

# AGENDA

## WORCESTER COUNTY COMMISSIONERS

Worcester County Government Center, Room 1101, One West Market Street, Snow Hill, Maryland 21863

**July 31, 2018**

- 1:00 PM - Meet in Commissioners' Room 1101 Government Center, One West Market Street, Snow Hill, Maryland
  
- 1:01 PM- Call to Order, Prayer, Pledge of Allegiance
- 1:02 PM- Introductions
- 1:03 PM - Work Session on P25 Radio Project
  
- 3:00PM- Session Ending

**AGENDAS ARE SUBJECT TO CHANGE UNTIL THE TIME OF CONVENING**

**Hearing Assistance Units Available - see Kelly Shannahan, Asst. CAO.**

Please be thoughtful and considerate of others.  
**Turn off your cell phones & pagers during the meeting!**



OFFICE OF THE  
COUNTY COMMISSIONERS

## Worcester County

GOVERNMENT CENTER  
ONE WEST MARKET STREET • ROOM 1103

SNOW HILL, MARYLAND

21863-1195

HAROLD L. HIGGINS, CPA  
CHIEF ADMINISTRATIVE OFFICER  
MAUREEN F.L. HOWARTH  
COUNTY ATTORNEY

COMMISSIONERS

DIANA PURNELL, PRESIDENT  
THEODORE J. ELDER, VICE PRESIDENT  
ANTHONY W. BERTINO, JR.  
MADISON J. BUNTING, JR.  
JAMES C. CHURCH  
MERRILL W. LOCKFAW, JR.  
JOSEPH M. MITRECIC

To: County Commissioners

From: Harold Higgins, Chief Administrative Officer *HH*

Re: P25 Radio Project

Date: July 25, 2018

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At your meeting on July 17, 2018, you asked for the following information regarding the radio project. Below each question/information request is the answer:

1. Meeting notes from the Ocean Pines meeting with Harris- See Attachment 1 (p.4-6).
2. Phone app for reporting issues- completed and disseminated on July 24, 2018. The email was forwarded to you.
3. Checklist- If the phone app was not workable a written checklist was to be provided to the radio users for reporting issues- currently not needed.
4. Mitigation Plan- This is referencing a Mitigation Plan the County was to create to deal with the interference issue. This was not a task for Harris to complete. See the presentation on interference in Attachment 5 (p. 17-30).

Emergency Services staff have been identifying sources and levels of interference, when present, as well as mapping the signal level of our radio system. Staff continues to perform due diligence related to interference mitigation in order to ensure optimal call quality and call delivery. It is important to note that this interference is known to exist primarily in the months of May and June each year and no measurable interference has been recorded by staff since the second week of July.

Emergency Services staff, working with the FCC Regional Planning Committee, have identified eight potential new 800MHz frequencies and eight new 700MHz that may be licensable to Worcester County. Staff has reviewed these frequencies and identified, by location, potential co-channel issues and also started the process of performing routine monitoring of the channels with test equipment. It is the recommendation of Emergency Services that we continue to work parallel paths regarding interference and suggest our resolution to be prioritized as follows: resolving existing coverage deficiencies, increasing County wide signal levels, migrating to cleaner 800MHz frequencies (if

identified as such) and as a final option migrating to cleaner 700MHz frequencies (if identified as such).

5. Microwave link for the Mystic- Central connection- See attached timeline (Attachment 2) and Gantt chart (Attachment 3) related to Harris completing the Project (p. 7-10).

Eastern has all the equipment to finish the Alcatel Lucent 9500 Microwave Radio Link except the radios. The radios are custom built. Once we receive the radios, it will be about 2 weeks of construction to complete the Mystic site. Our staff and Harris have been actively trying to push the delivery of the radios.

Emergency Services is discussing with Eastern Communication a temporary solution for Mystic connectivity. We have agreement in principle (pending approval of their owner) for Eastern to provide labor and configuration support required to get us a connection via Ocean City using some very inexpensive gear (we have grant funds to cover this) as a temporary solution that will become a back-up once the permanent link is in. The manufacturer of that gear believes this equipment could be here in 2-3 days from the order. This temporary link, while not sufficient for permanent operation of the system, would be utilized to conduct formal coverage acceptance testing and characterization of the coverage footprint of the Mystic Harbour Tower Site.

6. Master list of Issues Addressed- See Attachment 4 (p.11-16).

7. 700 MHz

Emergency Services has reached out to several sources for assistance in identifying 700MHz frequencies that could potentially be licensed to Worcester County as well as conducted a very high level review of what would be required to execute such a task.

- There are a total of 8 channel pairs that, per the FCC Regional Planning Committee, are within licensable contours for Worcester County. Of these 8 channel pairs, all but 2 are used within areas known to propagate to us during tropospheric ducting conditions including Philadelphia, Newark, NJ, Camden, NJ and Passaic, NJ. Plus there are others very close to us and likely to present co-channel issues including use by the State of Maryland in Baltimore and Annapolis.
- The following equipment at each tower site is not compatible with 700MHz frequencies and would require replacement:
  - Antennas
  - Tower Top Amplifiers
  - Receive Multicouplers
  - Transmit Combiners
  - Power Amplifiers
  - Transmit Modules

-Receive Modules

- Based on a review of our contract pricing, Emergency Services estimates that the replacement of these components would cost approximately \$289,500 per tower site (\$1,737,300 total). Additionally, these components cannot be changed while the system is live. As a result, after casual consultation with the Harris System Engineer, in order to perform this work without taking the radio system offline for a period of a week or more we would need to essentially bring an entire new radio system in and make a hard switch as we did when moving from EDACS.
  - The County is currently still using 800MHz only portable radios within County Roads, Landfill, Water Wastewater, Maintenance, DRP, Environmental Programs, Pocomoke City DPW, Snow Hill DPW and OPA DPW at approximately \$1,500/each. Additionally there are approximately 15 desktop radios (at approximately \$9,250/each) While a full inventory is needed to quantify the number to be replaced, a high level review indicates that this would be approximately \$500,000.
  - Finally there are approximately 7 in-building amplifiers in the County that are 800MHz only. A vendor would need to inventory each component within these systems to determine what items need to be replaced, however, it could be estimated at approximately \$12,500/each. Additional consideration is needed to determine the method of accomplishing a modification to these devices that are privately owned within private businesses.
8. Coverage Testing- Per conversations with DNR we have until the second week of September assuming no major weather event that causes the trees to turn sooner.
9. Federal Engineering- FE will be attending the work session to make themselves available for questions and to gain a better understanding of the Commissioners' needs.



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EMERGENCY SERVICES

**Worcester County**

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FRED E. WEBSTER, JR.  
DIRECTOR

### OCEAN PINES / HARRIS RADIO DISCUSSION

On 26 July 2018, at the request of Commissioner Chip Bertino, a meeting was held at the Ocean Pines Fire Department South Station. In attendance were Commissioner Bertino, County Chief Administrative Officer Harold Higgins, Ocean Pines Fire Chief Steve Grunewald, Deputy Chief Bill Bounds, Emergency Services Director Fred Webster and Assistant Director James Hamilton. Representing Harris Corporation were Worcester County Project Manager Brian Blacktor, Sales Representative Jim Magee, Local Service Technician Guy Sterling, Worcester County Project Engineer Oyetunde (Daniel) Jolaoye, System Sales Engineer Don Griffis, Projects Manager Prem Kumar and a software developer from the company.

The Ocean Pines Fire Department and County staff expressed several concerns regarding the current operational capabilities of the P-25 radio system. Most of these issues relate to performance of the system in call delivery. Significant discussion occurred regarding modeled and tested performance of the system. Within the Ocean Pines area in particular, testing indicates that the system is delivering sufficient signal, per contractual requirements, and should be supportive of high quality communication. Several documented incidents have been reported however where communication has been significantly degraded. Extensive testing by both Harris and the County has indicated that significant interference is being received to the County's licensed frequencies from up and down the East Coast. This interference is caused by atmospheric conditions known as Tropospheric Ducting and significantly impacts radio spectrum particularly in early summer. This season has been particularly challenging and has impacted us as well as Ocean City, Somerset County, Wicomico County and the State of Maryland. Harris has delivered RF recording equipment to the County to help identify interference sources to develop a mitigation plan.

The following is a bullet point list of items that were discussed during the meeting:

- Ocean Pines FD expressed several issues related to call delivery, specifically citing a water rescue that occurred off of "the point".

- Harris provided overview of system design, initial coverage testing results and interference that the system has experienced.
- All parties engaged in an extended discussion of interference and the path forward including responsibilities to mitigate interference.
- County staff and Ocean Pines expressed concern regarding the stability of software within subscriber equipment that has caused significant resources to be expended for radio reprogramming. Harris representatives present acknowledged software bugs and pledged to provide beta software for testing by select users and county staff prior to next release. Harris has agreed to provide pre-release software to the County in addition to “demo radios” so that the pre-release software may be tested by both County staff as well as system end users. This will allow the County to have an opportunity to beta test software before it is loaded into operational radios.
- County staff expressed concern regarding the lack of individual call functionality between the Ocean City and Worcester County systems.
- Commissioner Bertino expressed a concern reported to him by the Sheriff’s Office that officers need to talk into their microphones. Harris responded that county staff could “tweak” individual radio programming to the individual user and microphone being used to attempt to overcome this as the expense of picking up additional background noise.
- Harris staff displayed some new models of radios including the XL-185p, XL-200p and some prototype fire service specific models and accessories that were not available when the County purchased the system. Ocean Pines staff expressed that they would prefer these models.
- The need for an antenna reconfiguration at Central Site to better serve the Newark area.
- Issue related to vendor equipment configuration or specification involving generators and UPS systems at the Pocomoke and Mystic Harbour locations.

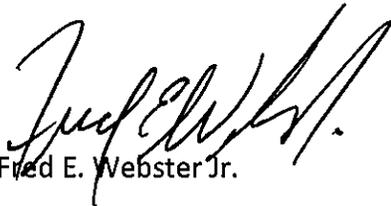
The following were identified as action items at the conclusion of the meeting:

- Harris to assist the county with keeping pressure on Eastern Communication (a Harris dealer contracted separately by the county) to deploy microwave connectivity to the Mystic Harbour tower site.
- Harris to provide a mobile app or paper log to help Harris identify locations where signal strength seemed to be a problem. Radio users would use the app (or log) to do real time reporting to Harris.
- Harris to assist County Emergency Services with identifying interfering signals and developing a mitigation plan. The Mitigation Plan for the interference issue is the County responsibility though.

- Harris to perform an audit of radio installations in Ocean Pines fire department vehicles.
- Harris to provide beta software and loaner radios (2 for each firehouse- 20 total) for new software testing
- Harris to continue to work to perform formal coverage testing upon the completion of network connectivity to the Mystic Harbour tower and then use that data to make coverage adjustments where required.

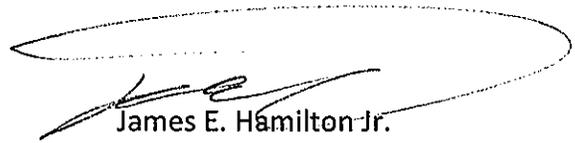
The meeting was adjourned shortly after 12 noon.

As prepared by



Fred E. Webster Jr.

Director of Emergency Services  
Services



James E. Hamilton Jr.

Assistant Director Emergency

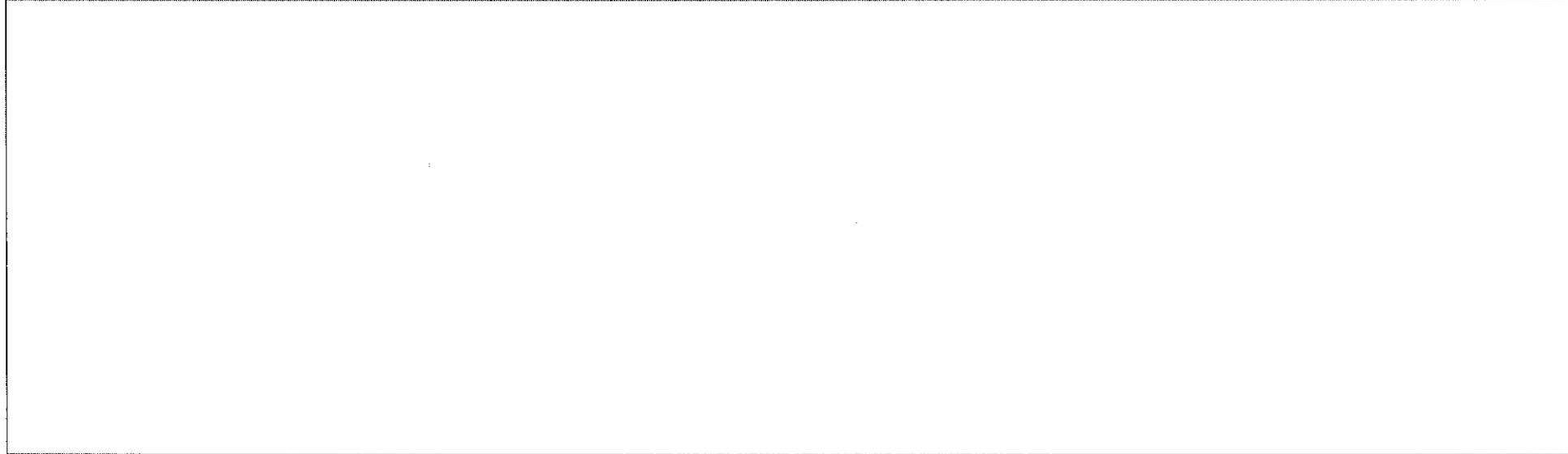
## MYSTIC TIMELINE

- Mystic Harbour Water Tower offered by the County as a potential site within the P25 Radio System RFP. Harris selected this sites and it was incorporated into the contract.
- At the recommendation of the Harris sales staff, County staff were advised that microwave backhaul could be obtained at a much lower cost by procuring the equipment and services from another Nokia dealer rather than directly from Harris.
- Worcester County issued a Notice to Bidders on November 17, 2015 with Eastern Communications being the sole bidder. The Commissioners approved a contract on January 19, 2016 with Eastern Communications for the design, procurement of equipment and installation of the microwave link components. The microwave link consists of a pair of dishes (antennas), waveguide (connecting cable) and radios at each of the sites (Mystic and Central).
- On February 27<sup>th</sup>, 2016, Infinity Engineering working as a subcontractor for Eastern Communications performed an initial path study of the microwave link between Central Site tower and the Mystic Harbour Water Tank. This path feasibility study was provided to the County on March 17<sup>th</sup>, 2016.
- Harris, on behalf of the County, filed Antenna Structure Registration paperwork with the FAA. The FAA performed an Obstruction Evaluation and provided approval for antenna installation on the water tower if the County would install obstruction lighting on the structure.
- On May 9, 2016, the Maryland Aviation Administration (MAA) notified the staff that they had reviewed the FAA application and based upon COMAR 11.03.05 were asserting concurrent authority to block the installation of any antenna equipment on the water tower. This effectively stopped any work related to the Mystic Harbour location while County staff and Harris evaluated multiple options to meet contractual coverage requirements without the use of the water tower structure.
- County staff had dialog with Eastern Communications on June 17<sup>th</sup>, 2016 to provide an update regarding possible alternate tower sites and Eastern took a stand-by posture pending a new site location. Eastern advised that once a site was selected they would require 12-16 weeks to complete installation and testing of the link.
- County staff and Harris, working with the Maryland Aviation Administration and Ocean City Airport spent time through the summer of 2016 attempting to find an acceptable option for existing and new structures that would be acceptable to the Maryland Aviation Administration.
- On October 4, 2016, the County Commissioners approved the construction of a new tower to be constructed on the Mystic Harbour property but to remain under the height required by the MAA.
- On October 17<sup>th</sup>, 2016, Eastern Communications was notified that pre-construction engineering was about to begin for construction of the new tower. Eastern immediately began a new path feasibility study and advised that they would be ready to complete the full path study once the tower was erected.
- Following performance of required Coverage Acceptance Testing in the summer of 2017, Harris provided the County a coverage testing report on September 15, 2017. Harris elected to delay construction of the Mystic Harbour site while determining if an alternate site location could produce a result allowing the system to pass contractual coverage requirements (which they had failed).
- On October 17, 2017, the Commissioner reviewed the coverage testing report and sent Harris a response letter on October 20, 2017.

- County staff had a conferences call with Harris on December 14, 2017, and the Commissioners sent a second letter to Harris on December 21, 2017.
- County staff had a conference call with Harris on January 12, 2018.
- On January 25, 2018, County staff had an in person meeting with a number of Harris staff.
- Eastern Communications checked in several times through December 2017 and January 2018 to determine when the tower would be constructed so that they could complete engineering and installation.
- In January of 2018, the Eastern Communications project manager retired and a new project manager was assigned.
- In the first week of February 2018, County officials and Harris reached an agreement for beneficial use of the radio system that included the construction, as designed, for the Mystic Harbour Tower Site. Eastern Communications was notified by both Harris and County (on 2/6/18) staff to proceed with microwave work.
- Work started on February 19<sup>th</sup> with the contractor grading the site, pouring foundation, awaiting inspections, etc. The foundations had to cure before the shelter could be delivered or tower erected. On February 28<sup>th</sup>, 2018 the shelter and tower were delivered and installed at the Mystic Harbour site. Site work continued throughout the week to place fencing, stone and other miscellaneous items.
- ✕ • Upon notification to Delmarva Power that the site was ready for power, it was determined that changes to the electrical delivery system were required. Emergency Services staff, working with Public Works Water/Wastewater and the subcontracting electrician (Carter's Electric) determined that an abandoned transformer on the site needed to be replaced with a switching cabinet and a new single phase transformer installed. This required a "demolition approval" from the County to Delmarva Power, payment for redesign of the electrical distribution system and then two days of field work by Delmarva Power.
- Eastern Communications and their subcontractor conducted an additional site survey on April 2<sup>nd</sup>, 2018 at both the Central Site and Mystic Harbour tower sites.
- Throughout April and May 2018, County staff worked several times per week with Eastern Communications staff on roaming between Ocean City and Worcester County. During these activities we conversed every few days with Eastern staff regarding the microwave link. Eastern assured us that everything was going well and they were working on the equipment.
- Power was provided to the location by May 23<sup>rd</sup>, 2018.
- ✓ • On June 8<sup>th</sup>, 2018, County staff had a meeting with the Eastern Communications project manager who advised that there had been a miscommunication with their subcontractor and the order was just being placed with Nokia.
- During the month of June, County staff sent weekly emails to Eastern Communications requesting installation dates along with Harris having weekly contact with them for updated status. During this period all parties were advised that everything was on-track however an install date was not yet available but would be in mid-July.
- ✓ • Staff sent weekly emails to Eastern between the weeks of June 25<sup>th</sup> through the week of July 9<sup>th</sup> requesting updates however did not receive a direct response. Our Harris Project Manager stated throughout this period that he was speaking to Eastern weekly and had also been in touch directly with the Nokia factory and determined that the factory did not receive a final order with appropriate configuration information from Eastern Communication's subcontractor (Infinity Engineering) until June 28<sup>th</sup> however at this point everything was moving and the anticipated delivery time for the Nokia equipment would be 4-6 weeks from June 28<sup>th</sup>.

- On July 16, 2018, County staff reached out to senior management at Eastern Communications to advise that we have been unable to get an answer on the status for two to three weeks and that a definite installation date was required. Staff immediately received a return call from the Eastern project manager advising of the "miscommunication" between their subcontractor and the Nokia factory and confirming that the equipment entered production on June 28<sup>th</sup>. The project manager further stated that they have involved their senior management (as has Harris) to request that Nokia do everything in their power to expedite delivery. The project manager further assured that the tower crew is on stand-by to perform installation as soon as the Nokia equipment is delivered.

| ID | Task Mode | Task Name                                 | Duration | Start       | Finish      | Predecessors | 18 | Aug 12, '18 | Aug 19, '18 | Aug 26, '18 | Sep 2, '18 | Sep 9, '18 | Sep 16, '18 | Sep 23, '18 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|----|-----------|---|----------|-------------|-------------|--------------|----|-------------|-------------|-------------|------------|------------|-------------|-------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1  | ▶         | Microwave Radios Being Built              | 6 wks    | Thu 6/28/18 | Wed 8/8/18  |              | T  | W           | T           | F           | S          | S          | M           | T           | W | T | F | S | S | M | T | W | T | F | S | S | M | T | W | T | F | S | S | M | T | W | T | F | S | S | M | T | W | T | F | S | S | M | T | W | T | F | S |
| 2  | ▶         | Microwave Lab Configuration               | 3 days   | Tue 8/14/18 | Thu 8/16/18 | 1FS+3 days   |    |             |             |             |            |            |             |             |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 3  | ▶         | Microwave delivery                        | 0 days?  | Tue 8/21/18 | Tue 8/21/18 | 2FS+3 days   |    |             |             |             |            |            |             |             |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 4  | ▶         | Microwave Installation                    | 5 days?  | Wed 8/22/18 | Tue 8/28/18 | 3            |    |             |             |             |            |            |             |             |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 5  | ▶         | MPLS Network Installation & Configuration | 3 days?  | Thu 8/30/18 | Mon 9/3/18  | 4FS+1 day    |    |             |             |             |            |            |             |             |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 6  | ▶         | Network Verification                      | 3 days?  | Tue 9/4/18  | Thu 9/6/18  | 5            |    |             |             |             |            |            |             |             |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 7  | ▶         | SLIP WINDOW FOR NETWORK ISSUES            | 1 day?   | Wed 9/12/18 | Wed 9/12/18 | 6FS+3 days   |    |             |             |             |            |            |             |             |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 8  | ▶         | Mystic RF Timing Verification and Testing | 1 day?   | Thu 9/13/18 | Thu 9/13/18 | 7            |    |             |             |             |            |            |             |             |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| 9  | ▶         | Final System Coverage Testing             | 7 days?  | Fri 9/14/18 | Mon 9/24/18 | 8            |    |             |             |             |            |            |             |             |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |



|  |           |  |                    |  |                       |  |                    |  |                 |  |
|--|-----------|--|--------------------|--|-----------------------|--|--------------------|--|-----------------|--|
| Project: Project1<br>Date: Fri 7/20/18 | Task      |  | Project Summary    |  | Manual Task           |  | Start-only         |  | Deadline        |  |
|  | Split     |  | Inactive Task      |  | Duration-only         |  | Finish-only        |  | Progress        |  |
|  | Milestone |  | Inactive Milestone |  | Manual Summary Rollup |  | External Tasks     |  | Manual Progress |  |
|  | Summary   |  | Inactive Summary   |  | Manual Summary        |  | External Milestone |  |                 |  |

**DATE: 2/14/2018**

**MILESTONE: P25 SYSTEM ACTIVATED AND USERS MIGRATED FROM EDACS**

**DATE: 2/15/2018**

**PROBLEM: Radios displayed "INVALID ID"**

**DESCRIPTION:** Some radios, particularly on the North end, displayed an INVALID ID message.

**STATUS:** CLOSED

**PROGRESS REPORT:** Determined that Eastern Communications had placed the Ocean City simulcast system online. Radios programmed with all sites, in anticipation of a roaming relationship with Ocean City, were at times able to lock onto Ocean City's system that was not yet configured and have their registration rejected. Staff contacted Ocean City and the Ocean City transmitters were switched off while Worcester County radios were reprogrammed by Harris and County staff to remove references to Ocean City frequencies. This work was performed on 2/15-2/20. County and Ocean City staff coordinated a meeting with Harris and Eastern Communications to express the deep need that both companies work very closely together to ensure that these types of issues do not happen.

**NEXT STEPS:** N/A

**DATE: 2/15/2018**

**PROBLEM: FD Station 200 Desktop Issue**

**DESCRIPTION:** Unspecified issue reported impacting operation of desktop radio within the fire station.

**STATUS:** CLOSED

**PROGRESS REPORT:** County staff and Harris contractor responded to the station and found a programming issue with the radio. Radio reprogrammed and issue resolved.

**NEXT STEPS:** N/A

**DATE: 2/20/2018**

**PROBLEM: Audio levels not consistent**

**DESCRIPTION:** Noted that audio levels aren't consistent, particularly with law enforcement users. While many users have expected volume levels, others are very quiet and difficult to hear.

**STATUS:** In-Progress

**PROGRESS REPORT:** Staff worked with Harris engineering as well as two other jurisdictions that use the same system revision and subscriber radios. Staff identified that the use of "Adaptive Gain Controls" (AGC) within radio programming would assist with maintaining a level of standardization in audio when some users were not speaking into their microphones. Staff, working with select users and Harris, implemented AGC during reprogramming efforts with an AGC setting based on test results. After fielding these settings, users that weren't speaking directly into their microphones were significantly improved at the expense of users that were speaking directly into their microphones becoming distorted. Staff conducted extensive additional testing with guidance from Harris and determined that an AGC setting of "0dB" provided for of a median adjustment that prevented users from being distorted. While this still assisted with those users that weren't speaking into the microphone, they are still somewhat low with these settings.

**NEXT STEPS:** Staff have been working to reprogram law enforcement units with the new "AGC 0dB" setting. Generally this issue is isolated to law enforcement users.

**DATE: 2/21/2018**

**PROBLEM: Berlin PD Radio Programming Issue**

**DESCRIPTION:** Staff working with Berlin PD determined that a set of radios assigned to Berlin Police Department were not programmed by the Harris subcontractor (SSC).

**STATUS: CLOSED**

**PROGRESS REPORT:** County staff reprogrammed Berlin PD radios for correct operation.

**NEXT STEPS:** N/A

**DATE: 3/9/2018**

**PROBLEM:** Fire Marshal and a few Ocean Pines FD radios reported "INVALID ID"

**STATUS:** CLOSED

**DESCRIPTION:** FM-2 and a couple of Ocean Pines FD radios were reported to have experienced an "INVALID ID" condition. Staff, working with Harris, were able to determine that a software problem within the radio allowed the radio to roam to the Ocean City system when it should not have been able to do so. Harris provided new code to resolve this problem. County and Harris staff loaded new code into all radios.

**NEXT STEPS:** N/A

**DATE: 4/11/2018**

**PROBLEM:** SOME RADIOS NOT AUTHENTICATING USING LINK LAYER

**STATUS:** CLOSED

**DESCRIPTION:** Staff determined that in initial programming efforts, subcontractors did not load Link Layer Authentication Keys into radios. These LLA Keys allow the radio to be verified when authenticating onto the system. Additionally, staff determined that some radios were never upgraded by the vendor to support the Link Layer feature. Working with Harris, the project manager obtained the licenses required to support upgrading radios not otherwise featured for this option and provided for the loading of LLA Keys into radios during the next programming touch.

**NEXT STEPS:** N/A

**DATE: 4/20/2018**

**PROBLEM:** Radios Disappearing from database

**DESCRIPTION:** Staff determined that a small quantity of radios that had been entered into the radio system were no longer present.

**STATUS:** CLOSED

**PROGRESS REPORT:** Harris identified that an issue within the database caused certain radios to not be updating after being entered. Harris performed database corrections.

**NEXT STEPS:** N/A

**DATE: 4/25/2018**

**PROBLEM:** Radios not working on State of Maryland System

**DESCRIPTION:** Report from WCSO that some radios attempting to talk to MSP on the State of Maryland system were being denied.

**STATUS:** CLOSED

**PROGRESS REPORT:** Staff requested a database review with the State of Maryland radio system manager. It was discovered that some units were missed between our export and their import of our unit database. Staff worked to identify all missing units and have them added to the State of Maryland database.

**NEXT STEPS:** N/A

**DATE: 4/26/2018**

**PROBLEM:** Health Department Staff reported radio access needs

**DESCRIPTION:** Worcester County Health Department reporting that they need additional radios and/or replacement radios.

**STATUS:** In-Progress

**PROGRESS REPORT:** Staff had meeting with health department staff and radio coordinator for State of Maryland Department of Health. Determined that while the State of Maryland provided some new APX6000 radios, working on the State of Maryland radio system, to the local health department, they would not perform ongoing maintenance or programming of these radios nor would they be replacing the legacy Worcester County radios used by the Health Department. Staff discussed taking over maintenance and programming responsibilities as well as the budget considerations for providing the additional APX6000 radios locally. DES and WCHD staff discussed the need to budget for this in the next budget cycle with an estimated budget impact of approximately \$115,000.

**NEXT STEPS:** Revisit with WCHD during FY20 budget planning.

**DATE:** 4/30/2018

**PROBLEM:** Reported poor call quality issues in Ocean Pines

**STATUS:** CLOSED

**DESCRIPTION:** Ocean Pines Fire reports poor call quality outdoors at 88 Teal Circle and 2305 Points Reach.

**PROGRESS REPORT:** Staff responded to the locations and determined that signal levels at Teal Circle on a portable radio were on the fringe for call delivery. Signal levels at Points Reach were determined to be on the very low end of acceptable for outdoor coverage. Staff did note low level co-channel interference that likely compounded the issue with already low signal levels based on seeing carrier alarms indicative of interference during the time of the incident. The State of Maryland also reported significant interference to State Troopers on the State of Maryland radio system during this rough time period. Staff employed the Ocean City Fire Boat that was involved in the incident as well as had the Chief of Ocean Pines FD come out a few days later to attempt to replicate the issue. Parties were unable to replicate the issue and during that testing all communications were good.

**NEXT STEPS:** Staff continue to monitor system performance in the Ocean Pines-area as well as attempt to track possible interference. No additional coverage related complaints have been made since turning on roaming functionality with Ocean City tower sites that assist particularly with areas such as Points Reach and Teal Circle that are direct line of sight to Ocean City towers. Harris Field Services technician has also made it a point to check in weekly with the Chief of Ocean Pines FD to ensure that no further issues have been experienced.

**DATE:** 5/1/2018

**PROBLEM:** Newark Coverage

**DESCRIPTION:** Newark FD reported issues within portions of their district with in-building radio coverage.

**STATUS:** In-Progress

**PROGRESS REPORT:** Staff made aware of a letter from the Newark FD to the County Commissioners that there were some houses and buildings that they have responded to that lacked high quality indoor coverage. Staff performed mapping of the area off of both the P25 system and legacy EDACS system. As the P25 system was focused to provide in-building coverage based upon zoning and land use data where the EDACS system wasn't, staff observed that signal levels in Newark were substantially lower than on the legacy system. This was determined to be the result of an engineering decision by Harris to meet the objectives of the County's RFP to provide signal levels based on anticipated building construction. Staff did note that there are some testing tiles that appear to fail coverage design.

**NEXT STEPS:** Staff have continued to collect samples from data from both radio systems to work with Harris to potentially change the antennas at Central Site from directional to omni-directional. Harris is looking at various antenna options that may be implemented once the Mystic Harbour site is online and real world coverage can be characterized. New coverage maps based on various antenna changes have been generated as recently as July 24<sup>th</sup> and additional testing of proposed changes is scheduled to be conducted on July 27<sup>th</sup>.

**DATE: 5/13/2018**

**PROBLEM: NAWAS Interconnection not reliable**

**DESCRIPTION:** Dispatch center reporting that the NAWAS interface is down.

**STATUS:** CLOSED – MONITORING

**PROGRESS REPORT:** Initial investigation by staff found the UAC interface card within the interoperability gateway to be locked up. Card reset and working however down again after about 24 hours. Harris field technician investigated and working with Technical Assistance Center and engineer to determine root cause. Technician applied attenuation to input signal and also changed DIP Switch settings. Card and interface has to date remained stable.

**NEXT STEPS:** Monitoring to ensure no reoccurrence.

**DATE: 5/29/2018**

**PROBLEM: UPS / Generator Configuration**

**DESCRIPTION:** The configuration of the vendor provided UPS and Generator at the Pocomoke and Mystic Harbour tower sites causes the generator to fail.

**STATUS:** Closed

**PROGRESS REPORT:** Harris, working with UPS and Generator manufacturers, determined that a setting was missing from the UPS at each site as well as interconnect cabling. Harris field technician has applied the recommended setting and cross connect and the problem has not occurred since.

**NEXT STEPS:** Staff are satisfied with resolution

**DATE: 5/30/2018**

**PROBLEM:** Reported issues with scan function

**DESCRIPTION:** Multiple WCSO units and two FD units report that they are missing calls while scanning.

**STATUS:** In-Progress

**PROGRESS REPORT:** Staff worked with WCSO in particular to replicate and further narrow the problem. After extensive testing it was determined that the radio did not respond as expected to the mobile radio microphone being removed from the microphone clip causing scan to not be working when expected and to sometimes change the scan list priority settings. Staff immediately recorded the results of testing and provided this information to Harris. Harris was able to recreate this issue within their lab and attribute it to a bug in the newest software release. Harris produced an interim code revision for mobile radios intended to correct this bug and provided the revised code to staff for testing. Staff have deployed this code to a large number of WCSO users for testing.

**NEXT STEPS:** Staff, working with WCSO, will continue to evaluate the effectiveness of the revised code related to this issue. To date testing has been successful with no additional problems reported. This bug fix will be included in the next full code release that is expected to be produced in the next several weeks. Once the final code release is provided, staff working with key users will perform additional field testing prior to loading this code into radios in bulk.

**DATE: 6/6/2018**

**PROBLEM: Patch to Eastern Shore, VA FD reported down**

**DESCRIPTION:** Reported by a FD user that the patch used to link to Virginia FD radio system appears to be down.

**STATUS:** CLOSED

**PROGRESS REPORT:** Staff responded to the site and determined a connector had come loose to the power supply of the radio used for the patch. Staff secured the power connector and tested the system.

**NEXT STEPS:** N/A

**DATE:** 6/8/2018

**PROBLEM:** Call quality issues reported in north end of the county impacting primarily WCSO.

**DESCRIPTION:** Users reported difficulty in gaining channel grants and distorted audio noted on uplink and downlink.

**STATUS:** Closed

**PROGRESS REPORT:** Staff observed very high interference as a result of tropospheric ducting. Staff learned that at these same times, the State of Maryland 700MHz radio system experienced similar issues, particularly in West Ocean City, Bishopville and Ocean Pines areas that made their system virtually unusable during this period.

**NEXT STEPS:** N/A

**DATE:** 6/12/2018

**MILESTONE:** Full roaming enabled with the Town of Ocean City Ocean Pines (Site 5) and Island (Site 30) towers.

**DATE:** 6/15/2018

**PROBLEM:** INDIVIDUAL CALLS NOT ROUTING BETWEEN WORCESTER AND OCEAN CITY USERS AND SITES

**DESCRIPTION:** Upon implementing full roaming with the Town of Ocean City it was discovered that individual calls (direct calls between two users) were not able to be completed between Worcester County and Ocean City users nor when a user roamed to the other political subdivision's towers.

**STATUS:** Awaiting Development

**PROGRESS REPORT:** Harris indicates that senior management have committed to the development of this feature and that development is in-progress.

**NEXT STEPS:** Pending feature development.

**DATE:** 7/18/2018

**PROBLEM:** Reported patch to Eastern Shore, VA FD radio system down

**DESCRIPTION:** FD user reported that the radio link to Eastern Shore, VA was down and not functioning.

**STATUS:** CLOSED

**PROGRESS REPORT:** Staff and Harris technician responded to the Klej Grange tower where the patch is maintained and found the UAC card of the interoperability gateway to be locked up. Harris technician rewired the interface to the radio to make use of contact closure rather than VOX for receive and modified DIP Switch settings as previously modified for NAWAS interface.

**NEXT STEPS:** Continue to monitor for reoccurrence.

**DATE:** 7/19/2018

**PROBLEM:** Coverage in Newark

**DESCRIPTION:** County Administrator contacted staff to report a rumor that Newark FD experienced problems with coverage the evening before while on scene of a chicken house fire located at the intersection of Bowden Rd and Langmaid Rd.

**STATUS:** In-Progress

**PROGRESS REPORT:** Upon receiving notification from CAO, staff sent an email to the Newark FD Chief requesting detailed information, pulled audio recordings of radio traffic and responded to the scene with test equipment. Testing at the scene showed signal values consistent with the contracted coverage for that location however low enough to be highly impacted by radio shielding structures. Speaking to personnel that were at the scene of the incident it was determined that radio issues occurred within the chicken house building and when standing between two closely spaced chicken houses. Each chicken house was found to have a metal roof and metal siding with no windows. Staff were unable to enter the structure to determine the amount of attenuation that the buildings created however it is estimated to well exceed the design threshold for that area under an agricultural designation that only requires 6dB of building attenuation to be considered. These structures also appear to have been constructed during the County's previous radio coverage regulations that specifically exempted agricultural structures from radio coverage requirements.

#### **ADDITIONAL MAINTENANCE RELATED ITEMS PERFORMED ON MOBILE AND PORTABLE RADIOS**

- 1 XG-25p presented by WCSO user with damaged volume knob due to falling from table. Replaced switch kit.
- 1 XG-75pe presented by Snow Hill FD with damage to case as a result of being shut in the door of an ambulance, replaced front cover assembly.
- 1 XG-25m presented by WCSO with bent pins on the microphone connector port, connector port replaced.
- 3 XG-75p portable radio speaker microphones found to be defective, replaced and returned to Harris for warranty replacement.
- Several fire department and public works radios reported to have intermittent power problems. Staff checked and found bad splices in power wiring performed by Harris subcontractor at fuses. Staff repaired connections.
- 1 XG-75p presented by fire department user with A/B switch broken off, switch kit replaced by staff.
- 1 P7300 portable radio reported issues by Pocomoke PD, found to have a broken off antenna, replaced by staff.
- 1 Ambulance reported to have mobile antenna broken off while backing into station, repaired by staff.
- 1 "Dual Control" XG-75m radio presented by Bishopville FD on an engine with intermittent power issues and flickering screen. Staff discovered improper wiring to battery disconnect switch. Staff rewired.
- 40 XG-25p portable radios found to have been missing Link Layer Authentication feature from the factory. Harris provided licensing to upgrade these radios, completed by staff.

# Co-Channel Interference

Worcester County, MD

## Current Worcester County Frequencies

- On December 21, 1999 Worcester County entered a contract for \$83,100 with RCC Consultants, Inc to obtain frequencies, draft an RFP and make an award recommendation for a new 800MHz trunked radio system.
- Based upon RCC frequency selection, Worcester County was granted a license for 10 800MHz non-Public Safety specific (non-NPSPAC) frequencies by the FCC in December 20, 2001.
- Historically, some interference was noted on these frequencies over the 16 years that they were used on Enhanced Digital Access Communications System (EDACS), however such interference was observed to impact radio system operation less than a few hours per year.

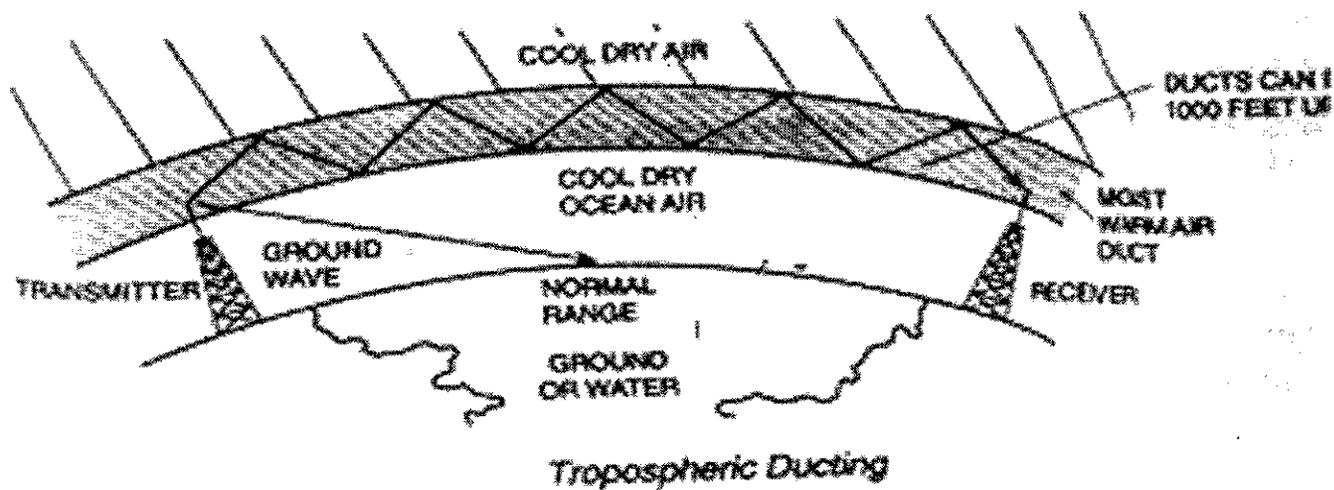


## Causes of Interference

- Known as “Co-Channel Interference” is created when two or more signals, from different sources, occupy the same frequency.
- Our Co-Channel Interference exists when atmospheric conditions permit a phenomenon known as “Tropospheric Propagation”.
- Caused by warmer temperatures aloft than on the ground.
- Impacts areas along large bodies of water (Ocean, Great Lakes, etc) the most.
- Tropospheric Propagation is what may cause an FM radio station you listen to regularly with clear reception to become broken and mixed with another station on certain days of the year.

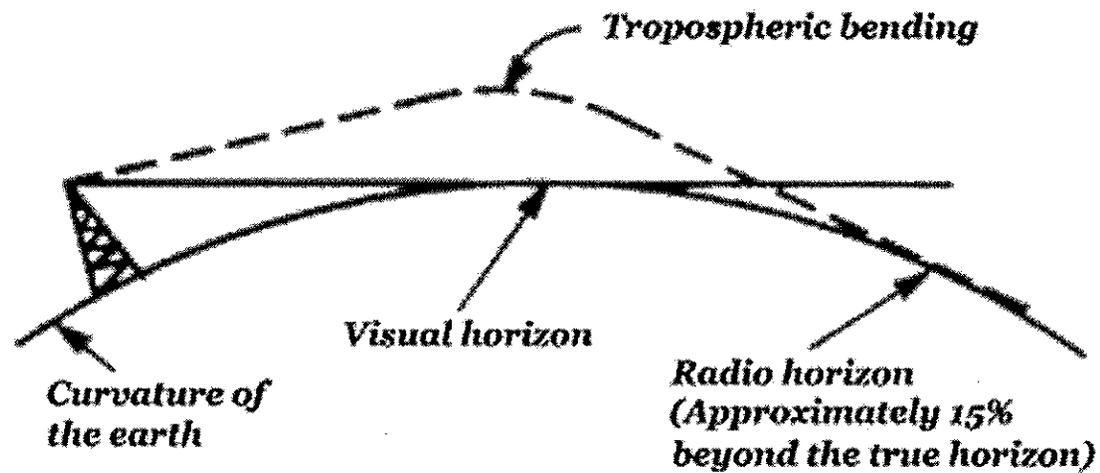
## Tropospheric Ducting

Is when radio waves, normally blocked by the curvature of the earth, are carried in a "duct" between two different areas, beyond normal line-of-sight, which would normally not be carried said distance.



## Tropospheric Bending

Is when radio waves, typically blocked by the curvature of the earth, are reflected off of the Troposphere and “bend” back toward the earth.



## The issue:

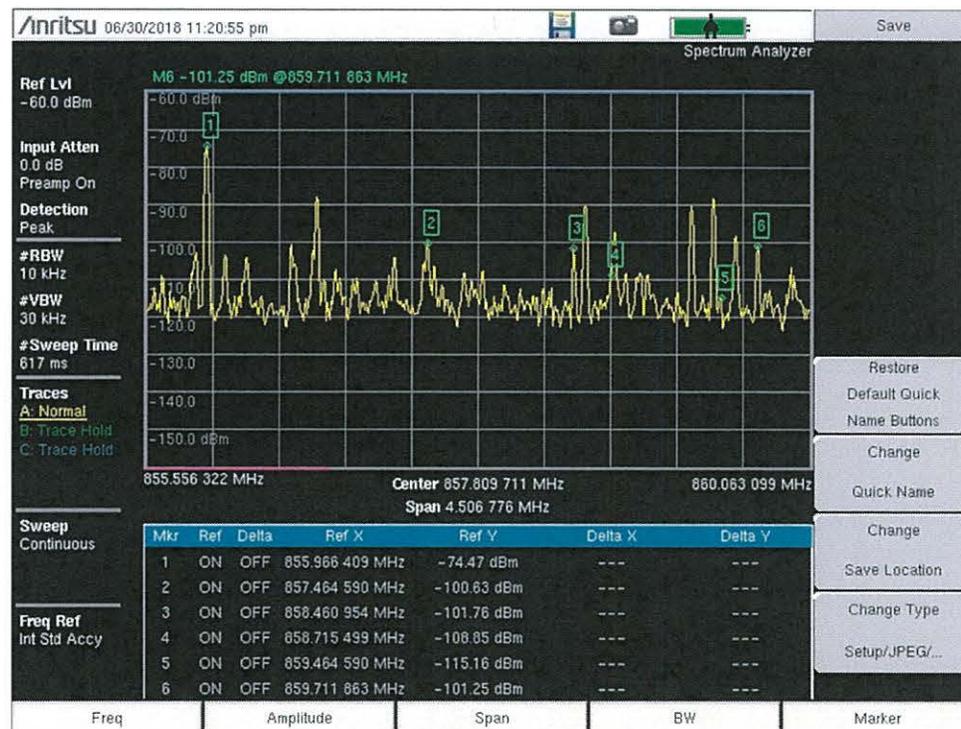
- This is what is happening with our new P25 radio system – the NJ State Police (in Port Elizabeth), VA Beach and Hampton, VA signal is reaching Worcester County.
- Radio waves that arrive via tropospheric propagation are sometimes very strong when the atmosphere is dense and the troposphere reflects the radio waves like light upon a mirror.
- Our radio system is designed to industry standards as defined by the Telecommunications Industry Association. This standard, based on radio performance, assumes that a signal level of -110dBm is needed for the radio to receive reliable communications with easily understood speech. This is the signal level that our system is designed to provide as a minimum.
- Co-Channel signals (from Port Elizabeth, NJ, VA Beach, and Hampton, VA), that arrive at near equal or stronger strength than our own, will cause distortion or completely block our signal resulting in poor or failed communication. Such transmissions are not blended as they once were with our analog radios, but can completely block the digital signal.
- This phenomenon is generally limited to the summer months and is highly weather dependent.

## Who else has this issue?

- Any user along the coast that hasn't specifically built their system to overcome high level co-channel interference including:
  - State of Maryland 700MHz Radio System Worcester/Somerset Simulcast Cell
  - Somerset County
  - Ocean City EDACS

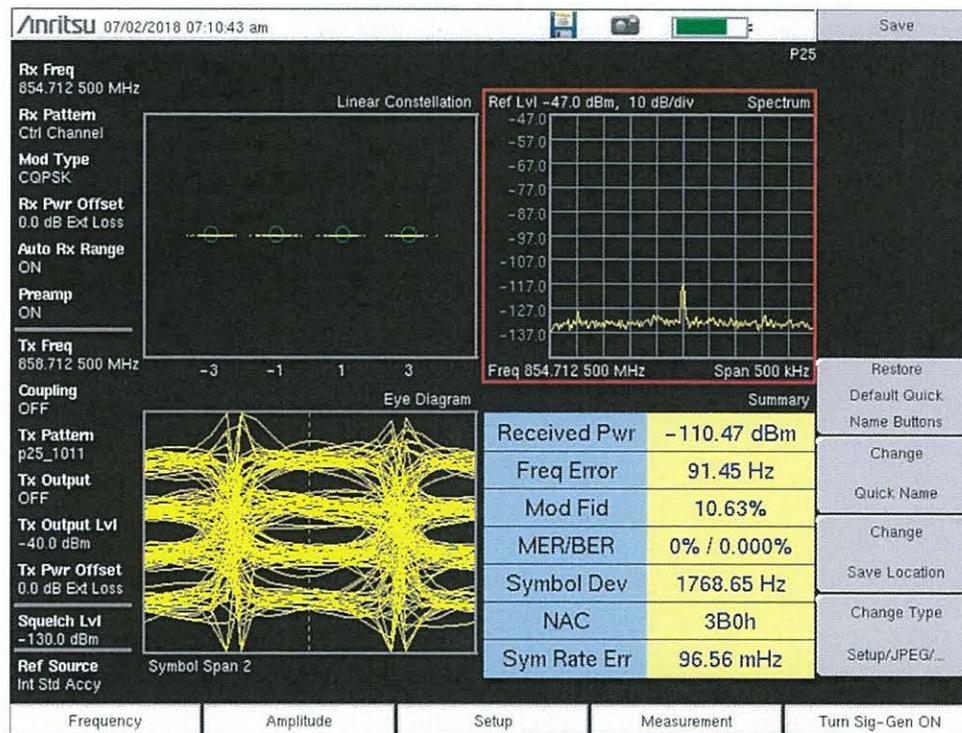
## What have we done so far?

- Identify the channels being interfered with and the level of interference.
  - Viewing test equipment to monitor our channels during various times of day and night, in different weather conditions.
  - Noting levels, trends in channels at same levels.



## What have we done so far?

- Identify Source
  - Researched frequencies of licensed systems causing problems.
  - Located system control channel and verified level was consistent with level of co-channel carrier.
  - Decoded control channel Network Acces Code (NAC) to recover System ID.
  - Verify system ID belongs to suspect source.

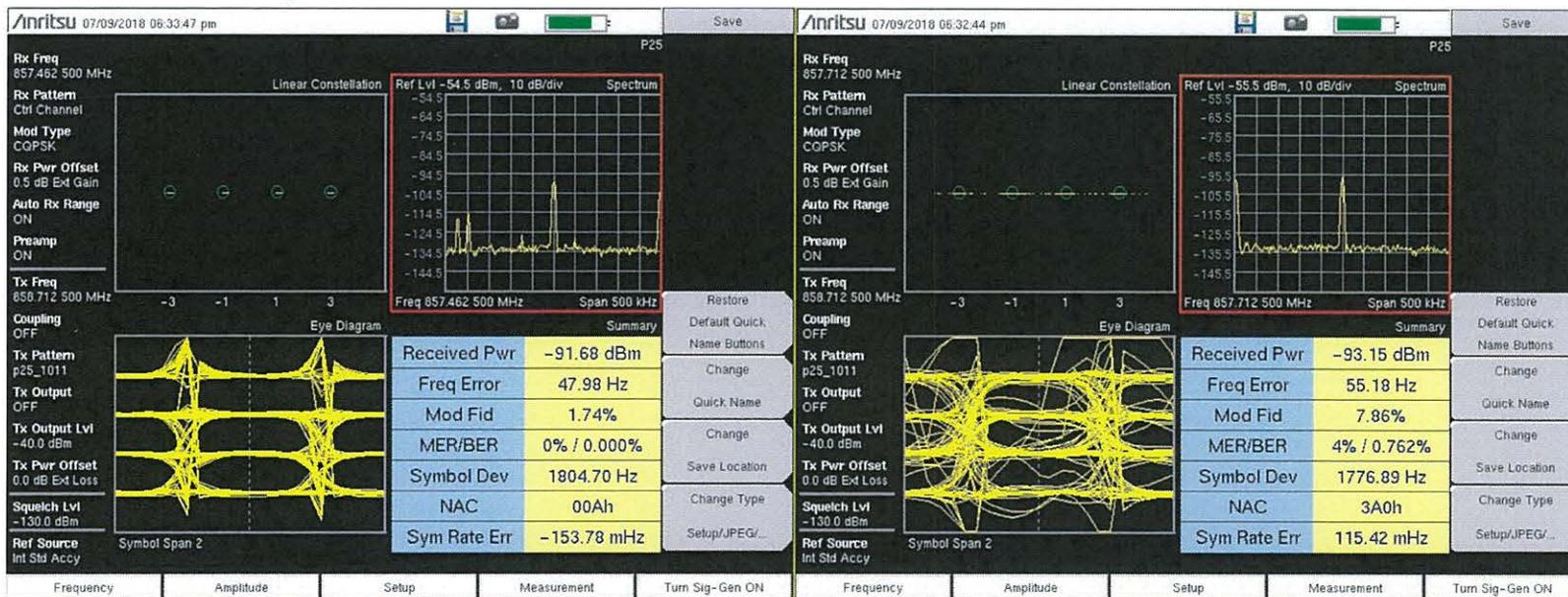




# Example Co-Channel Analysis from Public Landing

Worcester County P25

NJSP Port Elizabeth



## Possible Interference Mitigation Options

- Move to “new” channels
  - Staff working with FCC Regional Planning Committee 20 for assistance identifying any newly available or “splinter” / “orphan” NPSPAC channels. Consultant assistance may be necessary.
  - Monitor potential new channels to determine if they are less prone to interference. May require 360 man-hours to test each potential channel.
  - Submit request for channels to FCC Region 20 – due by August 8, 2018.
  - Window for approval of new channels is in August of each year – August 22, 2018.
  - Apply to FCC for licensing.
  - Retune all sites and reprogram all radios to operate on new channels – by Harris.
  - Due to the time required to perform these tasks and the urgency to resolve this problem, a consulting engineering firm with significant manpower and resources is needed.
  
- Increase RF density to overcome co-channel signals
  - Reconfigure some antennas
  - Likely to require adding additional tower sites

## Next Steps

- Staff to continue working with FCC RPC 20 to identify potential frequencies. Once potential frequencies are identified, significant around the clock staff time must be dedicated to monitor those frequencies for viability prior to the second week in August when application must be approved by the RPC or wait another year. POSSIBLE CHALLENGE: Staff time resources, no ability to identify non-NPSPAC channel options, limited test equipment access, cleaner channels may not be available, system downtime.
- Staff to continue to map system and co-channel signal strengths and attempt within the best of our ability to offer potential additional site options and antenna reconfigurations. POSSIBLE CHALLENGE: Staff time resources, lack of RF modeling software.
- Given the estimated time to complete these tasks and the urgency of these matters, staff strongly believes that a consultant is critical to the successful resolution of these issues.