STATEWIDE AGENCIES RADIO SYSTEM (STARS)

PROGRAM

A Report to the Governor, House Appropriations Committee, And Senate Finance Committee

October 2016

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October 1, 2016

TO: The Honorable Terry McAuliffe, Governor of Virginia

The Honorable Thomas K. Norment, Jr.
Co-Chairman of the Senate Finance Committee

The Honorable Emmett W. Hanger, Jr.
Co-Chairman of the Senate Finance Committee

The Honorable S. Chris Jones
Chairman of the House Appropriations Committee

Pursuant to the Appropriation Act, Item 422 C.2 (Regular Session, 2016), I am respectfully submitting herewith a report on the Statewide Agencies Radio System (STARS) Program.

Respectfully,

W. S. Flaherty

Superintendent

WSF/RAE

Enclosure

Implementation Report

Statewide Agencies Radio System (STARS) Contract

Colonel W. Steven Flaherty, State Police Superintendent and Mr. Mark Moon, Vice President and General Manager of Motorola signed a $329 million contract between Motorola and the Commonwealth of Virginia for the design, construction, and implementation of the Statewide Agencies Radio System (STARS) on July 13, 2004. A ceremonial contract signing was held on July 16, 2004, in conjunction with a press conference.

Effective July 1, 2011, The Virginia State Police Communications Division assumed the engineering, installation, maintenance, and operations of the STARS system. The STARS Network including the backbone microwave network, the land mobile radio network, the five Tidewater tunnels and two Western tunnels, and all vehicles for all 21 state agencies were operational.

STARS provides a multi-channel trunked digital voice and data wireless communications capability specifically designed to meet APCO Project 25 public safety requirements. The core network was built on the legacy Virginia State Police microwave radio network through upgrades to Synchronous Optical Network (SONET) ring-protected transmission paths. This network supports the 21 participating state agencies and one locality throughout the Commonwealth and facilitates interoperability with other state, local, and federal agencies.

The design of STARS was the culmination of a partnership with the Commonwealth, the project's engineering consultant AECOM Design formerly, Hayes, Seay, Mattern & Mattern, Inc. (HSMM) / CTA Communications, and Motorola. The design considered: 1) meeting the needs of participants; 2) utilizing existing resources where possible; and 3) minimizing risk. STARS allows the Commonwealth to retain a high level of service and security and the flexibility to add additional capacity through the addition of radio frequencies. However, due to the high number of other entities that utilize similar frequencies, the ability to acquire these for specific sites is becoming difficult. In all applicable design components, STARS has addressed safeguards to system security, including controlled system access, and Advanced Encryption Standard (AES) encryption for law enforcement users. The system infrastructure through periodic upgrades will serve the Commonwealth for many years to come.

Total Cost of System Implementation

Special Funds

Pursuant to the Code of Virginia §2.2-2264, the General Assembly authorized the Virginia Public Building Authority to issue revenue bonds not to exceed $159,300,000 for the constructing, improving, furnishing, maintaining, acquiring and renovating buildings, facilities, improvements, and land for the STARS project. Chapter 245 approved by the General Assembly session March 30, 2006, authorized additional funding via Bonds issued by the Virginia Public Building Authority in the amount not to exceed $201,900,000 to complete STARS.

The revised Contract appropriation cost for STARS is	**$361,200,000**
Less $50,000 allocated to Department of Forestry	**$361,150,000**
Phase 1 Cost	**$346,186,399**
Bond Funds remaining at completion of Phase I	**$14,963,601**
New site construction Phase 2	**$3,218,788**
New site construction Phase 3	**$1,619,871**
New site construction Phase 4	**$4,046,542**
700 MHz Re-banding Phase 5	**$6,000,000**
New site construction Phase 6	**$78,400**
Projected Funding Balance at Project Completion	**$ - 0 -**

STARS Management Structure

The STARS participants are composed of the following 21 state agencies and one locality. Representatives from each agency make up the User Agencies Requirements Committee (UARC):

Chesapeake Bay Bridge and Tunnel Police
Department of Agriculture and Consumer Services
Department of Alcoholic Beverage Control
Division of Capitol Police
Department of Conservation and Recreation
Department of Corrections
Department of Emergency Management
Department of Environmental Quality
Department of Fire Programs
Department of Forestry
Department of Game and Inland Fisheries
Department of Health
Department of Juvenile Justice
Department Military Affairs
Department of Mines, Minerals, and Energy
Department of Motor Vehicles
Department of State Police
Department of Transportation
Virginia Information Technologies Agency
Virginia Marine Resources Commission
Virginia Port Authority
Buchanan County Sheriff's Department and Grundy Police Department

The STARS Management Group is a Board established by Executive Order 28 (2002) and composed of the Secretaries of Agriculture and Forestry, Commerce and Trade, Finance, Health and Human Resources, Natural Resources, Public Safety and Homeland Security, Technology, and Transportation. The Secretary of Public Safety and Homeland Security serves as the Chairman. The STARS Management Group provides direction and overall governance for the development, implementation, and on-going operation of STARS. In addition, they review all procurements and contracts, coordinate radio frequency licenses granted by the federal government to agencies of the Commonwealth, and promote interagency cooperation and coordination in the use of communications resources.

The User Agencies Requirements Committee (UARC) consists of two representatives (primary and alternate) from each member agency and institution. The Chairman of the UARC is selected by the STARS Management Group. The current Chairman is Mr. James R. Squares, Jr. with the Virginia Department of Motor Vehicles. The UARC meets as necessary, but at least quarterly. The specific duties of UARC are to advise on the needs of member agencies for the planning, design, establishment, and operation of STARS, provide advice on proposals for other federal, state, or local agencies to join STARS and on any proposals for third party use of any STARS infrastructure or component, and assist the STARS Management Team with the development of a comprehensive management plan and procedures for the operation of STARS.

Projected STARS Reoccurring Operating Costs

The STARS Network is a public safety grade wireless communications system that must be maintained in an operational status 24 hours per day, 7 days per week. To accomplish this, a well-trained staff of engineers and technicians must be available and have access to parts, test equipment, and vehicles on a 24/7 basis. Based on a study by the STARS Management Group, commercial services were cost prohibitive, would not maintain the required level of knowledge of the network, and was not available on a 24/7 basis. The Department of State Police has historically been a self-maintained communications network provider with Department employed engineers and technicians. There is no other practical or cost effective way to maintain the STARS network infrastructure and the subscriber vehicles within the network.

The implementation of STARS replaced the legacy Virginia State Police radio system. Effective July 1, 2011, the Virginia State Police Communications Division assumed the engineering, installation, maintenance, and operations of the STARS system. The Department assumed the responsibility for equipping new vehicles, aircraft, and boats that belong to the 21 STARS agencies, removing equipment from decommissioned or crashed vehicles, and the refurbishment and re-installation of the reconditioned hardware into another vehicle. Per Chapter 665, 2015 Virginia Acts of Assembly, Item 43, the FY 2016 allotted funding for Telecommunications and Statewide Agencies Radio System (STARS) (30204) is $25,840,605.

Maintaining technology today is a labor intensive and costly proposition. Hardware and software is typically obsolete by the time it is purchased and installed, and STARS is no exception. The FY 2017 lifecycle cost to keep the core Motorola portion of the network current is $1,443,811. This does not include the hardware and software upgrades necessary to keep the transport network at top operational efficiency. By July 2019, all land mobile radio hardware must be replaced. The projected cost to replace this hardware will be approximately $8 million. In addition, much of the support hardware including microwave radios, power subsystems, and multiplexing equipment is at or approaching end-of-life. All new sites under construction are being equipped with the latest hardware.

The dispatch centers in the original network consisted of 40 analog Gold Elite consoles and 38 MCC7500 digital consoles. The analog consoles are not supported after Release 7.16 which is scheduled for implementation in July 2017. Replacement of the remaining analog consoles should be complete as of the publishing of this document at a cost of $715,413.

There are a number of other major subsystems that require replacement in the near future. These include:

Subsystem	Projected Cost
Mobile Data Terminals	$2,700,000
UPS and -48VDC power plants	$2,100,000
Mobile and Portable Radios, DVRS	$96,000,000
SIRS Radios	$2,900,000
XTL5000 Consolettes	$3,000,000
Control Station Replacement	$3,800,000

It is anticipated that in FY 2018, $12,400,000 will be required to fund aging infrastructure and hardware that has reached end-of-life and new technology that will address frequency availability and advanced authentication to comply with CJIS requirements.

The costs above do not consider the manpower, installation supplies, per diem and other travel costs, and gasoline but are a representative listing of the order of magnitude of the expenses required to keep the network operational.

COMLINC

Local, state, and federal radio systems operate in a number of specific frequency bands (VHF low-band, VHF high-band, UHF, 700 and 800 MHz). Radios operating in different frequency bands cannot communicate directly. The Commonwealth Link to Interoperable Communications (COMLINC) allows dispatchers at the state, federal, county, and city communications centers to establish communications patches between themselves and another agency regardless of frequency band. For example, a Sheriff's Department can patch to the Fire Department regardless of the frequencies used by each agency. Patches can also be made to phone networks and used to establish dispatcher conferences. By using COMLINC, each dispatcher initiates the patch themselves at their console in coordination with the participating agency. COMLINC also provides instant recall of recorded audio.

COMLINC was initially implemented in 16 localities in Virginia State Police Division 1, and at State Police Divisions 1 and 5 Headquarters, along with the STARS Network Operations Center (NOC). As of this report, there are now 172 agencies/jurisdictions on the COMLINC network, including all State Police Divisions, most localities, colleges and universities, and state and federal agencies. The initial systems were procured via competitive bid.

COMLINC enables current STARS Network participants to communicate with an array of disparate locality radio systems, thereby eliminating any need to contemplate a cost prohibitive expansion of the STARS Network. This expanded interoperability with localities provides seamless radio coverage across the Commonwealth to enable multijurisdictional public safety responses to both unplanned and planned events. COMLINC's success continues to be validated by steady growth in participation and daily use of this interoperability network across the Commonwealth.

As the network has grown, the Virginia State Police Communications Division accepted responsibility for engineering, installation, maintenance, and technical support for the entire statewide COMLINC network without an increase of manpower or budget. As with the STARS Network, this network is outdated with increasing maintenance expenses and decreasing functionalities. For example, most COMLINC servers and workstations still operate on the Microsoft Windows XP operating system, which is no longer supported by Microsoft. This means that vulnerabilities discovered within Windows XP are no longer corrected by Microsoft and only heighten the network's vulnerability to nefarious actions. The cost of upgrading the network to the latest software programs and replacing the oldest equipment is estimated at over $3 million. A system-wide upgrade to current standards would not only ensure the continued success of COMLINC, but also increase its functionality by allowing interoperability with handheld broadband devices.

SIRS

In 1977, the Statewide Interdepartmental Radio System (SIRS) Advisory Board was created to improve coordination between state and local law enforcement agencies. At that time, no direct radio link existed between these agencies. The Advisory Board accepts applications for the use of the selected low-band VHF radio frequency of 39.54 MHz for statewide access for SIRS participating agencies. The FCC had set aside a Very High Frequency (VHF) of 155.475 MHz (wideband) and 155.4825 MHz (narrowband) as VHF interoperability channels to be used by law enforcement statewide. The SIRS Advisory Board manages the low band and VHF interoperability frequencies.

Currently, all STARS law enforcement vehicles are equipped with an independent low band (39.54 MHz) SIRS radio. This radio being independent of the STARS radio is always available to send and receive radio transmissions. STARS mobile radios are programmed to transmit and receive on VHF high-band frequencies.

SIRS radios have been installed in 18 STARS sites throughout the Commonwealth and will appear on all VSP dispatch consoles to improve interoperability with localities and the VSP.

Mobile Data Enhancement

The original STARS contract provided mobile data terminals (MDT) for all law enforcement via laptops installed in the vehicles and the Integrated Voice and Data (IV&D) feature in the network. This capability provided for Virginia Criminal Information Network (VCIN) checks and Division of Motor Vehicle (DMV) license checks through the radio network. The variety and complexity of information technology changes daily, as does the bandwidth requirements. The IV&D feature in the STARS network was designed to accommodate short message traffic and cannot accommodate enhancements such as DMV photographs. To accommodate these new bandwidth requirements commercial wireless data cards were added to the laptops.

In addition to the increased bandwidth demands, the FBI and Department of Homeland Security have added new security requirements that require portable computer hard drives to be encrypted to protect sensitive data. If stolen, encryption for all transmitted data that traverse unsecured networks such as the Internet, and multi-factor authentication ensures that the person logging into the network is who they purport to be.

All of these latter requirements add a strain on an already tight budget. Hard drive encryption requires new software. The encryption of transmitted data requires virtual private network (VPN) hardware and software. Depending on the implemented solution for multi-factor authentication, hardware and/or software will be required. All of these capabilities require new administrative procedures.

The original STARS Motorola laptops are out of warranty and are being replaced with the latest Panasonic Tough book laptops. The projected cost to replace the Motorola laptops is $2,700,000 and an annual cost of $541,000 for out of warranty and replacement costs.

New STARS Site Construction

After the STARS Network was turned over to the Communications Division, users in a number of areas within the Commonwealth began to report radio problems that were identified as areas of very weak or poor coverage. Radio transmissions were garbled or robotic sounding in digital terms or radios were not able to send and receive. STARS Network Operations Center personnel began to gather the locations and opened informational trouble tickets that enabled the engineers to perform coverage testing to determine the best location for new sites.

During the initial network construction, the VSP Communications Division took over engineering and installation of several subsystems of the STARS network resulting in a cost savings to the Commonwealth. Subsequently, the Communications Division requested permission from the STARS Management Group to use these funds to install additional land mobile radio sites to fill in coverage gaps in the original network. To date, 13 sites have been completed with five more in various stages of construction.

The additional new sites and their degree of completion are as follows:

Waverly	Complete
Dumfries Scales	Complete
Rawley Springs	Complete
Potts Mountain	Complete
Bath County Hydro	Complete
Elliott Knob	Complete
Massanutten	Complete
Virginia Beach	Complete
Gordonsville	Complete
Big Walker Mountain	Nearing construction completion
Lambsburg	Complete
Buck Knob	Pending execution of lease agreement with owner
1st Division Dispatch	Complete
VSP Driver Training Facility	Complete
Amelia VDOT	Pending award to lowest responsive and responsible bidder
Blue Mountain	Pending approval to co-locate with locality
Purgatory	Pending execution of lease agreement with owner
West Point	Complete

Work continues on identifying additional coverage gaps.

Conclusion:

In closing, maintaining technology today is a labor intensive and costly proposition. Hardware and software are often times obsolete by the time of installation, and the STARS Network with its complementing systems (COMLINC and SIRS) is no exception. The STARS Network provides a public safety grade radio and data network to VSP and 22 other agencies. As with any network, the infrastructure, as well as hardware and software are approaching end-of-life. As indicated in this report, it is anticipated that in FY18, $12,400,000 will be required to fund aging infrastructure and hardware and beginning in FY19, significant funding will be required for similar end-of-life technology.