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PRINCE GEORGE'S CO FINALLY GOES TRUNKED! SCANNER LISTENERS COULD BE SHUT-OUT FROM MUCH OF NEW RADIO SYSTEM

It will probably go down as the most costly project in county history. During January, Prince George's County and its municipalities will start migrating police and fire/EMS radio communication to the county's newly built $80 million Motorola 700 MHz trunked network.

Prince George's County, the region's last jurisdiction to vacate analog conventional channels to dispatch police and firefighters, becomes the region's first jurisdiction to build on the recently vacated analog TV channels.

While the county's new system offers improved audio quality for police and firefighters, for scanner listeners, this could mark the beginning of the end.

The county's system use two digital formats – FDMA (frequency division multiple access), which is what most digital public safety radio networks currently use, and TDMA (time division multiple access), which doubles the capacity of each voice channel.

The problem for scanner listeners is that no scanner currently decodes TDMA. To further complicate matters, it may take years before one does! The public safety TDMA standards have not yet been adopted, so it is unlikely a scanner manufacturer will commit to a TDMA scanner at this point.

Prince George's County's system will mix FDMA and TDMA formats. We are told that some talkgroups, such as those used by fire/EMS personnel, will remain in FDMA mode to allow for easy interoperability. This gives other jurisdictions capability to monitor and communicate with PGFD if they have 700 MHz-capable digital radios such as the Motorola XTS 5000.

The police will primarily use the "unmonitorable" TDMA format. Adam and Charlie sectors, however, will supposedly use FDMA so those talkgroups may be monitored by Montgomery County police. As of this writing, however, they transmit in TDMA mode, along with the other PGPD talkgroups that are simulcast from the UHF-T band.

The other PGPD dispatch talkgroups will supposedly stay in TDMA mode, unless an older FDMA-only radio is monitoring the talkgroup. In that case, the transmissions will revert to FDMA mode, which will allow scanner listeners to monitor. Alternate/tactical PGPD channels will be TDMA only.

The county has 21 antenna sites (see map in page 8). The county's system is divided into two tiers (or subsystems), one for the north, and one for the south. The dividing line is roughly Pennsylvania Avenue.

If you have a digital scanner that can receive 700 MHz, such as the BCD396T/996T, BCD396XT/996XT, PSR-500/600 or PRO-106/197, you can try to monitor the FDMA portion of the county's new system.

Program your radio with two new systems (or sites), one for the north and one for the south. Set your scanner to P25 trunking and enter each set of the control channels as separate systems. You may ignore the TDMA ranges since the scanner cannot decode them!

North: 774.68125, 774.20625, 774.15625, 773.63125
South: 773.88125, 773.23125, 772.90625, 772.48125

Position	Frequency	Spacing	Format
00	851.00625	6.25	FDMA
01	762.00625	6.25	FDMA
02	851.01250	12.5	TDMA
03	762.00625	12.5	TDMA

The county is using Motorola's "Apex" series radios which include the APX 7000 for handheld use and the APX 7500 mobile radios.

The system will also employ GPS-tracking technology. Fire/EMS units will be tracked in realtime, while police officers will be polled as needed or when an officer presses the radio's emergency button. The locations will appear on a map display in the dispatch center.

As for the public's inability to monitor the TDMA talkgroups, the county may offer a media plan. No announcement has been made. The radio would cost about $5000, perhaps as much as $6000.

In addition to the privacy TDMA currently offers, about 450 of the system's 7000 radios will have encryption modules which cost about $1000 more per radio.

The county will retain a few public safety channels such as 155.685 and 155.79. One will simulcast the fire dispatch talkgroup and the other will be a telemetry circuit for firehouse alerting. The majority of the county's VHF and UHF frequencies will be returned to the FCC for re-licensing.

The current UHF-T band police dispatch channels simulcast the corresponding trunked talkgroups. The police are making the transition to the new system during January. Clinton sector has been selected as the first district to make the switch. Other police districts will follow along with corrections, sheriff and court house security and various municipalities, on their own schedule.

Analog police radios will remain in use as a back-up and the county simulcasts will continue until the county's new 9-1-1 call center is completed in Bowie in November 2010. At that point, the fire/EMS radio users will switch to the new system as well.

The trunked system is intended for use by public safety agencies only. Schools, public works, etc. will remain on existing radio systems.

Rep. Steny Hoyer, Co. Exec. Jack Johnson, PSC Dep. Dir. Wayne McBride, and Pub. Safety Dir. Vernon Herron were among many officials who attended the official launch of the county's new public safety radio network on Dec. 7, 2009 (photo by Tom Yeatman).

# # #

THE T-D-M-A DILEMMA!
Loudoun and P.G. shutting-out scanner radio listeners!

Loudoun and Prince George's counties became the first jurisdictions to deploy new digital radio technology in the Washington area for use by police and firefighters. Prince George's County officially launched its new system on Dec. 7. The next day, Loudoun County sheriff switched, followed by the county's firefighters a week later. Although Prince George's County already launched its system, the county will start migrating police and then firefighters to the system during 2010.

Scanner listeners, who are unable to monitor the new digital format, most of whom were caught off guard, have expressed concern in online forums such as Scan-DC, RadioReference and thewatchdesk.com.

Unlike the older FDMA (Frequency Division Multiple Access) technology which has been used by public safety for years, TDMA (Time Division Multiple Access) allows for two simultaneous conversations per channel. TDMA has been used by the cellular industry for years, but it is new to public safety. FDMA is commonly known as APCO Project 25 Phase 1 while TDMA is Project 25 Phase 2. But digital scanners only decode FDMA (Phase 1) -- not TDMA (Phase 2).

The Department of Homeland Security has advocated adoption of the Project 25 Phase 2 technology for all state-of-the-art first responder communications systems, says Charles Bryson, director of RCC Consultants. He adds that TDMA technology used in Project 25 Phase 2 is mandated by FCC rules for users of the new 700 MHz spectrum (47 CFR §90.535). Users of 700 MHz must employ TDMA no later than December 31, 2014. There is no current FCC rule requiring users of the 800 MHz band to eventually meet similar TDMA requirements.

In addition to Loudoun and Prince George's counties, Stafford County plans to deploy a 700 MHz TDMA system and the State of Maryland is accepting proposals for a statewide 700 MHz TDMA network as well.

The standards body developing Project 25 is the Telecommunications Industry Association (TIA).

The Association of Public-Safety Communications Officials (APCO) is the liaison between the public safety community and the manufacturers and is the organization that gave birth to "Project 25."

Many scanner listeners have expressed concern and are wondering when they can expect a TDMA-capable scanner on the market. Paul Opitz, Uniden product manager, says the current TDMA systems are not confirmed to conform to any standard (other than the proposed Project 25 Phase 2 standard). He says Uniden

has no plans to support non-standard systems (unless they happen to be supported as an unintended consequence of providing support for some standard kind of system).

"I think it isn't so much proprietary," Opitz writes in regard to Motorola's X2 TDMA technology, as "it's built around an unratified proposed standard. It [Motorola's TDMA format] may very well conform to Project 25 Phase 2 in the end, but basing development conditions on that chance could be an expensive dead end."

There is no guarantee that Motorola's X2 TDMA will be equivalent to the Phase 2 TDMA standard, and that standard is still a few years away.

What are Uniden's plans regarding Phase 2 system support, once the standard is ratified and systems operating under the standard become operational?

Opitz says Uniden has not announced any plans as of yet. "We typically study operational systems and released standards and then alpha/beta test engineering solutions before making any such announcement," Opitz noted. He says such efforts typically require three to 18 months, depending on the engineering solution required, noting that firmware-only updates are shorter while firmware with hardware upgrades take longer.

When can scanner listeners expect something to happen? "Once other jurisdictions switch to Project 25 [Phase 2] systems, we will covert to full TDMA/Phase 2," says Mary Maguire, Loudoun County fire-rescue spokeswoman. "This will also depend on the national finalization and acceptance of the Project 25 standard which is anticipated by 2012," she added.

As there are no operational systems conforming to the Phase 2 standard which technically only exists as a proposal at this time, Opitz says Uniden is with much of the industry at the "pre-evaluation stage."

There is one anomaly that may allow at least some scanner listening of the new systems. In an effort to support interoperability, these systems are configuring selected channels to support both TDMA and FDMA. The radio conversations will remain in TDMA mode, unless an older FDMA-only radio is monitoring the talkgroup. In that case, the transmissions will remain in FDMA mode which will allow scanner listeners to monitor. TDMA is preferable for these systems since it doubles the capacity of each voice channel.

# # #

NEW RADIO SYSTEM FOR U.S. CAPITOL POLICE

The U.S. Capitol Police (USCP) is progressing with its new radio system project. Sgt. Kimberly Schneider, USCP spokeswoman, provides these details from a recent department newsletter.

The radio modernization project promises to provide efficient coverage around the U.S. Capitol complex. Numerous underground tunnels, garages and subways within the Congressional office buildings have created a challenge for radio signals to penetrate with the current system, which is more than 20 years old. The radio modernization project stresses five key attributes: interoperability, security, coverage, capacity and voice quality.

This newer radio technology promises to allow the USCP to become "fully interoperable" with both federal and local law enforcement agencies within the Nation Capital Region, as well as fire/rescue and emergency medical responders.

The radio system will be digital, trunked and encrypted!

Two new USCP communications centers will allow dispatchers to operate up to 13 channels at one time, which will enhance capabilities during special events, such as inaugurations, July 4th celebrations, demonstrations, and/or multiple critical incidents. USCP communications personnel will be assigned to both the primary and mirror centers, which will ensure that radio operations are not interrupted.

Three communications training consoles will also be installed at the Training Services Bureau in Cheltenham, which will be utilized to assist all USCP entities during training scenarios.

The radio modernization project is expected to be completed by early 2012. Sgt. Schneider says the project is currently in its design phase which is expected to be completed during January. A vendor will then be selected. The procurement and radio facilities construction work will begin after that and continue through much of 2010. The full radio modernization project is scheduled to be completed in the spring of 2012.

# # #

STARS

STATEWIDE AGENCIES RADIO SYSTEM

Virginia's STARS network reaches Northern VA!

The Commonwealth of Virginia's new statewide radio network has reached the D.C. suburbs, with sites in Arlington and Fairfax going online during the end of 2009.

Virginia signed a $329 million contract with Motorola on July 14, 2004 for the design, construction and implementation of the STatewide Agencies Radio System (STARS) which will serve 21 state agencies.

Those 21 agencies are: The Chesapeake Bay Bridge-Tunnel police, Alcohol Beverage Control, Charitable Gaming, Capitol Police, Conservation & Recreation, Corrections, Emergency Management, Environmental Quality, Fire Programs, Forestry, Game & Inland Fisheries, Health, Juvenile Justice, Military Affairs, Mines, Minerals & Energy, Motor Vehicles, State Police, Transportation, Information Technologies, Marine Resources and Port Authority.

Testing of the system began four years ago in Richmond. Testing of STARS sites in Northern Virginia began in December 2009.

Although it serves multiple agencies, STARS is designed geographically around the seven VSP divisions. The Network Operations Center (NOC) is at the state police HQ (SPHQ). STARS is divided into two zones with a master site in Richmond for the east (Divisions 1, 2, 5 and 7) and one in Salem for the west (Divisions 3, 4 and 6). STARS is now fully operational in Divisions 1, 2 and 5. Remaining divisions will be fully operational no later than the spring of 2010.

A redundant microwave network links the 117 STARS sites. At least 48 sites are a combination of VHF/microwave and 69 are microwave only. Municipal agencies may install transceivers at STARS sites to be used as needed for patching with STARS.

State police command staff (sergeants and above) have encryption in their radios. In addition, all criminal investigators, the tactical team, executive protection, Counter-Terrorism & Criminal Interdiction, and canine officers, all dispatch consoles, and all STARS and communications division units will have encryption as well.

The encryption is user selectable and the codes can be changed using over the air rekeying (OTAR). Fortunately for scanner listeners, it appears the state police intend to keep encryption disabled for routine dispatching. The STARS training manual states that "Encryption would be justified in circumstances involving responses to civil disorder, weapons of mass destruction (WMD) incidents, narcotics enforcement investigations or whenever the end user must pass sensitive information that should not be heard by the general public."

Mobile Computer Terminal (MCT) data is carried over the voice channels, but voice traffic always has priority.

State troopers are being assigned Motorola ASTRO XTL 5000 and ASTRO XTL 2500 mobile radios, and the XTS 5000 for portable use. The trunked radios automatically affiliate with the strongest available transmitter site. An analog Motorola CDM750 low-band radio will be installed in VSP vehicles for 39.54, the Statewide Interdepartmental Radio System (SIRS), which will continue to be used by Virginia law enforcement.

Each trooper's vehicle is equipped with a Digital Vehicle Repeater System (DVRS) – an even more intelligent version of the old mobile/vehicle "pack rat" repeater. The DVRS relays conversations between the VHF mobile radio and the trooper's portable 700/800 MHz radio.

The XTS 5000 portable radios operate on the 700/800 MHz bands only. VSP's XTS 5000s depend entirely on the DVRS to connect them with the VHF-based STARS network. Mobile radios are VHF only, and are unable to access the 700/800 MHz channels which are exclusively programmed in the portable radio. The DVRS, however, allows the portable radio to access the VHF channels in the mobile radio, but not visa versa.

The portable radio may be used to change talkgroups within a single zone on the mobile radio, but it cannot change between zones. Regardless of what talkgroup the multiple users are on, all portable radios sharing the same DVRS will hear the same radio traffic. Using a discrete 700 MHz frequency, portable radio users can speak directly with each other on simplex or use the DVRS in the "local" mode as a standalone repeater without the VHF radio accessing STARS!

Although we do not have the actual talkgroup IDs, we do have one of the VSP talkgroup fleetmaps (see page

9). The last digit in most talkgroup names designates the VSP division. Zones 1 to 7 correspond to each of the seven VSP divisions: Richmond, Culpeper, Appomattox, Wytheville, Chesapeake, Salem and Fairfax (see map on page 7).

STATE_1 is intended for statewide interoperability and, unlike the other talkgroups ending in "1", is not specific to Division 1. VSP BLUE is an incident-based VSP tactical talkgroup. VSP_DIR is for portable to portable communication (programmed in portable radios only).

MCALL (Mutual Call) will be used by other STARS users to contact a VSP dispatcher. INOP_LE is intended for interoperability between state police and other law enforcement. INOP_PS is similar but used with public safety agencies. MUTUAL talkgroups are non-dispatcher controlled tactical channels for any STARS radio user (troopers are instructed to keep this talkgroup in their scan list). Dispatchers will connect outside agencies into STARS over the COMLINC VoIP-based interoperability network.

Zones 15 and 16 are the current conventional VHF VSP channels.

VCALL10/VTAC (Zone 21) are conventional VHF channels for interoperability. NC1CALL/IR_# (Zone 22) are federal non-law enforcement interoperability conventional channels. LE_A/LE_# (Zone 23) are conventional channels for use with federal law enforcement.

Zone 24 is the Transportable Communications Site (TCS). The TCS is a five-channel 800 MHz self-contained P25 trunking system mounted in a trailer with generator and a cache of 50 portable radios. All STARS 700/800 MHz portable radios are programmed to work with this system.

7CALL/7TAC/7FIRE/7MED/7LAW (Zones 25-28) are the national 700 MHz conventional interoperability channels. 8CALL/8TAC (Zone 29) are the national 800 MHz conventional mutual aid channels. RINS (Zone 30) are the Regional INterservice conventional channels used in the D.C. area, also known as the COG channels. Channels that end in "D" or "Dir" are direct (simplex).

The APCO Website lists these various interoperability frequencies in an Excel spreadsheet.

Zone 31 contains three 800 MHz conventional channels used for interoperability in the state's eight tunnels. VSP is always the "A" channel. A radio channel from the municipality on either end of the tunnel will be broadcast in the tunnel on the "B" and "C" channels. Communications from outside the tunnel will be re-broadcast within the tunnel. Eight in-tunnel amplifier systems have been installed in the Hampton Roads, Monitor-Merrimac, Midtown, Downtown, CBBT 1 and 2, Big Walker Mountain, and East River Mountain tunnels.

All STARS agencies have access to STARS_DIR, a 700 MHz simplex frequency used for on-scene inter-agency communication.

The VSP Fairfax division sites were tested in December 2009. Salem, Appomattox and Wytheville divisions are scheduled to be operational during April, May and June, with full system acceptance scheduled for June or July 2010.

Shown are a STARS XTL 5000 and a CDM750 SIRS radio installed in a VSP vehicle at a division open house in Salem. STARS installations also include the siren/light controller (at top). The XTL 5000's display shows:

VR (Vehicular Repeater) which is OFF but it is set to VR CH-42-A (765.71875). Zone 16 (Z16) is one of the two zones for the current conventional (CV) VSP channels (see chart on page 9). The frequency for SALM 2 is 159.0 [146.2] (photo by Darrell Rayfield).

# # #

Richard Rowland, who has been monitoring STARS since its infancy in Richmond, provides this report on monitoring the system's installation shop.

Monitoring STARS radio installations
By Richard Rowland

Virginia started installing STARS mobile radios in late 2005. A newspaper article carried a story about the new radio system and that Motorola had rented a large building to use for radio installations. No address or location for the building was given.

Stumbling across a building one day where 15 to 20 VSP blue and gray marked cars were parked on Midlothian Turnpike called for a closer inspection. This build-

ing was the old Sears Roebuck Tire America at the Cloverleaf Mall shopping center. The STARS install shop indeed it was.

From then on it was like shooting fish in a barrel. Not only VSP, but at varied times vehicles from Game & Inland Fisheries, Forestry, Corrections and Marine Resources would be there. It was easy to see which agencies were getting radios. The list goes on and on with lots of unmarked vehicles which could not be identified. One thing for sure, they were getting STARS radios.

When an install was complete, the vehicle was returned to the parking lot and, if so equipped, the siren and colored or flashing lights were checked. The Motorola siren and light controller are part of the "STARS package" as well.

After several vehicles were completed, a radio tech would check the radio's mobile and portable alias. The alias usually consists of a combination of six to nine letters and numbers that identify the radio in the system.

Testing sounds something like this: *8100 to the NOC (Network Ops Ctr) for an alias check please. This is NOC, I am reading Sierra Papa 131 Mike (or simply, SP131M). 10-4, 8100 clear. You're welcome, NOC out.*

SP designates State Police, followed by a unique three-digit number and an "M" for mobile. A similar procedure would be repeated for portable radios using "P". Some aliases have been unique, such as one for Marine Resources, which is MRC BOAT 13.

Included in most testing is a confirmation that an alarm for the mobile, control head, the door post and the portable are also working. So far an audible signal has not been detected during the alarm tests.

All this was in easy view when the shop was at Cloverleaf Mall. When Chesterfield County officially purchased the mall property, the install shop lost its lease and moved to Midlothian Turnpike. The shop is now more secluded and out of sight on Southlake Blvd. in the vicinity of Johnson Willis Hospital.

All testing comms are through the Richmond control channel with the repeater on the tower at the VSP headquarters on Midlothian Turnpike. SPHQ can be heard beyond Richmond when other sites are linked or affiliate with the Richmond site.

There are eight training talkgroups, A through H. When a great number of installs take place, the classroom is filled with students being taught how to use the new radios. You will not hear a lot of activity on the training talkgroups, sometimes more like several microphones are stuck and the instructor's voice is heard in the background.

In summary, in order to keep up with installs you have to lock-out a few talkgroups. These include, but are not limited to, VSP dispatch, Corrections, and Game & Inland Fisheries. These are so talkative that they lend little opportunity to hear anything else.

When a large number of installs take place and the students return to pick up their vehicles at the end of the day it is a good time to find talkgroups. Keep your scanner in the open or search mode. Upon departure from the install shop is when the radio checks and the chatter starts.

Having kept track of the aliases you heard previously you have a good idea who is using the talkgroup you may be monitoring, its name and agency ID or assignment. This will be valuable when the various agencies begin using the new radios.

At one time it was suspected that installs for each division would take place at varied locations throughout the state. This is not holding true, as it appears that regardless of the agency or its location, the install is done in Richmond.

Motorola hired several sub-contractors to assist with tower work and installs and has employees who work on the towers or at the install shop. Subcontractors include Clear Communications in Charlottesville, Commtronics in Ettrick, Gately Communications in Hampton and Radio Communications of Virginia in Richmond.

<u>STARS can be monitored using the right scanner!</u>

Unencrypted STARS talkgroups can be monitored if you have a P25-capable digital scanner. I am in Richmond and monitor STARS on the Radio Shack Pro-96 and Pro-2096. Programming is via Win96 software. Other software programs may work; however, I am not familiar with them. STARS requires us to program extended tables as shown below. The tables cannot be programmed via the keyboard on the Pro-96/2096. Using Win96 programming software, click the "Extended Tables" tab, and enter the appropriate tables shown below:

<u>STARS TABLES Custom Table:</u>

##	CH Lo	CH Hi	Base Freq	Offset	Step
00	00000	04095	851.00625	00000	6.25
01	04096	08191	762.00625	04096	6.25
02	08192	12287	136.00000	08192	2.50
03	12288	16383	146.00000	12288	2.50
04	16384	20479	156.00000	16384	2.50
05	20480	24575	166.00000	20480	6.25
06	24576	28671	136.00000	24576	6.25
07	28672	32767	161.59375	28672	6.25

Enter each site as a separate system. With the assistance of RadioReference and Pro96Com, here are frequencies for Northern Virginia STARS sites.

Spotsylvania, Thornburg (Site 106)
151.18250, 152.09750, 159.20250, 159.39750

Madison, Fork Mountain (Site 107)
151.04750, 151.21250, 151.28000, 152.08250, 152.71250

Warren, Hogback Mountain (Site 108)
151.36250, 151.39250, 152.21750, 159.00750, 159.12750, 159.23250, 159.38250

Fairfax, Fairfax (Site 117)
152.20250, 159.09250, 159.24750

Prince William, Independent Hill (Site 118)
151.02500, 151.34750, 151.46750, 152.54750

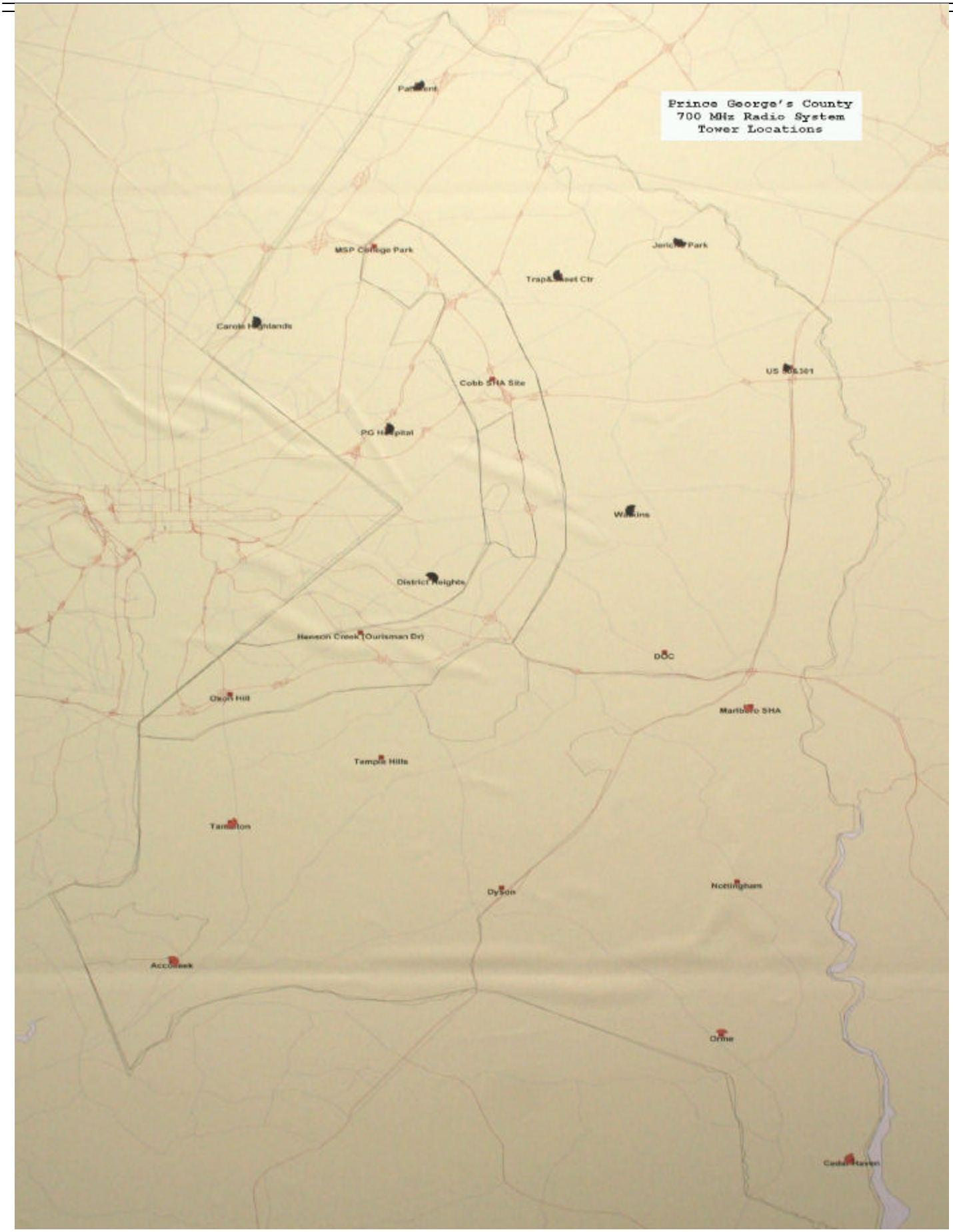
Arlington, Arlington (Site 119)
152.53250, 159.11250, 159.26250

Loudoun, Mount Weather (Site 123)
152.50250, 152.80250, 159.15750, 159.41250

King George, Edgehill (Site 127)
152.51750, 152.81750, 158.75250

Greg Guise snapped this photo of the Fairfax County STARS tower (Site 117). He says the new self-supporter is just northwest of the existing 240-foot tower. Greg says they are using open-dipole antenna(s).

The map shows the seven VSP divisions which coincide with the STARS geographic implementation.


Prince George's County
700 MHz Radio System
Tower Locations
Parliament
MSP College Park
Jericho Park
Trap & Skeet Ctr
Carole Highlands
Cobb SHA Site
US 50 & 301
PG Hospital
Williams
District Heights
Henson Creek (Ourisman Dr)
DOC
Okon Hill
Marlboro SHA
Temple Hills
Tamarton
Dyson
Nottingham
Accokeek
Orme
Cedar Haven

VSP STARS TALKGROUP FLEETMAP

Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 15	Zone 16	Zone 18	Zone 19	Zone 20
VR31	VR3	VR13	VR19	VR26	VR35	VR47	VR11	VR42	VR2	VR2	VR2
RICH_1	**CULP_1**	**APMX_1**	**WYTH_1**	**CSPK_1**	**SALM_1**	**FRFX_1**	**CV-TAC**	**CV-TAC**	**M CALL-1**	**INOP_LE_1**	**INOP_LE_6**
RICH_TAC1	**CULP_TAC1**	**APMX_TAC1**	**WYTH_TAC1**	**CSPK_TAC1**	**SALM_TAC1**	**FRFX_TAC1**	**CV-RICH1**	**CV-RICH2**	**M CALL-2**	**INOP_PS_1**	**INOP_PS_6**
RICH_2	**CULP_2**	**APMX_2**	**WYTH_2**	**CSPK_2**	**SALM_2**	**FRFX_2**	**CV-TAC**	**CV-TAC**	**M CALL-3**	**COMLINC_1**	**COMLINC_6**
RICH_TAC2	**CULP_TAC2**	**APMX_TAC2**	**WYTH_TAC2**	**CSPK_TAC2**	**SALM_TAC2**	**FRFX_TAC2**	**CV-CULP1**	**CV-CULP2**	**M CALL-4**	**INOP_LE_2**	**INOP_LE_7**
RICH_3	**CULP_3**	**APMX_3**	**WYTH_3**	**CSPK_3**	**SALM_3**	**FRFX_3**	**CV-TAC**	**CV-TAC**	**M CALL-5**	**INOP_PS_2**	**INOP_PS_7**
VSP_BLUE1	**VSP_BLUE2**	**VSP_BLUE3**	**VSP_BLUE4**	**VSP_BLUE5**	**VSP_BLUE6**	**VSP_BLUE7**	**CV-APX1**	**CV-APX2**	**M CALL-6**	**COMLINC_2**	**COMLINC_7**
M_Call-1	**M_Call-2**	**M_Call-3**	**M_Call-4**	**M_Call-5**	**M_Call-6**	**M_Call-7**	**CV-TAC**	**CV-TAC**	**M CALL-7**	**INOP_LE_3**	**MUT_INV1**
INOP_LE_1	**INOP_LE_2**	**INOP_LE_3**	**INOP_LE_4**	**MComm5-A**	**INOP_LE_6**	**INOP_LE_7**	**CV-WYTH1**	**CV-WYTH2**	**MUTUAL 1**	**INOP_PS_3**	**MUT_INV2**
INOP_PS_1	**INOP_PS_2**	**INOP_PS_3**	**INOP_PS_4**	**INOP_LE_5**	**INOP_PS_6**	**INOP_PS_7**	**CV-TAC**	**CV-TAC**	**MUTUAL 2**	**COMLINC_3**	**MUT_INV3**
COMLINC_1	**COMLINC_2**	**COMLINC_3**	**COMLINC_4**	**INOP_PS_5**	**COMLINC_6**	**COMLINC_7**	**CV-CSPK1**	**CV-CSPK2**	**MUTUAL 3**	**INOP_LE_4**	**MUT_INV4**
MUTUAL_1	**MUTUAL_2**	**MUTUAL_3**	**MUTUAL_4**	**COMLINC_5**	**MUTUAL_6**	**MUTUAL_7**	**CV-TAC**	**CV-TAC**	**MUTUAL 4**	**INOP_PS_4**	**MUT_INV5**
STATE_1	**STATE_1**	**STATE_1**	**STATE_1**	**STATE_1**	**STATE_1**	**STATE_1**	**CV-SALM1**	**CV-SALM2**	**MUTUAL 5**	**COMLINC_4**	**MUT_INV6**
VSP_DIR_1	VSP_DIR_2	VSP_DIR_3	VSP_DIR_4	VSP_DIR_5	VSP_DIR_6	VSP_DIR_7	**CV-TAC**	**CV-TAC**	**MUTUAL 6**	**INOP_LE_5**	**MUT_INV7**
							CV-FRFX1	**CV-FRFX2**	**MUTUAL 7**	**INOP_PS_5**	
							CV-TAC	**CV-TAC**	**STATE 1**	**COMLINC_5**	
							CV-SURV	**CV-SURV**			

Zone 21	Zone 22	Zone 23	Zone 24	Zone 25	Zone 26	Zone 27	Zone 28	Zone 29	Zone 30	Zone 31	Zone 32
VR14	VR27	VR27									VR1/4
VCALL10	**NC1CALL**	**LE A**	TCS-01	7CALL50	7CALL70	7FIRE63	7LAW61	8-CALL	RINS1	TUNNEL_A	**REGROUP**
VTAC11	**IR 1**	**LE 1**	TCS-02	7CALL50D	7CALL70D	7FIRE63D	7LAW61D	8-CALL-DIR	RINS1-DIR	TUNNEL_B	**Maint-1**
VTAC12	**IR 2**	**LE 2**	TCS-03	7TAC51	7TAC71	7FIRE64	7LAW62	8-TAC1	RINS2	TUNNEL_C	Maint-2
VTAC13	**IR 3**	**LE 3**	TCS-04	7TAC51D	7TAC71D	7FIRE64D	7LAW62D	8-TAC1-DIR	RINS2-DIR	STARS_DIR	Maint-3
VTAC14	**IR 4**	**LE 4**	TCS-05	7TAC52	7TAC72	7MED65	7LAW81	8-TAC2	RINS3	ORION TAC1	Maint-4
VFIRE21	**IR 5**	**LE 5**	TCS-06	7TAC52D	7TAC72D	7MED65D	7LAW81D	8-TAC2-DIR	RINS3-DIR	ORION TAC2	Maint-5
VFIRE22	**IR 6**	**LE 6**	TCS-07	7TAC53	7TAC73	7MED66	7LAW82	8-TAC3	RINS4	ORION TAC3	Maint-6
VFIRE23	**IR 7**	**LE 7**	TCS-08	7TAC53D	7TAC73D	7MED66D	7LAW82D	8-TAC3-DIR	RINS4-DIR	ORION TAC4	Maint-7
VFIRE24	**IR 8**	**LE 8**	TCS-09	7TAC54	7TAC74	7FIRE83		8-TAC4	RINS5	ORION TAC5	
VFIRE25	**IR 9**	**LE 9**	TCS-10	7TAC54D	7TAC74D	7FIRE83D		8-TAC4-DIR	RINS5-DIR		
VFIRE26	**HRN_FIOP**		TCS-11	7TAC55	7TAC75	7FIRE84			RINS6		
VMED28	**ALEX_FIOP**		TCS-12	7TAC55D	7TAC75D	7FIRE84D			RINS6-DIR		
VMED29	**MANA_FIOP**		TCS-13	7TAC56	7TAC76	7MED86			PMARS		
VLAW31	**FRED_FIOP**		TCS-14	7TAC56D	7TAC76D	7MED86D			PMARS-DIR		
VLAW32			TCS-15			7MED87					
			TCS-16			7MED87D					

Zones 8 to 14 are blank; Zone 17 is receive only of the 7 NOAA weather channels (WX-1 to WX-7).

Talkgroups in **BOLD** are accessible using mobile or portable radios; all others are portable radio only.

The Capitol Hill Monitor
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Please address all correspondence to Alan. We encourage readers to submit material and write articles that relate to the hobby. All submissions are subject to editing for style and content. When submitting material please make certain we can contact you should we have any questions. We welcome frequency and visitor requests, but please include a reply envelope.

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