



CTA COMMUNICATIONS, INC.
CONSULTANTS

FINAL REPORT
Executive Summary
**Communications
Needs
Assessment
Analysis Update**



DARE COUNTY,
North Carolina

July 7, 2006

EXECUTIVE SUMMARY

ABSTRACT

The communications systems that support Dare County's public safety people and functions continue to experience technical and operational problems. CTA Communications has been retained by the County to review their communications environment, and to recommend upgrades and improvements that will address not only the current problems, but also requirements that are being emphasized by security concerns highlighted by 9/11, Katrina, and other emergencies of the past decade.

CTA has analyzed the County's needs, both in 1996 and again ten years later in 2006, and recommends movement to a trunked radio system operating in the 800 MHz band. The County has the option of either joining the North Carolina VIPER system, augmenting their offering with additional infrastructure, or of implementing a County-Owned radio system. In either case, the system would comprise six radio sites interconnected with a microwave network.

1.0 Introduction and Overview

The unique shoreline that makes Dare County a destination resort for many landlocked Americans also complicates public safety communications within the County.

- The substantial seasonal population fluctuation along the barrier islands creates a demand for services that is paralleled only in urban inland counties;
- The exposure to the Atlantic hurricane patterns creates both emergency conditions that must be supported by communications, and risk of loss of communications infrastructure just when it is needed most;
- The topography of the islands makes radio propagation difficult. The narrowness of the islands limits the choice of radio sites.



The current communications infrastructure ranges from fully adequate for some agencies to nearly useless for others. While it is currently in good physical condition, and would probably be adequate to support the County's permanent population of some 30,000 people, the demands placed on it by the continuously expanding seasonal population of some 300,000 people frequently cause it to fall short.

With the inevitable expectation of a high category hurricane hitting the county coastline at peak tourist season, it is likely that the weak link in the ability of the County's public safety organizations to respond will be their ability to communicate, not only among themselves but with outside assistance responding to the emergency. Hurricane Katrina provided lessons for all coastal communities that emergency preparedness requires coordinated effort among all responders, and coordinated effort requires solid communications.

CTA Communications studied the County's communications environment in 1996, and found the following problems:

- Inadequate Radio Coverage, particularly in heavy tourist areas;
- Channel Crowding during routine operations;
- Inadequate Reserve Capacity for Emergencies;
- Channel Congestion: Too many agencies on the same radio channel;
- Lack of Interoperability both within and outside the County;
- Interference both from within and from outside the County;
- Reliability: old outdated equipment;

Our study in 2006, ten years later, found that although there is improvement in many areas, the same problems continue to exist. Also, ten years later the expectations that Americans have for their public safety agencies have been expanded and focused through 9/11, Katrina, Oklahoma City, Columbine, and the world situation today.



In 1996 our recommendation was that the County should migrate to an integrated public safety communications system that addressed all the problems and provided expansion capability for future growth. In 2006 the demands have increased, the technology has changed somewhat, new options are open, but the same basic unfulfilled needs exist. In 2006 our recommendation is still the same as it was in 1996, although the specifics of the design have changed. The County has had the luxury over the past ten years of simply improving their existing infrastructure, an attractive option since the costs are relatively low.

Now it is time to consider a complete infrastructure replacement: one that will serve the County to the level needed for a sometime population of 300,000, one that has reserve capacity for substantial emergencies, and one that provides room for future growth.

2.0 Alternatives Considered and Analyzed

After meeting with communications stakeholders in late March of 2006, and after numerous teleconferences and e-mails both before and subsequent to that survey, CTA identified three potential alternatives:

- I Continue to upgrade your current systems;
- II Join the North Carolina 800 MHz VIPER system currently planned ;
- III Own and operate your own 800 MHz trunked radio system;

Our assessment of the viability of these three alternatives is that only Alternative II and III will address the problems and provide the capacity necessary for the next fifteen to twenty years of County operation. While existing systems still have room for improvement, limits have been reached. Because of the inability of being able to obtain sufficient frequencies in the same frequency band, the inherent interference in the current frequency bands, and the fact that provision of the functionality needed by modern public safety personnel would require implementation of a very complex operational situation, CTA determined that in the long run Alternative I is not viable for the County. We therefore focus on the 800 MHz solution, either that which is owned and operated by others or that which is owned and operated by the County.



We also note that the FCC is currently mandating a shift from wideband to narrowband operation in the County's current bands, which will require moving to digital technology in about five years with the result that there will need to be a wholesale replacement of all County communications equipment at that time.

3. The Recommended Design

CTA recommends a trunked radio system operating in the 800 MHz frequency band, utilizing six radio sites interconnected by microwave radio links. The County's 9-1-1 center is scheduled to move to a new location shortly, and that would be the "nerve center" of the system.

We recommend a *trunked radio system* because this allows integrated operation for County agencies such that during routine situations they can communicate on a non-interfering basis among their personnel, while during emergencies they can be integrated together as multi-agency response teams.

We recommend the *800 MHz frequency band* because we have determined that there are many frequencies available in that band, and interference is non-existent. We recommend *six radio sites* because that will provide radio coverage to and from portable radios that are carried inside buildings of the construction type that is currently in place in the County, and that is anticipated to be constructed in the future. We recommend a *microwave radio network* not only because microwave is less prone to damage than other broadband networks such as fiber or leased circuits, and also because the County can use excess capacity to provide broadband data and voice telecommunications among agencies located throughout the County.

The two options: VIPER and County-Owned are quite similar in design, but are significantly different in many ways. In both options, the County would need to purchase their subscriber equipment (mobile, portable, and desk-top radios).

VIPER is an 800 MHz trunked radio system that is designed to serve the NCHP. It is currently functional in the center of the State, and is scheduled to be extended into Dare County in the immediate future.



The State intends to bring it into three radio sites: one at East Lake, one at Kitty Hawk, and a third at Bodie Island near Oregon Inlet. In order to make VIPER viable, the County would need to do the following:

- Add three additional radio sites: two to provide radio coverage on Hatteras Island and one in the South of the mainland at Stumpy Point;
- Add five additional radio channels at the Kitty Hawk site to provide sufficient capacity for the high utilization projected in the area;
- Add radio controlled consoles at the 9-1-1 center;
- Add microwave links supporting the three additional radio sites.

In the County-owned option, the County would do the following:

- Install six radio sites, one at each of the VIPER sites (taking advantage of the VIPER facilities), two sites on Hatteras Island, and the Stumpy Point site;
- The Kitty Hawk site would have ten channels, the remainder would have five channels each;
- Add regional control equipment at the 9-1-1 center, controlling only the sites in the Dare County system;
- At the 9-1-1 center, the console system would be directly connected to the Dare County System;
- Add microwave links that integrate the 9-1-1 center into the system, as well as connect to the three VIPER radio sites. This would entail two additional microwave links over the VIPER option.



Alternative III, the County-owned system, provides the following advantages over Alternative II, joining the VIPER network:

- The County would have full control over all aspects of the operation and management of the system;
- The regional control equipment is in a protected location at the Manteo 9-1-1 center, which improves reliability;
- The regional control equipment is located no more than three microwave links from the most distant radio site, rather than seven links for VIPER (the VIPER Controller is in Farmville), reducing risk of downtime;
- The consoles are wired directly into the regional control equipment, providing dispatchers full functionality and the ability to record all talk groups;
- The microwave links to Kitty Hawk and Bodie Island are separated, improving the survivability of the Kitty Hawk link;
- The 9-1-1 dispatch center has multiple backup radio stations to provide dispatch capability in the event of a console failure or failure of any microwave link;
- Connection to VIPER is at the county controller level, providing the same degree of interoperability but county control;
- The County has complete control over the infrastructure maintenance for the entire system, as well as control over maintenance of their subscriber units;

Since survivability of the radio system after a major hurricane is of critical importance to the County, CTA recommends the following additional measures to be taken, either as part of the implementation of one of the alternatives or in future phases:

- Interconnection of the microwave system to the VIPER system that is envisioned to move into Hyde County, providing loop redundancy for Hatteras Island;
- Implementation of a transportable radio site that could be moved into place in the event one of the County sites is destroyed for any reason;



- Investigation of satellite interconnection between the most vulnerable radio sites on the Barrier Islands and the 9-1-1 center, in the event the microwave network is compromised.

4.0 Cost Analysis

Tables E-1 and E-2 show the estimate of probable cost and estimated discounts which may be expected. Alternative II requires sole source procurement from Motorola. Theoretically Alternative III could be competitively bid, however if any manufacturer other than Motorola were to supply the County system, interconnection to the VIPER system would be problematic. Therefore even with Alternative III, sole source with Motorola is pretty much de facto. We recommend that equipment for either the VIPER alternative or the County Owned alternative be purchased under the existing State VIPER contract with Motorola, which has been competitively negotiated and provides reasonable discounts.



TABLE E-1
 Estimate of Probable Cost
 Alternative II: State Owned and Operated 800 MHz Trunked Radio System

		LIST COST		HIGH ESTIMATE		LOW ESTIMATE
RADIO INFRASTRUCTURE	100%	\$ 2,994,790	85%	\$ 2,545,600	75%	\$ 2,246,100
MICROWAVE	100%	\$ 1,319,880	90%	\$ 1,187,900	90%	\$ 1,187,900
NON-FIXED EQUIPMENT	100%	\$ 6,341,500	85%	\$ 5,390,300	75%	\$ 4,756,100
PHYSICAL FACILITIES	100%	\$ 894,275	90%	\$ 804,800	90%	\$ 804,800
VENDOR SERVICES	100%	\$ 937,610	85%	\$ 797,000	75%	\$ 703,200
SPARES - NON FIXED	100%	\$ 126,830	100%	\$ 126,800	100%	\$ 126,800
SPARES - FIXED	100%	\$ 52,089	100%	\$ 52,100	100%	\$ 52,100
CONTINGENCY	100%	\$ 520,895	90%	\$ 468,800	80%	\$ 416,700
TOTAL		\$ 13,187,869		\$ 11,373,300		\$ 10,293,700



TABLE E-2
 Estimate of Probable Cost
 Alternative III: County Owned and Operated 800 MHz Trunked Radio System

		LIST COST		HIGH ESTIMATE		LOW ESTIMATE
RADIO INFRASTRUCTURE	100%	\$ 6,222,256	85%	\$ 5,288,900	75%	\$ 4,666,700
MICROWAVE	100%	\$ 1,591,960	90%	\$ 1,432,800	90%	\$ 1,432,800
NON-FIXED EQUIPMENT	100%	\$ 6,341,500	85%	\$ 5,390,300	75%	\$ 4,756,100
PHYSICAL FACILITIES	100%	\$ 1,502,525	90%	\$ 1,352,300	90%	\$ 1,352,300
VENDOR SERVICES	100%	\$ 1,677,013	85%	\$ 1,425,500	75%	\$ 1,257,800
SPARES - NON FIXED	100%	\$ 126,830	100%	\$ 126,800	100%	\$ 126,800
SPARES - FIXED	100%	\$ 93,167	100%	\$ 93,200	100%	\$ 93,200
CONTINGENCY	100%	\$ 931,674	90%	\$ 838,500	80%	\$ 745,300
TOTAL		\$ 18,486,925		\$ 15,948,300		\$ 14,431,000



5.0 CTA Recommendations

It is a certainty that Dare County will be hit by a devastating hurricane; the only uncertainty is when. While it is not a certainty that terrorists will select Dare County for its “soft” tourism targets, an unready county makes an attractive target. Catastrophe is real and probably guaranteed, and to a large part not under the control of the County. What *is* under the control of the County is response.

The after-action reports for 9/11 (New York) and Katrina in New Orleans place *lack of communications* near the top of the list of reasons for inadequate response. As is the case with all of America, Dare County *must* learn from these catastrophes. Examination of the 9/11 (Pentagon) after-action report shows that the capital region jurisdictions *did* learn from the chaos that resulted after the Air Florida crash in January of 1983. The fact that they improved their *communications* in the interim was a major reason for the limited loss of life during 9/11.

The County’s communications infrastructure, while being minimally adequate for routine operations for some of your public safety agencies, is inadequate for others, and will become the weakest link in the ability of your public safety agencies to respond to a true catastrophe. Your current infrastructure is *not* survivable, it does *not* provide adequate interoperability, it does *not* provide county-wide coverage inside buildings, it does *not* provide sufficient capacity to respond to either a substantial emergency or multiple small emergencies, and it does *not* provide protection against interference. While it might be adequate for a rural agricultural county, it is *not* adequate for a major Atlantic tourist destination serving 300,000 people and expanding every year.

The time for action is now. CTA Communications recommends that Dare County move forward on a complete public safety communications overhaul. We recommend moving to a single unified communications system that will provide adequate radio coverage for *all* your public safety and public service personnel, a system that will provide sufficient capacity to allow response to multiple concurrent emergencies, a system that will be *designed* for reliability and survivability. We recommend an 800 MHz trunked radio solution, and we recommend that it be implemented in the very near future – because every year without adequate communications exposes the County to risk.



CTA well understands that a multi-million dollar project must be carefully considered before being undertaken. We urge the County to consider public safety communications to be an essential capital project: no less important than schools, no less important than adequate water and sanitation, no less important than the bridges that maintain the tourism lifeblood of the County. While your public safety people recognize their communications as essential to their everyday responses, your citizens will probably only *too late* understand the impact of inadequate communications by reading about it in the inevitable Dare County after-action report.

After all, Public Safety Response *is* under the Control of the County.

