Voice Interoperability Plan for Emergency Responders

A CJIN Module

Voice Communications System

Legislative Report

December 2004

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Executive Summary

This Legislative Report is being prepared as mandated in North Carolina General Statute House Bill 1414 Part XVIII, Section 18.4

GENERAL ASSEMBLY OF NORTH CAROLINA
SESSION 2003

SESSION LAW 2004-124
HOUSE BILL 1414

PART XVIII. DEPARTMENT OF CRIME CONTROL AND PUBLIC SAFETY

REPORT ON VIPER SYSTEM
SECTION 18.4. The Criminal Justice Information Network (CJIN) Governing Board and the Department of Crime Control and Public Safety shall report to the Joint Legislative Transportation Oversight Committee and to the Joint Legislative Corrections, Crime Control, and Juvenile Justice Oversight Committee on the Voice Interoperability Plan for Emergency Responders (VIPER) system. The report shall include a detailed project plan for the VIPER system, the projected costs to the State for the system, the revenue sources to fund the system, and the amount of total State funding, including Highway Fund support, recommended by the CJIN Board and the Department. The report shall also address the potential cost to, and any other impact on, county and local governments. The Department and the CJIN Board shall report pursuant to this section on or before December 1, 2004.

Background

Wireless radio communications is the life line for public safety officials and is a critical need that is essential to the protection of life and property. Yet, our state's public safety personnel often rely on outdated wireless technologies and radio systems that have surpassed their service life. The age of existing systems, combined with technological advances in wireless communications, changing mission requirements of public safety agencies and FCC regulations, are compelling agencies to look at replacing their radio systems. The problems associated with aging systems include excessive maintenance and repair costs, inadequate vendor support,

unavailable replacement parts, and system failures, not to mention that these systems do not allow interoperable communications.

A robust and expandable communications system is paramount to support the changing mission requirements of public safety operations in our state. Police, fire and emergency medical operations are more complex today than ever before. With the introduction of new mission responsibilities such as community oriented policing, anti-terrorism and advanced life support emergency medical services, public safety personnel are taking on new responsibilities and placing diverse requirements on their communications systems.

The need for interoperable communications has been an issue for many years. In 1994, then Attorney General Rufus Edmisten commissioned a study group to report on the need for a statewide common radio system for public safety. This study group, referred to as the Statewide Interagency Public Safety Radio Communications (SWIPS) group was made up of representatives from multiple state agencies that relied on radio communications on a daily basis. This group produced a document outlining the need for statewide, interoperable communications.

This need for a statewide interoperable communications system was further demonstrated during the 1994 Special Crime Session of the General Assembly. The Criminal Justice Information Network (CJIN) Study examined communications needs, as well as other data sharing requirements of criminal justice agencies in North Carolina. This study, which was delivered in 1995, confirmed the immediate need for a statewide 800 MHz radio system and recommended that construction of the network begin within two years. In an effort to continually address technology trends, the CJIN Board contracted with The Gartner Group in 2002 to refresh the findings of the 1995 study.

In both cases, the studies identified an immediate need for a statewide interoperable communications system and as stated in the CJIN Governing Board study, the State Highway Patrol was recommended to perform the function of developing and managing a new, statewide voice radio system.

In light of continued natural and manmade disasters that occur inside North Carolina and with the increase in terrorist activity nationwide, it is imperative that our state move forward with the implementation of a statewide, interoperable public safety voice radio system accessible to all emergency responders.

The very nature of providing emergency services to the citizens of North Carolina requires reliable, robust interoperable communications. During house fires, auto accidents and even during snow and ice storms, emergency response involves multi-disciplined agencies providing fire fighting, emergency medical treatment and law enforcement services. These responses could be more efficient and effective if these agencies could talk to one another using a single common radio network.

Goals

Current radio systems and technology in use by state agencies in North Carolina along with a majority of smaller local jurisdictions statewide is such that significant dollars need to be invested to solve such problems as overcrowding of channels, antiquated or unserviceable equipment, and federal mandates towards narrower bandwidth to conserve and better use available frequency spectrum.

In addition, incompatibility of equipment amongst agencies, at all levels of government, greatly hampers collaborative efforts and inhibits interagency communications.

The goal of the Voice Interoperability Plan for Emergency Responders (VIPER) project is to move forward with the construction of a statewide voice radio communications system to ensure that emergency responder users can communicate quickly and effectively, each and every time they call for assistance, and to provide a communications system that promotes interoperability between public safety agencies.

Project Approach

Both the 1995 CJIN Governing Board study and the re-validation study in 2002, recognized that a statewide voice radio communications system should be constructed using the 800 MHz frequency spectrum, due in part to the availability of 800 MHz frequencies for public safety, but also because of the widespread use of 800 MHz by most of North Carolina's major metropolitan areas and the commencement of 800 MHz system development by the State Highway Patrol in 1999.

In addition to a statewide 800 MHz voice radio communications system, Crime Control and Public Safety Secretary, Bryan E. Beatty, asked the State Highway Patrol to develop and implement a short term solution to address interoperable communications across North Carolina to assist agencies while development of a long term system was being performed. This short term solution simply serves to connect many of the antiquated and disparate communications systems in use today, but offers no long term replacement for these systems and requires operator intervention to establish connections between agencies. The short term and long term VIPER projects are referred to as the Tactical and Strategic solutions, respectively.

Construction of the VIPER Tactical solution is underway now, funded in its entirety by 2003 Department of Homeland Security funds directed to North Carolina. The construction of the VIPER Strategic solution has been hampered in past years by the lack of significant funding, although

continual efforts to use Congressional Earmarks and Hazard Mitigation funds from FEMA have allowed the project to move forward. The State Highway Patrol has been successful in forging partnerships with counties to also grow the implementation of the VIPER Strategic solution and is poised to continue this approach in 2004 with the recent awards of Homeland Security Law Enforcement Terrorism Prevention Program (LETPP) and State Homeland Security Grant Program (SHSGP) funding towards expanding VIPER.

Aside from influxes of Homeland Security funding, the State Highway Patrol proposes to continue the implementation of the VIPER Strategic solution, using a multi-year phased approach that is anticipated to take up to five years to deploy, assuming available funding.

Summary of Findings

The State Highway Patrol currently operates a Motorola SmartZone 800 MHz system with over forty remote voice radio transmitter sites across North Carolina and it is upon this system that the VIPER Strategic solution will be expanded. The State Highway Patrol has access to a considerable number of radio tower locations and jointly operates a statewide digital microwave radio system with the University of North Carolina Public Television system. These components have formed the basis for a project that has involved careful examination of all of the potential resources needed to construct a statewide voice radio system of this magnitude. The State Highway Patrol has conducted on site surveys of all radio tower sites used by the State Highway Patrol and CJIN for its present voice and data communications systems and developed a matrix to determine the suitability for reuse and the associated costs for doing so. Many local counties and municipalities have contributed to the success of the CJIN Mobile Data Network (CJIN-MDN), yet current tower structures are not capable of additional weight and wind loading necessary to support

additional VIPER infrastructure. In almost every instance that a partnership already exists with a local government, efforts have been made to improve the present radio tower site environment, not only to support the VIPER Strategic project, but to also afford in kind improvements to local agencies as well.

Recommendations

The goal of VIPER is to provide interoperable communications for public safety agencies in North Carolina. Interoperable communications as intended for the VIPER Network is the ability for public safety agencies to communicate with each other using a single, common radio system. With the assessments of available resources complete, the VIPER team recommends that deployment of the 800 MHz SmartZone system and the associated digital microwave system continue, with a suitable funding package in place to produce statewide coverage within five years. This will involve significant upgrades to existing radio tower sites and infrastructure, the development and construction of new radio tower sites where identified and the addition of support staff members to the State Highway Patrol's present Technical Services Unit to provide support for construction, on going maintenance and management of the final VIPER Strategic solution product. Based upon the State Highway Patrol's findings, it is estimated that the total cost of system construction, including capital costs, will total $190M. The re-occurring costs, including system maintenance, utilities and salaries and benefits for support personnel will approach $12M when the project reaches maximum deployment.

Introduction

Wireless radio communications is the life line for public safety officials and is a critical need that is essential to the protection of life and property. Yet, our state's public safety personnel often rely on outdated wireless technologies and radio systems that have surpassed their service life. The age of existing systems, combined with technological advances in wireless communications, changing mission requirements of public safety agencies and FCC regulations, are compelling agencies to look at replacing their radio systems. The problems associated with aging systems include excessive maintenance and repair costs, inadequate vendor support, unavailable replacement parts, and system failures, not to mention that these systems do not allow interoperable communications. As an example, a lightning strike at one of the State Highway Patrol's communications sites in June of 2004 knocked out the radio transmitter. When the technician called the vendor to get a replacement part, the vendor reported that because the parts were so old, they only had 2 of those parts left in inventory.

A robust and expandable communications system is paramount to support the changing mission requirements of public safety operations in our state. Police, fire and emergency medical operations are more complex today than ever before. With the introduction of new mission responsibilities such as community oriented policing, anti-terrorism and advanced life support emergency medical services, public safety personnel are taking on new responsibilities and placing diverse requirements on their communications systems.

There have been several high profile events nationally where interoperable communications hindered the efforts of public safety. The Columbine High School attack in 1999, the Murrah Federal Building bombing in Oklahoma City in 1995, and the terrorist attack on the Twin

Towers and the Pentagon in 2001. Additionally, there have been major events in North Carolina where interoperable communications hampered the efficiency and effectiveness of emergency responders including, but not limited to, the air crash at Raleigh-Durham Airport in 1994, Hurricane Fran in 1996, and Hurricane Floyd and the subsequent flooding in 1999. Most recently, in 2003, Hurricane Isabel knocked out all public safety communications in Perquimans County and flooded communications equipment in Hyde County, thus rendering those counties helpless when trying to respond to emergencies.

The need for interoperable communications has been an issue for many years. In 1994, then Attorney General Rufus Edmisten commissioned a study group to report on the need for a statewide common radio system for public safety. This study group, referred to as the Statewide Interagency Public Safety Radio Communications (SWIPS) group was made up of representatives from the Department of Insurance, the Department of Transportation, State Telecommunications Services, Wildlife Resources, Emergency Management, the State Highway Patrol, the State Bureau of Investigation, Emergency Medical Services and Emergency Management. This group produced a document outlining the need for interoperable communications. As stated in the document "*The myriad of governmental wireless communications systems currently operating within the geographic boundaries of North Carolina for public safety and public services have been evolving over the years in a piecemeal, uncoordinated and fragmented manner. Because of the narrow focus only on the singular needs and desires of a particular organization, without consideration for communications with other entities, the opportunities for the interlocking and the coordination of networks were foregone. As a result, many incompatibilities among the communications systems of federal, state and local agencies and institutions have been created. Because of the widespread proliferation and use of many different and irreconcilable technologies, the vast majority of these entities can* ***NOT***

communicate with each other, either by voice or data. Equally important, many of the current radio systems are old, obsolete and unable to meet present requirements and future needs. The ability to access and react promptly and efficiently to emergency situations is influenced greatly by being able to establish direct communications among the responding and responsible agencies." [1]

During the 1994 Special Crime Session of the General Assembly, the legislature commissioned the Criminal Justice Information Network (CJIN) study. Price Waterhouse was awarded a contract to compile the findings of the Legislative Blue Ribbon panel. This study included a component to examine the feasibility of a statewide 800 MHz mobile data and a statewide voice radio system. The following excerpt from the Executive Summary report further indicates the need for a statewide interoperable communications system. "*We have noted repeated frustration with the inability of most law enforcement / public safety agencies to communicate through incompatible mobile radios while participating in a joint response. In addition, there is a growing need for mobile data access for all law enforcement and public safety agencies, ranging from simple vehicle and driver's license checks, to full criminal history searches, photo imaging, and remote entry of incident, arrest, accident, and citation information from the field. Due to the lack of statewide standards and definitions, considerable funds are being spent in an effort to address this problem in an uncoordinated fashion. The result is multiple pockets of expensive implementations throughout the state, based on differing technology, without the ability to interconnect adjoining sites."*[2]

The study addressed the need for a managing organization and identified the requirements for that organization. "*The managing organization should have the following attributes:*

- *Be a large stakeholder in a statewide mobile voice and data*
- *Have experience in the implementation of statewide radio systems*

- *Demonstrate a willingness to support and an ability to understand a variety of user requirements*
- *Be willing to work with local agencies to support their initiatives*
- *Be capable and willing to work with all levels of government, including the Governor's Office and the General Assembly to build support for mobile voice and data systems*
- *Understand the dependencies of law enforcement and public safety of radio systems.*

Based on these requirements, it is recommended that the State Highway Patrol perform this function. They currently maintain a statewide radio system which supports numerous agencies. They have already played a leadership role in directing attention to the need for statewide mobile voice and data. And they have also demonstrated a concern for supporting the needs of other agencies outside the criminal justice and public safety arena."[3] Additionally, the State Highway Patrol is statutorily authorized and directed under general statute 20-196 to setup and maintain a statewide radio system.

Most recently, the 9/11 Commission hearings have revealed that the lack of interoperable communications hindered the rescue efforts at the twin towers in New York and the Pentagon. As reported in a May 2004 article by the American National Standards Institute (ANSI) *"Interoperability in communications technology such as radio equipment used by first responders proved to be a critical topic of discussion during the hearing. Based on evidence that first responders in the New York fire and police departments had tremendous difficulty communicating among themselves and between agencies on 9/11, a strong call for standardization in this area of technology was made."*[4]

It is imperative that North Carolina pursue the implementation of a statewide interoperable public safety communications system to

better equip our emergency responders so that they may serve and protect the citizens of our state.

Goals

Ultimately, the goal of VIPER is to construct a statewide mixed – mode voice radio communications system to insure that our users can communicate quickly and easily each and every time they use their radio and to provide a communications system that allows interoperable communications between public safety agencies.

It is well established that for public safety providers, radio communications is often the single lifeline that provides access to help and support in life threatening situations. The reliable operation, coverage, security and ease of use of the radio system are major factors that can positively or negatively affect user safety. One of the highest priorities that VIPER has identified for the State's voice communications system users is the need to improve the safety of our public safety officials and the general public.

Existing Systems

Current Situation

Radio technology is a fundamental tool of law enforcement and public safety; therefore it goes without saying that every public safety agency has some sort of radio communications. According to the 1995 CJIN report, estimates set the number of radios in use in public safety statewide as high as 75,000 units. The study also reported, "*Incompatible radio equipment is inhibiting interagency communications in routine and emergency situations. A lack of statewide guidance and standards in radio communication technology fosters discordance and escalates the cost of providing communications statewide. In addition, FCC frequency refarming proposals may inevitably force the state to replace most of its transmitters and radios.*"[5]

As a prime example of the state of communications in North Carolina, the existing State Highway Patrol's statewide radio communications infrastructure is based on technology which is over forty years old and is extremely limited in capability compared to present technology. Maintenance and support has become a burdensome task as this equipment is so old that replacement parts are no longer stocked by the vendors. Many local governments are facing the same issues.

Current Radio Systems do not allow for state officials to communicate with local agencies and often local agencies can't effectively communicate with officials in neighboring counties. Unfortunately, current and planned investments in incompatible technologies will exacerbate the above problems well into the next century unless statewide action is taken now. Smaller agencies lack the technical and financial resources to effectively procure and manage the 800 MHz trunking technology infrastructure.

The state-of-the-art approach to large scale voice radio communications systems today is based on 800 MHz trunking technology. Trunking enables many users to share fewer channels by using technology which is more efficient use of radio spectrum. When a user makes a call, a frequency is assigned to that user for the duration of the call. At the completion of the call, the frequency is released for the next call. In this architecture, user capacity only becomes a problem when the number of users who want to make calls at any one instance exceeds the number of available frequencies at any given trunked radio transmitter site.

A rule of thumb used in the industry today supports that, based upon the number of radio calls made by public safety officials during a normal day, each channel of a 5 channel trunked radio transmitter site can support the routine radio traffic of 100 users.

In 2002, the CJIN Board commissioned a "refresh" study of the Voice Trunking Network (CJIN-VTN) study completed in 1995. This study, conducted by Gartner Consulting, included a user survey of potential users, two regional meetings held in Greensboro and New Bern, and survey data analysis. 700 surveys were mailed with a 28% return rate that according to Gartner was within reasonable expectations for such a survey. Some of the findings of the survey were:

- *80% of county representation that represented 95% of the state's population.*
- *Existing radio systems used by respondents*
    - *69% low band or high band*
    - *40% UHF*
    - *21% 800 MHz*
- *83% of 800 MHz responders use Motorola infrastructure*
- *30% of respondents were dissatisfied with the ability to inter-operate with agencies within their county*
- *62% of responders were dissatisfied with the ability to inter-operate with other state agencies*
- *Almost one third of survey responders were dissatisfied with the performance of their current radio system.*

Interest in Statewide Partnership

Most respondents agreed that a statewide CJIN-VTN would provide the following benefits:

- *Seamless statewide voice communications*
- *Seamless interagency communications*
- *Unobstructed flow of criminal information across agencies*

- *Improved officer safety*
- *Better public safety service to the citizens of North Carolina*

80% of respondents expressed an interest in statewide partnership, with 50% expressing a very strong interest.[6]

State and local agencies have already invested more than $270 million in 800 MHz technologies for their public safety officials. Those that have invested in Motorola SmartNet or SmartZone based systems in the state include:

- Asheville
- Charlotte
- Concord
- Durham
- Fayetteville
- Greensboro
- High Point
- Jacksonville
- Kernersville
- Lenoir County
- New Bern
- New Hanover County
- Rocky Mount
- Salisbury
- Shelby
- Tarboro
- Winston-Salem
- Raleigh Durham Airport Authority
- Cary
- Wake County
- East Carolina Univ.

There are currently four non-Motorola 800 MHz Systems in North Carolina.

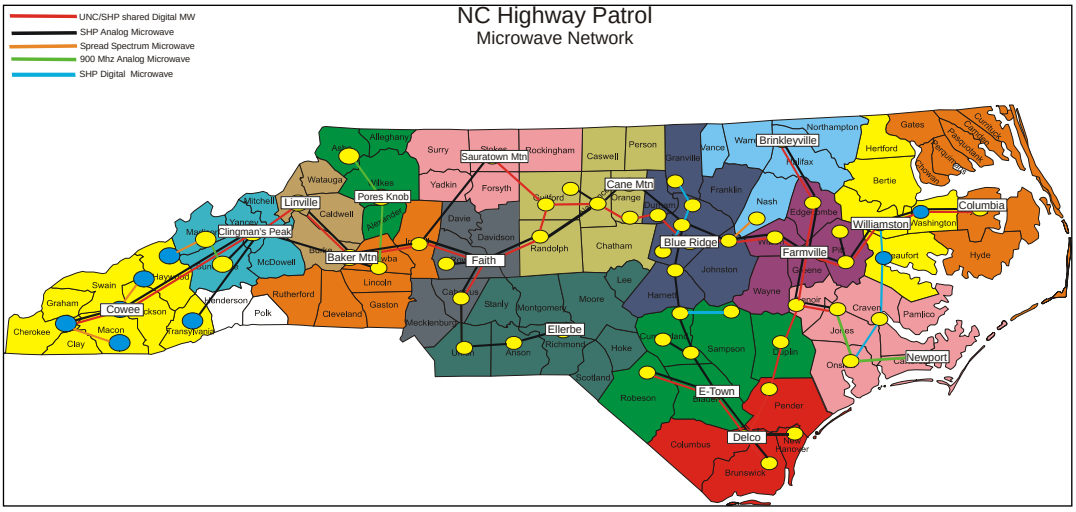
- Harnett County
- Hickory
- Johnston County
- Wilson

The VIPER Plan

The Voice Interoperability Plan for Emergency Responders (VIPER) is a phased solution to the lack of interoperable communication among public safety officials in North Carolina. The first phase is an immediate, short term solution that is referred to as the Tactical Solution and the second is a long term, Strategic Solution.

Tactical Solution

The Tactical solution is already under construction at the time of this document and consists of 17 remotely installed Raytheon JPS ACU 1000 communications gateways that will serve anywhere from four to seven counties depending on the geography of the areas surrounding the sites as illustrated in the accompanying graphic. Each of these sites will be interconnected via the State Highway Patrol's microwave network and will be controlled at each of the State Highway Patrol's eight Communications Centers across the state, the Emergency Operations Center (EOC), the State Highway Patrol's Technical Services Unit and Emergency Management's Disaster Recovery Operations Center (DROC).



VIPER Tactical remote communications gateways.

There will be three portable communications trailers with 100 foot telescoping towers placed across the state to support any long term (more than 4 hours) manmade or natural disaster or emergency requiring interoperable communications among the public safety responders. The plan calls for these units to be placed in locations that allow for deployment anywhere in the state within three hours.

Funding in the amount of $3.2m has been made available from the State's portion of the 2003 Part II Department of Homeland Security funding. Current plans call for the project to be completed by 31 December 2004.

Strategic Solution

The Strategic Solution consists of building a statewide trunked 800 MHz radio system by expanding on the existing investment made by the State Highway Patrol and Wake County. The State Highway Patrol purchased the communications equipment loaned to the US Special Olympics Committee to support the Special Olympics hosted in North Carolina in 1999. This equipment was installed in the Wake County area and began supporting limited communications for the State Highway Patrol. In 2000, as a result of Hurricane Floyd, the State Highway Patrol realized a need to help facilitate the evacuation of the heavily populated southern beaches surrounding the Wilmington area. This evacuation route would require the reversal of all traffic lanes of Interstate 40 west bound for nearly 100 miles to intersect with Interstate 95.

The State Highway Patrol received a Federal Emergency Management Agency (FEMA) Hazardous Mitigation Grant and a federal grant through Senator John Edwards to provide communications infrastructure equipment to cover this portion of Interstate 40 to coordinate the movement of traffic and to secure all the highway access points. This was

achieved by adding eleven new sites to the Motorola SmartZone 3.0 system purchased from the Special Olympics.

The State Highway Patrol partnered with Wake County in 1999 to upgrade the State Highway Patrol's existing SmartZone 3.0 system to a mixed mode Motorola SmartZone 4.1 system and support the additional sites needed to provide countywide coverage. This partnership has allowed the State Highway Patrol to upgrade its older system and position itself to support digital communications and expand the coverage in the Wake and surrounding areas.

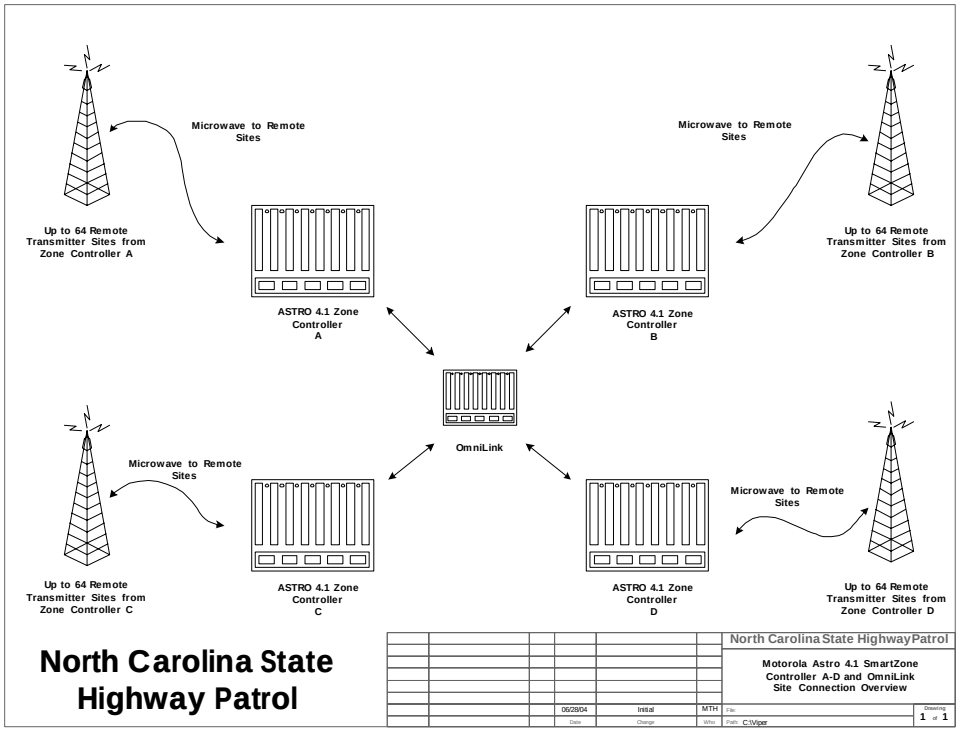
Senator Edwards and Congressman Price were successful in securing a federal grant of nearly $1m in 2003 to expand the radio system. These funds are being used to expand the currently named VIPER network along the Interstate 95 and Interstate 85 corridors.

The State's Homeland Security Strategy in 2003, identified interoperable communications for public safety agencies and emergency responders as the most important project for North Carolina's preparation to combat and respond to terrorist attacks. With that came the prioritization of grants for VIPER communications in the solicitation for Law Enforcement Terrorism Prevention Program and State Homeland Security grants. These funds have been awarded to be spent on the installation of VIPER infrastructure.

The statewide VIPER Network will be based upon the expansion of the existing Motorola SmartZone 4.1 mixed-mode system. The use of the 4.1 mixed-mode system allows for the support of digital communications as well as backward compatible support of analog communications. As mentioned in the previous section concerning existing systems, many

agencies that have already invested in 800 MHz technology have analog systems. It is the intent of the VIPER Network to have interoperable communications between VIPER and those existing 800 MHz systems.

SmartZone 4.1 systems are based on the use of SmartZone Controllers that act as routers. These controllers can support up to 64 transmitters sites and can be linked together using a device called Omni Link when multiple zone controllers are needed to support additional sites. It is estimated that the statewide VIPER network will necessitate 238 remote transmitter sites which will require four SmartZone controllers. These zone controllers will be decentralized with one being installed in western North Carolina, one in eastern North Carolina and two in the Raleigh area. As designed, the 4.1 system can support up to 64,000 radios with more than 4,000 talk groups.



VIPER Network

Each agency on VIPER will have its own autonomous talk group and handle their own call taking and dispatching as is their normal practice today. VIPER will simply be the radio system that they use for communications that has more features and wider coverage. Wider coverage allows officials from that agency to travel across the state and continue to communicate with their dispatchers. With most local systems, they can only communicate when in the coverage area of their communications system which generally covers their city or county. With the VIPER Network, they will be able to travel across the state and communicate as if they were still in their area.

When needed, public safety officials will be able to switch, or change channels, to a mutual aid talk group that will allow them to have interoperable communications with other public safety agencies.

Network Monitoring

The VIPER 800 MHz Network and the digital microwave network that provides the connections for each of the remote radio sites are part of a complex communications network crossing all of North Carolina. In order to be able to perform accurate and real time network monitoring and management of both the Motorola 800 MHz Astro voice radio communications system and the Alcatel MDR8000 digital microwave, the State Highway Patrol utilizes a comprehensive network fault management (NFM) system referred to as “MOSCAD”. MOSCAD provides the ability to customize both inputs and outputs at each of the remote site locations and provides critical site monitoring of functions such as; building temperature, generator operation, building access and entry alarms, as well as electrical power from utility, generator or battery back up. In addition, MOSCAD is designed to directly interface to each of the critical radio and microwave site components individually to provide network monitoring

staff with the ability to remotely troubleshoot system alarms, alternate between redundant systems, initiate test procedures and enable and disable infrastructure components for various other purposes. MOSCAD's central monitoring software can be specifically tailored to provide network monitoring personnel with exact, front panel like views of the equipment being monitored such that when technicians arrive on site, together the technical staff can directly see the result of changes made during the repair process. This feature and others also available all contribute to the State Highway Patrol's ability to achieve maximum efficiency in managing this complex system and minimizing system downtime, greatly enhancing officer safety and the delivery of services to the citizens of North Carolina

Microwave Network

The State Highway Patrol has been using microwave communications to link transmitter sites and transport voice communications since the early 1970's. Over the years, the State Highway Patrol has partnered with UNC-TV to share the microwave backbone they use to transport TV signals. The State Highway Patrol builds spurs off the main microwave backbone out to remote transmitter sites to allow for system connectivity and data transfer.

In 2002, UNC-TV and the State Highway Patrol began upgrading many of the analog microwave paths to new, more efficient digital technology. These microwave communications provide a laser like beam or path of narrowly focused radio waves that transports voice and data wirelessly from point to point. This means of communications, mostly in the 6.6 - 6.9 GHz range is more secure for public safety agencies since it's not open to outside networks, is supported by public safety employees and eliminates the risks associated with buried and pole mounted wired communications.

There exists an opportunity for savings for the Department Of Justice in the form of collocating present CJIN mobile data sites with VIPER sites to eliminate the need to have wired telephone, point-to-point data circuits that produce a recurring cost by using new digital microwave.

Local Agency Communications Center access to the VIPER network

Connections to the VIPER network from local communications centers can be accomplished in several different ways. If the local communications center is already using Gold Elite Console technology, a direct connection to the SmartZone Embassy switch (AEB) could be made via microwave or fiber optic connection, or through the use of radio control stations connected to the Gold Elite Central Electronics Bank (CEB). If consoles other than Gold Elite Consoles are being used, connection through the use of radio control stations is the only available option. With the deployment of ACU-1000's across the state as part of the VIPER Tactical solution, a potential for reuse of this equipment exists as counties migrate to the VIPER Strategic system. Utilizing the ACU-1000's, dedicated connections could be made to support planned conversions from the current, locally operated radio system to the VIPER Strategic solution during transition.

Frequency Plan

VIPER will be constructed based on the plan adopted by the National Public Safety Planning Advisory Committee (NPSPAC) – NPSPAC is an open membership committee which enables the public safety community and the public to participate in spectrum management through recommendations on policy, technical standards, and procedures to satisfy long-term public requirements. Based on NPSPAC's report, the FCC allocated the 821-824/866-869 MHz bands (often called the NPSPAC channels) for public safety use, and adopted policies, procedures and rules that constitute a national plan for public safety

services. Additionally, the national plan specified that regional plans would be developed before frequencies would be allocated.

This process is now closed with the adoption of the plan by the FCC. North Carolina's plan falls in the Region 31 of the NPSPAC plan, and its 800 MHz plan was filed with the FCC in 1997.

System Coverage

The intent of the VIPER Team is to construct a statewide 800 MHz trunked radio system that provides 95% in the street coverage with a 3 watt portable radio. However, the possibility exists that this coverage will not provide the building penetration desired by some local agencies. In those cases, it is the responsibility of the local agency to conduct the building penetration coverage analysis, secure the necessary additional tower location(s), purchase and install the transmitter(s) and required microwave equipment and to provide the necessary network connectivity to link it/them to the VIPER network.

Secure Communications

It is anticipated that some of the VIPER users will require the transmission of secure information. For operations such as surveillance operations, drug task force operations and anti-terrorist activities, it is imperative that the safety of the system users not be compromised by non-secure communications. This makes it a priority for the system to support both digital and secure encrypted voice communications.

The Motorola ASTRO 4.1 Trunked solution is intended to support several encryption methods. These are of varying vintages and capabilities.

DES (Digital Encryption Standard) Developed by the National Bureau of Standards in the 1970's. DES is not authorized to encrypt communications deemed to be in the interest of national security. DES is an analog, 56 bit

encryption format that has a maximum number of 7.2 x 1016 different key combinations. It will pass over an analog ASTRO 4.1 mixed mode channel.

DES-XL (Digital Encryption Standard – Enhanced) Developed by and proprietary to Motorola as an improvement to the original DES 56 bit format. The original DES key suffered from up to a 30% range reduction and the “XL” variant eliminated the range loss problem. This too will pass over an analog ASTRO 4.1 mixed mode channel.

DES-OFB (Digital Encryption Standard – Output Feedback) Developed as a 64 bit encryption format as part of the APCO Project 25 suite of standards. DES-OFB is the recommended encryption for digital operation and will pass over an ASTRO 4.1 digital channel.

AES (Advanced Encryption Standard) Approved by the US Secretary of Commerce as the official US government standard, effective May 26, 2002. AES is the Federal Information Processing Standard (FIPS) that specifies a cryptographic algorithm for use by US government organizations to protect sensitive, unclassified information. AES is a 256 bit algorithm and will pass over an ASTRO 4.1 digital channel.

KVL (key Variable Loader) A handheld user level device required to “load” a secure key into an encryption equipped subscriber radio.

OTAR (Over the Air Re-Keying) a method in which a secure key can be directed to a subscriber radio or radios without having to individually load an encryption key with the KVL. OTAR requires the presence of a Key Management Computer (KMC) that controls the flow of the keys over the systems radio channels and directs the new secure keys to the intended radios in the field. The KMC can also be used to “wipe” keys from radios. OTAR is a very expensive and somewhat cumbersome device since it is recommended that there be only one on a system. This would require the State Highway Patrol to perform this function for others. OTAR is not an

acceptable solution to the federal government, nor is it one that is currently recommended for VIPER.

Support Analog and Digital Communications

Clearly the trend in any communications network, whether wired or wireless, voice or data, is the movement of information via digital transport rather than analog. The advantages of digital communications is well documented and includes improved audio quality (especially with encrypted communications), increased capacity through more efficient use of available frequency spectrum, enhanced features contributing to ease of use, and the opportunity to move to a non-proprietary standards based system and multiple subscriber choices.

With this in mind, it is a given that a long-term goal of the statewide VIPER radio system is to support digital only operation, compliant or compatible with user and industry standards. Thus any improvements or upgrades considered should be made that support this upgrade to meet the long-term goal.

At the same time, there are 38 existing Motorola 800 MHz radio systems in North Carolina, the majority of which only support analog voice communications. These systems represent a major investment by local agencies, and most of these radios have a good bit of useful life remaining. Therefore, one of the short term goals for the statewide radio system is to continue to support analog communications using the existing trunked radios, and add support for digital communications (ideally compliant with standards, i.e. Project 25) in order to establish a migration to a future all digital system. It will be required that all radios purchased in the future to access VIPER be digital capable to support a system conversion to digital when it occurs; eliminating the need to replace radios that may not have met or exceeded their service life cycle.

Support Additional Spectrum / 700 MHz

Existing trunked radio systems have limited ability to support additional frequency spectrum. While additional spectrum is critical to enable the needed coverage and capacity improvements (short and long-term), the existing systems are severely limited in their ability to expand using new spectrum. This report has also noted that the best source for the frequencies to allow expansion will come from the 700 MHz band as the TV broadcast stations relinquish it and possibly additional 800 MHz spectrum should the FCC approve the Nextel consensus plan.

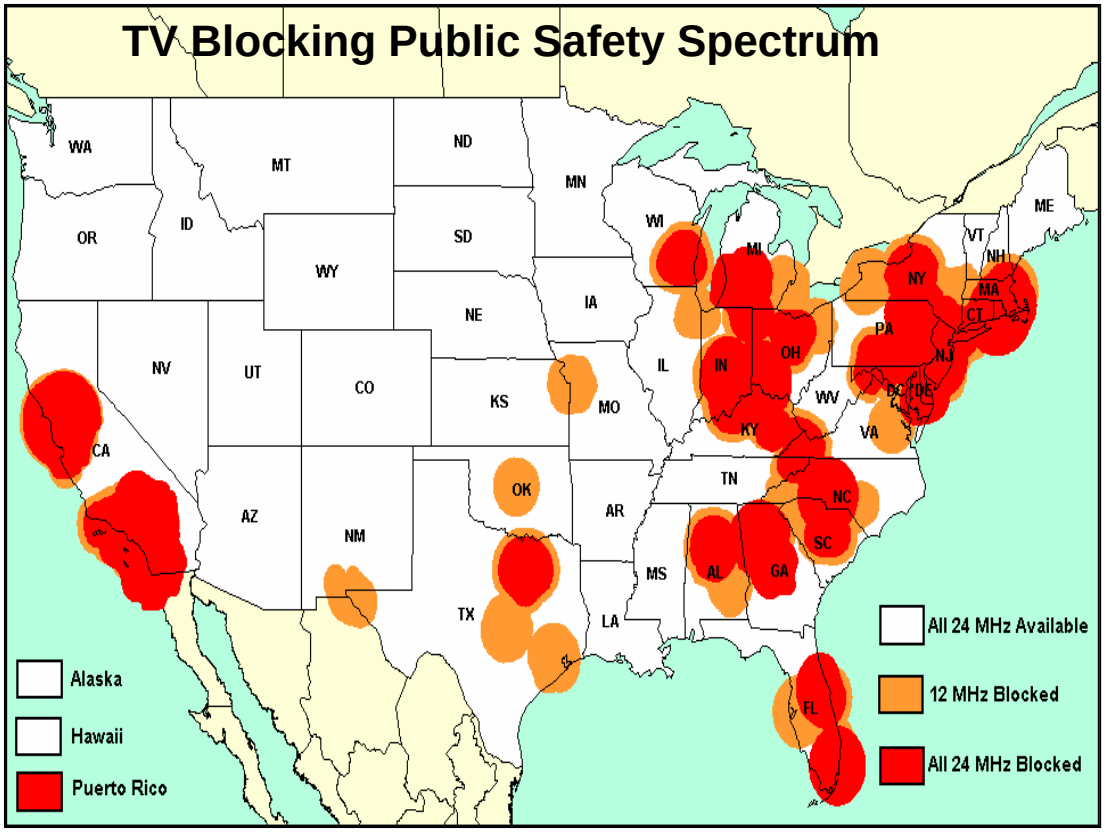
TV channels 63-64 and 68-69 have been identified by the FCC as public safety spectrum. However, there are two things that must take place before this spectrum can be used. First, each state must compile, and the FCC must approve, a plan to use these frequencies. This plan is filed as the NPSPAC plan for each region of the country. North Carolina's plan will be filed as the Region 31 Plan. National Public Safety Planning Advisory Committee (NPSPAC) – NPSPAC is an open membership committee which enables the public safety community and the public to participate in spectrum management through recommendations on policy, technical standards, and procedures to satisfy long-term public requirements. Second, and most important, the spectrum must be vacated by the currently licensed TV stations. The FCC has set a date of 2006 for these frequencies to be available to public safety. At the time of this document there has been no indication that this deadline will be met.

The need to support 700 MHz spectrum in order to allow expansion of the systems coverage and capacity is a notable concern. However, it is established as a long-term goal only in recognition that the 700 MHz channels are unlikely to be available for use for at least 5 or more years, and the benefit of migrating to 700 MHz may not justify the cost of the migration.

Similarly, VIPER has, as a long-term goal, the ability to implement new digital technologies that support “narrowband” channels of 12.5 KHz bandwidth. This technology could provide a means to create more usable channels using current VIPER licensed spectrum by using less bandwidth for each channel. Taking advantage of this technology requires a system that only uses digital and does not support analog traffic.

This would require a complete replacement of all existing infrastructure equipment and those subscribers units not capable of 700 MHz operation. Therefore, it is encouraged that consideration be given to purchasing subscriber units that support 700 MHz operation.

The accompanying chart shows where 700 MHz spectrum is currently in use by TV stations.



700 MHz TV Stations

An option that exists for the future use of 700 MHz spectrum could be to use the wideband channels for the Data Network and reuse the 800 MHz data channels in the voice network. Wideband data channels will increase bandwidth and throughput which would allow for wireless transmission of photographs, large reports and even video in some cases. However, the option to use 700 MHz channels should be evaluated when they become available to determine if the benefits are worth the expense.

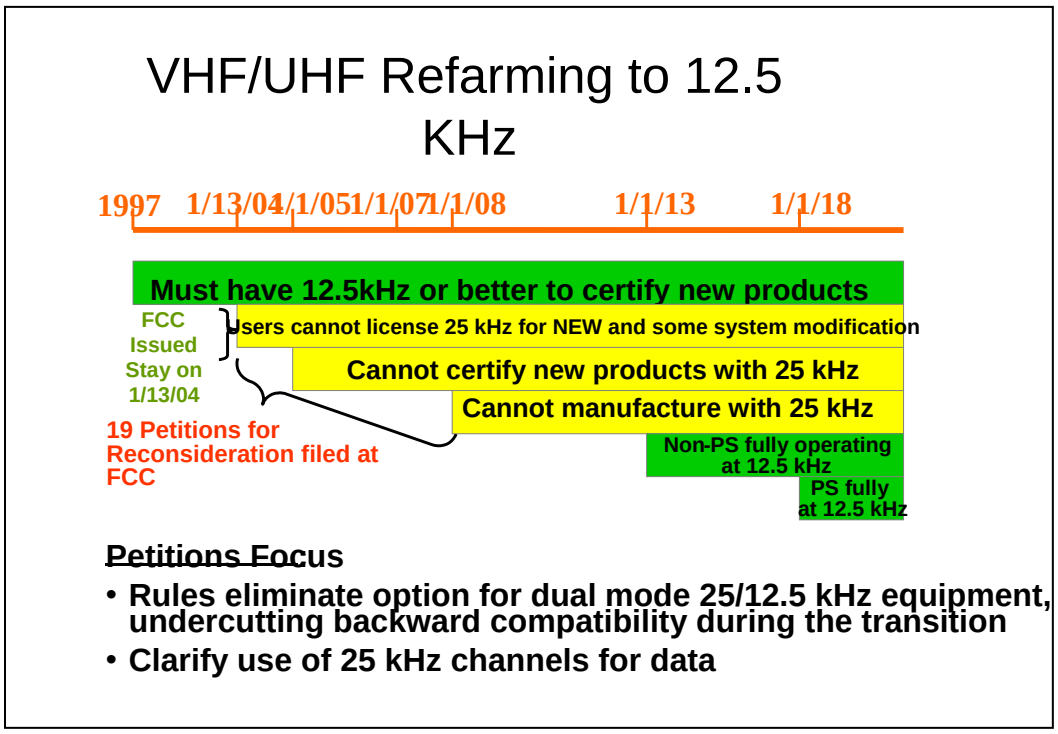
Narrow Banding

In 1997, the FCC implemented a plan to make more efficient use of public safety radio spectrum. It was determined that wide band, 25 KHz channels currently below 512 MHz, would be reduced in two stages. The first stage from 25 KHz to 12.5 KHz, and the second reducing to 6.25 KHz to create additional radio channels. This plan is referred to as narrow banding and commonly called re-farming. The original plan to reduce channel spacing from 25 KHz to 12.5 KHz would be mandatory by 2018 giving agencies time to budget and plan for radio equipment replacement. This plan also required that radio manufacturers build dual band radios beginning in 1997. Additionally, the rules required that any system changes or upgrades to existing radio system after January 13, 2004, must be narrow band.

Obviously, this requirement would create havoc on existing systems where older wideband subscriber units would not work on a mixed mode network. APCO, on behalf of Public Safety agencies, filed a petition with the FCC, a reconsideration of the narrowband requirements, and requested a stay of those requirements until a decision was rendered by the FCC. The FCC granted the “stay” until a ruling is made on the reconsideration. A concession offered in the request for reconsideration was that the narrow banding date for 12.5 KHz be rolled back from 2018

to 2013. A date for 6.25 KHz narrow banding has not been determined; however, narrow banding to the 6.25 KHz level will require that radios operate in a digital mode.

The FCC narrow band rules also require that manufacturers no longer produce wideband capable radios beginning in 2008. This too was included in the APCO request for reconsideration and stay due to agencies not being able to buy replacement radios for existing wideband systems.



Alternative Communications Solutions

In researching the VIPER strategic plan, the team examined commercially available solutions to determine if there were any avenues available that would address the needs of a statewide system with the level of coverage required for both state and local emergency responders. South Carolina has a Motorola SmartZone 4.1 infrastructure available to emergency responders; yet they do not own the system. Motorola, Inc., owns, controls and maintains the entire infrastructure and backbone in South Carolina. This system approach began as a partnership between the State of South Carolina and South Carolina Natural Gas (SCANA); however, due to the state's inability to continue to fund support or expand the system beyond its original, limited coverage; a privatization of the system was sought as a solution. The immediate problem of providing capital for system expansion and ongoing funding for maintenance and operation was addressed; regrettably with the inordinately high user fees ($75 per subscriber radio), they have experienced only a limited adoption of the system by potential users.

Another alternative being offered to public safety has been one provided by Nextel. This involves the prioritization of public safety users, equipped with a commercial handset (radio/phone combination), on a public, commercial radio system. The Nextel solution presently does not provide a statewide communications platform and discussions with Nextel as part of our research does not lead us to believe that this will occur anytime in the near future. In addition, the IDEN technology utilized by Nextel, although it is a trunked radio method, is not APCO certified, nor a recognized public safety communications standard in any area of the world. Nextel handsets are made by only one vendor and require an ongoing, monthly financial commitment with no guarantee of service.

The VIPER team also examined satellite based technologies to determine if they were suitable for a statewide communications system. Satellite technology does have one advantage over typical trunked radio systems in that it is not terrestrial based. This essentially means that a satellite based communications system would be relatively free from harm as related to most natural or manmade disasters. However, the primary drawback to satellite based systems is that in order to function, the subscriber handset or radio unit must be in constant view of the sky. This would eliminate operation inside buildings or in areas of dense foliage or during heavy rainfall or intense cloud cover. All of these detractions far outweigh the benefit of the system being somewhat impervious to being dependant on easily damaged infrastructure on earth. Satellite systems also suffer from lengthy delays as the conversation is routed up into the sky many hundreds of miles and back down again to the receiving radio or handset. Furthermore, satellite based technology will have to be refreshed as the orbit of the satellite can only be sustained for a finite number of years. North Carolina is facing this challenge at the present with the Satellite based system that it uses for pre and post disaster responses within Emergency Management. The present satellite provider has informed the state that within a five year time frame, a wholesale change-out of the current equipment will be required to work in conjunction with a new satellite, soon to be launched. Satellite based systems are often most beneficial in areas where no terrestrial based infrastructure exists or would be vastly cost prohibitive to build. Examples of this might be the areas of the United States in the southern desert and southwestern states and overseas in the desert areas of Africa, Australia and the Middle East.

The Following sections are considered part of the VIPER Strategic detailed project plan.

The following Assumptions and Constraints were taken into consideration in the compilation of the VIPER project plan:

Assumptions

- Project fully funded
- Will be able to purchase land in areas where we do not have tower sites
- Vendor material availability through the life cycle of construction
- VIPER will provide statewide interoperable communications for all public safety agencies in North Carolina.
- Implementation and construction will be achieved through a phased five year plan.
- The General Assembly will approve the support and maintenance positions requested in the VIPER plan.
- VIPER has the sponsorship of the leadership of the State Highway Patrol, Secretary of Crime Control and Public Safety and the Governor's Office.
- High participation from local and state public safety agencies
- Technology deployed will be backward compatible with majority of existing 800 MHz radio systems in North Carolina.
- State or local agency property can be used for tower sites where no tower exists

Constraints

- FAA approval of tower sites selected
- FCC spectrum availability at time of license
- Funding must be available for each phase of the five-phased project to be completed in a timely manner.

- VIPER is dependent upon the support and maintenance personnel positions being approved by the General Assembly.
- VIPER is dependent upon radio spectrum availability in the 800 MHz range of frequencies.
- Timelines for tower work and installations may be impacted by inclement weather.

Milestones

The major milestones for the VIPER Project are as follows:

- ***Milestone 1***
  Successful completion on Phase Zero — 4th Quarter 2006
- ***Milestone 2***
  Successful completion of Phase One — 4th Quarter 2007*
- ***Milestone 3***
  Successful completion of Phase Two — 4th Quarter 2008*
- ***Milestone 4***
  Successful completion of Phase Three — 4th Quarter 2009*
- **Milestone 5**
  Successful completion of Phase Four — 4th Quarter 2010*

** Completion dates are based on project full funding being available beginning in 2005.*

Acceptance Criteria

The following criteria will used to determine when a newly constructed VIPER site is declared accepted and operational for use by public safety agencies**:**

- All major components of a VIPER transmitter site must operate for 30 continuous days with 100% reliability.
- Digital microwave links must pass a 5 day bit error rate test (BERT).
- New tower construction sites must pass an independent tower inspection.
- Emergency power sources must operate all major communications components for a continuous 8 hour period.
- Where new buildings are installed, buildings must meet or exceed state or local building codes as determined by building location.
- Successful demonstration of two-way communications from a newly constructed site to any or all of the constructed operational sites in the VIPER network.

Quality Assurance Review

Internal

The State Highway Patrol has developed two Work Breakdown Structures, (WBS) for the implementation of the VIPER infrastructure during the anticipated five year implementation process. These two WBS represent both VIPER remote site implementation at a location in which a new radio tower must first be constructed prior to the installation of the VIPER equipment, and at locations where a radio tower is existing, yet improvements must be made to accommodate the installation of the VIPER equipment. Upon completion of the installation of equipment in either of the WBS, a quality assurance process has been included. This

quality assurance review consists of several steps and includes several audits and tests that follow industry standards or manufacturer recommended tests.

Motorola, Incorporated, as part of its internal review process for site implementation, and submitted as part of the company's Six Sigma certification, developed a standardized site implementation and measuring protocol referred to by the communications industry as the Motorola R56 standard. This standard addresses a wide area of topics directly related to sound technical practices in the communications industry and it is against these standards that the State Highway Patrol intends to compare work performed. This will include work performed by both internal staff and external contractors related to site construction. A sample copy of the Motorola R56 audit is attached as Appendix 1.

There are several commercially available automated test procedure (ATP) packages available and almost all seem to have been used and tested by agencies constructing similar systems to that proposed for VIPER. The State Highway Patrol is continuing to evaluate which of the commercial products it will procure and utilize for the ATP.

To complete the internal quality assurance review, the State Highway Patrol has derived the following tasks that will be part of the WBS and consists of the following steps:

1. Conduct R56 Compliance at site (2 day duration)
2. Develop punch list of items needed to bring site into compliance. (1 day duration)
3. Engineering group to address shortfalls or necessary modifications (1 week duration)
4. Perform audit of documentation and required submittals of regulatory items to include but not limited to: Construction Permit

sign offs, FCC licensing documentation, FAA documentation (2 day duration)

5. Perform ATP to ensure site functionality per design. (1 day duration)
6. Perform ATP to ensure appropriate radio coverage has met or exceeded 95% portable in the street coverage on a per site basis. (2 day duration)

Quality Assurance Review

Independent Verification & Validation (IV & V)

The Information Technology Services (ITS) will provide the external Quality Assurance Review through their Independent Verification & Validation (IV & V) process. Using ITS to provide this service will save the project approximately 5% of the overall project cost as compared to hiring an outside vendor.

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Interoperable Communications

The National Task Force on Interoperability published a document titled "Why Can't We Talk" and it defines interoperability as "...*the ability of public safety agencies to talk to one another via radio communication systems – to exchange voice and/or data with one another on demand, in real time, when needed."*[7] In the publication, "*Statement of Requirements for Public Safety Wireless Communications & Interoperability*" published by the Department of Homeland Security's SAFCOM Program opens the section on "Public Safety Requirements and Roles" by stating, "*Public safety operations require effective command, control, coordination, communication, and sharing of information with numerous criminal justice and public safety agencies, as well as public utilities, transportation companies, and private industry. Thousands of incidents that require mutual aid and coordinated response occur every day. High-profile incidents, such as bombings or plane crashes, test the ability of public safety service organizations to mount well-coordinated responses. In an era where technology can bring news, current events, and entertainment to the farthest reaches of the world, many law enforcement officers, firefighters, and emergency medical service (EMS) personnel cannot communicate with each other during routine operations let alone during major emergencies, such as the Oklahoma City Bombing."*[8]

There are more than 18,000 law enforcement agencies in the United States. Approximately 95 percent of these agencies employ fewer than 100 sworn officers. Additionally, there are over 32,000 fire and EMS agencies across the Nation. Due to the fragmented nature of this community, most public safety communications systems are stovepipe, or individual systems that do not communicate with one another or facilitate interoperability. Just as the public safety community is fragmented, so is radio spectrum. Public safety radio frequencies are distributed across four isolated frequency bands from lowband VHF (25-50 MHz) to 800 MHz (806-869 MHz).

Voice communications are critical, but voice communication requirements are not the only issue. Because of advances in technology, public safety operations are increasingly dependent on the sharing of data, images, and video. New technologies promote the convergence of information and communication systems with the result that mobile units are increasingly being viewed as merely wireless nodes within information networks.

The public safety community requires interoperable communications-the ability to communicate and share information as authorized when it is needed, where it is needed, and in a mode or form that allows the practitioners to effectively use it. Broadly defined, the public safety community performs emergency first response missions to protect and preserve life, property, and natural resources and to serve the public welfare. Public safety support includes those elements of the public safety community whose primary mission might not fall within the classic public safety definition, but whose mission may provide vital support to the general public and/or the public safety official. Law enforcement, fire, and emergency medical services fit the first category, while transportation or public utility workers fit the second".

SAFCOM defines interactive voice communications as "*...communications between public safety practitioners and their supervisors, dispatchers, members of the task force, etc., require immediate and high quality response, with much higher performance demands than those required by commercial users of wireless communications. Commands, instructions, advice, and information are exchanged that often result in life and death situations for public safety practitioners, as well as for the public*."[9]

In North Carolina we've had several high profile incidents that interoperable communications would have enhanced the efficiency and effectiveness of public safety responders. They include, but are not limited to, Hurricanes Fran, Floyd and Isabel and the air crash at RDU.

Most recently, the hurricanes and tropical storms impact on North Carolina has brought to light the need for interoperable communications. Unfortunately, the public safety responders from fire, emergency medical services, and state, local and county law enforcement agencies couldn't communicate with each other on a single radio.

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APCO Standards

In the mid-1970's, as trunked radio systems were being developed, the Association of Public Safety Communications Officials (APCO) recognized the need for standards in new radio communications systems. From this realization, came a set of minimum standards for trunked radio systems, known as APCO Project 16. This standard, defined a series of technical requirements that included emergency notification from portable and mobile radios and the ability to identify and disable radios to prevent unauthorized use. APCO Project 16 did not however set forth a uniform standard to which all manufacturers of trunked radio systems and subscriber units would adhere to and therefore did not produce across the board interoperability amongst manufacturers. With these shortcomings recognized, APCO set about to champion a new effort to ensure communications interoperability, Project 25.

Project 25 (P25) is now the recognized standard within the United States to define an interoperable two-way, wireless, digital communications platform. It was developed with input from all levels of government and was directed by the Telecommunications Industry Association (TIA). Project 25 strived to produce four clearly defined results for public safety communications; 1) effective, efficient and reliable communications amongst agency responders and to also afford the ability to communicate with other responding public safety disciplines; 2) to ensure competition in system life cycle procurement; 3) to provide user friendly equipment; and 4) to improve radio spectrum efficiency.

Project 25 applies not only to 800 MHz systems, but also to systems in the VHF and UHF bands as well. Indeed, Project 25 has been so successful in demonstrating a commitment from both users and manufacturers, that the Federal Communications Commission (FCC) has

gone on record by stating that Project 25 will be the standard to which systems operating in the new 700 MHz public safety spectrum will be required to adhere to.

Project 25 has two distinct phases; Phase 1 specifies the Common Air Interface (CAI) and Improved Multi Band Excitation (IMBE) vocoder requirements for operation within a 12.5 KHz bandwidth. The VIPER system will begin by meeting the 12.5 KHz bandwidth and CAI requirements, while maintaining a transition for analog users, by continuing with a 3600 baud control channel, while at the same time providing an infrastructure capable of migration to 9600 baud and full Project 25 Phase 1 digital only operation. Phase 2 is still under development. This level will ultimately attempt to further improve spectrum efficiency by reducing system bandwidth down to 6.25KHz operation, yet remaining compatible with all of the four original goals and Phase 1 system operation.

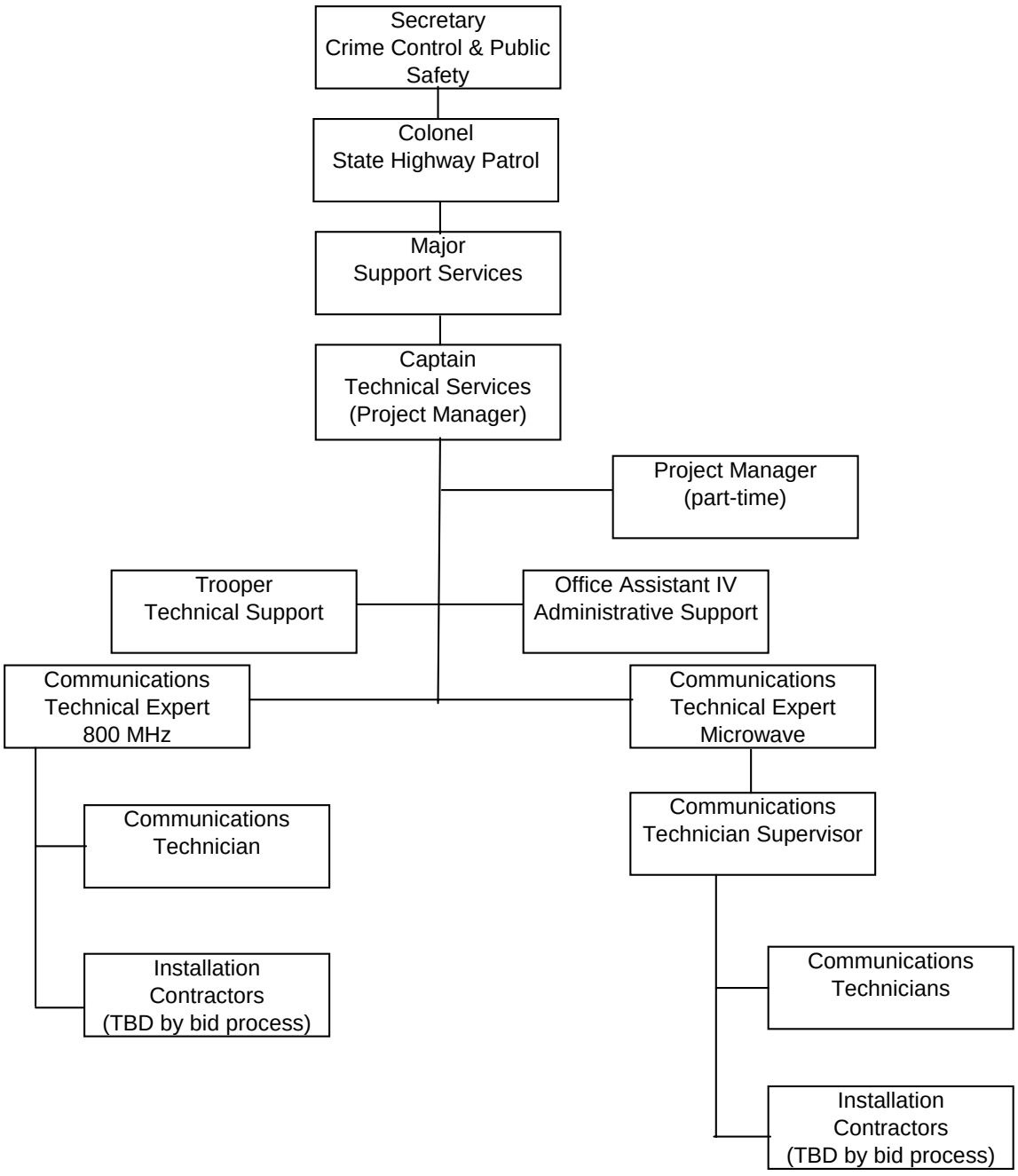
Radios (subscriber units)

As mentioned previously in this document, it is the intent of the VIPER Plan to be backward compatible with the majority of existing analog 800 MHz radio systems and still provide digital communications to those possessing the necessary equipment. With that said, it is our recommendation that no analog only radios be purchased to access VIPER, we strongly recommend that only digital radios be placed into service on VIPER. The reason for this recommendation is to prevent agencies from having to purchase new radios when the VIPER Network goes to digital only operations when that system transition occurs. This would eliminate the need for agencies to seek funding to have their entire stock of radios replaced.

Further, these radios must be configured for, or upgradeable to, OmniLink. SmartZone is the trunking method used by VIPER and OmniLink is the protocol that supports multiple SmartZone controllers, as is the configuration of VIPER's anticipated four Zones.

A separate table in this document outlines the basic needs and cost of upgrading radios to the VIPER minimum requirements. It should be noted that these prices are good only as of the date of publication of this document and do not represent any programming or labor charges agencies may encounter from their vendor when upgrading radios. The State's Information Technology Services Section maintains a state convenience contract for radios that contains current pricing.

VIPER Organizational Structure



In order to effectively enable each group that will be a part of the overall *VIPER Project*, roles and responsibilities are clearly defined and are as follows:

Project Role	Description	DCC&PS Resource	Other Agency Resource	Dependencies
Sponsor	• Sustain executive and organizational commitment and support for the VIPER project. • Communicate business direction changes to senior management.	Secretary Beatty and Colonel Clay		
Project Manager	• Initial POC • Hold initial meeting to explain concept, approach, roles, and timeline. • Maintain open communication with all groups. • Utilize standards and procedures. • Coordinate activities among multiple parties. • Publish documents to respective parties. • Overall project status reporting.	Captain W. F. Sandy and Part-time Project Manager		
Technical Expert/ System Manager	• Provide engineering support • Provides system design and architectural concepts • Provides feedback to Project Manager on project progress • Maintains a database of all site equipment and user equipment on the network • Maintains a database of all fleet mapping	Mike Hodgson		
Infrastructure Vendors	• Provide vendor specific network components • Provides support of equipment purchased • Responsible for delivering infrastructure needed to support environments	Mike Hodgson and Harold Meacombs		
Infrastructure Installation Contractors	• Responsible for individual job site construction, equipment installation and optimization	Dick Wooten and Mike Hardy		

Project Role	Description	DCC&PS Resource	Other Agency Resource	Dependencies
Construction Manager	• Responsible for the oversight of new transmitter site construction • Responsible for the oversight of existing site reconfiguration • Provides progress reports to Project Manager • Coordinates with construction contractors to maintain project timelines	Harold Meacombs		
Technical Support Personnel	• Responsible for supporting construction manager and the Technical Expert in the oversight of contractual services • Provides feedback to the construction manager and Technical Expert on issues concerning the network construction	Dick Wooten Joe Allison Thomas Hunsinger Ken Fountaine		
Procurement	• Procures equipment and services in compliance with state rules and regulations • Enters procurement requests in the state ITS procurement system	Robert Lukaszewski		
Administrative Support	• Maintains database of procured items • Monitors equipment delivery • Files/maintains/monitors service contracts • Files regulatory paperwork (FCC, FAA, EPA) • Monitors financial expenditures • Assist with project reporting	Diane Bumgardner Robert Lukaszewski		
Network Monitoring Manager	• Responsible for monitoring the health of the network to maintain uninterrupted service provided from those sites on-line • Reports network troubles to the technical support personnel • Network Management • Responsible for scheduling network staff to monitor the network	Rodney Spell		
Facilities	• Responsible for power generators • Responsible for HVAC • Grounds maintenance	Dick Wooten and New Requested Positions		

Maintenance and Support Personnel

As with any large project, the VIPER Network will require support personnel to keep it operating at optimal levels 24 hours per day 7 days per week. As a primary communication system, there is the need to strive for zero down time. With this requirement comes the need to strategically place support personnel, some with multiple roles and others with specific roles to keep the system operational.

Technical Support Team

There will be a need for two technical support teams, one in the east and one assigned to the west. These technicians will be responsible for maintaining the 800 MHz intellirepeaters (minimum of five at each site) the microwave communications equipment and all system monitoring equipment at each of the 238 sites across the state. Not only will this group be responsible for repairing broken or out of service equipment, but they will be required to visit each site every six months to perform preventative maintenance in an effort to reduce the amount of out of service equipment. It is estimated that there will be a need for 25 technicians classified as Telecommunications Equipment Technician II and 2 supervisors, one east and one west, classified as Telecommunications Maintenance Supervisor II. The salary cost of these employees and the associated tools, equipment and vehicles are identified in a spreadsheet in this document.

Power Distribution Technicians

As identified in the blackout of the August 2003 in the Northeastern United States, the need for auxiliary power for critical communications is absolutely necessary. With this in mind, each VIPER site will be equipped with an auxiliary generator and an Uninterruptible Power Supply (UPS) to maintain public safety communications in the event of a power outage.

Additionally, the microwave system is powered by 48 volt battery power and the necessary charging equipment. This equipment will need to be serviced and maintained on a regular basis to ensure its uninterrupted operation. To support this equipment, we recommend that 10 Power Distribution Technician II personnel be hired to support all the electrical support and distribution at each of the 238 remote sites. These technicians will also be assigned to eastern and western teams.

HVAC Mechanics

As with any sensitive electronic components, the radio and microwave equipment used in the VIPER Network must be operated in a controlled temperature environment. This electronic equipment is extremely sensitive to overheating and due to security needs at each transmitter site there exist minimal or no ventilation. Because of this, each site will be equipped with air conditioning and in some cases on high mountain tops, heat will be installed. We recommend that 2 HVAC Mechanics be hired to support, service, and maintain the heating and air conditioning equipment at these 238 sites, and be assigned east and west areas of responsibilities.

Grounds Maintenance

The property of the transmitter sites will need to be maintained. Grass and brush will need to be kept cut for security and operational issues as there will also be a need to maintain the access roads, some of which are very remote and need constant repairs. It has been speculated, that a tower in eastern North Carolina fell during Hurricane Isabel because trees hadn't been trimmed away from the guy wire paths. It is thought that trees fell on the guy wires starting a fatal oscillation of the tower. We want to insure that doesn't happen to any of the 238 VIPER sites. It is recommended that 2 Facility Management Coordinator II positions be

hired as crew supervisors and 8 Facility Management Coordinator I positions be hired and divided up into east and western teams to support the VIPER sites.

Depot Technicians

A centralized service shop will be maintained by nine Telecommunication Equipment Technician I positions. These personnel will maintain a stock of spare parts, tools and support equipment, and coordinate the shipping and receiving of vendor repaired parts and equipment. They will maintain a database of all site repairs, individual base station repairs and failures, generator and microwave repairs and other system equipment so that quality control can be monitored and tracked to ensure vendors are providing service at the contracted level and to identify network components that need replacing because of abnormal service issues.

Tower Maintenance Crews

With antennas, transmission lines and microwave dishes mounted on more than 238 towers, there is the need for 2 tower crews to climb these towers and perform annual inspections of the transmission line tie-downs, antennas and microwave dishes. They will also replace antennas damaged by lightning and ice storms. Additionally, these personnel will be responsible for painting towers and changing and maintaining the lighting systems required by the Federal Aviation Administration (FAA). It is recommended that two crews be employed with one supervisor at a salary grade 69, two supervisors at salary grade 65, and four tower workers at salary grade 63. There does not exist job classifications for tower workers in the current NC Office of State Personnel (OSP) Salary Plan. It is recommended that the VIPER team consult with OSP to create these job classifications.

Network Monitoring

It will be necessary to monitor the VIPER Network to ensure the entire network is working properly. To achieve this will require 6 Network Control Technician I positions and 1 Network Control Supervisor. Currently there are 3 Network Control Technicians and a Network Control Supervisor on staff with the State Highway Patrol monitoring the Criminal Justice Information Network – Mobile Data Network (CJIN-MDN). The Network Control Technicians are funded through a Byrne Grant and the Network Control Supervisor is a permanent full time position with the State Highway Patrol. It is recommended that permanent funding be provided for the Technicians and the number be increased to 6 to provide around the clock coverage. These positions can provide network monitoring for both the Mobile Data Network and the VIPER voice network.

Administrative Support

There are several positions that will be needed to ensure the effective flow of information and the processing of administrative requirements. They are identified as:

One **Safety Consultant I** position will be needed to evaluate and monitor all the VIPER sites and process to ensure compliance with OSHA rules and regulations. This person will also be responsible for maintaining safety training classes and training records for those all the VIPER personnel.

One **Electrical Inspector Supervisor** to inspect all the work done on VIPER sites to ensure that electrical work is performed in a safe and electrical code compliant manner.

One **Contract Supervisor** will be required to compose and consult with legal staff on service contracts and leases, and to monitor those recurring contracts for tower space or services. This position will be responsible

with working the Information Technology Services purchasing and contracts group to ensure that all VIPER contracts are conducted within the rules and guidelines set forth by ITS for these services. Additionally, this person will monitor all renewable contracts and take the necessary steps to renew and/or re-bid contracts on a timely basis.

One **Administrative Assistant III** will be responsible for maintaining, filing and renewing the more than 1100 Federal Communication Commission (FCC) licenses for all the VIPER radio transmitters. It is imperative that VIPER FCC licenses be filed and renewed in a timely manner to avoid losing our licensed frequencies.

There will be a need for 2 **Office Assistant IV** positions to handle phone calls, process paper work and other administrative needs for the VIPER support staff.

Network Engineer

A Telecommunications Engineer will be needed to be responsible for the oversight during construction, and the continued operation and management of this large and complex network. This person will be responsible for advising State Highway Patrol management and the VIPER Governance Committee on issues affecting the network. This position is already on staff with the State Highway Patrol in a full time permanent position.

Network Control Facility and Depot

A new building is needed to safely and securely house two of the VIPER Network SmartZone Controllers and the network operations and monitoring equipment and personnel. This building will also house the depot staff, parts and equipment to keep supplied the field technicians and to coordinate the shipping and receiving of vendor repaired parts and

equipment. Additionally, this building will house the network control and management personnel and equipment for the Mobile Data Network. This modern building will provide the necessary security and environmental controls needed to protect this sensitive electronic equipment that will provide critical data and voice communications to public safety officials across the state. There should be room in this facility for equipment to be assembled and tested before being deployed to remote radio transmitter sites. It is recommended that this building be built on the State Highway Patrol Training Academy campus, existing state property and near the termination point of the Mobile Data Network's current control equipment.

Land Acquisition Team

Following the suggestion of the Michigan State Police, who built a statewide interoperable voice network in 1984, we recommend creating a Land Requisition Team to scout, research, and work closely with the State Property Office to purchase property needed to build VIPER Network towers where no existing tower resources are available. This team should consist of four uniformed members of the State Highway Patrol and one staff attorney.

This team should be assembled upon approval of the plan and remain active until the final parcel of land is acquired. After the completion of these tasks, these members will return to their normal duties within the State Highway Patrol and the Department of Crime Control and Public Safety.

User Training Team

The Michigan State Police also informed us that most of the initial problems perceived by new system users were due to the lack of user understanding of systems features and operation and could be mitigated through new user training. They implemented a training program and

recommend that we assign two teams of two trainers each to provide end user and departmental train-the-trainer training to ensure that all new users be properly trained and be capable of using the radios in times of emergencies.

Governance Committee

It is recommended that a governing committee be composed to guide and recommend management of the VIPER Network. The public safety community will provide input to decisions that affect VIPER through the Governance Committee. This Governance Committee approach has been adopted as a best practices model in other states and at the federal level. This committee should be made up of no more than 15 members representing all public safety disciplines. Each member should represent an agency that is an active participant on the VIPER Network. It is recommended that the Governance Committee have the following representation:

- NC Fire Chief's Assn.
- Emergency Medical Services
- State Highway Patrol
- State Bureau of Investigation
- NC Emergency Management
- NC Sheriff's Assn.
- NC Police Chief's Assn.
- CJIN Board
- Wake County Representative
- NCSUN
- Local EM Coordinator
- Local Fire Chief
- Local Sheriff
- Local EMS Coordinator
- US Marshall's Service

The State Highway Patrol Commander shall serve as chairman of the Governance Committee for the first year. After the first year, the chairman would be voted on by the committee members.

In identifying members of the VIPER Governance Committee, Wake County has been selected as part of the first years committee due in part to them being the first agency to partner with the Highway Patrol in the construction of VIPER, and the significant investment in the upgrade and expansion of the Highway Patrols 800 MHz radio system.

Additionally, it is recommended that the Governance Committee create a technical sub-committee to provide technical advice on issues that could have statewide impact on the network. Membership of the technical sub-committee should come from agencies participating on the network.

It is further recommended that the Secretary of the NC Department of Crime Control and Public Safety make the initial appointments to the committee. After one year, the original committee members will be replaced by nominations from VIPER participating agencies and serve on a staggered 1 or 2 year term to be determined by original committee.

A nominal budget has been recommended to pay for “official travel” for committee members to attend meetings.

Network Costs

An extensive survey and analysis has been conducted on sites currently owned and those leased by the State Highway Patrol to determine their reuse potential. Additionally, contact has been made with the major utility companies operating in North Carolina to determine if any of their tower sites are available for re-use. Our goal has been to reuse as many existing sites as possible to reduce the overall cost of building the network and it should be noted that we expect the overall cost to be reduced by building partnerships with utility companies and others as we gain funding to construct the network. However, this report uses estimates that are known at the time of publication. With this in mind, it is anticipated that VIPER will require 238 tower sites across the state to provide 95% in the street coverage. Of these 238 sites, 120 sites will require construction of a new tower (59 of the 120 sites will require the rebuilding of existing, overloaded towers and 61 of the 120 sites will require constructing new towers where no tower exists), 118 sites have existing, ready-to-use towers.

There are many equipment and service parts to the VIPER plan that will be bid separately and/or purchased off existing State Convenience Contracts. There is not a single vendor or a prime contractor. In an effort to reduce the project cost, the State Highway Patrol's technical staff will act as the prime contract and manage subcontractors to perform individual tasks that cannot be done by Patrol personnel.

Federal Funding

To date, there has been $31,327,789 in federal funds awarded towards the construction of the VIPER network. $8,829,032 was awarded through the 2004 Homeland Security Law Enforcement Terrorism Prevention Program grants, $21,453,757 in 2004 State Homeland Security Grant Program grants and $1,045,000 awarded through the 2004 Homeland

Security Urban Area Strategic Initiative Grant program. Nearly all of this funding was awarded to local agencies that passed the funds through to the state for construction of VIPER in their areas. In addition to the Homeland Security funds the Patrol received a 2003 Congressional Earmark in the amount of $1.5m for VIPER expansion that is already underway.

State Funding

In the 2004 Legislative Session an appropriation was approved in the amount of $500,000 to support the expansion of VIPER in Cleveland County.

Other Funding

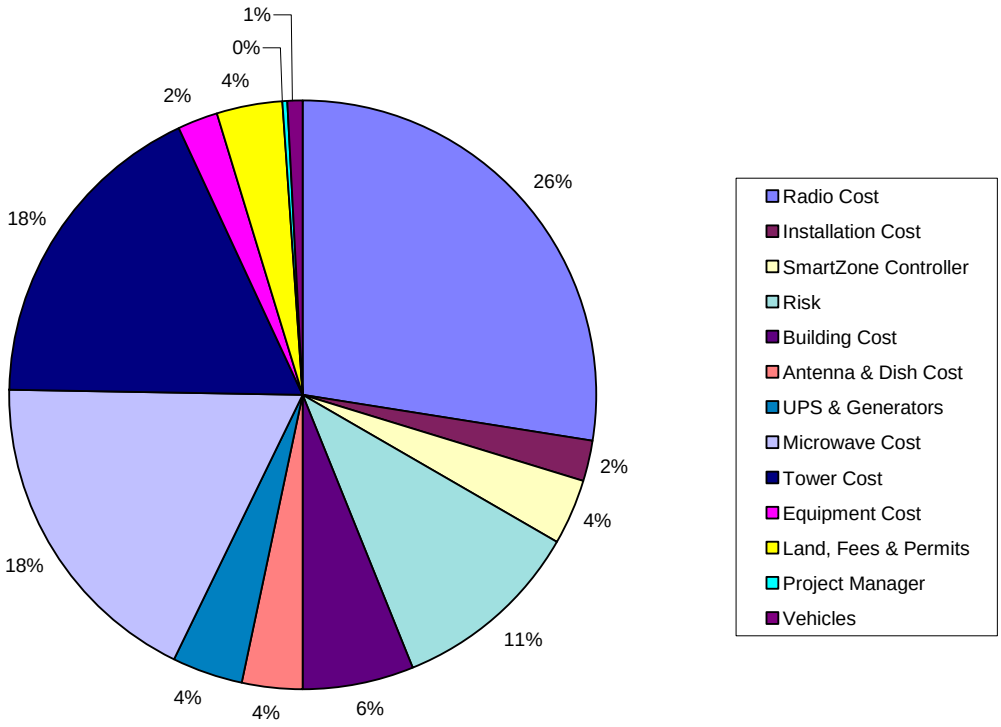
In addition to federal and state funding, appropriations from Patrol funds and county funds have provided an additional $164,671 in support of the VIPER Network.

It is our recommendation that a four year construction funding plan be provided as identified in the spreadsheet below.

VIPER One-Time / Construction Cost Summary

	Total Project Cost	Less 2004 LETPP	Less 2004 SHSGP	Less 2004 UASI grant	Less 2004 Legislative Appropriations	Less 2004 Other Available Funds	Total Remaining Project Cost
Infrastructure	$ 156,610,460	$ 8,829,032	$ 21,453,757	$ 1,045,000	$ 500,000	$ 1,664,671	$ 123,118,000
Network Building	$ 6,500,000						$ 6,500,000
Risk Mitigation	$ 20,000,000						$ 20,000,000
Tools and Equipment	$ 4,396,671						$ 4,396,671
Project Manager for Project	$ 400,000						$ 400,000
Vehicles	$ 1,605,000						$ 1,605,000
Total	**189,512,131**						**$ 156,019,671**

VIPER - One-Time / Construction Cost Breakdown



Recurring Costs

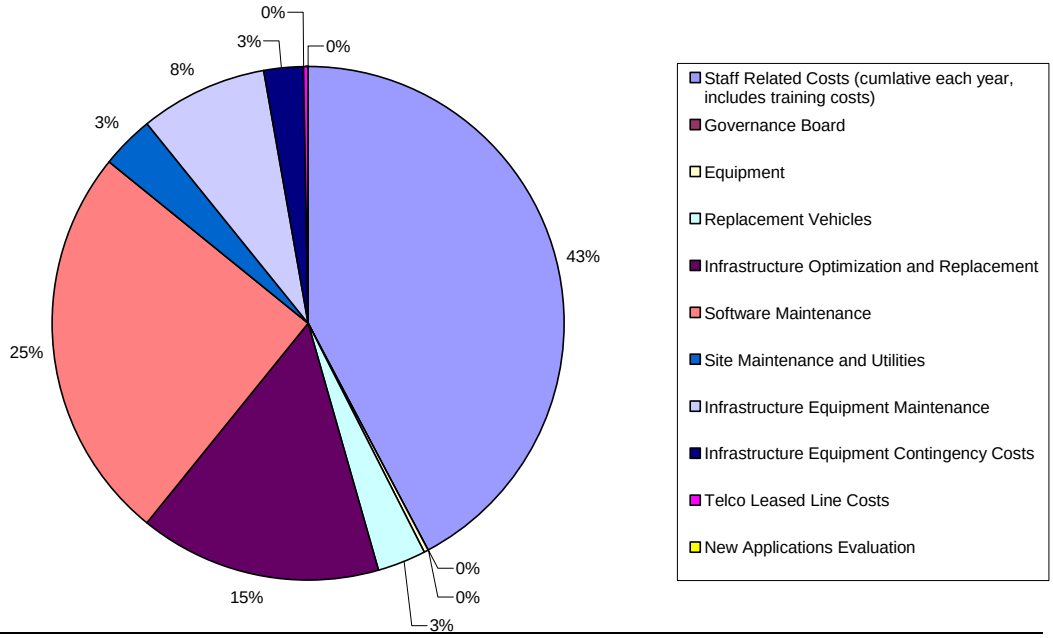
As with any large complex communications network, there is a significant amount of funding needed to operate and maintain the network. These costs include support staff, vehicles and equipment, maintenance agreements on equipment and software, equipment replacement and site utility and maintenance costs which are also identified on the VIPER Cost Summary spreadsheet.

This network will provide lifeline communications for public safety agencies and must be maintained and supported at 100% at all times. We believe the personnel, equipment and maintenance identified will provide the resources to do that. The recurring cost will increase proportionally each year during the construction phases.

VIPER Recurring Costs Summary

Infrastructure Recurring cost	Year Zero	First Year	Second Year	Third Year	Fourth Year	Annual Recurring
Staff Related Costs (*cumlative each year, includes training costs)*		$ 2,118,897	$ 3,209,870	$ 4,239,666	$ 4,858,024	$ 4,858,024
Governance Board		$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
Equipment		$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000
Replacement Vehicles					$ 348,000	$ 348,000
Infrastructure Optimization and Replacement		$ 825,000	$ 1,045,500	$ 1,326,510	$ 1,750,993	$ 1,750,993
Software Maintenance		$ 2,813,762	$ 2,841,700	$ 2,869,917	$ 2,898,416	$ 2,898,416
Site Maintenance and		$ 88,500	$ 178,770	$ 270,837	$ 364,727	$ 364,727
Infrastructure Equipment Maintenance		$ 173,900	$ 334,290	$ 869,771	$ 946,668	$ 946,668
Infrastructure Equipment Contingency Costs		$ 67,850	$ 138,414	$ 211,773	$ 288,012	$ 288,012
Telco Leased Line Costs		$ 12,006	$ 12,012	$ 12,018	$ 12,024	$ 12,024
New Applications Evaluation		$ 10,000	$ 10,200	$ 10,404	$ 10,612	$ 10,612
Total Phase Recurring Cost		**$ 6,144,915**	**$ 7,805,756**	**$ 9,845,896**	**$ 11,512,476**	**$ 11,512,476**

VIPER Recurring Costs



CJIN – Department of Crime Control & Public Safety/VIPER Legislative Subcommittee Report

Potential cost to counties and local governments and VIPER infrastructure funding

In compliance with legislative requirements, the Department of Crime Control and Public Safety and the Criminal Justice Information Network (CJIN) assembled a VIPER Subcommittee to address the legislative issues that included; cost of the network, potential cost to counties and local governments to participate on VIPER, requested funding from the Highway Fund, and possible revenue sources to fund VIPER. This committee's membership included representatives from state and local law enforcement, state and local emergency management, state and local fire service and emergency medical services agencies.

The VIPER Subcommittee has made the following recommendations based on the assumptions listed below:

- The estimated number of radios needed to equip first responders in the State is approximately 21,900. First responders are defined as Law Enforcement and Emergency Services personnel. We determined this by surveying Granville, Iredell, and Lenoir Counties to determine the number of first responders and the number of shifts for each category of first responders. The data from these three moderate sized counties was averaged together and produced a 'multiplier' that represents one hundred NC counties. It should be noted that we have no way of knowing how many of these personnel are permanently assigned a radio (take home) or how many are issued a radio at the beginning of their shift and return them at the end of their shift.
- A general obligation bond would take one year from its inception to being passed and funds were available.

- Revenues generated would come directly to the VIPER fund for use on the VIPER project and be considered carry-forward funds.
- The VIPER Governance Committee would have oversight on the revenue fund expenditures.
- Any fee increase or surcharge would be in addition to what's already out there today.
- All recommendations made here are merely proposals on ways to generate funding, and not necessarily supported by the individual groups being affected.

Potential cost to counties and local governments

There are many benefits to counties and local governments' participation. Naming a few of the most important issues include; counties and local governments will have autonomous talk groups, much like they have their own channels now, and will have common talk groups where they can communicate with other agencies during routine assignments and emergencies. If funded as identified in this report, counties and local governments will not have to maintain the network as they do now with their standalone radio systems, and county and local governments will not have to worry about improving their own system to comply with the Federal Communications Commission's regulation requiring narrow banding of radio spectrum.

The most obvious cost to counties and local governments when they choose to access the VIPER network will be the purchase of radios. As mentioned previously in this document, the exact number of radios used by counties and local governments is unknown. However, we've estimated the number of radios in three average counties and used that as a multiplier for the 100 counties. We do not know what extra features would be desired by counties and local governments, nor how many of

which type of radio, portable (handheld) or mobile (vehicle mounted), would be needed**.** Many of the more populated counties and local governments already use 800 MHz radios and will not need to purchase new radios to access VIPER.

The following chart gives pricing for basic configurations for each tier of both portable and mobile radios. These radios are available for purchase on the State convenience contract.

Examples of Radio Deployments

For the purpose of illustration, the following are examples of radio deployments within the three primary disciplines of public safety agencies. These examples are not to be taken as exact deployments by every agency; they are simply examples of radio deployments.

A typical radio deployment for **law enforcement** agencies is to install into each enforcement vehicle a mobile radio and to provide a portable radio to each on-duty member of that agency. The feature set of options for radios is up to the discretion of the agency, however the higher tier with more features are usually assigned to supervisors and command staff personnel.

For **fire department** personnel, a typical radio assignment would include mobile radios installed in each of the fire fighting apparatus and a complement of portable radios assigned to each apparatus directed by the departments Insurance Service Organization (ISO) classification. Other radios may be required as desired by the agency's command staff as determined by each agency.

For **emergency medical services** personnel, a typical radio deployment might include installation of one radio in each ambulance with operator

controls in the driver's compartment and the patient transport and treatment area, and a portable radio assigned to the vehicle supervisor.

Portable Radio Cost Estimates				
Potential number of radios		**Low Tier Portable radio price**	**Mid Tier Portable radio price**	**High Tier Portable radio price**
per unit		$ 1,568	$ 3,100	$ 4,200
21,900		$ 34,339,200	$ 67,890,000	$ 91,980,000
Mobile Radio Cost Estimates				
Potential number of radios		**Low Tier Mobile radio price**	**Mid Tier Portable radio price**	**High Tier Mobile radio price**
per unit		$ 1,700	$ 3,100	$ 4,500
21,900		$ 37,230,000	$ 67,890,000	$ 98,550,000
Note: These prices are estimates based on average configurations.				
Actual pricing will vary based on feature options purchased.				

A potential cost to counties and local governments when they elect to participate could concern additional system coverage. The basic VIPER Network's goal is to provide 95% in the street coverage using a 3 watt portable radio. However, the possibility exists that this coverage will not provide the building penetration desired by some local agencies. In those cases, it is the responsibility of the local agency to conduct the building penetration coverage analysis, secure the necessary additional tower location(s), purchase and install the transmitter(s) and required microwave equipment and to provide the necessary network connectivity to link it/them to the VIPER network.

The accompanying spreadsheet on page 66 offers radio pricing for different tiers and options at the time of this document.

VIPER Frequently Asked Questions

There have been several questions asked and concerns expressed about using 800 MHz as our radio frequencies for the VIPER network, an about the VIPER Network in general. Below are listed some of the most common.

- 800 MHz will not work in the mountains.

  800 MHz radios have been proven to work in mountainous areas across the United States, and in fact the current CJIN mobile data network is operating on 800 MHz frequencies. The states of Utah, Colorado, West Virginia and Pennsylvania are using 800 MHz radios for their radio systems.

- This radio network is simply a new radio system for the State Highway Patrol.

  The State Highway Patrol was identified by the CJIN Legislative Report to be the managing agency of the 800 MHz statewide voice and the statewide data system. The Secretary of Crime Control and Public Safety through the Division of the State Highway Patrol is statutorily required to maintain a statewide radio system. The State Highway Patrol, as with the Mobile Data Network, will be a small user in comparison to the number of local users on the network.

- The cost of construction will be expensive.

  As with all new technologies, there comes an expense to implement and maintain this new statewide network. However, when compared to modern radio systems installed in the states of Michigan, Pennsylvania and Ohio our estimates for North Carolina are not unreasonable. It should be noted that the state of New York has recently received a bid for a statewide radio system that is estimated to cost one billion dollars.

- Will there be voice and text pager capabilities with VIPER?

  No. Unfortunately, the technology used for 800 MHz trunked radio systems does not allow for a paging solution. Agencies requiring paging will have to continue to support their existing paging system. However, where available, tower space will be offered to VIPER participants on State Highway Patrol owned towers for local agency paging antennas.

- What about satellite communications?

Satellite technology does have one advantage over typical trunked radio systems in that it is not terrestrial based. This essentially means that a satellite based communications system would be relatively free from harm as related to most natural or manmade disasters. However, the primary drawback to satellite based systems is that in order to function, the subscriber handset or radio unit must be in constant view of the sky. This would eliminate operation inside buildings or in areas of dense foliage or during heavy rainfall or intense cloud cover. Satellite communications often don't work well in "urban canyons" (in streets and alleyways between tall buildings) because there is not line of sight to the satellites on the horizon. All of these detractions far outweigh the benefit of the system being somewhat impervious to being dependant on easily damaged infrastructure on earth. Satellite systems also suffer from lengthy delays as the conversation is routed up into the sky many hundreds of miles and back down again to the receiving radio or handset. Furthermore, satellite based technology will have to be refreshed as the orbit of the satellite can only be sustained for a finite number of years. However, satellite communications would be a viable option in areas where terrestrial infrastructure would be too costly to serve the population; such as the desert southwest of the US or the Middle East.

- Do I have to buy a certain brand of radio to operate on the VIPER network?

No. VIPER is the expansion of an existing Motorola radio system, obviously Motorola radios will work on the network. We have demonstrated the successful operation of EF Johnson radios on the VIPER network. So if a user prefers to use radios other than Motorola, they have the option of using EF Johnson radios.

- Will there be a cost to use the VIPER network?

The success of VIPER depends on our partnerships with state and local agencies, and the sharing of existing resources which may range from land to build towers on to re-use of existing towers. These in-kind contributions will help keep the overall cost of construction lower than if we had to buy property and build new towers everywhere a state owned tower was not available. It was those partnerships that allowed the state to build the statewide mobile data network for less that $20m as compared to the estimate in 1993 of more than $100m for the state to build the infrastructure.

- Will local agencies continue to dispatch their own personnel or will that be taken over by the Highway Patrol?

Local agencies will continue to dispatch and control their personnel as they do today. However, they will need to incorporate 800 MHz radios into their dispatch center consoles so they can communicate with their personnel.

- This project will be awarded to a single vendor!

We've heard this complaint from several sources. This is an expensive project and there will be large amounts of funds spent. However, with the Patrol acting as prime contractor, there is not a single vendor profiting from the total project funds. There are many products that will be purchased from different vendors who will be required to compete in the competitive bid process. However, there may be circumstances such as product integration with existing infrastructure and compatibility where a single or fewer vendors may be selected, but those vendors will not profit from other infrastructure equipment. These products include, but are not limited to, equipment buildings, towers and tower work, generators, microwave equipment, intellirepeaters, network routers and quality assurance.

Eligibility Requirements for 800 MHz Portable Radios:

Any existing Motorola or EF Johnson radios may be utilized on the VIPER system as long as they meet the following criteria: Any existing ANALOG LTS2000/LCS2000, MTS2000/MCS2000 or EF Johnson analog series radios MUST be capable of at least SMARTZONE operation and SHOULD be capable of OMNILINK operation as well. Any existing DIGITAL ready or DIGITAL capable AstroSaber/XTS3000/Astro Spectra or XTS2500/XTS5000/XTL5000 series radios MUST be capable of SMARTZONE operation and SHOULD be capable of OMNILINK operation as well. ALL DIGITAL ready or DIGITAL capable radios MUST be configured to operate on a DIGITAL talkgroup to access the VIPER network. NO NEW ANALOG radios will be permitted on the system. Analog talkgroups will be assigned only to customers with existing analog only radios that are capable of a minimum of SMARTZONE operation. New VIPER users who do not currently operate 800 MHz VIPER compatible radios MUST purchase radios capable of DIGITAL operation with SMARTZONE or SMARTZONE OMNILINK.

Motorola 800 MHz Portable Radios (Analog) compatible with VIPER:	Base Radio Cost	SmartZone Operation Cost	OmniLink Operation Cost	Digital CAI Option	Digital ID Display Option	Rapid Desk Charger	Rapid Vehicular Charger	SmartZone Operation Upgrade Cost	OmniLink Operation Upgrade Cost	Digital CAI Upgrade Cost	Digital ID Display Upgrade Cost
LTS2000 Model III, Front Display (H10UCH6DC5AN/BN)	N/A	N/A	N/A	N/A		$100.00	N/A	Available only at time of original order	N/A	N/A	
MTS2000 Model I, Top Display (Model Number H01UCD6PW1AN/BN)	N/A	N/A	N/A	N/A		$100.00	$385.00	$523.00	$200.00	N/A	
MTS2000 Model II, Front Display, Limited Keypad (Model Number H01UCF6PW1AN/BN)	N/A	N/A	N/A	N/A		$100.00	$385.00	$523.00	$200.00	N/A	
MTS2000 Model III, Front Display, Full Keypad (Model Number H01UCH6PW1AN/BN)	N/A	N/A	N/A	N/A		$100.00	$385.00	$523.00	$200.00	N/A	

Motorola 800 MHz Mobile Radios (Analog) compatible with VIPER:	Base Radio Cost	SmartZone Operation Cost	OmniLink Operation Cost	Digital CAI Option	Digital ID Display Option	Rapid Desk Charger	Rapid Vehicular Charger	SmartZone Operation Upgrade Cost	OmniLink Operation Upgrade Cost	Digital CAI Upgrade Cost	Digital ID Display Upgrade Cost
LCS2000 Model III, Front Display (M10UCH6DC5AN/BN)	N/A	N/A	N/A	N/A		$100.00	N/A	Available only at time of original order	N/A	N/A	
MCS2000 Model I, Limited Display, No Keypad (Model Number M01UCD6PW1AN/BN)	N/A	N/A	N/A	N/A		$100.00	$385.00	$475.00	$200.00	N/A	
MCS2000 Model II, Single Line Display, Limited Keypad (Model Number M01UCF6PW1AN/BN)	N/A	N/A	N/A	N/A		$100.00	$385.00	$475.00	$200.00	N/A	
MCS2000 Model III, Dual Line Display, Full Keypad (Model Number M01UCH6PW1AN/BN)	N/A	N/A	N/A	N/A		$100.00	$385.00	$475.00	$200.00	N/A	

Motorola 800 MHz Portable Radios (Digital) compatible with VIPER:	Base Radio Cost	SmartZone Operation Cost	OmniLink Operation Cost	Digital CAI Option	Digital ID Display Option	Rapid Desk Charger	Rapid Vehicular Charger	SmartZone Operation Upgrade Cost	OmniLink Operation Upgrade Cost	Digital CAI Upgrade Cost	Digital ID Display Upgrade Cost
Astro Saber Model II, Front Display, Limited Keypad (Model Number H04UCF9PW7AN/BN)	N/A	N/A	N/A	$0.00	$64.00	$100.00	N/A	$440.00	$200.00	$770.00	$75.00
Astro Saber Model III, Front Display, Full Keypad (Model Number H04UCH9PW7AN/BN)	N/A	N/A	N/A	$0.00	$64.00	$100.00	N/A	$440.00	$200.00	$770.00	$75.00
XTS3000 Model I, Top Display, No Keypad (Model Number H09UCC9PW7AN/BN)	$1,637.00	$1,275.00	$170.00	$438.00	$64.00	$100.00	$385.00	$475.00	$200.00	$700.00	$75.00
XTS3000 Model II, Front Display, Limited Keypad (Model Number H09UCF9PW7AN/BN)	$1,926.00	$1,275.00	$170.00	$438.00	$64.00	$100.00	$385.00	$475.00	$200.00	$700.00	$75.00
XTS3000 Model III, Front Display, Limited Keypad (Model Number H09UCH9PW7AN/BN)	$2,215.00	$1,275.00	$170.00	$438.00	$64.00	$100.00	$385.00	$475.00	$200.00	$700.00	$75.00
XTS1500 Model I, No Display, No Keypad (Model Number H66UCC9PW5BN)	$638.00	$830.00	Incl.	Incl.	Incl.	$100.00	N/A	$490.00	Incl.	Incl.	Incl.
XTS2500 Model I, Front Display, Limited Keypad (Model Number H46UCC9PW5AN/BN)	$807.00	$1,675.00	Incl.	Incl.	Incl.	$100.00	N/A	$490.00	Incl.	Incl.	Incl.
XTS2500 Model II, Front Display, Limited Keypad (Model Number H46UCF9PW6 AN/BN)	$1,318.00	$1,675.00	Incl.	Incl.	Incl.	$100.00	N/A	$490.00	Incl.	Incl.	Incl.
XTS2500 Model III, Front Display, Limited Keypad (Model Number H46UCH9PW7AN/BN)	$1,658.00	$1,675.00	Incl.	Incl.	Incl.	$100.00	N/A	$490.00	Incl.	Incl.	Incl.
XTS5000 Model I, Top Display, No Keypad (Model Number H18UCC9PW5AN/BN)	$1,388.00	$1,275.00	$170.00	$438.00	$64.00	$100.00	$385.00	$475.00	$200.00	$700.00	$75.00
XTS5000 Model II, Front Display, Limited Keypad (Model Number H18UCF9PW6AN/BN)	$1,834.00	$1,275.00	$170.00	$438.00	$64.00	$100.00	$385.00	$475.00	$200.00	$700.00	$75.00
XTS5000 Model III, Front Display, Limited Keypad (Model Number H18UCH9PW7AN/BN)	$2,110.00	$1,275.00	$170.00	$438.00	$64.00	$100.00	$385.00	$475.00	$200.00	$700.00	$75.00

EF Johnson 800 MHz Portable Radios (Digital) compatible with VIPER:	Base Radio Cost	SmartZone Operation Cost	OmniLink Operation Cost	Digital CAI Option	Digital ID Display Option	Rapid Desk Charger	Rapid Vehicular Charger	SmartZone Operation Upgrade Cost	OmniLink Operation Upgrade Cost	Digital CAI Upgrade Cost	Digital ID Display Upgrade Cost
5100 Model II, Limited Keypad (Model Number 5182-810-22-0000)	$2,360.00	Incl.	N/A	Incl.	Incl.	$120.00	N/A	N/A	N/A	N/A	N/A
5100 Model III. Full Keypad (Model Number 5183-810-22-0000)	$2,556.00	Incl.	N/A	Incl.	Incl.	$120.00	N/A	N/A	N/A	N/A	N/A

Motorola 800 MHz Mobile Radios (Digital) compatible with VIPER:	Base Radio Cost	SmartZone Operation Cost	OmniLink Operation Cost	Digital CAI Option	Digital ID Display Option	Dash Mount/Remote Mount (Choose One)	Control Head Cost	SmartZone Operation Upgrade Cost	OmniLink Operation Upgrade Cost	Digital CAI Upgrade Cost	Digital ID Display Upgrade Cost
Astro Spectra (All Models regardless of control head configuration)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$475.00	$200.00	$770.00	$75.00
Astro Spectra Plus (All Models regardless of control head configuration)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	$475.00	$200.00	$770.00	$75.00
XTL5000 Handheld Control Head, Limited Keypad (Model Number M20URS9PW1AN/BN)	$1,497.00	$1,275.00	$170.00	$438.00	$64.00	$107.00/$252.00	$804.00	$475.00	$200.00	$770.00	$75.00
XTL5000 Rotary Control Head, Limited Keypad (Model Number M20URS9PW1AN/BN)	$1,497.00	$1,275.00	$170.00	$438.00	$64.00	$107.00/$252.00	$367.00	$475.00	$200.00	$770.00	$75.00
XTL5000 Pushbutton Control Head, Limited Keypad (Model Number M20URS9PW1AN/BN)	$1,497.00	$1,275.00	$170.00	$438.00	$64.00	$107.00/$252.00	$367.00	$475.00	$200.00	$770.00	$75.00
XTL5000 Pushbutton Control Head, Full Keypad (Model Number M20URS9PW1AN/BN)	$1,497.00	$1,275.00	$170.00	$438.00	$64.00	$107.00/$252.00	$501.00	$475.00	$200.00	$770.00	$75.00
XTL5000 Pushbutton Control Head, Full Keypad 9000e Remote only configuration (Model Number M20URS9PW1AN/BN)	$1,497.00	$1,275.00	$170.00	$438.00	$64.00	$252.00 (Remote Only)	$804.00	$475.00	$200.00	$770.00	$75.00

EF Johnson 800 MHz Mobile Radios (Digital) compatible with VIPER:	Base Radio Cost	SmartZone Operation Cost	OmniLink Operation Cost	Digital CAI Option	Digital ID Display Option	Dash Mount/Remote Mount (Choose One)	Control Head Cost	SmartZone Operation Upgrade Cost	OmniLink Operation Upgrade Cost	Digital CAI Upgrade Cost	Digital ID Display Upgrade Cost
5300 Model III Pushbutton Control Head, Full Keypad (Model Number 5383-810-22-0000)	$3,450.00	Incl.	N/A	Incl.	Incl.	$100.00/200.00	Incl.	N/A	N/A	N/A	N/A
5300 Model III Handheld Control Head, Full Keypad (Model Number 5383-810-22-0000)	$3,950.00	Incl.	N/A	Incl.	Incl.	$200.00 (Remote Only)	Incl.	N/A	N/A	N/A	N/A

Tone and Voice Paging

The VIPER network, like all other 800 MHz trunked radio systems, will not support paging capabilities. It will be incumbent upon local agencies to provide or continue to support paging systems for their personnel. Where available, the State Highway Patrol will continue to extend access to State Highway Patrol managed tower sites to support local paging operations.

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Potential VIPER Revenue Sources

In times of fiscal restraint, it is difficult to identify funding in a general budget for such large expenditures. However, as identified in the aftermath of the attacks on the United States on September 11, 2001, interoperable communications was the single most identified impediment to emergency responses during those emergencies. Likewise, interoperable communications is vital everyday for public safety and a funding solution should be sought.

Funding Streams

The CJIN-DCC&PS VIPER Subcommittee discussed how to fund VIPER during our meetings. In the time we had to produce this report we have identified the dollars needed for construction costs, recurring costs, and possible funding sources. However, the sources of those funds should be researched and validated by the Legislative Fiscal Staff.

Many states are facing the same interoperability issues after the release of the 9-11 Commission Report that indicated the lack of communications was an obstacle in the effectiveness of emergency responders. Interoperable communications is the number one issue identified by states for addressing homeland security and preparing for a terrorist attack or natural disaster. Unfortunately, with the absence of federal funding, this is an issue that must be addressed by the states.

The following assumptions were made:

- The estimated number of radio equipped first responders in the State is approximately 21,900. We determined this by surveying Granville, Iredell, and Lenoir counties to determine the number of first responders and the number of shifts for each category of first responders. The data from these three moderate sized counties was averaged together and produced a ‘multiplier’ that represents one hundred NC counties.

- A general obligation bond would take one year from its inception to being passed and funds were available.
- The logistics of collecting the revenue from the various sources could be resolved in a timely manner.
- Revenues generated would come directly to the VIPER fund for use on the VIPER project. They would be considered carry-forward funds, as opposed to reverted funds which go away at the end of a State fiscal year.
- The VIPER Governance Committee would have oversight on the revenue fund expenditures.
- Any fee increase or surcharge would be in addition to what's already out there today.
- All recommendations made here are merely proposals on ways to generate funding, and not necessarily supported by the individual groups being affected.
- Recurring funds in the VIPER budget are for upkeep of items that are damaged such as lightening strikes that are not covered under maintenance agreements and warranty periods. They are not for technology upgrades for the network.

Proposed VIPER Funding Streams

	First Year	Second Year	Third Year	Fourth Year	Fifth Year	Totals
Non Recurring (NR) Infrastructure	$ 47,780,168	$ 45,213,168	$ 31,119,168	$ 31,907,168	$ -	$ 156,019,672
Recurring (R) Operations	$ 6,144,915	$ 7,805,756	$ 9,845,896	$ 11,512,476	$ 11,512,476	N/A

Option 1: 100% general obligation public safety bond, $0 State appropriation

* bond money is available in year 2 (first year is spent getting the bond approved)

Infrastructure	First Year	Second Year	Third Year	Fourth Year	Fifth Year	Totals
NR State appropriation	$ -	$ -	$ -	$ -	$ -	$ -
NR Bond money	not available yet	$ 47,780,168	$ 45,213,168	$ 31,119,168	$ 31,907,168	$ 156,019,672
Operations						
R Other sources of revenues	$ -	$ 6,144,915	$ 7,805,756	$ 9,845,896	$ 11,512,476	N/A

Option 2: A combination of general obligation public safety bond money and State appropriations
(Based on the strategy that VIPER will have the same % user breakdown as CJIN-MDN has today)

* SHP is 15% of CJIN-MDN users (funded by highway fund), other state agencies are 3% of CJIN-MDN users (JPS to fund), bond money does the rest
* state money is available starting in year 1, bond money is available starting in year 2 (first year is spent getting the bond approved)

Infrastructure	First Year	Second Year	Third Year	Fourth Year	Fifth Year	Totals
NR State appropriation - Highway fund	$ 7,167,025	$ 6,781,975	$ 4,667,875	$ 4,786,075	$ -	$ 23,402,951
NR State appropriation - JPS	$ 1,433,405	$ 1,356,395	$ 933,575	$ 957,215	$ -	$ 4,680,590
NR Bond money	not available yet	$ 39,641,798	$ 39,611,718	$ 25,375,878	$ 23,306,738	$ 127,936,131
						$ 156,019,672
Operations						$ 156,019,672
R Other sources of revenues	$ 1,228,983	$ 5,073,741	$ 8,369,012	$ 9,785,605	$ 11,512,476	N/A
note: percentages used due to delayed start of bond monies (rounded)	20%	65%	85%	85%	100%	

Proposed VIPER Funding Streams (continued)

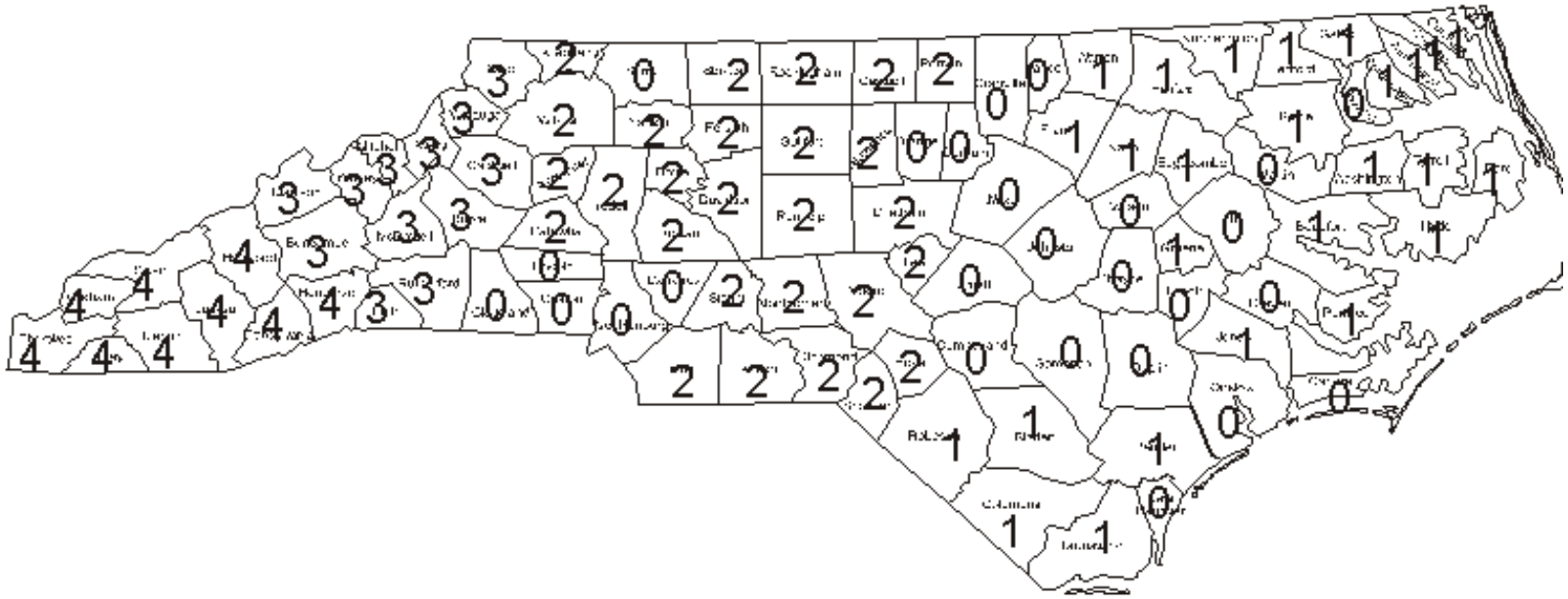
Option 3: All State appropriations, $0 Bond
(Based on the strategy that VIPER will have the same % user breakdown as CJIN-MDN has today)
* SHP is 15% of CJIN-MDN users (funded by highway fund), other state agencies are 3% of CJIN-MDN users (JPS to fund), general appropriation does the rest
* state money is available starting in year 1

Infrastructure	First Year	Second Year	Third Year	Fourth Year	Fifth Year	Totals
NR State appropriation - Highway fund	$ 7,167,025	$ 6,781,975	$ 4,667,875	$ 4,786,075	$ -	$ 23,402,951
NR State appropriation - JPS	$ 1,433,405	$ 1,356,395	$ 933,575	$ 957,215	$ -	$ 4,680,590
NR State appropriation - general fund	$ 39,179,738	$ 37,074,798	$ 25,517,718	$ 26,163,878	$ -	$ 127,936,131
NR Bond money	$ -	$ -	$ -	$ -	$ -	$ -
						$ 156,019,672
Operations						
R Other sources of revenues	$ 6,144,915	$ 7,805,756	$ 9,845,896	$ 11,512,476	$ 11,512,476	N/A

Option 4: A "Fast Start VIPER" approach of State appropriations in years 1-2, Bond
* Ask Highway Fund and JPS to advance us more money in earlier years until the bond money is available in year 2
* This option lets you get started while the bond is being prepared and appproved in year 1.

Infrastructure	First Year	Second Year	Third Year	Fourth Year	Fifth Year	Totals
NR State appropriation - Highway fund	$ 10,000,000	$ 10,000,000	$ 4,692,951	$ -	$ -	$ 24,692,951
NR State appropriation - JPS	$ 2,000,000	$ 2,000,000	$ 938,590	$ -	$ -	$ 4,938,590
NR Bond money (available in year 2)	Not available yet	$ 35,780,168	$ 39,581,627	$ 31,119,168	$ 19,907,168	$ 126,388,131
						$ 156,019,672
Operations						
R Other sources of revenues	$ 1,536,229	$ 5,073,741	$ 8,369,012	$ 10,361,228	$ 11,512,476	
note: percentages used due to delayed start of bond monies	25%	65%	85%	90%	100%	

VIPER Five Year Phased Map



Year Four 4

Year Three 3

Year Two 2

Year One 1

Year Zero 0

Proposed Funding Sources for VIPER Recurring Operational Costs

The VIPER Subcommittee's proposed funding sources for VIPER recurring operational costs are grouped into three categories:

* highly recommended
* recommended / endorsed
* not recommended.

Highly Recommended

- Add a surcharge on 911 wired fees and 911 wireless fees; add a one-time fee to new cell phone accounts upon activation.
- Add a public safety surcharge to real and personal property insurance policies.
- Add a surcharge to the tire disposal fee and the battery disposal fee.
- Add a surcharge to tobacco products

Recommended

- Increase the driver's license fee
- Increase the vehicle registration fee
- Increase the alcoholic beverage tax.

Not Recommended

The following potential funding sources for VIPER recurring costs were discussed but not recommended for various reasons:

- Collect a toll / install toll booths on NC Interstate Highways. The rationale is that everyone driving on the NC Interstate Highway benefits from VIPER so they should help pay for its operations. This recommendation was not pursued because NC does not presently

have toll roads. However, it should be considered in the future if toll roads become a reality

- Add a NC surcharge to the current Federal Communications Commission (FCC) licensing which collected by the federal government. This recommendation was not pursued because the general consensus was that it would be cost prohibitive to implement this idea.

- Add a NC surcharge to the fuel tax. This recommendation was not pursued because NC already has some of the highest fuel taxes of neighboring states.

- Increase the vehicle inspection fee. This recommendation was not pursued because some counties are presently increasing the fee for emissions control.

- Increase court costs. This recommendation was not pursued because recent increases in county fees have gone to the general fund.

- Charge a VIPER subscriber user fee. The VIPER Subcommittee was 100% unanimous that we should **not** charge a user fee. VIPER should be accessible to all first responders in the State, regardless of agency budget. In addition, VIPER is a partnership between the State and the county/local governments. Many of our partners are presently donating in-kind services today, but might be compelled to start charging VIPER for use of their resources if they had to pay an access fee or even decide not to participate at all.

	VIPER Revenues for Recurring Costs			
Category	**Source**	**Possible Increase/ Surcharge**	**Annual Transactions**	**Annual Revenues Generated**
Highly Recommended	**Insurance Policy Premium Surcharge**	$5.00	unknown	
Highly Recommended	**Tire disposal fee surcharge/tire ***	$ 1.00	8,407,248	$ 8,407,248
Highly Recommended	**Battery disposal fee surcharge ****	$ 1.00	80,912	$ 80,912
Highly Recommended	**Tobacco tax increase *****	$ 0.01	877,375,117	$ 8,773,751
Highly Recommended	**New cell phone activation: one-time fee**	unknown	unknown	
Highly Recommended	**Wireless 911 fees #**	$ 0.05	3,500,000	$ 2,100,000
Highly Recommended	**Wired 911 fees #**	$ 0.05	4,400,000	$ 2,640,000
Recommended	**Registration fee Increase ##**	$ 1.00	7,000,000	$ 7,000,000
Recommended	**Drivers License Increase ##**	$ 1.00	2,000,000	$ 2,000,000
Recommended	**Alcoholic beverage tax increase**	unknown	unknown	
			Total Annual Revenues	**$ 31,001,911**
		Recurring Cost Needed:		**$ 11,512,476**

* www.wastenotnc.org

**http://wastenot.enr.state.nc.us/swhome/SW01-02_AR.doc

*** www.cdc.gov/tobacco/statehi

Estimate based on population and NC census number of households

DOT/DMV

Endnotes:

[1]" Statewide Interagency Public Safety Radio Communications" Document Introduction, 1994

[2]Price Waterhouse LLP, "Criminal Justice Information Network Final Report" Executive Summary, page 10 electronic copy 1995

[3]Price Waterhouse LLP, "Criminal Justice Information Network Final Report" Statewide Voice and Data, page 228, electronic copy 1995

[4]American National Standards Institute, News Article: 9-11 Commission Hearing Calls for Standards in Areas of Emergency Response *Homeland Security Secretary Tom Ridge Calls for Adoption of National Emergency Preparedness Standards Development by ANSI and NFPA*, May 19,2004

[5]Price Waterhouse LLP, "Criminal Justice Information Network Final Report" Statewide Voice and Data, page 201, electronic copy 1995

[6]Gartner Consulting, State of North Carolina Criminal Justice Information Network-Voice Trunking Network, "CJIN Governing Board Presentation", pages 16-22, 14 November 2002

[7]National Task Force on Interoperability, *Why Can't We Talk?, Page 5, February 2003*

[8]The SAFECOM Program, Department of Homeland Security, *Statement of Requirements for Public Safety Wireless Communications & Interoperability*, Version 1.0, Page 1, March, 10, 2004

[9]The SAFECOM Program, Department of Homeland Security, *Statement of Requirements for Public Safety Wireless Communications & Interoperability*, Version 1.0, Page 3, March, 10, 2004