of the House Appropriations and Senate Finance Committees no later than December 1, 2008. As such, our approach to this top-level assessment is to prioritize network planning and required analysis at a regional level in concert with current network construction and planning in the surrounding areas to complete connectivity throughout the peninsulas.

As envisioned, the proposed Hampton Roads fiber network seeks to fulfill regional economic development goals creating a cohesive, redundant and secure open access network throughout the peninsula region of Virginia. The Hampton Roads network will connect the Eastern Shore network currently under construction with the Northern Neck/Middle Peninsula network currently in the planning stage, allowing private providers cost-effective transport to serve key facilities and municipalities throughout the entire Chesapeake Bay area. As proposed, the recommended first phase of a Hampton Roads network consists of 92 miles of fiber deployed in proximity to the majority of potential key end-users, service provider facilities such as Central Offices (COs) and highly populated cities while avoiding difficult and expensive construction obstacles such as underwater highway routes, major interstate highways and federally owned/military base property. Network nodes or points of presence (POPs) have been identified for future phases of network expansion to serve additional areas, many of which are considered rural and are currently un- or under-served by broadband providers.

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This assessment addresses only the project costs for this main network fiber backbone. Project costs will vary based on a number of factors, but primarily the extent of underground versus aerial construction required. With a large amount of underground construction, costs are estimated to range from $10 - $11 million. Assuming a greater amount of aerial placement, no collocation sites needed and less expensive bridge crossings, costs could range between $6 and $7 million.

These estimates do not include costs for future distribution networks needed to serve out into the more rural areas nor costs for any type of access networks that would serve customers directly. Piecing together the entire network grid is an evolving process phased in over time. Changing technologies and funding budgets largely set the pace of progress. Intangible goals and objectives, such as the value of telemedicine, Public Safety E911 Interoperable Communications, creation or retention of jobs, and new learning opportunities cannot be measured in dollars when assessing feasibility strictly on a cost basis.

Icon Broadband Technologies and Consulting Gateway Corporation appreciate this opportunity to be of assistance to the Commonwealth of Virginia. Please feel free to contact us with any questions. We look forward to continuing to be an integrated partner with the communities of the Commonwealth in improving telecommunications services which impacts so many quality of life issues.

Sincerely,

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Directive

The purpose of planning district commissions, as set out in the Code of Virginia, Section 15.2-4207 is …*to encourage and facilitate local government cooperation and state–local cooperation in addressing on a regional basis problems of greater than local significance.* There will probably be no better example of how this purpose can be served than the future role of the Planning District II region of the Hampton Roads Planning District Commission (HRPDC) when it comes to comprehensive state planning for broadband and telecommunications services in the Chesapeake Bay area. Communications infrastructure of the HRPDC will have a much larger role than just 'local significance' by connecting the communications networks of the Accomack and Northampton Counties Planning District Commissions of the Eastern Shore, with the Middle Peninsula and Northern Neck Planning District Commissions of Northeast Virginia. Such a connection will ensure cohesive regional connectivity and expand availability to a greater number of service providers, potentially shortening the timeframe for all participants to realize a return on their investment. Furthermore, such a broadband highway placed within reasonable distance of the communities in the Hampton Roads positions the area for future investments in fiber optics extensions deeper into the communities.

Members of Virginia's legislature recognize the importance of looking at the potential role of the HRPDC in Virginia's investment in the fiber optic network infrastructure under construction on the Eastern Shore, and future high speed connectivity in the neighboring Middle Peninsula and the Northern Neck region. From the following language provided in the State's projects budget, it appears that the Hampton Roads feasibility assessment is intended to initially address two (2) issues; (i) an estimate of the project's costs, and (ii) the availability of funding to implement any proposed network from federal, state and other sources:

> "The Secretary of Commerce and Trade shall report to the Chairmen of the House Appropriations and Senate Finance Committees on the work undertaken to support high speed broadband deployment in the Hampton Roads (Planning District II) region pursuant to the appropriation of funding for such purpose in Chapter 847 of the Acts of Assembly of 2007. Such report shall also include a feasibility assessment of the implementation of a broadband infrastructure that should include, but not be limited to, services such as a load-balanced 20-gigabit capacity to all site locations; fully redundant, fault-tolerant data networking; unlimited bandwidth without monthly recurring charges; disaster recovery planning and services; internet streaming video services; network-based telephone services; electronic software distribution, inventory and maintenance systems; network security and intrusion prevention systems; video teleconferencing; community wireless "hot spots"; system co-location and maintenance; and electronic, network-based, building security systems made available to all federal, state, and local government agencies, medical facilities, and other commercial and private entities. Such assessment should include an estimate of the project's full costs as well as the availability of funding to implement said proposal from federal, state and other sources. The report, including the feasibility assessment of implementing the broadband network, should be submitted no later than December 1, 2008."

The feasibility assessment provided herein provides the Secretary of Commerce with the due diligence research, planning and 'first-look' financial projections necessary to compile the requested report, as well as guidance for the General Assembly's future network planning and budgeting activities.

Background

The HRPDC represents over 1.6 million people and includes 16 jurisdictions: the Cities of Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg, and the Counties of Gloucester, Isle of Wright, James City, Southampton, Surry, and York. More than 535,000 housing units are located throughout the densely populated cities.

Densely Populated Cities in Study Area	**Population**	**Housing Units**
	CC 2000-04-01[1]	*CC 2000-04-012*
Virginia Beach	425,257	*162,277*
Norfolk	234,403	*94,416*
Portsmouth	100,565	*41,605*
Chesapeake	199,184	*72,672*
Suffolk	63,677	*24,704*
Hampton	146,437	*57,311*
Newport News	180,150	*74,117*
Poquoson	11,566	*4,300*
Williamsburg	11,998	*3,880*
Total	*1,373,237*	*535,282*

Key employers, higher education and healthcare facilities located throughout this region include:

Private and Public Sector Major Employers	
Gwaltney of Smithfield	Norfolk Naval Station
International Paper Company	U.S. Department of Homeland Defense
Americaid Community Care	Industrial Resource Technology
National Center for State Courts	Lockheed Technical Operations Inc
Smithfield Foods	QVC Chesapeake
Mitsubishi Chemical America	MAC Services
Anheuser Busch Inc.	Household Credit Services
Ciba Specialty Chemicals	Canon Information Technology

[1] April 1, 2000 Census: http://factfinder.census.gov/servlet/GCTTable?_bm=y&-geo_id=04000US51&-_box_head_nbr=GCT-T1&-ds_name=PEP_2007_EST&-_lang=en&-format=ST-9&-_sse=on

[2] April 1, 2000 Census: http://factfinder.census.gov/servlet/SAFFFacts?_event=Search&geo_id=05000US51830&_geoContext=01000US%7C04000US51%7C05000US51830&_street=&_county=&_cityTown=&_state=04000US51&_zip=&_lang=en&_sse=on&ActiveGeoDiv=geoSelect&_useEV=&pctxt=fph&pgsl=050&_submenuId=factsheet_1&ds_name=DEC_2000_SAFF&_ci_nbr=null&qr_name=null&reg=null%3Anull&_keyword=&_industry=

Private and Public Sector Major Employers continued	
Dominion Virginia Power	Virginia State Department of Health
The Atlantic Group	National Aeronautics & Space Administration
Windsor Mill	U.S. Department of Fiscal Service
SW Edwards and Sons	West Telemarketing
Bartlett Nuclear	Howmet Castings & Service Inc.
Narricot Industries	Nextel Communications
Deerfield & Southampton Correctional Centers	AMSEC
Norfolk Shipbuilding and Drydock	Teletech Customer Care
Hercules Incorporated	Science Applications International Corporation
Money Mailer LLC	U.S. Department of Army and Air Force
Technico Corporation	Newport News Shipbuilding
The Great Lakes Companies Inc	Ferguson Enterprises
APAC Customer Services	Icelandic USA Inc.
Jefferson Science Association	Siemen's Automotive Corporation
Northrop Grumman	Bank of America Card Services Corporation
Norshipco	Portfolio Recovery Association
U.S. Navy Exchange	Virginia International Terminal
United States Automobile Association	Maersk Line Limited
GEICO, Government Employees Insurance	Colonnas Shipyard
Shorewood Packaging	Earl Industries
CDI Marine Company	Ceses Marine Terminals Inc
CVN Distribution Company	Colonial Williamsburg Foundation
Kraft Foods	Unilever Supply Chain Inc
General Dynamics Advanced Inc	Stihl
Canon, Inc.	

Key Healthcare Facilities	
County Departments of Social Services	Virginia State Departments of Health
Bon Secours DePaul Medical Center	Children's Hospital of the King's Daughters
Maryview Medical Center	Medical College of Hampton Roads
Naval Medical Center	Riverside Regional Medical Center
Eastern Virginia Medical School	Sentara Healthcare
Eastern State Hospital	Avid Medical
Courtland Health Care Center	York Convalescent Center
Chesapeake General Hospital	Medical Management Services
Southampton Memorial Hospital	Western Tidewater and Medical Health
Mary Immaculate Hospital	Maryview Hospital
Pines Residential Treatment	Direct Home Health Care
Spectrum Healthcare Resolutions	First Home Care Corporation
Health Systems of Virginia Inc	Lakeview Medical Center Inc
Hillhaven Nansemond Rehabilitation Center	

Higher Education Facilities	
Old Dominion University	Tidewater Community College – 4 locations
Thomas Nelson Community College – 2 locations	College of William and Mary
Norfolk State University	Hampton University
Christopher Newport University	ECPI College of Technology – 2 locations
Regent University – Virginia Beach campus	Rappahannock Community College – Glenns
Virginia Wesleyan College	Paul D. Camp Community College – 2 locations
Eastern Virginia Medical School	National College
Atlantic University	Tidewater Tech – 4 locations
ODU Higher Education Centers – 3 locations	Bryant & Stratton College – Virginia Beach
George Washington University – 3 locations	ITT Technical Institute
Strayer University – 2 locations	World College
Chesapeake Center for Science & Technology	Craddock Career and Technical Center
New Horizons Regional Education Center – 3 locations	Norfolk Technical Vocational Center
Pruden Center for Industry & Technology	Tidewater Tech Trades Vocational School
Virginia Beach Advanced Technology Center	VEC Peninsula Worklink Comprehensive Centers – 3 locations
JobZone – 2 Comprehensive Centers, 3 Satellite	Suffolk Workforce Center

Project Approach with Findings

The proposed Hampton Roads fiber optic backbone network is intended to connect the major communities within the region passing key end-users and creating connectivity points (Points of Presence, or POPs) for future economic development growth. A prime example of such a network is the Mid Atlantic Broadband Cooperative (MBC) wholesale fiber transport network of Southwest and Southside Virginia. The MBC network follows primarily the interstate 58 route running west to east with connectivity points in the business and industrial parks, telecommunication carrier facilities, and communities located reasonably near the fiber pathway. This network has facilitated service provider extensions of broadband services into the communities passed, and successfully attracted new businesses that require high bandwidth connectivity. Based on the success of the MBC network investment, network planning for the Hampton Roads follows that connectivity approach.

In addition to key end-users and municipal facilities, existing telecommunication physical facilities and State-owned towers are identified to aid in (1) identifying potential service provider connectivity and last mile service delivery options, and (2) future planning for extensions of the backbone fiber deeper into neighboring un- and under-served communities.

GIS techniques have been used extensively to develop this initial assessment. Figures one (1) through six (6), maps developed to spatially display the proposed network route and area features are provided as Appendix A.

I. Preliminary Engineering and Conceptual Design

A. Identify conceptual Point of Presence (POP) Locations on the network and Relevant Existing Telecom Facilities

Approach:

(1) Identify key end-users to be served from future distribution and service provider access networks such as government facilities, industrial/commercial parks, schools, health care facilities, E911 responder agencies, etc. Utilized HRPDC GIS department and Virginia Scan public database resources for data collection.
(2) Public and for-purchase data was utilized to show location of existing telecommunications network facilities such as Central Offices (COs) and towers applicable to the proposed route.

Findings:

Potential key end-users in the healthcare, education and municipal sectors were identified and mapped. Key economic development sites such as commercial business and industrial parks were also mapped. Although sixteen (16) jurisdictions comprise the Hampton Roads planning district area, the majority of these key facilities are located within the independent cities. Fiber extensions (as spurs or rings) are required to create at least one (1) community POP for complete inclusion of all HRPDC member jurisdictions and for purposes of this 'first look' report would be considered as a future phase of network planning and deployment. To complete connectivity between all peninsula networks currently in planning or construction, the proposed network stretches to the north to create a meet point for the Middle Peninsula region continuing on into the Northern Neck region, and includes making a connection to the planned fiber at the Chesapeake Bay Bridge-Tunnel (CBBT) that will continue north up the Eastern Shore. Lead public safety points in each community were identified and mapped (police, sheriff, communication centers). Additional potential end-users with extensive locations such as fire and emergency facilities and military agencies were not provided in a mapping format and the required conversions were beyond the scope and budget of this initial assessment, but listings of these facilities are included in the report appendix for future planning use.

B. Determine the Extent of the Network

Approach:

(1) Determine the network locations best suited to serve distribution and access networks while meeting the minimum performance and quality of service requirements. The resulting network might consist of both wire-line and wireless technologies such as fiber optics, microwave, etc. GIS mapping is utilized for representation and analysis.

Findings:

The network as proposed does not reach all of the 16 HRPDC jurisdictions in the first phase. Distribution points or proposed Points of Presence (POPs) were identified for future phases of network expansion to reach additional jurisdictions and into and through many rural communities. These interconnection points are identified on the proposed network route with a general note of the community targeted for distribution network deployment. Distribution points would initially consist of targeted splice locations and extra fiber included in the first phase deployment rather than physical facilities. If physical facilities are available near a reasonable distribution route, such should be included in any formal network design for the first phase network. Additionally, state-owned towers have been identified as potential assets to serve distribution and last mile access needs.

The network as proposed assumes the number of fiber strands and equipment required to meet industry-standard performance and quality of service requirements of both providers and end-users. The language provided in the State's budget indicates the assessment should be made of broadband infrastructure capable of supporting (but not limited to) the following services:

> **Requirement (1):** A load balanced 20-gigabit minimum capacity network able to provide high-speed connectivity to site locations consisting of major employers including the health care industry, government facilities and agencies, and education institutions.
>
> **Compliance:** While a 20-gigabit minimum capacity network is stated, the consultants interpret such a requirement to establish that an enterprise class, service provider network is being specified. To understand the capabilities of the minimum capacity being specified, an enterprise class 20 port gigabit switch configuration which consolidates switching across 20 Gigabit Ethernet copper ports with managed intelligence, supports more than 100,000 connections per second and 12,000,000 concurrent connections with wire-speed throughput.[3]
>
> Looking at the minimum requirement another way, what is being specified is a network greater than a 10 Gigabit Ethernet (10GBE) network, somewhat of a mainstay for backbones within enterprise and service provider networks, but not quite as robust as the 40-Gigabit TeraGrid fiber optic network backbone built for open science research and launched by the National Science Foundation in August 2001. The TeraGrid project was expected to include 20 teraflops of computing power distributed at five sites, capable of managing and storing nearly 1 petabyte of data, high resolution visualization environments, and toolkits for grid computing.
>
> For the HRPDC application, an ideal quality network model to simulate would be a "Carrier-Class" Transport Services Infrastructure and Co-Location Nodes Network, similar to that of MBC in Virginia. MBC has deployed Infinera's Digital Transport Node (DTN) system, providing 200Gig of capacity between Atlanta, Charoltte, Raleigh, Richmond, McLean and the Equinix facility (network-neutral interconnection point) in Ashburn, Virginia. MBC provides Long Haul Optical Transport in 1Gig, 2.5 Gig, 10 Gig, and 40 Gig services. MBC also provides Sonet/TDM Services and Metro Ethernet/IP Services.

[3] http://www.coyotepoint.com/news.php?id=20

The party managing the network is required to address load balancing of traffic across the network to eliminate bottlenecks and maximize network throughput. Network load balancing, a clustering technology, enhances the scalability and availability of mission-critical TCP/IP-based services, such as Web, Terminal Services, virtual private networking, and streaming media servers. To scale performance, Network Load Balancing distributes IP traffic across multiple cluster hosts. It also ensures high availability by detecting host failures and automatically redistributing traffic to the surviving hosts. The unique and fully distributed architecture of Network Load Balancing enables it to deliver very high performance and failover protection, especially in comparison with dispatcher-based load balancers.[4]

Requirement (2): A designed network that would be fully redundant.

Compliance: Redundancy in a network must be addressed at the design stage and can be accomplished in various ways. Within a fiber network, often a fiber ring or fiber interconnection with another fiber network is designed so as to avoid a fiber spur (stranded termination point). If a fiber spur is constructed, other technologies, such a T-1 lines or wireless microwave technology can be acquired to provide redundancy.

The redundancy plan for the fiber network being built around the Chesapeake Bay includes the interconnection between the Maryland Broadband Fiber Optic Network at the Wallops Island Research Park to the fiber network being built to the south on the Eastern Shore crossing the Chesapeake Bay Bridge Tunnel (CBBT), then heading north for interconnection with the HRPDC network tentatively planned, connecting to a Middle Peninsula-Northern Neck network which ultimately is intended to connect again to the Maryland Broadband Cooperative Network.

Requirement (3): A fault-tolerant data network.

Compliance: The network needs the capability to automatically detect link or adapter failure and switch data flow to a redundant link. Use of "link aggregation" combines multiple adapters into a single channel for greater bandwidth and data flow, which increases network reliability and performance. Fault tolerance is managed at the equipment points of the network.

Requirement (4): Providing for network disaster recovery planning and services.

Compliance: Because of the planned network interconnection/interface with the other Planning District Commission Networks and Maryland Broadband Cooperative Network, the HRPDC disaster recovery plan and services should compliment and supplement the recovery plans of the interconnected networks. Development of an effective disaster recovery plan typically includes:

- Standardization of equipment where possible so as to be interchangeable
- Sharing of fiber strand maps so as to be easily accessible and identifiable for emergency repair

[4] Sections taken from Microsoft TechNet "Network Load Balancing Technical Overview"; 2008 Microsoft Corporation. http://technet.microsoft.com/en-us/library/bb742455(printer).aspx

- Utilization of software that tracks Outside Plant (OSP) Reports and builds a database of property records. Examples include total value, route miles, sheath miles, cable feet, cost per foot, average pole/trench costs, general reports, retirements work orders and archives
- Contractors on retainer or other arrangements for immediate dispatch and repair of the network infrastructure
- Multiple copy and off-site data storage of network information
- Arrangements for a back-up Network Operating Center (NOC)
- Back-up power and environmental controls
- Standard Operating Procedures (SOP), contact information, backup facilities, protocols, escalation procedures, etc.

Requirement (5): A network plan addressing security and intrusion prevention systems.

Compliance: Fiber optic cabling by its functionality is considered more secure than many other wire-line technologies. But, network security goes way beyond physical integrity extending into protections and performance against worms, viruses, Trojans, DDos attacks, software vulnerabilities and more. Intrusion Prevention Systems (IPS) products help secure network infrastructure to ensure business continuity. An IPS is a network security device that monitors network and/or system activities for malicious or unwanted behavior and can react, in real-time, to block or prevent those activities. Network-based IPS, for example, will operate in-line to monitor all network traffic for malicious code or attacks. When an attack is detected, it can drop the offending packets while still allowing all other traffic to pass. Intrusion prevention technology is considered by some to be an extension of intrusion detection system (IDS) technology. Intrusion prevention systems may also serve secondarily at the host level to deny potentially malicious activity. There are advantages and disadvantages to host-based IPS compared with network-based IPS. In many cases, the technologies are thought to be complementary.

Requirement (6): A network plan addressing system co-location, operation (including governance) and maintenance.

Compliance: Developing a network plan to address system collocation, operations and maintenance and overall governance of the network goes hand-in-hand with the business model that is created based on who will be part of the network, what services or role the network will provide, who will own the network, what security and compliance regulations must be adhered to, and much more. If the network is to be an open access network, access is “open“ if it is sufficiently non-discriminatory in allowing competitors access to the facility under equivalent cost and quality terms. Constructing and operating a network will require a number of agreements to mandate and regulate access, control and service delivery (i.e. Quality of Service (QoS) agreements). The following highlights just some of the agreements that will need to be considered and touches on some of the items to be addressed within the agreement.

Network Operations Management Agreement

Most communities lack the staff and expertise to manage the network once built. A typical solution is to contract with a third party with previous experience to manage the network. The Network Operations Management Agreement addresses items such as:

- Bandwidth responsibilities including managing and allocating subscribed bandwidth to customers and across the network
- Compliance with Customer Privacy and Personal Property Rights
- Customer billing and collection
- Operations budget preparation and monitoring
- Customer and provider technical support/Back-office support
- Enforcing Quality of Service (QOS) responsibilities
- Oversee maintenance and emergency repair of the network

Network Maintenance and Emergency Repair Agreement

The network manager may not be the party responsible for actual maintenance and emergency repair in the event the network goes down. Typically such responsibilities are contracted with a local contractor or service provider that has technical field crews and equipment within less than one hour of the network. Examples of issues typically included within this agreement are as follows:

- Stocking of equipment and infrastructure parts and materials critical to bring the network back up within a short period of time that cannot wait to be ordered and delivered
- Periodic inspection of the outside plant for areas of concern such as loose attachment hardware, low sag of the cable, condition of splice enclosures and handhole vaults, signs of tampering with the network by other utilities or vandals
- Most QoS agreements require an emergency repair response within no more than 2 hours of being notified with the intent of bringing the network back-up as soon as possible (within 4-8 hours)
- Most QoS agreements require five 9s reliability meaning the network is up 99.999% of the time (following Telcordia Standards)
- Quite often the same contracted party for maintenance and emergency repair will be the same party contracted to perform customer hookup and disconnect services. This introduces a variety of items to address such as established levels of responsibilities between the network and the homeowner, right-of-way and easement matters, underground utility locations, care, handling and conduit while on private property, etc.

Network Access Agreement with Service Providers

Agreements with service providers using the community network will need to be developed. A variety of issues needing to be looked at include:

- Clear delineation and understanding of who is responsible for what

- Compliance with Customer Privacy and Personal Property Rights
- Maintenance and emergency repair coordination and responsibilities
- QoS Standards
- Fees for use/lease
- Compliance with federal, state and local laws
- Network co-use conduct and notification

Pole Attachment/Trench Use Agreement

Use of other owned facilities such as exiting poles, conduit, trenches, etc. is usually handled one of two ways; either through a joint use agreement if the Community owns similar facilities that are needed by the other owners of such facilities or through annual payments. There are federal guidelines and requirements on establishing fair and reasonable fees through the calculation of developed formulas, as well as when such attachments cannot be denied. Examples of issues addressed in a Pole Attachment or trench use agreement include:

- Location of cable placement
- Responsibilities for Make-Ready work and repair
- Parameters set as to accessing infrastructure
- Ownership tagging/identification of infrastructure
- Sag allowances and depth placement in trenches with appropriate cover and overall compliance with the National Electric Code requirements

Content Agreements

Content agreements will be specific to the particular content being acquired. For example typically bandwidth would require a redundant path be available in the event the main feed goes down; TV programming would address franchise agreements and fees as well as Public, Educational and Government (PEG) channel provisions; voice would require the highest priority in reliability and handling of 911 calls.

Governance Plan

Community public welfare custodians over open access networks recognize that while politics is a means by which the governance process operates, *fair governance* implies that these mechanisms function in a way that allows the elected officials (the "agents") to respect the rights and interests of the constituency stakeholders (the "community principals"), in a spirit of democracy. Politics involves processes by which a group of people with initially divergent opinions or interests reach collective decisions generally regarded as binding on the group, and enforced as common policy. Governance, on the other hand, conveys the administrative and process-oriented elements of governing rather than its antagonistic ones. Governance is that separate process or certain part of management or leadership processes that make decisions that define expectations, grant power, and verify performance. A Governance Doctrine will need to be developed to guide the Network Management in getting started and continue with the on-going

development and expansion of the government owned network, applications and services provided off the network.

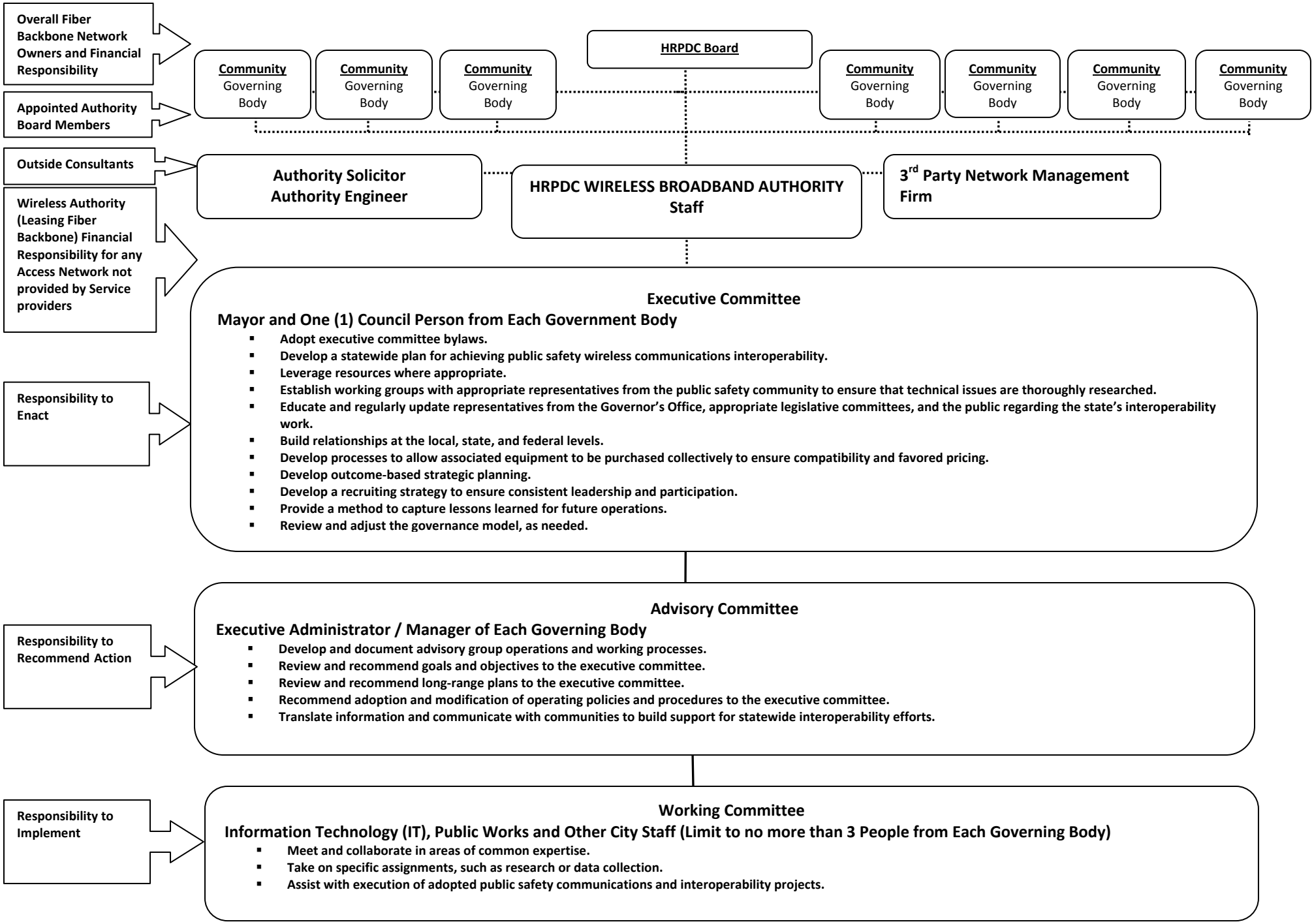
The following steps for planning Network Governance are those recommended by SAFECOM. SAFECOM is a communications program of the Department of Homeland Security's (DHS) Office for Interoperability and Compatibility (OIC). While SAFECOM applies more directly to Emergency Response Interoperable Communications networks, the same principles can be used as a foundation from which to build the community network Governance Doctrine. The communities' open access network should be thought of as much more of a comprehensive government owned fiber backbone network where the future distribution and access networks might include applications associated in meeting the general public at large interest such as transportation, telemedicine, utility SCADA systems, wireless PDA support / video streaming, and public health inspection, as well as individual customer needs such as Internet connectivity, TV, telephone services, home and business security, off-site data storage and much more. The following identifies the phased-in approach, but detailed discussion and modification to customize the planning approach for the community network is beyond the scope of this "first look" assessment.

Steps for Planning Network Governance
1. Phase I – Establish Key Relationships and Funding
2. Phase II – Gather Information
3. Phase III – Create Network Plan and Roadmap
4. Phase IV – Identify Roles and Responsibilities
5. Phase V – Recruit Service Provider Participants
6. Phase VI – Conduct Service Provider Interviews
7. Phase VII – Analyze Data, Set Goals and Begin Preparations for Strategic Planning
8. Phase VIII – Finish Preparations for and Conduct Strategic Planning Session
9. Phase IX – Develop Network Communications Interoperability Strategic Plan and Develop a Network Operational Hierarchy Management Organization
10. Phase X – Use Guidelines for the First 90 days of Implementation and Practice the Plan

The recommended operational hierarchy of the network Governance Doctrine consists of a three tier management organization consisting of the:

- Executive Committee – having the responsibility to enact, and
- Advisory Council – having the responsibility to recommend action, and
- Working Subcommittee – having the responsibility to implement.

The following figure represents the relationship and responsibilities of the entities involved.


Overall Fiber Backbone Network Owners and Financial Responsibility
Appointed Authority Board Members
Outside Consultants
Wireless Authority (Leasing Fiber Backbone) Financial Responsibility for any Access Network not provided by Service providers
Responsibility to Enact
Responsibility to Recommend Action
Responsibility to Implement
HRPDC Board
Community Governing Body
Community Governing Body
Community Governing Body
Community Governing Body
Community Governing Body
Community Governing Body
Community Governing Body
Authority Solicitor
Authority Engineer
HRPDC WIRELESS BROADBAND AUTHORITY Staff
3rd Party Network Management Firm
Executive Committee
Mayor and One (1) Council Person from Each Government Body
Adopt executive committee bylaws.
Develop a statewide plan for achieving public safety wireless communications interoperability.
Leverage resources where appropriate.
Establish working groups with appropriate representatives from the public safety community to ensure that technical issues are thoroughly researched.
Educate and regularly update representatives from the Governor's Office, appropriate legislative committees, and the public regarding the state's interoperability work.
Build relationships at the local, state, and federal levels.
Develop processes to allow associated equipment to be purchased collectively to ensure compatibility and favored pricing.
Develop outcome-based strategic planning.
Develop a recruiting strategy to ensure consistent leadership and participation.
Provide a method to capture lessons learned for future operations.
Review and adjust the governance model, as needed.
Advisory Committee
Executive Administrator / Manager of Each Governing Body
Develop and document advisory group operations and working processes.
Review and recommend goals and objectives to the executive committee.
Review and recommend long-range plans to the executive committee.
Recommend adoption and modification of operating policies and procedures to the executive committee.
Translate information and communicate with communities to build support for statewide interoperability efforts.
Working Committee
Information Technology (IT), Public Works and Other City Staff (Limit to no more than 3 People from Each Governing Body)
Meet and collaborate in areas of common expertise.
Take on specific assignments, such as research or data collection.
Assist with execution of adopted public safety communications and interoperability projects.

This recommended management organization was put in-place for the intended benefit of the communities and their Stakeholders such as:

Local Departments & Organizations	**State Organizations**	**Federal and Other partners**
EMS Advisory Board	Public Safety	USCG
Local Police Departments	Information Technology	Homeland Security
Local Fire Departments	Emergency Management and	FBI
Regional Communication Centers	Homeland Security	US Attorney
	Military Department	Interoperable Communications
	Public Health	Technical assistance Program
	Corrections	Civil Air Patrol
	Environmental Protection	
	Transportation	
	Office of Statewide Emergency Telecommunications	
	Judicial Detention	

The Wireless Broadband Authority is structured as an Operating Authority with full rights and powers granted to it under Virginia law. While the legislative powers of an authority pertain to government units under which law enforcement (police), fire fighting and Hazardous Material response, and other government responsibilities are typically provided, it is important to recruit focus group participants from other nongovernment provided agencies. Such focus groups can provide an efficient and effective way to gather diverse practitioner perspectives and assist in identifying other individuals and entities that should be included in the strategic planning and implementation of initiatives of the Wireless Broadband Authority. Such focus groups could include:

- Law Enforcement (which would include video surveillance and traffic cameras)
- Fire and Hazardous Materials Response (which would include bomb response units)
- Health Care
- Communications (which would include early warning and detection / Emergency Mass Communication System and other wire-line and wireless communications)
- Environmental (which would experts that would address weather, smog, dust, nuclear, poison gas or food, and any other natural or man-made sight, sound, touch and breathing disaster)
- Public Works (which would address transportation, electric, water and sewage infrastructure)
- Funding Focus (which is always the lifeline to allow the COG operations to breath and grow)
- Disaster Recovery and Systems Maintenance Planning

Strategic planning is an on-going process and should constantly include as one of its objectives how best to leverage and integrate the local efforts with statewide efforts. Many times funding

is a trickle down supply which starts to flow at the federal level, onto the state level, then county and ending up at the local level. The following are just some of the issues that usually integrate local and regional plans with statewide plans.

- Statewide Planning Issues
- Use of wireless spectrum
- Mass evacuation
- Statewide Emergency Management
- Statewide Health Care Issues
- State Highways and Roads Transportation
- Federal / State Homeland Security Coordination Training

- Related Regional or Local Planning Issues
- Use of wireless spectrum
- Regional Evacuation
- Local Emergency Management
- Countywide Health Care Issues
- County and Local Roadways / Transportation
- State / Local Public Safety Coordination Training

Other documents that will need to be addressed include:

- Authority Bylaws
- Prioritization of Tasks and Performance Management
- Rate Ordinances and Resolutions
- Marketing and Public Relations

Requirement (7): Arrangements to accommodate scalable bandwidth while eliminating or minimizing monthly reoccurring costs.

Compliance: Arrangements to accommodate scalable bandwidth while minimizing monthly reoccurring costs will have to be discussed and result from negotiations with the party(s) that the network owners will contract with for the bandwidth. Typically when purchasing bandwidth there are reoccurring and nonrecurring cost components. Also, for redundancy purposes, most networks have the arrangements in-place and the capability to switch over to a standby secondary provider in the event the primary provider's network goes down or experiences problems.

Requirement (8): Capable of accommodating community voice, video and data services such as network-based (IP-based) telephone services, Internet video streaming, and high-speed Internet including the ability to support community wireless "Hot Spots".

Compliance: In its simplest terms, it is easiest to think of the proposed fiber optic backbone network as the connectivity of main networks for access and long haul of traffic to the world-wide web and integrated networks not only throughout the country, but throughout the globe. Distribution networks serve the purpose of backhauling traffic to the long haul main networks, and access networks connect to the distribution networks to provide last mile/last foot connectivity to the end-user. Typically fiber optic cabling and technology is significantly used for distribution and main network activities. Fiber optics is being used in a limited, but growing number of access networks often referred to as Fiber-to-the Premise (FTTP). A properly designed and equipped fiber optic network is capable of accommodating community voice, video and data services. Fiber optic distribution networks are often used to backhaul wireless data from concentrated and aggregated wireless "Hot Spots". Fiber optics is not the only type

of technology for access networks that can handle voice, video and data applications, but as bandwidth demand and applications grow, it is becoming much more difficult for other wire-line technologies to accommodate load. Currently the majority of access networks consists of copper telephone lines, coaxial cable TV lines, or fixed wireless point-to-point or point –to – multipoint networks. Therefore, the proposed fiber optic network will be able to accommodate community voice, video and data services, but the role of the network will be to primarily provide long haul transport of such data, with limited exceptions.

Requirement (9): Capable of supporting e-business enterprise applications such as video teleconferencing, electronic software distribution, inventory and maintenance systems, medical facility use for telehealth and insurance and medical record processing, on-line job training and continuing education, and a variety of other high bandwidth intensive commercial and private entity applications.

Compliance: The same roles of the different networks discussed under Requirement (8) apply to e-business enterprise applications. The proposed fiber optic network will be able to accommodate and support e-business enterprise applications such as video teleconferencing, electronic software distribution, inventory and maintenance systems, medical facility use for telehealth and insurance and medical record processing, on the job training and continuing education, and a variety of other high bandwidth intensive commercial and private entity applications, but the role of the network will be to primarily provide long haul transport of such data, with limited exceptions.

Requirement (10): Capable of supporting e-government applications such as network-based building security systems made available to all government agencies, E911 Interoperability Communications and first responder agencies, and other high bandwidth intensive federal, state and local government applications.

Compliance: The same roles of the different networks discussed under Requirement (8) apply to e-government applications. The proposed fiber optic network will be able to accommodate and support e-government applications such as network-based building security systems made available to all government agencies, E911 Interoperability Communications and first responder agencies, and other high bandwidth intensive federal, state and local government applications, but the role of the network will be to primarily provide long haul transport of such data, with limited exceptions.

Requirement (11): Capable of supporting e-Learning applications such as distance learning, academic research, library access, and other high bandwidth intensive education applications.

Compliance: The same roles of the different networks discussed under Requirement (8) apply to e-Learning applications. The proposed fiber optic network will be able to accommodate and support e-Learning applications such as distance learning, academic research, library access, and other high bandwidth intensive education application, but the role of the network will be to primarily provide long haul transport of such data, with limited exceptions.

(2) Quantify the network components such as length of fiber, number of towers, number of nodes, regeneration facilities, main network connectivity points, extent of anticipated make-ready work, Network Operating Center (NOC) location, etc.

Findings:

A conceptual fiber optic route was developed with the objective of locating the fiber in proximity to a significant number of key end-users, service provider facilities such as Central Offices (COs) and highly populated cities while avoiding difficult and expensive construction obstacles such as underwater highway routes, major interstate highways and federally owned/military base property. Figure 6 (Appendix A) highlights the proposed route and its relationship to incumbent telecommunication provider facilities. An approximate narrative description is as follows:

Proposed Fiber Optic Backbone Route:
Beginning at the Chesapeake Bay Bridge Tunnel (CBBT)
→South on 13 (Northampton Blvd.)
→Stay on 13/166 Past Middleton
→Stay on 166 to Norfolk State University (E. Princess Anne Rd to Park Ave)
→Go South on 168 on Avory Ave. over Bridge Crossing Elizabeth River
→South on 460/166 (E. Brambleton Ave. to Campostella Rd) Toward Chesapeake
→South on Poindexter St. to Toll Booth across Jordan Bridge to Elm Ave.
→Through the Norfolk Naval Shipyard (Elm Ave.)
→South on 141 (George Washington Hwy)
→North 17 (Frederick Blvd past Bon Secours Maryview Medical Center)
→Across High Street Bridge (17)
→West on 17 (High Street)
→West on 17 Bridge Road
→Across 17 Bridge Rd. over Nansemond River
→North 17 across Chuckatuck Creek
→North 17/258 Carrollton Blvd.
→Across 17/258 (Carrollton Blvd.) over James River Bridge
→ 17E/258 (W. Mercury Blvd.)
→258 (W. Mercury Blvd.)
→North 134 (N. Armistead Ave.)
→Hampton Roads Center Pkwy
→North 134 (Magruder Blvd.)
→North134 (Hampton Hwy)
→North 17 (George Washington Highway)
→17 N crossing York River into Gloucester

→17N (State Route F687)

→17N/33 into Middlesex.

Fiber Relationship to Targeted Features

Feature	Total in Study Area	Total Within 2 Miles of Fiber	Percentage Within 2 Miles of Fiber
Telecom Central Offices	113	26	23%
Development Sites	341	129	38%
Public Buildings	94	22	23%
Airports	5	3	60%
Hospitals	26	11	42%
Higher Education Facilities	39	15	38%
K-12 Public Schools	377	117	31%
Military Facilities			

Fiber Optic Backbone Network Features:

Backbone fiber networks are designed to transport large quantities of data between a relatively few number of sites where data is added or dropped to feed surrounding customer areas. Additionally, those few sites allow for the necessary restrengthening or amplification of the signal to account for natural losses which occur with transmission distance. To provide the necessary reliability of the network, those sites must also have power reliability beyond that of commercial electric utilities (power backup required).

High capacity networks will transport the data over all fiber optic cable using lasers to produce high intensity light at precisely controlled frequencies. Because some light frequencies degrade or attenuate over shorter distances, commercial applications use narrow bands of frequencies near 1550 nm (nano meter wavelength) which can be combined or multiplexed together (Dense wave length multiplexing or DWDM) for the long haul transport. Similar but less expensive multiplexers utilize wider bandwidths per channel (Course wavelength division multiplexers or CWDM) A network initially designed to handle 20 gbps might not initially need DWDM but could be be planned with that in mind.

The most common method of packaging data for handling is a protocol called SONET developed by the telephone industry because of its flexibility in handling large quantities of data. Commercial equipment is designed to handle streams of data at specific data rates defined by the SONET standard. Data streams of between 2.5 (SONET OC-48) and 10 gbps (OC-192) can easily be handled over a single wavelength channel. DWDM equipment can handle tens of channels over a single fiber optic cable strand.

Fiber optic cable is designed in strands approximately the diameter of a human hair. Usually twelve strands are placed within a plastic tube and one to twenty-four commonly placed into a single cable. The costs of installing a single cable vary only slightly between a 12-count fiber cable and a 288-count fiber cable. The major difference in the outside plant is simply the incremental cost of the larger cable. For this backbone fiber cable, a twelve count cable would cover both the design needs of the program, anticipated expansion and spares. The difference in costs between a 12 and 48 count fiber cable for this deployment would be only on the order of $100,000. It is generally considered prudent to install the larger count fiber to allow for sales of fiber to other users either during the construction of the project or at some future time. The higher count fiber is recommended for this project.

Locations for signal regeneration can be either new sites constructed for the purpose of housing this equipment or existing sites where an incumbent telephone company or other entity already has such a site. The incumbent telephone provider, Verizon, owns many of these facilities where they either switch or forward on telephone traffic and handle Internet or other data traffic for local users. They often have space for other potential vendors called collocation space which they must rent, if available, to other telephone providers and may rent to other users at their discretion. By the nature of their business, this space is already provided with backup power to maintain their voice network. It provides an interconnect point to transfer data from the new backbone network into the Verizon local loop infrastructure for providing data over their infrastructure to end users. Collocation in Verizon locations has not always been possible either for economic or space reasons. Existing non-incumbent networks in Virginia have often been forced to construct their own sites for the purpose of signal regeneration and connection to local customers. This network should be planned with the former method (collocate with incumbent) utilized where possible including sufficient funding to handle the latter method (build new facilities) where necessary or otherwise deemed advisable. In the latter case it will be necessary to build additional fiber or other infrastructure (new local loop) to connect from the collocation site to end users.

To summarize the network would consist of approximately 92 miles of 48 count fiber optic cable connecting at a number of collocation sites with local fiber or other infrastructure to make the last mile connection to end users. The fiber would probably utilize OC-48 or OC-192 SONET over a network at least designed to migrate to DWDM architecture. The collocation points might be at Verizon or other entity owned existing collocation points or newly constructed sites developed for this network. In either case there would be provision for generator and other backup devices to ensure that the network operates with a high degree of reliability.

C. Prepare Cost Estimates for the Outside Plant (OSP)

Approach:

(1) Use typical industry unit prices and costs to develop a preliminary estimate of the network cost.

Outside plant costs encompass network design and engineering, project/construction management and constructing the fiber optic infrastructure necessary to handle the network backbone traffic envisioned by this network. For purposes of this estimate the costs of buildings and equipment which may be

necessary for collocating equipment will also be included as well as estimates of the cost of obtaining bonds, writing grants, holding public meetings and other "soft costs" associated with such a project (pre-project studies and planning).

Preliminary outside plant cost estimates can vary dramatically based on uncertainties in the preliminary planning process. The fiber optic cable can be deployed aerially on existing utility poles or buried. Costs associated with preparing existing utility poles for aerial deployment, called make-ready, can vary widely based on the degree of congestion of attachments (electric power, cable provider coax or fiber optic cable, telephone company copper infrastructure and other fiber providers fiber optic cable) already existing on the poles. Those costs would be paid by this project. In severe cases a majority of the poles might need to be changed out with larger poles in order to allow for a safe deployment to occur. Rules for such safe attachment are presented in the National Electric Safety Code which calls generally for a forty inch vertical separation between power and the area where fiber optic cable may be attached and a twelve inch separation between other providers as well as safe clearance above vehicles which may pass underneath the cable.

An alternative to aerial deployment is to bury the fiber underground using either an armored cable or by installing the fiber in conduit. This method has the advantage of increased security—there is less likelihood of damage by vehicles or weather—but is usually considerably more expensive. A combination of aerial and underground deployment could also be used selecting the most economical choice on an area by area basis. Costs for underground deployment can also vary widely depending on the congestion, terrain along the right of way (concrete, underground rock, soil) and other considerations.

The table following provides an estimate for costs based on assumed conditions along the path of the fiber. For the all fiber case, make-ready has been assumed to be light to moderate in more rural areas ($4.5k per mile), and heavy in the more urban areas ($12k per mile). Underground conditions have been assumed to be such that lower cost trenching or plowing can be used in rural areas with the more expensive missile boring or directional boring in the more urban areas. Areas attributed to each type of construction have been determined using 2000 US census data to determine whether the area is rural, suburban or urban in character. Detail is provided in the notes to the table. No decision has been made as to whether the deployment will be aerial (on utility poles) or underground. Estimates of both methods of construction are included.

Estimated Outside Plant Costs			
Mileage	**Area**	**Cost Aerial**	**Cost Underground**
33.2	Rural	$825,000	$1,168,700
27.8	Suburban	$811,600	$1,213,700
19.1	Urban	$800,610	$ 975,100
5.9	Bridge Crossings	$3,140,900	$3,140,900
Collocation Sites (10)		$2,000,000	$2,000,000
Pre-Project Studies and Planning		$300,000	$300,000

Estimated Outside Plant Costs continued			
Mileage	**Area**	**Cost Aerial**	**Cost Underground**
Planning, Project Management, Engineering		$398,760	$398,760
Total (Project Estimate)		$8,276,970	$9,197,160
Contingency		$1,595,390	$1,595,394
Total With Contingency (High Estimate)		$9,872,363	$10,972,592
Low Estimate (no collocation sites needed; less expensive bridge crossings)		$6,301,913	$7,406,142

Notes:
1. An arbitrary distinction was made between rural, suburban and urban based on block group housing densities. 0.1 home per acre plus half of block groups with .1 to .5 homes per acre was considered rural; the remainder of the most rural areas plus block groups containing 1-2 homes per acre and one half of block groups with 1-2 homes per acre were considered suburban; all other block groups were considered urban.
2. Make-ready for aerial construction was estimated to be $4,500, $9,000 and $12,000 per mile for rural, suburban and urban areas respectively.
3. Aerial construction includes 5% directional bore for rural and suburban areas and 25% for urban areas.
4. Major water crossings were estimated at $100 per foot for both aerial and urban construction

D. Prepare Cost Estimates for Network Electronics

Approach:

(1) While network electronics specifications will not be addressed, main network components will be identified and a cost range provided. Since extent of services will not be known, cost data will be structured based on other similar networks providing similar services.

At the backbone level voice, data and video data are treated equally across the network. A typical network node would consist of an optical add drop multiplexer (OADM) with supporting electronics, racks and hardware which would convert the backbone data (OC-48 or OC-192) into small data streams (e.g. gigabit Ethernet) for distribution to local users. A DWDM solution providing several OC-48 channels for backhaul would cost approximately $200,000 per site. A CWDM solution would cost no more than half as much, uses less space and generates less heat. The final cost of either solution will vary based on the number of local area links connecting the node to end users as well as the number of OC-48 or OC-192 channels incorporated into the design.

E. Prepare Cost Estimates for Operations and Maintenance of the Network

Approach:

(1) Typical operating costs, maintenance costs and service provisioning costs will be addressed.

Costs to maintain and operate the network will vary based on decisions on network architecture, aerial vs. underground deployment and whether collocation sites must be constructed. Typical budgetary percentages are shown in the following table with notes. A typical budget would be approximately $750,000.

Network Costs	
Item	**Budgetary**
Staffing Includes management and sales position plus two network operations staff.	43%
Electronics maintenance and licensing	18%
Utilities, Pole Attachment fees, Fiber Maintenance, Assumes ownership of ten (10) 400 square foot collocation sites	12%
Insurance and Taxes	17%
Other	10%

Provisioning of new customers would include the addition of electronics to turn up a new circuit, local loop connectivity and a drop and installation at a customer premise. Costs could vary from a few hundred to a thousand dollars for electronics and service drop where the local loop exists on an aerial pole line to many tens of thousands of dollars where underground service has to be constructed over considerable distances. For instances where the local loop exists, $5000 to $10,000 is a reasonable preliminary estimate for connection to a large bandwidth customer such as a university or office park.

II. Investigate the Availability of Funding to Implement the Proposed Network

F. Provide Funding Resources

Approach:

(1) A listing of available and applicable funding resources will be provided. This includes governmental sources, foundations, and private resources.

Findings:

A complete listing of funding sources is provided in the Appendix.

G. Identify Funding Requirements and Eligible Activities

Approach:

(1) General requirements such as local share, and eligible applicants and activities will be identified.

Findings:
The majority of grants available for telecom and broadband are targeted towards deployment in rural communities. This first phase network deployment in the Hampton Roads is intended to serve an economic development purpose from a regional perspective, laying the foundation for future extension into rural areas. Such large public infrastructure economic development projects are typically assisted by grants from the U.S. Economic Development Agency (EDA) and state budget appropriation. Low interest loans are available from the Virginia Resources Authority for infrastructure investments.

A regional fiber network would serve as a catalyst for interoperability partnerships with public safety entities. Interoperability is a key focus of the U.S. Department of Justice and Department of Homeland Security. Such a use of the proposed fiber network would entitle regional law enforcement entities to apply for Homeland Security funding to achieve regional interoperability.

A variety of funding vehicles ranging from grants to loans are available to facilitate *rural* broadband deployment, and would be available to some communities located in the Hampton Roads region for future phases of deployment beyond the metropolitan areas. Although the HRPDC is primarily comprised of urban and suburban areas of the Hampton Roads Metropolitan Statistical Area, jurisdictions include non-metropolitan communities such as Surry County, Southampton County, Franklin City, and portions of Suffolk City and York County. The jurisdictions targeted for future phases of network deployment include:

- County of Surry
- City of Suffolk
- City of Franklin
- James City County
- Southampton County
- City of Poquoson

Nearly all funding programs require a dollar contribution match on behalf of the applicant, thereby necessitating appropriation on the part of the General Assembly or a department of the State. The following funding sources have been used historically on rural broadband projects in Virginia:

The Virginia Department of Housing and Community Development (VDHCD) is currently assisting rural communities with feasibility assessments and business planning using a combination of Community Development Block Grant (CDBG) funds and department budgeted funds. Typical planning grants provided by the VDHCD range from $25k to $75k per community or group of communities. Currently, VDHCD requires a dollar contribution from the grantee of approximately 10% of grant funds. Additionally, in previous years this department's budgets have included funds for assisting with implementation of fiber backbone networks to encourage broadband service expansion by providers. Such assistance is available to support local broadband innovation in conjunction with other infrastructure projects (such as water/sewer), and community service applications. The purpose of the programs, however, is to support CDBG initiatives in low to moderate income areas.

USDA Community Connect program provides grants to localities to facilitate broadband services in *unserved* communities. Funds are budgeted yearly and are competitively awarded. Local legislative support is needed to bring attention to committed communities. This program is intended to address areas without any DSL or cable modem service; satellite is not considered a broadband option. There are areas in the HRPDC that would be eligible for this assistance, such as all of Surry County. One requirement of the Community Connect grant is the establishment of a community Internet access center with at least ten (10) stations available for access without charge to the public, but the grant does not dictate the method of access used (i.e. wired or wireless). This grant could facilitate a POP established in the community as part of the proposed backbone network in partnership with a wireless provider serving the rest of the community with last mile access. Grantees must provide 15% of project costs in matching funds.

US Economic Development Agency (EDA) is providing financial support for construction of the northern section of the Eastern Shore of Virginia network backbone. The Public Works and Economic Development Program of the Economic Development Administration (EDA) is designed to enhance regional competitiveness and promote long-term economic development in regions experiencing substantial economic distress. Through the program, EDA provides Public Works investment assistance to support the construction or rehabilitation of essential public infrastructure and facilities necessary to generate or retain long-term private sector jobs and investments, attract private sector capital, and promote regional competitiveness. Grants (referred to in CFDA No. 11.300 as investments) may be used for projects such as expanding and upgrading infrastructure to attract new industry, supporting technology-led development, redeveloping brownfield sites, promoting eco-industrial development, and supporting heritage preservation development investments such as those promoted by the Executive Order on Preserve America. Eligible applicants include: State, city, county, or other political subdivision of a State, including a special purpose unit of a State or local government engaged in economic or infrastructure development activities, an institution of higher education or a consortium of institutions of higher education, an Economic Development District organization, a private or public nonprofit organization or association, including a faith-based non-profit organization, acting in cooperation with officials of a political subdivision of a State, or an Indian Tribe, or a consortium of Indian Tribes. Matching funds are required; generally EDA will not provide more than 50% of project funds, though and additional 30% may be authorized based on regional impact and need. Matching funds may be in the form of in-kind contributions, such as contributions of space, equipment, assumptions of debt, and services to provide the required non-federal share of the total project cost. 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.

Virginia Resources Authority (VRA): The VRA was created by the Virginia General Assembly in 1984 to support community infrastructure investments by providing cost-effective financial solutions to local governments and other public bodies. In addition to infrastructure projects such as public safety, transportation and water, the VRA is authorized by the State to fund wired and wireless broadband projects through revolving fund loans to localities at below-market interest rates and to issue bonds backed by the moral obligation of the Commonwealth. The VRA provides access to three (3) types of financing assistance: Pooled Financing (VRA funds), Term Financing (SunTrust Leasing Corp), and Interim Financing (SunTrust Bank).

Governor's Development Opportunity Fund: The Governor's Development Opportunity Fund is to be used by the Governor to attract economic development prospects and secure the expansion of existing industry in the Commonwealth. Funds may be used for public and private utility extension or capacity development on and off site; public and private installation, extension, or capacity development of high-speed or broadband Internet access, whether on or off site; road, rail, or other transportation access costs beyond the funding capability of existing programs; site acquisition; grading, drainage, paving, and any other activity required to prepare a site for construction; construction or build-out of publicly owned buildings; training; or grants or loans to an industrial development authority, housing and redevelopment authority, or other political subdivision for purposes directly relating to any of the foregoing. Funds shall be awarded as grants or loans to political subdivisions. Loans shall be approved by the Governor and made in accordance with guidelines established by the Virginia Economic Development Partnership and approved by the Comptroller. Loans shall be interest-free unless otherwise determined by the Governor and shall be repaid to the Fund. The Governor may establish the interest rate to be charged; otherwise, any interest charged shall be at market rates as determined by the State Treasurer and shall be indicative of the duration of the loan. The Virginia Economic Development Partnership shall be responsible for monitoring repayment of such loans and reporting the receivables to the Comptroller as required.

Advanced Communications Assistance Fund: This State fund is intended to assist underserved localities with taking advantage of advanced communication services through loans or grants. Funding assistance

can be used for the internal communication needs of localities and in the planning, deployment and maintenance of dark fiber. Funds are appropriated by the General Assembly.

Virginia Community Capital: This for-profit bank focuses on providing access to economic development capital, working through partnerships with state/local organizations, city governments and traditional financial institutions. Instead of competing with traditional banks, this organization works with local partners to develop funding packages to meet the needs of Virginia's communities. Projects funded include economic development infrastructure and community facilities.

Additional Funding Mechanisms: Matching funds can generally be funding received from other sources such as grants or donations, or can often be offered as in-kind services with reasonable dollar values. This provides localities with the opportunity to leverage any funding received, and assets and investments such as community right-of-ways and infrastructure suitable for mounting or housing equipment. Additionally, in-house technology talent can be tapped for system integration, operation and maintenance functions. Cost savings realized by a realignment of services, access to lower-cost bandwidth or interoperability improvements may allow localities to reallocate spending to offset the capital investment of the new facilities or access.

Closing Comments

The broadband planning studies funded by Virginia Department of Housing and Community Development (VDHCD) are overwhelmingly supporting telecommunications and broadband services as a high priority to residents and businesses of the Commonwealth. Economic development efforts to retain existing or recruit new businesses to rural Virginia counties are hampered by lack of high speed infrastructure. In some rural counties, more than one-half of residents are commuting to work outside their county. While wireless Internet access is deployed in limited areas, its costs are typically higher than wire-line technologies primarily attributed to high costs associated with data backhaul over private networks. The absence of a fiber carrier in the counties to provide affordable traffic backhaul to the Internet has deterred new providers from offering services in competition with incumbent providers. Wireless technologies as generally deployed for retail services to the public have limited capabilities particularly in the areas of video and other high speed/large bandwidth applications, as well as occasional interference problems in severe weather or dense foliage.

While many of these obstacles do not exist in the urban corridor of the Hampton Roads region where the conceptual fiber backbone network passes some of the most populated cities in Virginia and would be overbuilding many other existing private networks, an assessment of the feasibility must consider the intended purpose. If the purpose is to enhance economic development efforts such as growing existing businesses, attracting new businesses, enabling home-based businesses, enabling teleworking and encouraging competition for services only in the urban corridor of the Hampton Roads region, then regardless of cost it is not feasible to pursue new network construction because high speed connectivity already exists. If however, the purpose is to provide economic development tools to not only the more rural areas of the Hampton Roads region, but to provide redundancy for the Eastern Shore network and the Middle Peninsula and Northern Neck planned networks, then interconnection of these networks

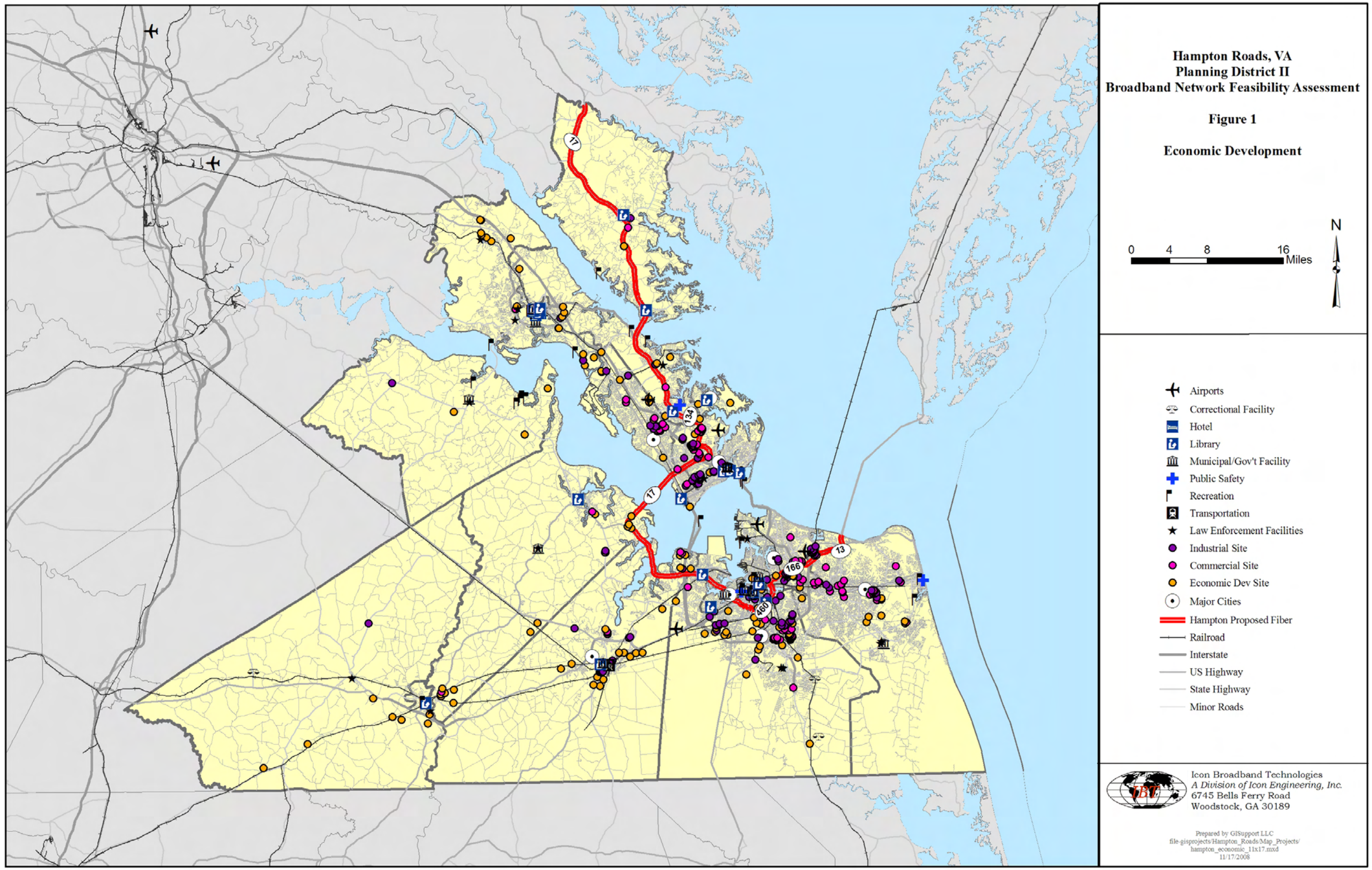
makes sense. The question is how can the interconnection be most cost effectively made and is the network and business model sustainable?

The conceptual network discussed follows portions of the same route, or is in near proximity to other private networks. This "first-look" assessment accomplished the stated objectives of addressing two (2) issues; (i) an estimate of the project's costs, and (ii) the availability of funding to implement the proposed network from federal, state and other sources. What the scope was not tasked to address is the degree of potential public-private partnering that could occur to eliminate or reassign cost components and development of a business model. For example, discussions with the private network owners should explore leasing infrastructure rather than overbuilding existing networks, co-locating facilities rather than constructing new facilities, outsourcing network management and maintenance rather than communities having to hire and train staff. The problem is that historically, private sector network owners were reluctant to partner with the public sector on competitive service networks. The current planning studies funded by VDHCD include issuing a Request for Interest (RFI) to service providers to investigate the willingness and role of service providers to partner or get engaged in the community projects. The study findings are shared with current and prospective providers to encourage collaboration in planning, demonstrates a business case, and discusses how interests of the communities can be served while meeting satisfactory return on investment needs of private providers. One of the objectives of the VDHCD rural broadband initiative is to design and implement open access networks, enabling any service provider to use the network under a fair and level playing field Governance Plan and fee structure.

Many of the following recommendations provided to the individual communities in their telecommunications broadband planning projects can apply to this fiber optic backbone main network.

- Issue a Request for Interest (RFI) from service providers regarding interest of use and willingness to build access networks to end-users, as well as participation in serving an open access network
- Pursue developing a Master Plan with the other surrounding projects of the Eastern Shore, Middle Peninsula and Northern Neck regions, individual studies like Surry County, and Mid-Atlantic Broadband Cooperative, Maryland Broadband Cooperative and other key players in the region
- Seek commitments from communities that such an initiative be considered a priority and a willingness to pursue implementing distribution networks
- 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 government obligations are secured
- Develop a business plan difficult to challenge under Virginia law pertaining to the permissible roles of municipalities in communication networks
- Work with service providers to develop last mile access models to determine best solutions
- Continue to educate government constituency and officials of the contributing role broadband plays in economic development considerations, educational opportunities and overall improvement of quality of life
- Seek the best source of funding and multiple funding partners
- Keep the momentum moving forward; once stalled, it is difficult to get moving again and difficult to rekindle support.

APPENDICES


Hampton Roads, VA
Planning District II
Broadband Network Feasibility Assessment
Figure 1
Economic Development
0 4 8 16 Miles
N
Airports
Correctional Facility
Hotel
Library
Municipal/Gov't Facility
Public Safety
Recreation
Transportation
Law Enforcement Facilities
Industrial Site
Commercial Site
Economic Dev Site
Major Cities
Hampton Proposed Fiber
Railroad
Interstate
US Highway
State Highway
Minor Roads
Icon Broadband Technologies
A Division of Icon Engineering, Inc.
6745 Bells Ferry Road
Woodstock, GA 30189
Prepared by GISupport LLC
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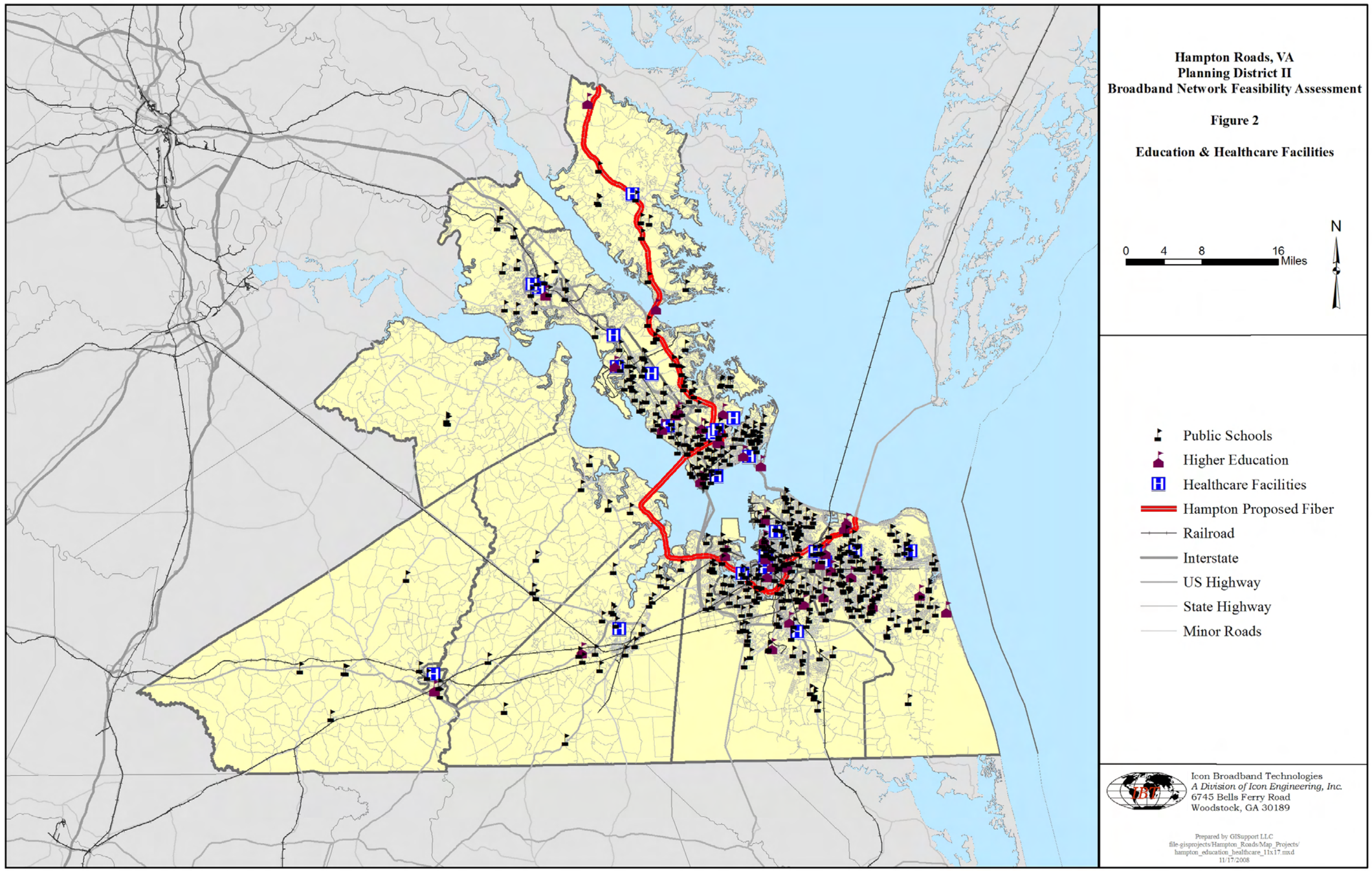
11/17/2008


Hampton Roads, VA
Planning District II
Broadband Network Feasibility Assessment
Figure 2
Education & Healthcare Facilities
N
0 4 8 16 Miles
Public Schools
Higher Education
Healthcare Facilities
Hampton Proposed Fiber
Railroad
Interstate
US Highway
State Highway
Minor Roads
Icon Broadband Technologies
A Division of Icon Engineering, Inc.
6745 Bells Ferry Road
Woodstock, GA 30189
Prepared by GISupport LLC
file-gisprojects/Hampton_Roads/Map_Projects/
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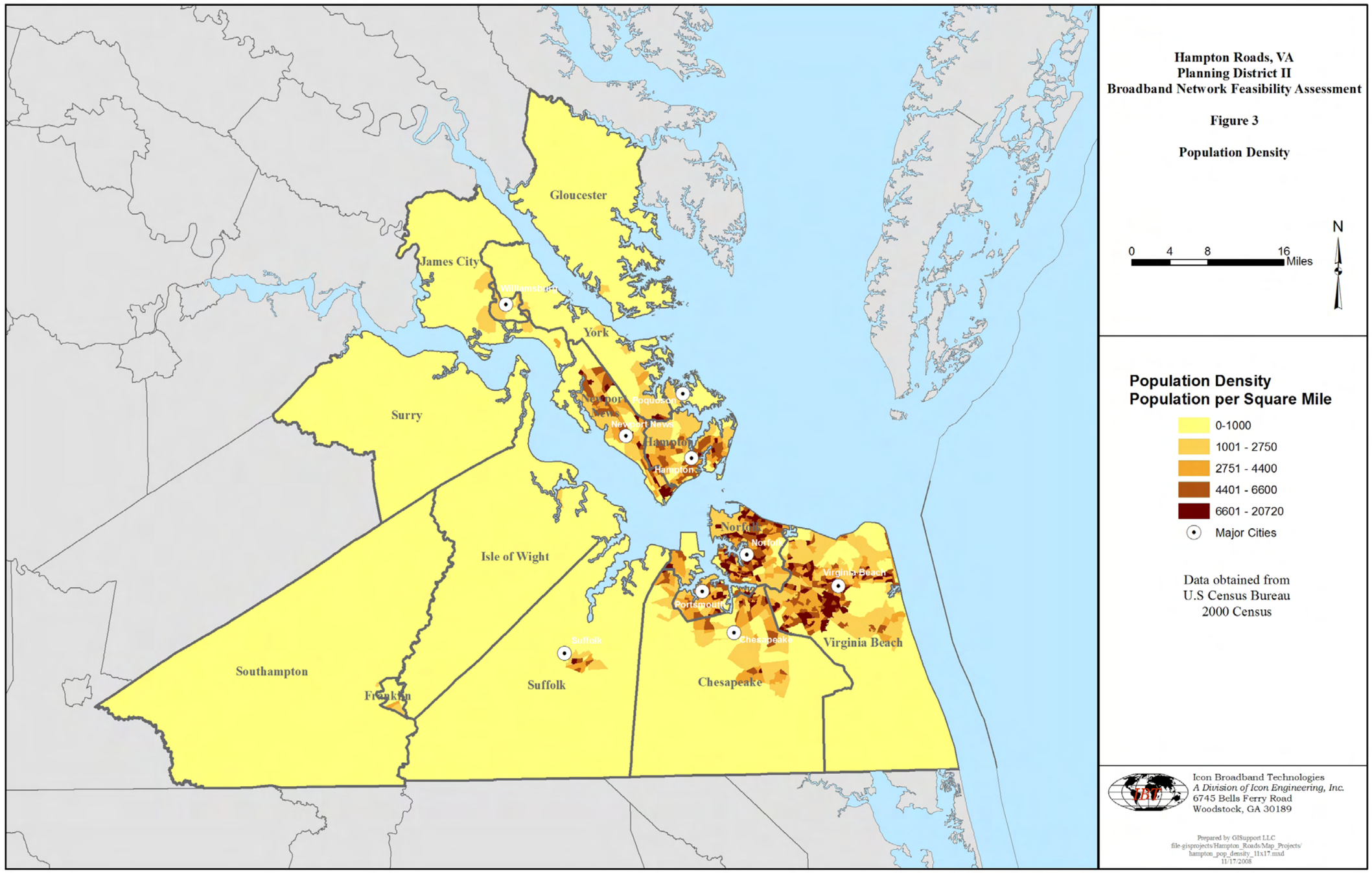

Hampton Roads, VA
Planning District II
Broadband Network Feasibility Assessment

Figure 3

Population Density

0 4 8 16 Miles

N

Population Density
Population per Square Mile

- 0-1000
- 1001 - 2750
- 2751 - 4400
- 4401 - 6600
- 6601 - 20720
- Major Cities

Data obtained from
U.S Census Bureau
2000 Census

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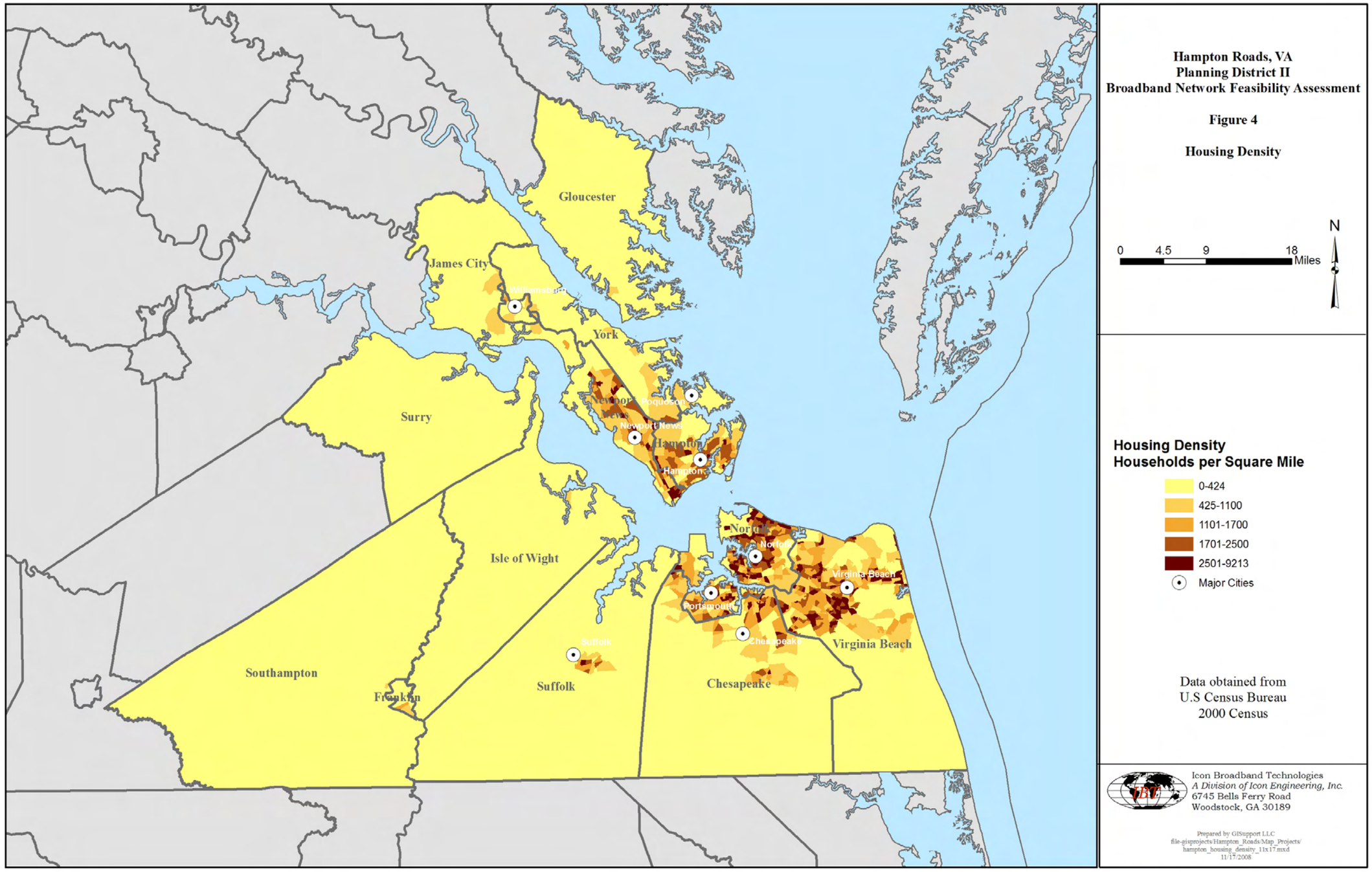
hampton_pop_density_11x17.mxd
11/17/2008



Hampton Roads, VA
Planning District II
Broadband Network Feasibility Assessment

Figure 4

Housing Density

N

0 4.5 9 18 Miles

Housing Density
Households per Square Mile

- 0-424
- 425-1100
- 1101-1700
- 1701-2500
- 2501-9213
- Major Cities

Data obtained from
U.S Census Bureau
2000 Census

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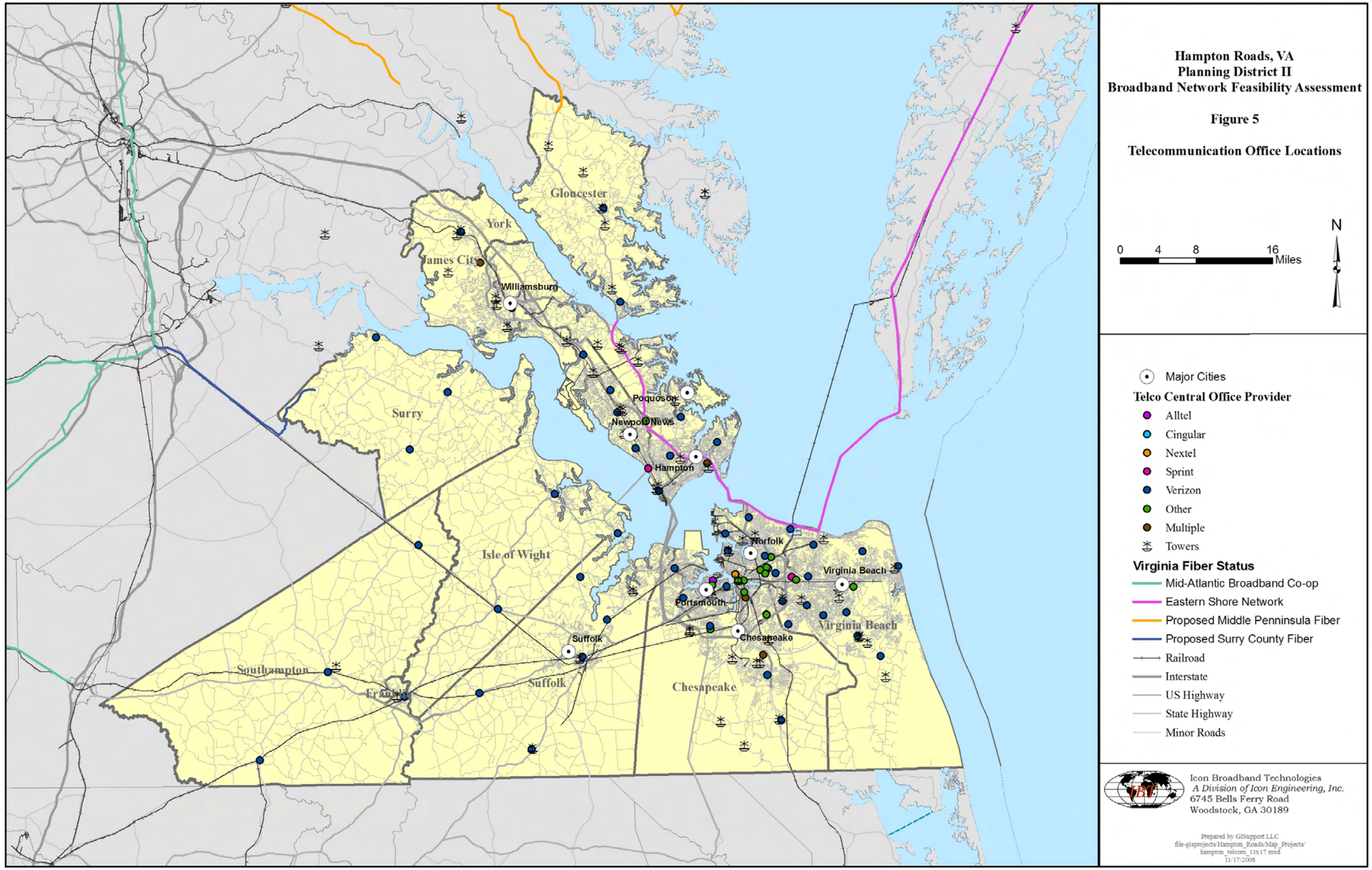
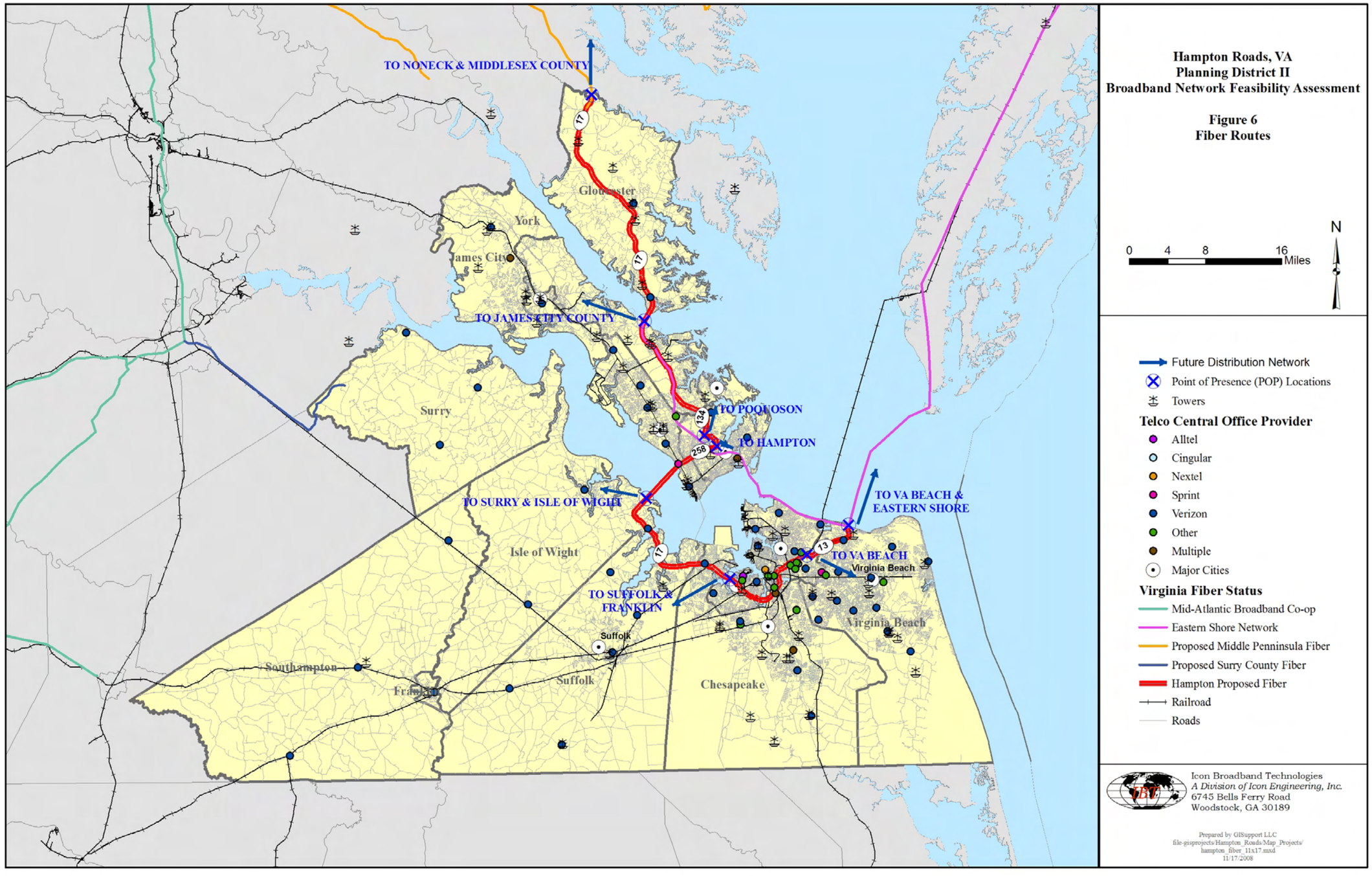

Hampton Roads, VA
Planning District II
Broadband Network Feasibility Assessment
Figure 5
Telecommunication Office Locations
0 4 8 16 Miles
N
Major Cities
Telco Central Office Provider
Alltel
Cingular
Nextel
Sprint
Verizon
Other
Multiple
Towers
Virginia Fiber Status
Mid-Atlantic Broadband Co-op
Eastern Shore Network
Proposed Middle Penninsula Fiber
Proposed Surry County Fiber
Railroad
Interstate
US Highway
State Highway
Minor Roads
Gloucester
York
James City
Williamsburg
Surry
Poquoson
Newport News
Hampton
Isle of Wight
Norfolk
Virginia Beach
Portsmouth
Chesapeake
Suffolk
Southampton
Franklin
Icon Broadband Technologies
A Division of Icon Engineering, Inc.
6745 Bells Ferry Road
Woodstock, GA 30189
Prepared by GISupport LLC
file-gisprojects/Hampton_Roads/Map_Projects/
hampton_telecom_11x17.mxd
11/17/2008


TO NONECK & MIDDLESEX COUNTY
Gloucester
York
James City
TO JAMES CITY COUNTY
Surry
TO POQUOSON
TO HAMPTON
TO SURRY & ISLE OF WIGHT
Isle of Wight
TO SUFFOLK & FRANKLIN
Suffolk
Southampton
Franklin
Chesapeake
TO VA BEACH & EASTERN SHORE
TO VA BEACH
Virginia Beach
Virginia Beach
17
17
134
258
17
13
Hampton Roads, VA
Planning District II
Broadband Network Feasibility Assessment
Figure 6
Fiber Routes
0 4 8 16 Miles
N
Future Distribution Network
Point of Presence (POP) Locations
Towers
Telco Central Office Provider
Alltel
Cingular
Nextel
Sprint
Verizon
Other
Multiple
Major Cities
Virginia Fiber Status
Mid-Atlantic Broadband Co-op
Eastern Shore Network
Proposed Middle Penninsula Fiber
Proposed Surry County Fiber
Hampton Proposed Fiber
Railroad
Roads
Icon Broadband Technologies
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6745 Bells Ferry Road
Woodstock, GA 30189
Prepared by GISupport LLC
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11/17/2008

Appendix B: Hampton Roads Fire and Rescue Facilities

County or City	Public Safety Agency
Chesapeake	Chesapeake Fire Department
Chesapeake	Chesapeake IAFF Local 2449
Chesapeake	Norfolk Steel Fire Brigade
Franklin	Franklin Fire & Rescue
Franklin	Hunterdale Volunteer Fire Department
Gloucester	Abington Volunteer Fire Department (County Link)
Gloucester	Abington Volunteer Fire Department (Official)
Gloucester	Gloucester Fire & Rescue
Hampton	Hampton Division of Fire & Rescue
Hampton	Langley Airforce Base
Isle of Wight	Carrollton Volunteer Fire Department
Isle of Wight	Carrsville Volunteer Fire Department
Isle of Wight	Chuckatuck Volunteer Fire Department
Isle of Wight	Isle of Wight County Emergency Services
Isle of Wight	Isle of Wight Volunteer Rescue Squad
Isle of Wight	Rushmere Volunteer Fire Department
Isle of Wight	Smithfield Volunteer Fire Department
Isle of Wight	Union Camp Fire Brigade
Isle of Wight	Windsor Volunteer Fire Department
Isle of Wight	Windsor Volunteer Rescue Squad
James City	James City County Fire Department
James City	James City Rescue Squad
Newport News	Fort Eustis/Fort Story Fire & EMS Department
Newport News	Newport News Fire Department
Newport News	Newport News IAFF Local 794
Newport News	Newport News Shipbuilding Fire Department
Norfolk	Ferrier Fire Fighting
Norfolk	Norfolk Fire & Paramedical Services
Norfolk	Norfolk IAFF Local 68
Norfolk	Norfolk International Airport Authority Fire Department
Norfolk	Norfolk Naval Base Fire Department
Norfolk	Tidewater Search and Rescue
Poquoson	Poquoson Fire & Rescue
Poquoson	Poquoson Volunteer Fire Department
Portsmouth	Craney Island Fire Department
Portsmouth	Norfolk Naval Shipyard Fire Department
Portsmouth	Portsmouth Fire Rescue & Emergency Services
Southampton	Boykins Volunteer Fire Department & Rescue Squad
Southampton	Branchville Volunteer Fire Department
Southampton	Capron Volunteer Fire & First Aid Crew
Southampton	Courtland Volunteer Fire Department
Southampton	Courtland Volunteer Rescue Squad
Southampton	Drewryville Volunteer Fire Department
Southampton	Hercules Inc. Fire Brigade
Southampton	Ivor Volunteer Fire Department

Appendix B: Hampton Roads Fire and Rescue Facilities

County or City	Public Safety Agency
Southampton	Ivor Volunteer Rescue Squad
Southampton	Newsoms Volunteer Fire Department
Southampton	Sedley Volunteer Fire Department
Southampton	Southampton County Fire-Rescue
Suffolk	Chuckatuck Volunteer Fire Department
Suffolk	Driver Volunteer Fire Department
Suffolk	Holland Volunteer Fire Department
Suffolk	Nansemon-Suffolk Volunteer Rescue Squad
Suffolk	Suffolk Fire & Rescue
Suffolk	Whaleyville Volunteer Fire Department
Surry	Claremont Volunteer Fire Department
Surry	Dendron Volunteer Fire Department
Surry	Surry Volunteer Fire Department
Surry	Surry Volunteer Rescue Squad
Virginia Beach	Blackwater Volunteer Rescue Squad
Virginia Beach	Chesapeake Beach Fire & Rescue
Virginia Beach	Creeds Volunteer Rescue Squad
Virginia Beach	Dam Neck Fire Department
Virginia Beach	Davis Corner Volunteer Fire Department & Rescue Squad
Virginia Beach	General Booth Volunteer Rescue Squad
Virginia Beach	Green Run Volunteer Rescue Squad
Virginia Beach	Kempsville Volunteer Rescue Squad
Virginia Beach	Knotts Island Volunteer Fire Department
Virginia Beach	Oceana Volunteer Fire Department
Virginia Beach	Ocean Park Volunteer Rescue Squad
Virginia Beach	Plaza Volunteer Rescue Squad
Virginia Beach	Princess Anne Courthouse Volunteer Rescue Squad
Virginia Beach	Sandbridge Volunteer Rescue Squad
Virginia Beach	Stumpy Lake & Salem Volunteer Rescue Squad
Virginia Beach	Thalia Volunteer Fire Department
Virginia Beach	Virginia Beach Fire Department
Virginia Beach	Virginia Beach IAFF Local 2924
Virginia Beach	Virginia Beach Fire Department Station #18
Virginia Beach	Virginia Beach Department of EMS
Virginia Beach	Virginia Beach Lifesaving
Virginia Beach	Virginia Beach Volunteer Rescue Squad
Williamsburg	Williamsburg Fire Department
York	York County Fire and Life Safety
York	Industrial Vol Fire Dept Amoco Oil Company

Appendix C: Hampton Roads Military Facilities

Military Agency	Address	City, State
Air Force Recruiting	1180 Lance Rd,	Norfolk
Air National Guard	Bldg 203	Naval Base
Army & Air Force Exchange Service		Norfolk
Army National Guard	3777 E Virginia Beach Blvd,	Norfolk
Army Recruiting Service	Janaf Shopping Ctr,	Norfolk
Army Recruiting Svc Norfolk	803 Front St,	Norfolk
Camp Peary Naval Reservation		York County
Camp Pendleton State Military Reservation		Virginia Beach
Dam Neck Combat Training Center		Virginia Beach
Fentress Nalf		Chesapeake
Fort Eustis Military Reservation		Newport News
Fort Monroe		Hampton
Fort Story		Virginia Beach
Langley AFB Main Exchange	61 Spatz Drive	Langley AFB
Langley Air Force Base		Hampton
Langley Air Force Base	74 Nealy Ave	Langley AFB
Langley Air Force Base		Hampton
Little Creek Naval Amphibious Base		Virginia Beach
National Guard Recruiter	208 Marcella Rd	Hampton
Naval Amphibious Base	2600 Tarawa Ct, #100,	Norfolk
Naval Shipyard Museum	2 High Street	Portsmouth
Navy Recruiting Station	14346 Warwick Blvd,	Newport News
Navy-Marine Corps Coordinator	620 John Paul Jones Cir, #249,	Portsmouth
Norfolk Naval Air Station		Norfolk
Norfolk Naval Base		Norfolk
Norfolk Naval Shipyard		Portsmouth
Oceana Naval Air Station		Virginia Beach
Portsmouth Wetland Board Prmt	801 Crawford St, #4,	Portsmouth
PSA Atlantic	1755 Powhatan St #211	Naval Base
US Air Force Recruiting	605 Newmarket Drive N, #23	Newport News

Appendix C: Hampton Roads Military Facilities

Military Agency	Address	City, State
US Air Force Recruiting	5900 E Virginia Beach Blvd, #113,	Norfolk
US Air Force Recruiting	870 N Military Hwy, #213,	Norfolk
US Air Force Recruiting	Janaf Shopping Ctr,	Norfolk
US Air Force Recruiting	2560 Airline Blvd,	Portsmouth
US Air Force Recruiting	8100 George Washington Mem Hwy	Yorktown
US Air Force Recruiting	4107 Portsmouth Blvd,	Chesapeake
US Army Department	Bldg T182	Hampton
US Army Recruiting	605 Newmarket Dr N,	Newport News
US Army Recruiting	8100 George Washington Mem Hwy	Yorktown
US Army Recruiting	4107 Portsmouth Blvd,	Chesapeake
US Army Recruiting Office Executive	5900 E Virginia Beach Blvd,	Norfolk
US Army Recruiting Service	1710 E Little Creek Rd,	Norfolk
US Army Recruiting Stations	14346 Warwick Blvd,	Newport News
US Army Reserve	3502 Bennetts Creek Park Rd,	Suffolk
US Coast Guard		Tabb
US Coast Guard	5505 Robin Hood Rd,	Norfolk
US Coast Guard	200 Granby St, #700,	Norfolk
US Coast Guard Integrated Support Command Local Housing	Coast Guard Blvd	Portsmouth
US Coast Guard Portsmouth Station		Portsmouth
US Coast Guard Maintenance Log	300 E Main St,	Norfolk
US Coast Guard Marine Safety	200 Granby St, #700,	Norfolk
US Coast Guard Station		Portsmouth
US Defense Contract Audit Agency	4101 Washington Ave	Newport News
US Defense Contract Audit Agency		Hampton
US Defense Department	521 Butler Farm Rd	Hampton
US Defense Department	111 Cybernetics Way,	Yorktown
US Marine Corps	1468 Ingram St	Norfolk
US Marine Corps		Norfolk
US Marine Corps	14th Street	Norfolk
US Marine Corps Recruiting	7690 Shore Dr,	Norfolk
US Marine Corps Recruiting	4107 Portsmouth Blvd, #109,	Chesapeake

Appendix C: Hampton Roads Military Facilities

Military Agency	Address	City, State
US Marine Corps Recruiting	8100 George Washington Mem Hwy	Yorktown
US Marine Corps Recruiting	Executive Office Bldg,	Norfolk
US Marine Corps Recruiting	605 Newmarket Dr N,	Newport News
US Marine Corps Reserve		Virginia Beach
US Marine Corps Reserve Center	7401 Warwick Blvd	Newport News
US Military Reserve		Suffolk
US Military Traffic Management	720 Thimble Shoals Blvd	Newport News
US Naval Air Amphibious School	Nab Little Crk,	Norfolk
US Naval Air Reserve	521 Park Cres	Naval Base
US Naval Air Station	1530 Gilbert St	Naval Base
US Naval Electronic Systems	1 Norfolk Naval Shipyard,	Portsmouth
US Naval Investigative Service	1 Norfolk Naval Shipyard,	Portsmouth
US Naval Medical Center		Portsmouth
US Naval Recruiting	8100 George Washington Mem Hwy,	Yorktown
US Naval Recruiting	521 Park Cres	Naval Base
US Naval Recruiting	5900 E Virginia Beach Blvd, #100,	Norfolk
US Naval Recruiting	2558 Airline Blvd,	Portsmouth
US Naval Recruiting	4107 Portsmouth Blvd,	Chesapeake
US Naval Recruiting	605 Newmarket Dr N, #21	Newport News
US Naval Reserve Recruiting	2019 Cunningham Dr, #416,	Hampton
US Naval Reserve Recruiting	1126 N Military Hwy,	Norfolk
US Naval Reserve Recruiting	7690 Shore Dr, #100,	Norfolk
US Naval Saint Helena Annex		Norfolk
US Naval Transmitter Station		Suffolk
US Navy		Norfolk
US Navy Amphibious Base		Virginia Beach
US Navy Commissary	Bldg 350 Norfolk Naval Shipyd,	Portsmouth
US Navy Commissary	1180 Amphibious Dr,	Norfolk
US Navy Commissary	1588 Mall Dr	Norfolk
US Navy Criminal Investigative	1329 Bellinger Blvd	Norfolk
US Navy Department		Norfolk

Appendix C: Hampton Roads Military Facilities

Military Agency	Address	City, State
US Navy Department Amphibious Constr	1815 Seabee Dr,	Norfolk
US Navy Department Amphibious Group	2600 Tarawa Ct,	Norfolk
US Navy Department Amphibious War	Nab Little Crk,	Norfolk
US Navy Department Assault Craft 2	Nab Little Crk,	Norfolk
US Navy Department Assault Unit 4	11th St,	Norfolk
US Navy Department Atlantic Cmmnd		Norfolk
US Navy Department Beachmaster Unit	1745 10th St,	Norfolk
US Navy Department Cinclant		Norfolk
US Navy Department Cmdr Carrier Air	610 A St	Naval Base
US Navy Department Cmdr Carrier Grp	Bldg N23	Norfolk
US Navy Department Cmdr Carrier Two	1540 Gilbert St	Naval Base
US Navy Department Cmdr Naval Base		Norfolk
US Navy Department Cmdr Second Fleet	Pier 10	Naval Base
US Navy Department Cmdr Submrn Sqd		Norfolk
US Navy Department Comptroller Department	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Data Processing	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Defense Counsel	9620 Maryland Ave #100	Naval Base
US Navy Department Defense Mapping	494 Park Cres	Naval Base
US Navy Department Disability Service	Bldg J50	Norfolk
US Navy Department Dispensary	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Explosive Ordnce	Nab Little Crk,	Norfolk
US Navy Department Fleet Asw Trng		Norfolk
US Navy Department Fleet Surveillance	Naval Inactive Ship Mntnc Fac	Norfolk
US Navy Department Fleet Training	9549 Bainbridge Ave	Naval Base
US Navy Department Fleet Training	Nab Little Crk	Norfolk
US Navy Department Medical Ctr Nnsy	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Military Prsnl	1155 Nider Blvd	Norfolk
US Navy Department Military Sealift		Norfolk
US Navy Department Morale Welfare	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Naval Air Engrng	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Naval Constr	Nab Little Crk,	Norfolk

Appendix C: Hampton Roads Military Facilities

Military Agency	Address	City, State
US Navy Department Naval Dispensary		Norfolk
US Navy Department Naval Healthcare		Norfolk
US Navy Department Naval Legal Service	9620 Maryland Ave	Naval Base
US Navy Department Naval Shipyard	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Naval Supply		Norfolk
US Navy Department Navsea Det	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Nuclear Engnrng	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Personalized Service	7737 Hampton Blvd,	Norfolk
US Navy Department Planning & Engrn	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Police	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Production Department	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Public Affairs	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Public Works	Bldg 59 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Quality Assurance	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Radiological	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Research Center	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Department Salvage Command	Nab Little Crk,	Norfolk
US Navy Department School of Music	1420 Gator Blvd,	Norfolk
US Navy Department Seal Team Eight	1840 Cove Rd,	Norfolk
US Navy Department Seal Team Four	Nab Little Crk,	Norfolk
US Navy Department Sima Little Crk	Nab Little Crk,	Norfolk
US Navy Department Special Welfare	Nab Little Crk,	Norfolk
US Navy Department Special Welfare	Nab Little Crk,	Norfolk
US Navy Department St Juliens Creek	Portsmouth Naval Shipyard,	Portsmouth
US Navy Department Tagos Support	Nab Little Crk,	Norfolk
US Navy Department Vc-6 Detachment	Nab Little Crk,	Norfolk
US Navy Exchange	Bldg 492 Norfolk Naval Shipyd,	Portsmouth
US Navy Exchange	1240 Gator Blvd,	Norfolk
US Navy Exchange		Norfolk
US Navy Fleet Accounting Service		Norfolk
US Navy Housing Welcome Center	1126 N Military Hwy	Norfolk

Appendix C: Hampton Roads Military Facilities

Military Agency	Address	City, State
US Navy Lodge Guest Housing	7811 Hampton Blvd	Norfolk
US Navy NW Radio Station		Chesapeake
US Navy Police		Norfolk
US Navy Public Works	9742 Maryland Ave	Naval Base
US Navy Sea Support	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Shipbuilding Supervisr	1 Norfolk Naval Shipyard,	Portsmouth
US Navy Undersea Surveilance		Norfolk
Yorktown Naval Weapons Station		York County
Youth Military Cadet Corps	288 E Little Creek Rd	Norfolk

Appendix D: Funding and Information Resources

Source of Funding or Info	Program	Description	Additional Information	Contact Information
State	Council for Rural Virginia	USDA state rural council, public-private partnership. Center for Rural Virginia - established by the State as non-profit, non-political entity. Both the Center and Council are 501(c)(3) tax exempt organizations.	As an advocate and catalyst for economic growth, the CFRV's priority is to be the link between government—federal, state and local-and our private-sector partners, so they may fund work plans and leverage resources. Can provide assistance with pursuing USDA funding.	Council for Rural Virginia 501 North Second Street Richmond, VA 23219 (804) 371-7141 http://www.cfrv.org/
Federal, Administered by the State	Virginia Department of Housing and Community Development (VA-DHCD)	There are a number of funding vehicles available through VDHCD including: • Community Development Block Grant Program • Project Planning Grants • Business District Revitalization Project Planning Grants • Community Needs Assessment / Economic Assessment Planning Grants • Regional Project Planning Grants • Community Organizing Planning Grants • Telecommunications Planning Grants	Link available on website for the New Market Tax Credits Assistance Program	Commonwealth of Virginia Department of Housing and Community Development 501 North Second Street Richmond, VA 23219-1321 (804) 371-7056 www.dhcd.virginia.gov
State	Virginia Resources Authority (VRA)	Created by the General Assembly in 1984, VRA supports community investments in wireless broadband. Financing solutions draw on VRA's creativity and unique ability to provide revolving fund loans to localities at below-market interest rates and to issue bonds backed by the moral obligation of the Commonwealth.		Virginia Resources Authority 1111 East Main Street Suite 1920 Richmond, VA 23219 (804) 644-3100 Phone (804) 644-3109 Fax www.virginiaresources.org/staff.shtml

Appendix D: Funding and Information Resources

Source of Funding or Info	Program	Description	Additional Information	Contact Information
State	Virginia Department of Business Assistance	The Virginia Department of Business Assistance connects businesses with the resources they need to meet challenges and realize market opportunities. The VSBFA is a political subdivision of the Commonwealth of Virginia whose mission is to promote Virginia businesses by increasing access to capital through the creative application of public and private financing, thereby maximizing employment opportunities and investment throughout the Commonwealth.	Through its portfolio of financing programs, the VSBFA assists in three primary ways: • Direct Lending • Indirect lending • Conduit Financing In order for the VSBFA to offer business financing assistance, the business must meet VSBFA's credit standards and meet the definition of a small business as defined in the Code of Virginia.	Virginia Department of Business Assistance (866) 248-8814 www.business.virginia.gov www.dba.state.va.us
Federal/State	USDA: Rural Business Opportunity Grant	Rural Business Opportunity Grants (RBOG) provide for technical assistance, training, and planning activities that improve economic conditions in rural areas.	Establish business support centers and otherwise assist in the creation of new rural businesses; Conduct local community or multi-county economic development planning; Pay reasonable fees and charges for professional services necessary to conduct the technical assistance, training, or planning functions.	http://www.rurdev.usda.gov/va/programs/RBS/oppgrant.htm
Federal	USDA: Distance Learning and Telemedicine Grants	Focus is primarily on funding user equipment that operates via telecommunications to connect students and teachers or medical providers and patients at separate locations. The Loan and Combination Loan/Grant Program fund additional resources that help improve education and medical care in rural America.	Eligible purpose limited to the application interface devices	http://www.usda.gov/rus/telecom/dlt/dlt.htm
Federal	USDA: Community Connect Grant	Assists unserved communities in establishing broadband communication facilities	Requires 15% local match; must be unserved by either DSL or cable; satellite does not count	http://www.usda.gov/rus/telecom/commconnect.htm

Source of Funding or Info	Program	Description	Additional Information	Contact Information
Federal/State	USDA: Rural Economic Development Loan and Grant Program	The Rural Economic Development Loan and Grant (REDLG) provides zero interest loan and/or grant funds to electric and telephone utilities eligible for financing by the Rural Utilities Program, an agency of the United States Department of Agriculture, to promote sustainable rural economic development and job creation projects through the creation and operation of a revolving loan fund program. ▪ Projects located in areas covered by the Coastal Barrier Resources Act are not eligible ▪ The third-party recipient must provide supplemental financing for its project. The minimum requirement is 20% of the amount of the loan being provided from the revolving loan fund. ▪ No in-kind contributions are accepted as supplemental financing. ▪ Initial loans made from the grant funded revolving loan fund must carry a zero-interest rate and not exceed a maximum term of 10 years. Lesser term notes are acceptable.	Assists private providers; 20% matching funds required. Eligible Third-Party Recipients and Uses of the Grant Funded Revolving Loan Fund: ▪ Initial loans, at zero-interest, from the revolving loan fund may only be made to: ▪ Nonprofit entities or public bodies for community development projects and community facilities and services; ▪ Nonprofit entities, public bodies, or for-profit entities for educational facilities; ▪ Nonprofit entities, public bodies, or for-profit entities for medical facilities; and ▪ Nonprofit entities and public bodies for business incubators to assist in developing emerging enterprises. ▪ Subsequent loans, at an interest rate not to exceed prime, may be made to for-profit entities, non-profit entities, or public bodies for any rural economic development purpose eligible under the program in accordance with the utility's revolving loan fund plan.	http://www.rurdev.usda.gov/va/programs/RBS/econdevloan.htm
Federal	National Telecommunication And Information Administration (NTIA): Public Telecommunications Facilities Program	Grant program to help broadcasting stations, state and local government, Indian Tribes and non-profit organizations construct facilities to bring educational and cultural programs to the American Public using broadcasting and non-broadcasting telecommunication technologies.	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 Director William Cooperman wcooperman@ntia.doc.gov

Source of Funding or Info	Program	Description	Additional Information	Contact Information
Federal	USDA: Rural Broadband Loan & Loan Guarantee Program	Assists the private sector in developing, planning and financing advanced communication systems; Billions in direct 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. Loan funds must be used within a five year period from the date of loan closing. A one time extension is permitted.	Loans must be $100,000 or More; Direct Loans; Guaranteed/Insured Loans - ongoing program, no time-line for submittal. The major sections of an application include: business plan, market research, historical and 5 year pro forma financial statements, system design and project costs.	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 www.usda.gov/rus/telecom/broadband.htm.
Federal	New Markets Tax Credit Program	The New Markets Tax Credit (NMTC) Program permits taxpayers to receive a credit against Federal income taxes for making qualified equity investments in designated Community Development Entities (CDEs). Throughout the life of the NMTC Program, the Fund is authorized to allocate to CDEs the authority to issue to their investors up to the aggregate amount of $18.5 billion in equity as to which NMTCs can be claimed. Qualifying census tracts in Hampton Roads non-metro counties include: Franklin City, Southampton County, and Surry County.	Substantially all of the qualified equity investment must in turn be used by the CDE to provide investments in low-income communities. The credit provided to the investor totals 39 percent of the cost of the investment and is claimed over a seven-year credit allowance period. In each of the first three years, the investor receives a credit equal to five percent of the total amount paid for the stock or capital interest at the time of purchase. For the final four years, the value of the credit is six percent annually. Investors may not redeem their investments in CDEs prior to the conclusion of the seven-year period	http://www.cdfifund.gov/what_we_do/programs_id.asp?programID=5#2
Private	Virginia Community Capital Inc.	New for-profit bank focused on economic development capital	Works with local funding partners to create funding package specific to community needs	http://www.vacommunitycapital.org/

Source of Funding or Info	Program	Description	Additional Information	Contact Information
Federal	Public Safety Interoperable Communications (PSIC) Grant Program	The National Telecommunications and Information Administration (NTIA) supports the advancement of information technologies and has moved aggressively to create an economic and regulatory environment in which innovations in information and communication technologies can flourish.	The grant program will assist public safety agencies in the acquisition of, deployment of, or training for the use of interoperable communications systems. Homeland Security Region IV participated in project funding in 2007 for radio upgrades. Interoperability between jurisdictions currently achieved via radio, not fiber.	Program Specialist Laura Pettus lpettus@ntia.doc.gov http://www.ntia.doc.gov/otiahome/otiahome.html
Federal	Federal Communications Commission	Universal Service Fund (USF) Program – Schools, Libraries and Healthcare Rural health care providers are using discounts from this program to provide patient services such as transmitting x-rays from remote to urban areas to be read by medical specialists Eligible entities include post-secondary educational institutions offering health care instruction, including teaching hospitals and medical schools	Universal Service Fund used by eligible entities to acquire any telecommunication service – all equipment that is necessary to transport information all the way to individual classrooms. Public and non-profit health care providers in rural areas can receive discounts on installation and monthly charges for telecommunications and Internet access service used for the provision of health care by using one of two methods: a mileage-based calculation, or a calculation of the "urban rate" to receive support equal to the difference between what they pay and what they would pay if they were receiving the service in any city in their state with a population of 50,000 or more.	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	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 .

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.

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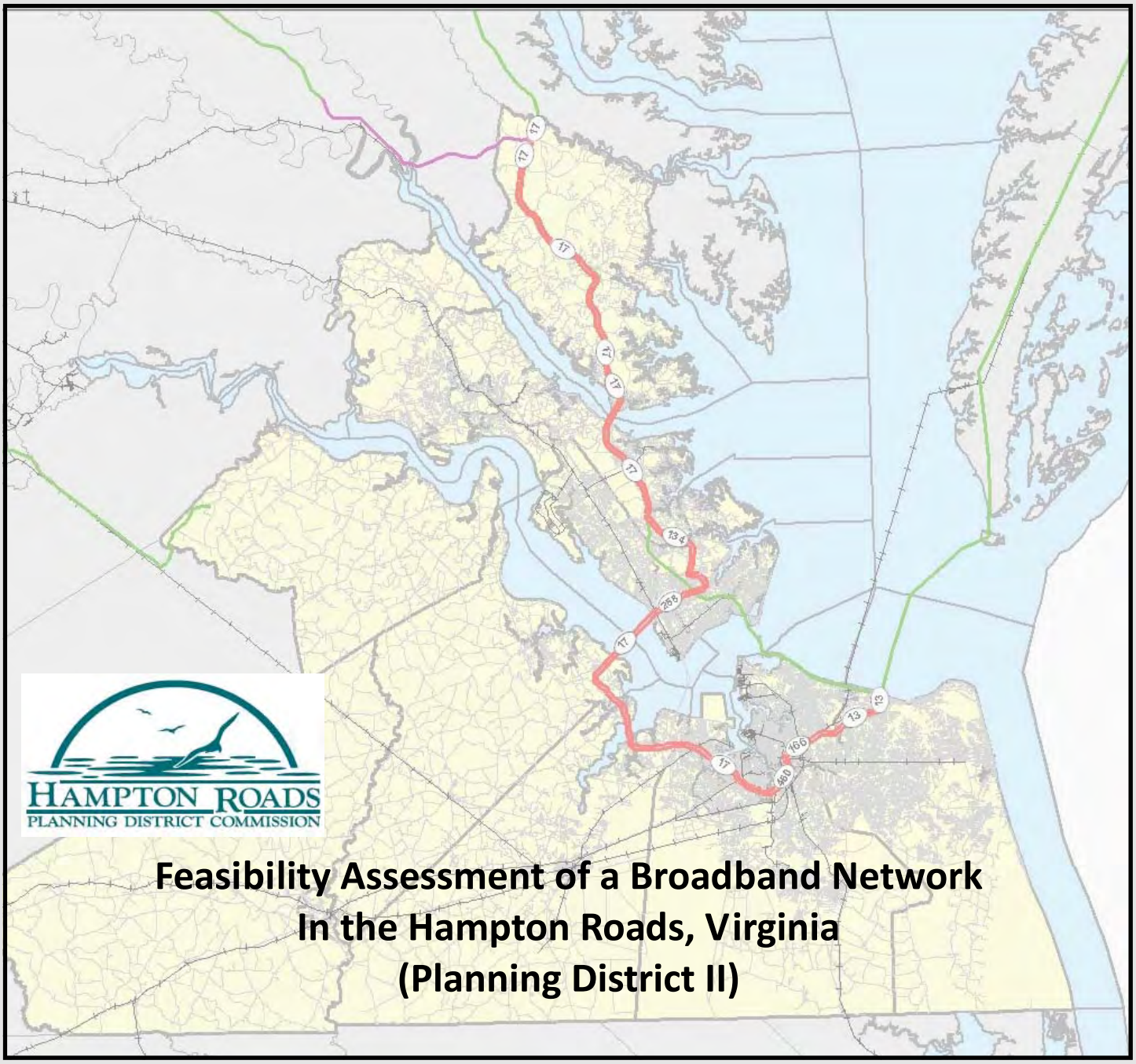

Feasibility Assessment of a Broadband Network In the Hampton Roads, Virginia (Planning District II)

Submitted to

Virginia Dept. of Housing and Community Development

November 17, 2008