



TARGETED RESULTS. EXPERTLY MANAGED.  
WE STAKE OUR REPUTATION ON IT.

---

A CDI Company

# City of Winchester, Virginia Public Safety Radio Communications Project

## Presentation to City Council

### Conceptual Designs and Opinion of Probable Costs

### August 16, 2011

---

**ARCHITECTURE • ENGINEERING • COMMUNICATIONS TECHNOLOGY**

AVIATION | CIVIL | CONSTRUCTION SERVICES | DATA SYSTEMS | ENVIRONMENTAL  
FACILITIES ENGINEERING | GEOSPATIAL | NETWORKS | PUBLIC SAFETY | TRANSPORTATION

# The Need

---

1. FCC licensing mandate requires VHF/UHF Narrowband by Jan 1, 2013.
2. The current radio system does not provide adequate in-building coverage to ensure the safety of public safety responders.
3. The current radio system does not provide sufficient capacity (quantity of radio traffic) to handle communications during a large-scale emergency or during numerous simultaneous incidents.
4. There is no public safety-grade emergency communications system to provide city-wide emergency management for schools, utilities, public works, etc. Cell phones are unreliable during mass incidents as the business model design used by wireless carriers does not require reliability or availability under adverse circumstances.

# Resolutions and Constraints

---

- Increased coverage is provided by more transmitter sites and increased power (ERP). In the VHF band, the FCC licenses impose a greater limit on permitted power.
- Increased capacity is provided by adding more channels and by using trunked technology (shared channels).
- There are insufficient VHF channels available to resolve the capacity issues. A license application has been submitted for 800 MHz frequencies which are the recommended option.
- Mutual aid responses require interoperability with VHF. Communications interoperability with Frederick County responding in the City is a major consideration for the Fire and Rescue Department. L.R. Kimball prepared an operational study and a VHF-800 interop conceptual design to address the concerns. The report was accepted by the Fire and Rescue Department and the Emergency Communications Center.
- Digital technology is the only offering in the marketplace from the major manufacturers for trunked radio systems.

# Resolutions and Constraints

---

- All potential city stakeholders have been interviewed and the requirements they reported have been documented.
  - Police Department
  - Sheriff's Office
  - Fire and Rescue Department
  - Emergency Communications Center
  - Emergency Management
  - Utilities Department
  - Public Services Department (Traffic, Streets, Refuse, Arborist, Maintenance)
  - Transit Department
  - Schools
  - Zoning and Inspections Department
  - Parks and Recreation Department
  - Social Services Department
  - Parking Authority

# Design Concepts

---

A conceptual design is initially developed to:

- Determine the resources that will be available to the vendor (e.g. FCC license conditions and frequencies, tower site locations, infrastructure facilities).
- Determine the system specifications necessary to meet the operational requirements of the City. The specifications will be part of a request for proposal (RFP).
- Provide an opinion of probable cost.
- Align stakeholder expectations for system performance.
- The vendor is invited to provide a system design that they will guarantee to meet the performance expectations specified in the RFP at the lowest cost.

# Alternative Designs

---

Three options requested by the City for review:

- 800 MHz Digital P25 Trunked Radio System (Recommended)
- Hybrid 800 MHz Digital P25 Trunked (Public Safety) and VHF Conventional (Non-Public Safety) Radio Systems
- VHF Narrowbanding Compliance Only

# 800 MHz Digital P25 Trunked Radio System

---

- **Scope**
  - Create a communications system that will meet requirements of Public Safety and Non-Public Safety agencies
- **Impact**
  - Improved overall dependability of communications system for all city agencies, increased effectiveness of communications reflecting increased service delivery, improved safety of users and community
- **Strategy**
  - Implement 800 MHz system for all agencies
- **Positives**
  - Overall improvement of radio communications public safety and non-public safety agencies
  - Meets all public safety requirements
- **Negatives**
  - Higher capital costs

# 800 MHz Digital P25 Trunked Radio System

---

## Coverage Specifications

- The vendor will be required to provide a communications system that meets *minimum* performance specifications under the following conditions.
  - Use a portable (handheld) radio
  - Communicate within the average concrete and steel structure (20dB signal loss)
  - Provide a statistical standard of 95% of the City area, 95% of the time
  - Live testing of audio quality, signal strength, and data errors (per TIA TSB-88-C)
- Buildings that provide a greater signal loss (i.e., below grade, massive structural obstacles) will most cost effectively provide communications by requiring an in-building antenna system (local building ordinance).
- The L.R. Kimball coverage maps (propagation studies) provided to the City depict basis for developing cost estimates and RFP requirements. The vendor will provide propagation studies as part of their proposal to demonstrate compliance with the RFP requirements.

# 800 MHz Digital P25 Trunked Radio System

OPINION OF PROBABLE COST	
Radio System Equipment	\$2,183,900
VHF County Interoperability	\$95,000
Digital Microwave Network	\$365,000
Facility Upgrades	\$398,000
1st yr maint, spares, contingency	<u>\$304,190</u>
<b>SUBTOTAL -Infrastructure</b>	<b>\$3,346,090</b>
Portables	\$704,200
Mobiles	\$917,100
Control Stations	\$106,250
Pagers	<u>\$6,300</u>
<b>SUBTOTAL -User Equipment</b>	<b>\$1,733,850</b>
<b>GRAND TOTAL</b>	<b>\$5,079,940</b>

# Hybrid 800-Digital / VHF-Analog Systems

---

- Scope
  - Create a communications system that will increase capabilities of Public Safety and Non-Public Safety agencies
- Impact
  - Improved overall dependability of communications system for all city agencies, increased effectiveness of communications reflecting increased service delivery, improved safety of users and community
- Strategy
  - Implement 800 MHz system for all public safety agencies
  - Continue use of VHF spectrum for all non-public safety agencies
- Positives
  - Overall improvement of radio communications public safety and non-public safety agencies
  - Meets all public safety requirements
- Negatives
  - Higher capital costs (though less than first option)
  - Maintenance of two radio systems on two independent frequency spectrums (may prove more costly than first option)
  - Interoperability within the City via gateways

# Hybrid 800-Digital / VHF-Analog Systems

---

- Meets Public Safety coverage and feature requirements and system reliability
- Provides cost savings on non-emergency end-user radios

# Hybrid 800-Digital / VHF-Analog Systems

OPINION OF PROBABLE COST	
Radio System Equipment	\$2,263,400
VHF County Interoperability	\$100,000
Digital Microwave Network	\$365,000
Facility Upgrades	\$398,000
1st yr maint, spares, contingency	<u>\$312,640</u>
<b>SUBTOTAL -Infrastructure</b>	<b>\$3,439,040</b>
Portables	\$460,200
Mobiles	\$657,200
Control Stations	\$154,500
Pagers	<u>\$6,300</u>
<b>SUBTOTAL -User Equipment</b>	<b>\$1,278,200</b>
<b>GRAND TOTAL</b>	<b>\$4,717,240</b>

# VHF Narrowbanding Compliance Only

---

- Scope
  - Meets the FCC narrowbanding compliance with minimal enhancements for reliability
- Impact
  - Coverage deficiencies remain and possibly slightly increase for all agencies. System reliability improves with standard facility and equipment enhancements for back-up
- Strategy
  - All agencies remain on VHF conventional.
  - Only purchase new radios to replace those that are not narrowband capable and reprogram radios that are capable
- Positives
  - Some improvement in reliability
  - Lower capital costs
- Negatives
  - Coverage, feature, and capacity requirements not addressed to improve safety for users and community
  - Additional subscriber replacements required for radios only being reprogrammed currently

# VHF Narrowbanding Compliance Only

---

- Does not meet Public Safety coverage and feature requirements
- Provides cost savings to meet minimum narrowbanding requirements and minimum enhancements for system reliability

# Opinion of Probable Costs – Third Estimate

OPINION OF PROBABLE COST	
Radio System Equipment	\$435,500
VHF County Interoperability	\$0
Digital Microwave Network	\$365,000
Facility Upgrades	\$285,000
1st yr maint, spares, contingency	<u>\$108,550</u>
<b>SUBTOTAL -Infrastructure</b>	<b>\$1,194,050</b>
Portables	\$54,300
Mobiles	\$276,200
Control Stations	\$81,000
Pagers	<u>\$15,300</u>
<b>SUBTOTAL -User Equipment</b>	<b>\$426,800</b>
<b>GRAND TOTAL</b>	<b>\$1,620,850</b>

# Recommendations for the RFP

---

- Prepare a Request for Proposals (RFP) for the 800 MHz system
- Items can be listed as optional to be removed during negotiations depending on the vendor's final pricing (one option could be the Hybrid approach but not the VHF compliance only)
- It is a better strategy to know the vendor pricing at the start of negotiations and subsequently assess the value versus the cost for each option
- A probable cost estimate may exceed an approved budget and yet the negotiated amount be within the budget.
- It is not uncommon for proposals to be received for which the amount over budget is more than justified by the value received for that cost.

# Tentative Project Schedule

---

- RFP Development defining performance standards, including pre-proposal meeting (30-45 days)
- Receipt, review, evaluation of RFP and presentation to Council for approval (30 days)
- Crafting and execution of vendor contract by City Manager (15-20 days)
- Vendor finalizes project design and initiates project implementation (15-20 days)
- Vendor initiates contractual services with incremental deliverables (180-240 days)
- System Assessment and Acceptance Testing (15-30 days)

# Funding Options

---

- Communications Project in the City Capital Improvement plan as follows:
  - FY 2012- \$1,000,000
  - FY 2013- \$2,000,000
  - FY 2014- \$2,000,000
- Funding can be a combination of cash (reserves) and debt issuance depending on the life of the asset being acquired.

---

QUESTIONS?