

Public Notification: Communicating Critical Information During Emergencies

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

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Abstract

The problem was that Chesterfield County, Virginia had a need to communicate critical information during emergencies and used limited means to do so. This deficiency provided the potential for harm to the county population. Descriptive research was conducted to determine the sociological implications, identified outcomes, existing methodologies and technology used to conduct public notifications. The research procedures included literature review, an interview and a questionnaire. The results revealed that notification of the public is a complex task however there are a multitude of methods that can be used to successfully perform this important public service. Recommendations included updating the county's emergency operations plan language and expanding upon the notification methodologies currently used.

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Introduction

The end is near, or so it would seem. Catastrophes that result in large numbers of human casualties and significant damage to property have been with humankind since recorded history. However, the recent number and severity of disastrous events to strike civilization seem to be hard to fathom. From the events of September 11, 2001 when terrorists killed thousands of people, to the 2004 Indian Ocean tsunami which claimed over 230,000 lives, to the death and destruction inflicted by Hurricane Katrina in 2005 on the United States Gulf Coast, and the more recent Virginia Tech mass shootings, it seems as though these type of events are occurring with more frequency and severity.

These disasters and others of a similar nature inevitably lead to discussion and research about how governmental authorities effectively notify the public both prior to an event and in its aftermath (Allen, 2004; Faerber & Hall, 2007; Quarantelli, 2002). Advances in technology coupled with the public's desire for timely information have lead to a proliferation of public notification systems which enable governments to communicate critical information to the public during times of crisis. The recent frequency of large scale disasters coupled with a technological revolution (Friedman, 2005) presents a real and difficult challenge for officials who wish to communicate with their population in an attempt to keep them from harm and reduce the adverse effects of these events.

The *American Heritage Dictionary* defines risk as “the possibility of suffering harm or loss; danger” (“The American Heritage® Dictionary of the English Language”, 2007). As noted in the *Leading Community Risk Reduction Student Manual* (United States Fire Administration [USFA], 2007b), fire service leaders are responsible to function as risk reduction leaders in their

communities and serve as champions in the reduction of risk factors affecting the public that they protect (SM-017). One of the primary methods for reducing risk is to communicate its presence to the public together with preemptive actions that can be taken to reduce the dangers and or minimize the damage associated with the risk. In *The Social Contours of Risk* the authors write that “Communicating risk is an emerging major activity of institutions responsible for managing risk” (Kasperson, et. al., 2005).

Risk communication is not a new concept. One of this country’s first and most famous public notification efforts, the ride of Paul Revere to alert the citizenry of a pending British attack, shows that the need for early warning of pending disaster was present even in this country’s beginning. Primitive notification systems, such as town criers, were eventually followed by the federal Emergency Broadcast System developed during the Cold War in the 1950s. (Allen, 2004; Leggiere, 2005). And much more sophisticated systems, using cutting edge technology, are now in place today.

The failure to use preemptive notifications can be catastrophic. One prime example was seen in the events preceding the attack of Pearl Harbor in 1945 (Ward, 2003). More recently, the public has suffered as a result of the lack of warning and notification prior to the Indian Ocean tsunami of 2004 and Hurricane Katrina in 2005 (Voisard & Meissen, 2006). More interestingly, despite multiple terrorist attacks on our country on September 11, 2001, no public warning systems were activated within the United States on that inauspicious day (Allen, 2004).

The research problem is that Chesterfield County, Virginia has a need to communicate critical information to the public during emergency events and currently employs limited means to do so. These limitations could result in increased casualties and or property damage during a catastrophic event. The purpose of this research is to assess current practices, determine desired

outcomes, identify practical solutions and recommend methodologies to be used in improving the county's ability to communicate critical information to the public during emergencies.

Descriptive research will be conducted to determine what, if any, are the social aspects of communicating crisis information to the public during emergency events? Further, what, if any, are potential identified outcomes of public notification during emergencies and what methodologies exist to perform these notifications? Finally, what systems and technologies are other jurisdictions using to perform public notifications to communicate with people during large scale emergencies?

Background and Significance

Located in the Richmond metropolitan statistical area (MSA) of central Virginia, Chesterfield County covers 446 square miles of land. Providing fire protection, emergency medical, emergency management and other specialty services, the Chesterfield Fire and Emergency Medical Services (CFEMS) department serves approximately 310,000 people with over 600 career and volunteer personnel staffing 29 fire and rescue stations. The department responded to over 39,000 calls for service in 2006 (Chesterfield County Fire and EMS [CFEMS], 2007).

The Richmond metropolitan area lies at the intersection of two major interstate highway systems serving the eastern United States. Chesterfield County directly abuts the City of Richmond to the south. Two major navigable waterways intersect in southern Chesterfield County with the James River, which borders the county to the north and east, also serving as a shipping route to the City of Richmond's deepwater port. Being within close proximity to the tidewater area of the state and the Atlantic Ocean, the area is prone to damage from hurricanes which strike the eastern United States. The most recent of these was Hurricane Isabel which

directly impacted the Richmond area in September 2003, killing 10 people in Virginia and inflicting over \$100 million dollars of damage in the Commonwealth (National Hurricane Center, 2006).

While serving as a residential community to the Fortune 500 companies headquartered in the City of Richmond, the county is also home to a number of commercial, industrial and technology businesses. Several small colleges and Virginia State University are located within the county's boundaries as well as a secure military installation. With an operating budget of \$1.1 billion dollars, Chesterfield County is home to a diverse and well educated population (Chesterfield County, 2007a). Based on recent census data, the county is the largest locality in the metropolitan Richmond area and the third largest county in population in the Commonwealth of Virginia (Chesterfield County, 2007b).

The Richmond area and more specifically Chesterfield County have not been without significant incidents which led to the need for mass public notification. The area has suffered fire conflagrations, winter storms, hurricanes, tornadoes and flash floods during the past several decades which, individually, have affected millions of the region's citizens. An article in *Firehouse Magazine* noted that several tornadoes struck the cities of Petersburg and Colonial Heights on August 6, 1993 resulting in significant damage. These tornadoes caused four deaths and resulted in hundreds of injuries (Rubin, 1994). Both of these cities border Chesterfield County to the south and the county suffered physical damage as well. CFEMS responded to both incidents with considerable mutual aid resources and assisted in recovery efforts.

More recently Tropical Storm Gaston struck the county on August 30, 2004. The remnants of this tropical storm deluged the Richmond metropolitan area with between five and ten inches of rain in just several hours. The resultant flash flooding killed several people

including one citizen in Chesterfield County who was swept away during a swift water rescue operation that was being conducted by CFEMS personnel. During this event, multiple swift water rescues were performed by CFEMS and a large affected area of the county was evacuated due to concern of a dam failure (CFEMS, 2005).

In August, 2007 Chesterfield County, using grant and capital funds, implemented a low power amplitude modulation (AM) radio station network (e-mail message to county employees on September 9, 2007). This network, which is owned and maintained by Chesterfield County, employs seven low power AM radio transmitter towers, strategically located near the primary population centers, to communicate with county residents and visitors. The information conveyed during normal day to day activities is taped by the Chesterfield County Public Affairs Office and consists of routine information about county services and events. However during emergencies, the system can broadcast live, real-time information directly from the county emergency operations center located in the county government complex.

As noted herein, Chesterfield County has had the need to conduct emergency public notification during numerous natural disasters. It is anticipated that this need will continue. The county's present reliance on the local media and a low powered AM radio network may not be comprehensive enough to meet the needs of a diverse county with a growing population base. The research conducted for this paper will investigate the rapidly changing face of emergency public notification and apply what is learned to recommend improvement in those services presently offered by the county.

This research specifically relates to the United States Fire Administration's objective to assist communities in developing comprehensive all-hazard risk reduction plans. (USFA, 2007a). The research also relates to the National Fire Academy's *Leading Community Risk Reduction*

(USFA, 2007b) course curriculum which specifies that a community risk reduction plan should be multi-hazard, multi-faceted and developed to minimize the effects of significant events (SM 0-15).

Literature Review

When conducting risk communication there is a vast body of sociological-based knowledge for consideration. In *Managing Fire Services*, the authors write of increasing numbers of people being exposed to natural and manmade hazards, the growing social interdependence related to populations living in high hazard areas, and increasing antisocial threats derived from global terrorism (Coleman & Granito, 1988). Related research shows that there are a number of psycho-social considerations when communicating with human beings, particularly during times of crisis. Extensive study has been conducted on how people communicate and some of this research has been specifically focused on risk communication.

The Fire Chiefs Handbook (2003) notes that each community has a unique profile based on the demographics, economics, environmental conditions, weather, culture and ethnicity of the region being governed. Just as the eastern coast of the United States rarely experiences earthquakes, so does the west coast infrequently deal with hurricanes. A community's unique profile must be taken into account when emergency management officials conduct risk analysis and communication activities (Barr & Eversole, 2003).

When government agencies convey critical information to the public one aspect of the human response that emergency managers must consider is panic (Faerber & Hall, 2007). Since governments began warning people of pending emergencies the responsibility to inform people of potential harm and how to respond has been debated. Many people believe that when the populace is faced with danger, they will panic. Research conducted on multiple situations where

a population has faced significant impending harm indicates that this perception simply is not true and that the general public is much more resilient than they are given credit for (Wessely, 2005). Emergency managers should balance the need to warn people with the possibility of creating undue fear. However, experts advise that rational fear can be a positive impetus to ensure that the public engages and takes action when warned (Faerber & Hall, 2007).

Humans are complex beings and research shows that preparation and response to personal and community risk is largely based on personal perception. In *The Social Contours of Risk* (2005), the authors' research indicates that people may not panic when trying to manage a crisis, but they can be overwhelmed very quickly. Among the general characteristics found by researchers when critical information is communicated during times of pending or real crisis; people tend to cope with information overload by oversimplifying the situation. Further, people are likely to believe primarily in what they see, either in person or via the news media, as opposed to other sources of information. Research also indicates that people have difficulty in discerning when communication is incomplete, critical information is missing or the when purported experts relating the information are not valid (Kasperson, et. al., 2005). In a related area, researchers studying the affects of communicating risk have identified the mental noise theory as a human aspect that emergency officials should account for. When people are upset or fearful for their safety, they have difficulty in listening to, understanding and retaining critical information. Researchers estimate that mental noise can reduce a person's ability to process information by more than 80% (Covello, 2006).

Following the events of September 11, 2001 studies looked at the influence of the media on the public during large scale emergencies. Research shows that the large national print, television and radio media outlets have a significant affect on what the public perceives is

happening during times of crisis. In *The Role of the Mass Communications System in Natural and Technological Disasters and Possible Extrapolation to Terrorism Situations*, the author writes that mass media organizations function as their own social institutions with their own sets of values, beliefs and norms (Quarantelli, 2002). E.L. Quarantelli (2002) further notes that one outcome of this situation is that the large media outlets are very selective about what they report and how it is framed in terms of social implications. Many news stories, especially those that deal with human hardship following a disaster, are often produced to relate human conflict [individual versus government bureaucracy] rather than a straight reporting of the facts surrounding a situation (p. 9).

Additional studies have shown that the way in which the media broadcasts information actually conditions people to adapt to their mental noise. Research conducted by the Center for Risk Communication indicates that the media are formatting their messages in a similar manner to that which is recommended for emergency management officials to ensure that the public is able to comprehend and retain critical information. Studies reviewing 10 years of media coverage of emergencies show that the average length of a sound bite used was 27 words, the average duration of the sound bite was 27 seconds and the average number of messages printed or broadcast was three (Covello, 2006).

Another aspect for consideration is that the large media institutions tend to focus their stories at a national level and often fail to communicate the intricacies of local issues very well. Studies have revealed that national media outlets do not necessarily reflect regional economic or political realities even though they produce and broadcast their stories as representing a local example of an overall problem (Quarantelli, 2002). Additionally, the tendency for major media outlets to provide news content with a specific slant or agenda has been widely documented by

research studies and personal anecdotes. Examination reveals that the targets of negative bias in reporting most often tend to be large corporations and government agencies [big brother] (Goldberg, 2002).

However, the media are not the only culprits when related to poor information management during disasters. As noted in *Disaster Myths and Hurricane Katrina 2005: Can Public Officials and the Media Learn to Provide Responsible Crisis Communication during Disasters?*, research conducted following Hurricane Katrina in 2005 has identified disaster mythology as an increasing problem. Often emanating from federal, state or local officials, misinformation fed into today's frenzied media environment is then broadcast to the public as fact. These myths, like the number of deaths attributed to Hurricane Katrina, begin to take on a life of their own and are then very difficult for public officials to later refute (Arnold, 2006).

The problems for public officials dealing with disaster myths and misinformation are significant. When the public is misinformed it often results in poor public response to direction and misguided decision-making. Officials then must spend valuable time and resources in attempting to correct the situation and provide accurate information. Further, as evidenced during the September 2001 terrorist attacks and Hurricane Katrina, officials that plan emergency response and recovery efforts based on misinformation from other public officials tend to misguide their efforts at response and recovery. This results in a misalignment of incident priorities and the potential allocation of resources to perceived rather than real problems (Arnold, 2006; Quarantelli, 2002).

Whether myth or reality, public officials also need to be aware of the consequences of fear when catastrophic events occur. Those emergency officials tasked with crisis communications need to take the human response to real or perceived danger into account when

communicating with the public. Significant research has been performed on the health affects of risk perception and people's response to fear. Among the general findings; human beings subconsciously select what to fear and generally fear similar things for similar reasons (Gray & Ropelk, 2002). For example, following the September 11, 2001 terrorist attacks airline travel dropped significantly, gun sales rose, and people began taking prophylactic antibiotics to ward off the perceived threat of the anthrax exposures that closely followed the September 11 attacks (p. 107).

Fear is largely related to public awareness. In *Dealing With The Dangers Of Fear: The Role Of Risk Communication*, the authors write that those risks most prevalent in people's minds generate the most fear (Gray & Ropelk, 2002). Risks don't necessarily go away; the fear generated by the public's awareness of a certain threat is often replaced by more pressing risks as communicated by the media, public officials or the public consciousness (p. 108). And studies have found that public fear is largely attributable to very common factors such as uncertainty, the degree of perceived personal threat, how new an apparent danger is, the size and scope of the problem, whether a person's exposure to the threat is voluntary, how much control people have over their well being and the trust that the population places in the public officials that are managing the threat (p. 110).

One aspect of risk perception and fear that is widely accepted through both empirical evidence as well as formal research is the human tendency of optimism bias. Gray and Ropelk (2002) note that the inclination of people to believe that bad things only happen to other people is real and must be managed. This human tendency presents challenges to emergency officials that have been widely documented in research literature and the media (p. 109). This trait of personal denial often overrides even thoroughly effective risk communication as people often

refuse to acknowledge and act on threats despite clear and concise information to the contrary. These identified human attitudes are not, however, supported by fact. Statistical analysis shows that a typical community in the United States experiences a significant emergency event, on average, about once every twelve years (Coleman & Granito, 1988).

Reinforcing this observation, research on the Department of Homeland Security Homeland Security Advisory System (HSAS) indicates that only ten percent of people surveyed have changed their personal plans based on the threat levels present in the United States. Studies have also observed that the public's perceived threat of a domestic terrorist attack have largely returned to levels measured prior to September, 11, 2001 (Knight, 2005).

However, just because you provide a notification service doesn't mean that the public will use it. The *Richmond Times-Dispatch* analyzed the after effects of the Virginia Tech campus massacre (Macenka, J., 2007). Since that day in April 2007, Virginia universities have spent millions of dollars on automated, multi-media, public notification systems. These systems provide several different notification options to the university's students, faculty and staff which include telephone, e-mail, public announcements, campus wide siren systems and text messaging. While some of these options do not require any participation on the user's part, the ones that do have not received wide-spread acceptance. As of September 2007, when these universities were fully back in the fall session following the Virginia Tech shootings, the five largest universities in the Commonwealth of Virginia had only enrolled approximately one third of their students in the notification services that required them to take action (i.e. sign up) to participate (Macenka, J., 2007).

Literature citations frequently refer to potential outcomes specific to the notification of the public during emergencies. In *Managing Fire Services* (Coleman & Granito, 1988) the

authors note that one of the primary and most frequent problems encountered by emergency officials during large scale emergency events is that of communication and coordination. Public officials should ensure that emergency notification systems and the corresponding methodology for employing these systems are a part of every community's emergency operations plan (Coleman & Granito, 1988). Studies have shown that even with the propagation of communications technology in today's society and the seemingly instant connectivity that people maintain with each other, societies largely fail to communicate critical information to their citizens during large scale emergencies (Voisard & Meissen, 2006). Reinforcing this observation, an article entitled *Homeland Security Advisory System* (2003) notes meetings and workshops that have been held to discuss emergency notification strategies from a national perspective. These sessions have shown that the United States currently lacks an overall public notification strategy at the national level (Rudman, 2003).

Risk communication involves the conveyance or exchange of information regarding hazards that are present or imminent. In *Crisis Response Journal*, Voisard and Meissen (2006) write that one can classify the flow of information as being in a push mode where the information is sent, unsolicited, to the end user or a pull mode where the end user requests information which is responded to by official sources. At a fundamental level it is important during the communication of risk and the accompanying mitigation actions that the communication be two-way ensuring that the receiver verifies receipt with the sender (Miasnik, 2005; Wray, et. al., 2006).

The flow of information during risk communication primarily affects three types of users. Decision makers should have a sense of the overall situation and a need to communicate information to both first responders and the public. Emergency services personnel have a need to

understand the situation status and overall action plan. Civilians, the end users of the communications flow, do not necessarily need the big picture but do desire specifics as to the risk and outcomes that directly affect them (Voisard & Meissen, 2006).

Henning (2004) notes in *Asking Tough Questions About Public Warning* that in determining the desired outcomes of conducting public notifications, officials should understand that local governments are primarily responsible for conducting such notifications and that the systems and methodologies used should be based on an all hazards focus. In *The National Public Warning Crisis Ward* (2003) writes that when assessing desired outcomes of risk communication strategies, research has shown that regional and national warnings do not tend to carry the weight and specificity of those generated by local level government agencies.

The Department of Homeland Security (DHS) also acknowledges that although events may be of a national magnitude, the management of such events is still primarily a local, regional and or state level responsibility. In an article published in the *Journal of Homeland Security and Emergency Management* Knight (2005) relates that many people have criticized the color coded Homeland Security Advisory System (HSAS) as being too simplistic and easily ignored. Studies that have been done on the HSAS indicate that slightly less than half of the people surveyed (49.5%) have knowledge of the system. These studies further indicate that awareness of the system also decreases with a person's age. In a recent study, which qualified awareness of the system based on a number of sociological factors, the two primary variations affecting awareness were race, with blacks slightly less aware than whites; and education, with higher levels of formal education equating to a higher awareness of the system among survey participants (Knight, 2005).

Researchers stipulate that communicating effectively during times of crisis requires emergency officials to carefully craft and deliver their messages. One tool to use in doing so is messaging mapping. Using these techniques, public officials identify the audience, the key messages and the supporting data to communicate critical information to the public. Message mapping allows for discipline in constructing and communicating information and permits multiple officials and agencies to be consistent and uniform in doing so (Covello, 2006).

Some industry experts warn that emergency managers have begun to rely too much on emerging notification technology and fail to recognize their responsibility to ensure that the human element is integrated into the equation. Emergency notification processes, in some instances, have evolved into technical systems that scientists and technocrats develop and implement. Emergency managers should use these resources as technical experts to advise and assist in addressing the overall problem of notifying the public, not as the primary developers of the process. Unless the technology is utilized in an all-hazards approach and managed by officials well-versed in the emergency management disciplines, the systems developed will fail to address the overall problem at hand (Faerber & Hall, 2007; Henning, 2004).

When scientists and other like experts are the primary people being depended upon for the technical expertise to initiate a warning or update information about a large scale emergency, there is the possibility for a disconnect to occur. As noted in *A Scientist's View of Public Warning*, (Michael, 2003) scientists have a different view of both natural occurrences as well as statistical probabilities than do laypeople. The author further documents that these factors, coupled with a lack of emergency management experience, may unintentionally cause misinformation to be communicated to the public (Michael 2003).

Regardless of who conducts the notification or the system used, there are a number of inherent limitations in doing so. Allen (2004) writes in *Blindsided by Disaster* that even with today's technology it is still difficult to contact large numbers of people quickly. Society is still largely out of direct contact during sleeping hours when televisions, radios and personal communication devices are turned off. And even if tuned into broadcast media, the public may not receive emergency notifications via traditional notification methodologies (Allen, 2004). Further, use of warning systems to conduct large scale notifications still tend to alert large numbers of people who are not actually at risk. Risk communication experts also question the capabilities of some systems due to the highly mobile nature of society today, (Henning, 2004) inquiring whether traditional warning systems like the National Weather Service weather radio and the Federal Communications Commission's Emergency Alert System are truly effective in reaching the public at critical times.

Researchers also relate that simply broadcasting emergency notification messages to large numbers of people is not always as effective as some would believe. Creating a situational awareness within the public and communicating critical information to the desired population is a difficult task. An emergency public notification system is only truly effective if it can reach the intended population with the correct information in a timely fashion (Miasnik, 2005).

In *The National Public Warning Crisis* Ward (2003) writes that even with the advances in technology to support notification systems, most emergency services personnel must still rely on third parties to initiate notifications. Warnings from different sources continue to be difficult to integrate into one common communication. And as much as Americans seem to be connected to their televisions and radios, these are not full proof conduits for communicating during

emergencies. With the proliferation of satellite radio and television services, a growing number of people are not monitoring locally generated broadcast services on a regular basis (p. 9).

The growing demand for communication of critical information and the development of technologies for doing so has resulted in calls for commonality to ensure that these notifications are conducted efficiently. Several government studies have identified diversity in systems and associated technology as being a detriment in conducting risk communication. As such, a common alerting protocol has been called for which would eventually ensure that these disparate systems are capable of cross-functionality and supporting different technologies (Botterell, 2003).

One often overlooked area that needs consideration is people with special needs. People who are incapable of processing information through normal methods still have a need for notification prior to or during critical events. With the special needs population in the United States numbering 40 million people, a number of products have been developed that integrate with common communication technologies to facilitate contact with this population (Allen, 2004).

In *Disaster Recovery Journal* D'Arcy (2006) writes that the need for rapid communication of critical information to a large number of people is not limited to governmental agencies communicating to the general public. Many large businesses and corporations, employing thousands of people in multiple business locations, have the same or similar needs for business continuity purposes. The construction of an effective crisis communications infrastructure is a consideration for the business community who has also begun to employ many of the same technologically based systems as government agencies.

Research of relevant literature revealed a number of methodologies, inclusive of different processes, systems and supporting technology that exist to perform emergency public notifications. Tying into the social aspects of conducting large scale notifications is the personal communications phenomenon that has affected the world in the last decade. In his book *The World Is Flat*, Friedman (2005) writes of recent technological developments, led chiefly by the development and expansion of the Internet, which have created a global connectivity never before seen in society and imagined by only a few forward thinking people. There are distinct advantages in using technologies for emergency public notification but Friedman (2005) cautions that informal social networks can often communicate information much more rapidly than formal government systems.

Included with these varied methodologies should be documentation as to how the system or systems will be activated, who the responsible parties are for activating and maintaining the systems and other information needed for the successful management of the system. The *Chesterfield County Emergency Operations Plan* (EOP) has a section which addresses emergency public information (Chesterfield County, 2004). This section notes the overall mission of the county's public notification effort, who the primary responsible officials are, the concepts of how emergency public notifications will be carried out and how notifications should be performed based on operational phases. It specifically names the Chesterfield County Administrator, the Coordinator of Emergency Management and or Director of Public Affairs as the personnel responsible for crafting and disseminating critical information during emergencies (p. 2-1).

The federal government maintains two national public emergency notification systems. The National Weather Service operates the National Oceanographic and Atmospheric Agency's

(NOAA) National Weather Radio (NWR) system. The Emergency Alert System (EAS), which transmits messages over radio and television stations is administered by the Federal Communications Commission (FCC). The NWR had traditionally been used to warn people about weather related emergencies but this system is increasingly being used in an all-hazards approach for more wide spread emergency notifications (Allen, 2004; Henning, 2004; Leggiere, 2005).

These large systems have some drawbacks. In *Blindsided by Disaster*, Allen (2004) notes that although the NWR transmitters cover 95% of the land mass occupied in the United States, less than 13% of the population has the radio receivers needed to receive the broadcasts. The EAS is limited by the fact that, with the exception of presidential messages, participation in the system by local television and radio stations is voluntary. And with the development of cable and satellite networks, many people are not listening to or viewing local broadcast content even if they are tuned to a radio or television. This is supported by studies that indicate that only 50% of the EAS messages are actually transmitted to the public (p. 19). Another problem with both systems is that they require emergency officials to interact with people who are tasked with activating the systems. Without direct input and activation capabilities held by local government officials, it is often difficult and time consuming to ensure that the messages are transmitted accurately and in a timely manner (Allen, 2004; Henning, 2004).

Beyond these two long standing systems, technological innovations have increased the capabilities to communicate with people on a personal basis and wireless connectivity has become increasingly common. Thus, public notification capabilities and associated outcomes have become more narrowly focused. In *Emergency Response: The Spirit of Paul Revere* Leggiere (2005) notes that communications system developers now see two primary methods of

notifying the public. The more traditional wide broadcast systems continue to use legacy technology like the Emergency Alert System (EAS). Adding to these capabilities present day technology, like cellular phones and wireless personal communications devices, provide officials with the ability to construct systems that narrowcast messages reaching a smaller, selected group or population of people.

With technology expanding some people have called for standardization in all areas of public notification. In December 2001 the Partnership for Public Warning (PPW) was founded to raise awareness, facilitate the organization of stakeholders and develop standards for all aspects of public warning (i.e. notification) systems. The PPW was disbanded in 2005 but prior to that had been involved in organizing a number of initiatives in an attempt to standardize public notification practices and technologies (PPW, 2007).

With the growth in these technologies and the variations in how information is transmitted, potential system buyers need to conduct research and consider what notification methodologies may work best in their jurisdiction. The multitude of systems and notification methodologies has led to calls for open architecture in the ability for first responders to access and employ technology for emergency notifications to the public (Larson, 2005). The desired outcome of developing an effective public notification system is not due to a lack of technology but rather due to the lack of an overarching strategy at the national level for conducting such notifications. The use of technology will only be successful if there is a commonly agreed upon vision and roadmap that encompasses all aspects of public warning and notification and provides for improvement in the dissemination of information during critical events (Allen, 2004).

Literature research also revealed a number of different systems and technologies employed by local, state and federal government organizations. The proliferation of different

communications devices such as cellular phones, personal data assistants (PDAs) and Blackberry™ devices aids in the ability to reach people but adds to the complexity of building and managing notification systems. Estimates indicate that about 25% of the population has the capability of being connected to some type of emergency notification system at any given time (Larson, 2005).

One type of technology that continues to evolve is telephone calling systems, (Henning, 2004, Willis, 2005) now more commonly known as emergency telephone notification systems (ETNS) (Weaver, 2004). Sometimes referred to as reverse 9-1-1, these systems typically use databases to place automated telephone calls to homes and businesses notifying the public of critical emergency information. The databases used are either self-maintained by the jurisdiction, usually through a subscription sign-up service, or are based on the billing database of the local or regional telephone companies (Henning, 2004, Weaver, 2004; Willis, 2005). Recognizing that ETNS is a growing communications tool, the National Emergency Number Association (NENA) has developed a standards making process for these systems (Weaver, 2004).

Automated notification systems are a derivation and expansion of the original reverse 9-1-1 systems. Rather than just calling homes and businesses through landline (e.g. hard line) telephone systems, automated notification systems have the ability to call and text various communications devices including telephones, cellular phones, PDAs, pagers, faxes, e-mails and other devices which receive SMS messages (Henning, 2004; Hoffman, 2004; Weaver, 2004). Many of these systems require subscription sign-ups by users who direct the system to their preferred contact device (Macenka, J., 2007).

Short Message Service (SMS) is a communications protocol that permits this text messaging to and between wireless communications devices. This communications technology

has led to the rise in text messaging in mobile environments using cellular phones and personal data assistants equipped with cellular capabilities. Many of the more recent public notification systems that have been developed make use of SMS to permit the receipt of emergency notification information while the user is in a wireless environment (Voisard & Meissen, 2006).

The use of outdoor warning sirens dates back to the days of civil defense efforts during World War II. With the expansion of communications technology and the outcomes of some of the significant catastrophes that have occurred during the past decade, there has been resurgence in the adaptation of outdoor warning sirens to integrate with more technologically advanced warning systems (Henning, 2004). In some cases the outdoor sirens create the initial awareness of an emergency which is then followed up with more sophisticated automated electronic messages to telephones, cell phones, pagers, PDAs and other wireless devices (Macenka, J., 2007).

Door to door notifications still remain a primary methodology for many jurisdictions. While reliable, having emergency personnel walking door to door to communicate important information to the citizens is time consuming, personnel intensive and relatively inefficient (Henning, 2004). However, for focused communication of voluntary or mandatory evacuation, this methodology still remains in use as a notification tool in jurisdictions (Chesterfield County, 2007b).

One older notification system that is still in use in some areas is a manual call tree system (D'Arcy, 2006). This system uses people to call lists of other people to pass on critical information. The list is exponential so once started, multiple people are activated to contact other people and the notification effort grows rapidly. However, compared to the technology that is

readily available today, calling trees have some inherent problems. If one person in the tree can't be reached those people below them on the tree (e.g. calling list) will not be called. It is also time consuming to make the manual calls and information can be unintentionally altered when passed from person to person. Research indicates that a phone tree attempting to deliver 1000 notifications is only 35% effective and takes four hours to reach that goal. Conversely, an automated calling system can reach 95% of the intended targets within approximately 15 minutes (D'Arcy, 2006).

To reinforce the expansive use of technology in the field of public notification, the 2004 March-April edition of *Homeland First Response* (2004) magazine contained a warning and alerting resource guide with a number of companies and products that provide risk communication and alerting to the public. Among the many products and services listed were telephone notification systems, SMS text services to mobile devices, warning siren systems, software and mapping vendors, Internet and e-mail notification services, indoor and outdoor alerting systems using loudspeakers, wireless audio-visual systems, and integrators that combined several of these systems into one notification service (p. 21).

The literature research conducted for this paper revealed that communicating to and with the public during times of crisis is a complex and difficult task for public officials. Exchanging information with people is a multifaceted problem under normal circumstances. When the stress of an emergency event is added to the complicated social dynamics of how people receive and process information, this task becomes even more difficult.

Officials designing and implementing public notification systems should identify desired outcomes that they wish to achieve in conducting this vital service. Each community is different and how emergency public notifications are performed can vary widely dependent on

community profiles. There are a vast number of methodologies, systems and services to assist in these efforts but planning must occur to ensure that the objectives are clearly defined and the methodologies used to reach the objectives are identified and developed as communication resources. This literature research served to validate the problem statement and reinforce the theory that Chesterfield County is not utilizing all available types of resources to conduct public notifications during emergency events.

Procedures

The descriptive research conducted to write this paper was focused on addressing the specific questions presented in the problem statement. Research that was carried out also provided general background for the research subject being addressed and was used to enhance the discussion contained herein. The specific intent of the literature research was to identify published works that documented the social aspects of communicating critical information to the public during emergency events; investigate identified outcomes of public notification processes; and cite documented methodologies, systems and associated technologies that exist to perform these notifications.

A questionnaire was developed to acquire feedback from other public safety agencies and jurisdictions as to what methodologies are presently being used to perform public notifications. The questions in this instrument were developed to add context to and confirm the information gained through the literature research which was conducted. To further this research an interview was conducted with an emergency management official to corroborate the literature research and gain insight as to real world application of these written theories and observations.

The research began with a search of pertinent literature at the National Fire Academy's Learning Resource Center (LRC) in August, September and November 2007. Multiple searches

for literature related to the problem statement were conducted using the computerized card catalog system in the LRC. The search terms used included public notification, reverse 911 system, emergency broadcast system, and several other variations and combinations of these terms.

Additional Internet based research was conducted using the Google™ Scholar and Merlot Internet search engines, both of which provide banks of scholarly research literature which is organized and searchable based on key words. The search terms used on these Internet sites were similar to those used with the LRC card catalog system. Each system produced a number of literature citations which were reviewed to determine whether the content was applicable to and supported the questions posed in this paper's descriptive research. Those papers, books and articles which were pertinent were used in the literature review conducted and are cited herein.

On December 5, 2007 a questionnaire was constructed using the SurveyMonkey Internet website. This web site provides for the construction, distribution, analysis and reporting of statistical data for use in research. The questionnaire was constructed to support an assessment of public safety agencies and other government jurisdictions to determine what type of emergency notification systems are in use throughout the United States and the related complexities of using such systems. The questionnaire was made available to those that wished to participate via an Internet uniform resource locator (URL) generated by the software. The author distributed an invitation to participate in the questionnaire through a number of contact systems inclusive of personal e-mail lists of professional acquaintances, e-mail list servers, and the National Society of Executive Fire Officers website. Two primary e-mail list servers were used; the TRADENET list and the Metro Fire Planners group.

The TRADENET list is derived from fire service professionals that are affiliated with the Training Resource and Data Exchange (TRADE) program managed by staff at the National Fire Academy. This group contains training and educational personnel from the American fire service and exists to facilitate the exchange of training-related information and resources among its members (USFA, 2007c).

Metro Fire Planners is an informal group of people from metropolitan sized (i.e. 400 members or more) fire departments from the United States and Canada that present and discuss fire service issues by way of an e-mail list server discussion board maintained by Yahoo Groups®. Whenever a member of the group wishes to ask a question, the question is sent via e-mail to the other members and posted to the Yahoo Groups® website.

The questionnaire was available via the SurveyMonkey website to participants from December 6, 2007 until December 31, 2007. The Internet uniform resource locator was made available to the aforementioned groups via postings to the e-mail list servers in early December, 2007. The results of the questionnaire are summarized in the results section of this paper.

An interview was conducted with Mr. Curt Nellis who serves as the Deputy Emergency Management Coordinator for Chesterfield County, Virginia. Mr. Nellis has an extensive background in the fire service and emergency management having served with various local and state agencies including the Virginia Department of Emergency Management. Mr. Nellis maintains a working knowledge of existing and proposed emergency notification systems in Chesterfield County and serves as one of the primary personnel tasked with managing communications with the public during significant events which strike the county.

The interview with Mr. Nellis was arranged in advance by way of a verbal conversation discussing this research project and was confirmed through an e-mail appointment. The context

of the research being conducted was provided to Mr. Nellis prior to the interview being conducted. The interview was conducted on Thursday, December 6, 2007 at the Chesterfield County Fire Administration Building. The purpose of the interview was to gain information regarding Chesterfield County's practices as they related to emergency notification made to the public during significant events. The information and insight acquired during the interview supported all of the research questions posed in this paper.

The limitations of this research are that it is assumed that the responses to the request for participation in the Internet based questionnaire, by way of the various methods cited, was voluntary and arbitrary. The results of the questionnaire were not validated through other research methods and the outcomes should be interpreted as such. Response to the questionnaire were not controlled or limited in any way by the technology employed and it is possible that a single person could respond to the questions more than once.

Results

Research, inclusive of an interview and a questionnaire conducted in support of this paper revealed information that directly relates to the questions presented for study. An interview was conducted with Mr. Curt Nellis who serves as the Deputy Emergency Management Coordinator for Chesterfield County, Virginia (personal interview, December 6, 2007). Among Mr. Nellis' responsibilities are facilitating communications with the public prior to and during emergencies striking Chesterfield County. Mr. Nellis has participated in and managed several projects related to the development of public notification systems and has a thorough working knowledge of both the social as well as technological implications of using such systems.

Mr. Nellis was asked to identify the processes, systems and technology that Chesterfield County presently uses to notify the public before and during large scale emergency incidents.

Mr. Nellis referenced several instances in which he has been involved when there was the need to communicate critical information to the citizens of Chesterfield. These included hurricanes, tropical storms, hazardous materials incidents and other large scale events. Mr. Nellis noted that Chesterfield County currently uses several different, but complimentary systems to conduct these types of notifications.

Mr. Nellis stated that the county alters their emergency notification and communication methodology dependant on the amount of advanced notice and speed of progression of the event. For rapidly occurring situations with little to no advanced notice the methodologies include the ability to activate the Emergency Alerting System (EAS) through either the Virginia Department of Emergency Management (VDEM) or the regional office of the National Weather Service, which is located in Wakefield, Virginia. The activation of EAS enables Chesterfield County officials to transmit critical information through local cable access channels, National Weather Service alert enabled radios, EAS enabled radios as well as local broadcast television and radio stations participating in this service. In addition, the Chesterfield Emergency Operations Plan (EOP) calls for the county police department to conduct door to door notifications and evacuations, if needed (Chesterfield County, 2004).

For events with some advanced notice (e.g. hurricanes), the emergency managers prefer to communicate via the Chesterfield County Public Affairs Office [serving as the county's public information officer] using press releases, the county's Internet website and a county owned and maintained AM radio network. The radio network was initially activated in August 2007 and uses seven low power AM radio transmitter towers which are tactically located near the county's primary population centers. The network is used day to day to convey routine information about county services and events. Mr. Nellis related that during emergency situations the system is

designed to transmit live information from the county emergency operations center. The information communicated during emergencies can also be taped and played periodically to update citizens on information deemed important by the county leadership team.

Mr. Nellis cautioned that the low power AM radio station network had some limitations as an emergency communications device. The system signal quality is poor to non-existent in some areas of the county which precludes its use by citizens who reside in or are passing through those areas. He also noted that the power output of the transmitters is constrained by Federal Communications Commission (FCC) regulations meaning the system can be expanded with more transmitters but the signal strength of the transmitters is limited due to the class and licensing of the system.

When asked, based on his experience, whether Mr. Nellis preferred one communications methodology over another he stated the Chesterfield County did not employ what he felt was the most up to date and effective emergency public notification system available today. The example that he cited uses automated communications technology based on user subscription services to send voice and digital text messages to various devices including telephone, cell phones, pagers, PDAs (ex. Blackberries®), and other mobile devices. He noted that the primary limitation in using these systems was the expense associated with purchasing and maintaining them.

Related to this question, Mr. Nellis noted several constraints with the present public notification systems that Chesterfield County currently relies on. There are advantages to Chesterfield County's Public Affairs Office use of the local media outlets in that the general public tends to rely on local television and radio stations for immediate information. The constraints associated with local media are that these broadcast companies are for-profit businesses that rely on commercials to finance their business operations. Mr. Nellis observed that

the county has little to no control over how, what and when these public broadcast stations transmit critical information during emergency events. He noted that his experience in emergency management has shown that the broadcast stations have a tendency to do well in conveying timely, accurate information during the height of an emergency but quickly lose interest and revert to normal programming when the event goes into recovery mode and the need to convey information to the public still exists.

A question was posed to Mr. Nellis as to how Chesterfield County measured the success of using emergency notification systems. Mr. Nellis noted that the systems that the county presently uses make it difficult to measure success in terms of the completion of critical communications during significant emergency situations. The broadcast media, low power radio station, county website and other current methodologies are primarily one way communication systems with little ability for confirmation or feedback that the message was received and understood.

Mr. Nellis added that the conveyance of critical information to the public during emergencies can be looked at as a two phase approach. His observation was that the first phase consisted of the need to communicate the risks and hazards associated with them. The second part of the message should include actions that the citizenry should take to minimize their exposure or mitigate the problem. The message should be considered incomplete if both phases are not addressed in the transmission of critical information during significant emergency events.

In his experience Mr. Nellis qualifies whether public communication has been successful by virtue of the feedback received from citizens who communicate with public safety agencies during and after large scale emergencies. Some of this feedback is received during emergency operation center activations when citizens call in to the EOC with questions or to receive more

detailed information. Mr. Nellis noted that Chesterfield County has recently developed a call center that will be activated in support of the county EOC. This call center should be able to provide county emergency officials with a sense of how the transmission of critical information to the public has been received and is being complied with.

Mr. Nellis was asked who, within the county government, manages and controls the notification systems and messages that are transmitted. Mr. Nellis spoke of a multi faceted approach rather than a single person with that responsibility. He responded that the county leadership group, consisting of elected officials and the county administrator, provide the overall priorities and critical information to be conveyed. Given that direction an emergency manager (i.e. county emergency management coordinator or designee) and the Chesterfield Public Affairs office craft the message. The technology for the transmission of the message is then managed by one of several personnel including the emergency management coordinator, her deputy (Mr. Nellis), the fire chief, police chief and or the public affairs office dependant on the event and circumstances.

Given Mr. Nellis' experience in emergency management he was asked to comment on the social implications of communicating risk during emergency situations. Mr. Nellis provided a number of observations, the first of which is that humans tend to personalize significant events and qualify the significance based on how the event may affect them. This occurs even if the emergency is of a national scale (e.g. 9-11-2001 terrorist attacks) and the impact has no direct personal affect on them. Mr. Nellis also observed that threat perception is personal regardless of the size of the event and this fact of human nature needs to be taken into consideration when communicating with the public during emergencies.

Mr. Nellis discussed the culture of rugged individualism that is prevalent in the United States and its effect on citizen preparation and response to large scale emergencies. He notes that there seems to be a prevailing attitude of denial in the American public which is manifested in the attitude that bad things happen to other people (i.e. optimistic bias as cited in the literature review section of this paper). This mindset often slows or negates the obvious need for personal preparation and timely response to threats. Mr. Nellis stated that this phenomenon is not as prevalent in European and Asian nations where citizens are much more proactive in their preparation for emergencies and do not maintain these counterproductive and dangerous attitudes.

Mr. Nellis spoke of the socio-economic implications of communicating information to the public during emergencies. He noted that these were wide ranging and included everything from the access to systems and technology that were used for mass notifications to the distrust of government and authority that is prevalent in some ethnic sub-cultures in the United States. His experience and research indicates that the growing language barrier in many areas is one of the most significant emerging aspects of communicating critical information before and during large scale emergencies.

The last question posed to Mr. Nellis dealt with his assessment of today's emergency notification systems and his opinion as to whether one process, system or technology was more effective than others. Mr. Nellis responded that based on the mobility of the public and the present real-time connectivity that exists with personal communications devices; the most effective system he has seen is digital text messaging systems. The advantages that Mr. Nellis noted in his response included the ability for these systems to reach the public through multiple devices (e.g. cell phones, pagers, PDAs). He also noted that most of these systems required

people to subscribe to them meaning that they public must take an active role in the maintenance of the connectivity that is vital to the success of such systems.

To further support the research conducted to gather information for this paper, a questionnaire was developed to acquire information from other agencies as to how they performed emergency public notifications. From December 5, 2007 through December 31, 2007 this questionnaire was available to emergency services personnel via the SurveyMonkey Internet website. Administration and distribution of the questionnaire is documented within the procedures section of this paper. The questionnaire was constructed to enable the author to determine the use and practices of public notification systems by emergency services organizations. The results of the responses are summarized herein. Over the 26 day period that the questionnaire was available 69 responses were obtained.

The first question qualified the type of organization that the respondent was representing in answering the questions. The majority of respondents represented career fire departments with combination fire departments making up the next highest response category. Together these two categories represented 86% of the overall responses to the questionnaire. This is largely related to how the questionnaire was advertised as noted in the procedures section of this paper. A small percentage of emergency management agencies participated and were also represented.

Table 1

Question 1: Please describe your organization (check the primary type if there are multiple services)

	Response Percent	Response Count
Career Fire Department	50.7%	35
Combination Fire Department	36.2%	25

Volunteer Fire Department	2.9%	2
Fire District	1.4%	1
Emergency Medical Services	0.0%	0
Police Department	0.0%	0
Emergency Management Agency	4.3%	3
Other (please specify)	4.3%	3
	<i>answered question</i>	69
	<i>skipped question</i>	0

The second question was constructed to qualify the type of governmental agency that the respondent worked in enabling readers to understand the type of government structure that the subsequent answers related to. The majority of respondents worked in city governments with the second highest percentage noting that their service agency was part of a county government structure. Together these two category responses equated to 78% of the overall responses to the questions. This outcome may be indicative of the groups of people that the questionnaire was advertised to. Based on the effort to solicit participation in the survey and the types of people who would have received the notice, the large percentage of emergency services personnel from city government agencies is expected.

Table 2

Question 2: Describe your type of government agency

	Response Percent	Response Count
City	55.9%	38
County	22.1%	15

Municipal (Township / Borough)	19.1%	13
State	2.9%	2
Federal	0.0%	0
	<i>answered question</i>	68
	<i>skipped question</i>	1

The third question was posed to qualify the size of the population served by the respondent's agencies. The majority of those answering the questionnaire work in agencies that serve between 10,000 and 50,000 people. The second highest percentage was those agencies that serve greater than 50,000 people and less than 100,000 people. Acknowledging that response to the questionnaire was possibly influenced by the solicitation of primarily metro sized (i.e. 400 career personnel or more) departments, the outcome was not significantly biased toward one population category than others.

Table 3

Question #3: Describe the population served by your agency

	Response Percent	Response Count
1 to 10,000 People	14.5%	10
10,001 to 50,000 People	31.9%	22
50,001 to 100,000 People	24.6%	17
100,000 to 250,000 People	10.1%	7
Greater than 250,000 People	18.8%	13
	<i>answered question</i>	69
	<i>skipped question</i>	0

Question four was asked to determine whether the respondent's agency actually conducted emergency public notifications. This question was asked to determine how prevalent the use of these systems is. The vast majority of the respondents answered affirmatively that their agency or government made use of public notification systems with 80% answering yes to the question. This is reflective of the identified need to provide this service to the public and represents that a large majority of jurisdictions currently do so.

Table 4

Question #4: Does your agency conduct widespread notifications to the public prior to or during large scale emergency events? (i.e. storms, hazmat, terrorism, etc.)

	Response Percent	Response Count
Yes	80.0%	52
No	20.0%	13
I don't know	0.0%	0
	<i>answered question</i>	69
	<i>skipped question</i>	0

With question five, the inquiry related to whether the respondent's agency or government was either constructing, planning on constructing or had no plans to construct a public notification system. This question was used to determine the activity levels of governments in this area following some of the more recent major catastrophic incidents to strike the United States and the world in general. Two thirds of the respondents indicated that their agency or government was either in the midst of acquiring and or constructing a system or was considering doing so. Seven respondents elected not to answer this question.

Table 5

Question #5: Is your agency or government currently developing an emergency notification system or planning to develop one or more systems in the future?

	Response Percent	Response Count
Currently developing / constructing / purchasing a system	53.2%	33
Planning on developing / constructing / purchasing a system	14.5%	9
No plans to develop / purchase a system	22.6%	14
I don't know	9.7%	6
	<i>answered question</i>	62
	<i>skipped question</i>	7

Question six was asked to determine what types of public notification systems were being used by those respondents whose agencies or government structure was doing so. The respondents were given the ability to check multiple types of systems thus the percentages do not reflect single responses for the 69 people participating in the questionnaire. Further, of those people providing feedback, nine elected not to answer this question. The types of systems offered as answers were those that the author had identified as most commonly in use through research conducted for this paper. Understanding that not all types of potential systems would be offered as answers, the questionnaire provided users with the ability to check other as an answer and then provide a description of the type of system in use by their agency.

The most prevalent system noted as being in use was a call out (i.e. Reverse 911™) system. As there are a number of different terms for this general category of notification system, some respondents checked other and then described the same type of system. The systems

qualified by the respondents as other are noted following the answer table. Some participants noted proprietary names which are difficult to quantify as to general type.

Table 6

Question #6: If your agency is conducting public notifications during large scale incidents what type(s) of systems are used to conduct these notifications? (Check all that apply)

	Response Percent	Response Count
Emergency Broadcast System (EBS)	60.0%	36
Emergency Sirens	51.7%	31
National Weather Service Alerts	38.3%	23
Call Out System (Reverse 911)	65.0%	39
AM / FM Radio Stations	51.7%	31
Phone Trees	1.7%	1
Loudspeakers / door to door contact	15.0%	9
Other (please describe)	20.0%	12
	<i>answered question</i>	60
	<i>skipped question</i>	9

Other responses:

- EAN System (Emergency Alerting Network)
- Internet, paging, cell phone
- Emergency info phone number/internet
- Cable override
- Subscriber based e-mail and SMS text notification systems
- EOC located/based public notification via cable channel

- Local television station
- Some of the above are done on a regional basis by NWS
- Code Red software which is a reverse 9-1-1 program
- This is currently in place. We always strive to improve
- Public Access Cable Television
- EBS on local cable channels
- Mapstorm

Having determined the types of systems being used question seven was intended to establish which agency, within the respondent's government structure, was primarily responsible for initiating the actual notifications during emergency situations. The respondents were also provided with the ability to note an answer that was not categorized within the questions. Those answering the question using the other category have their answers noted following the table. Allowing for situations where this responsibility is allocated to or shared by more than one agency, the respondents were given the ability to check all answers that applied.

Those governmental agencies or departments tasked with initiating public notifications during emergencies primarily fell to emergency management agencies with emergency communications centers and fire departments also largely responsible. In some cases this responsibility is shared among several of these agencies within a given jurisdiction. Police departments were the least specified agency but that response may be influenced by the fact that the solicitation for participation in the questionnaire was sent primarily to fire service and emergency management type personnel.

Table 7

Question #7: Which agency is responsible for initiating the emergency public notifications? (Check all that apply)

	Response Percent	Response Count
Emergency Communications Center (911)	54.7%	35
Fire Department	45.3%	29
Police Department	37.5%	24
Emergency Management Agency	57.8%	37
Other (please describe)	7.8%	5
	<i>answered question</i>	64
	<i>skipped question</i>	1

Other responses:

- Colorado State University
- EOC can also activate these systems
- We have two systems, one within the county, one within our city.
- This is a problem that we hope to resolve

To follow up on the responsibility for management of public notification systems, question eight asks whether the respondent's agency has a person or persons specifically designated to manage these notification system(s) for their government. Seven of the sixty two respondents chose not to answer this question. The vast majority of responses indicate that most of the notification systems have personnel specifically dedicated to the task of maintaining these systems. As research indicates that some of these systems require a significant amount of time

and resources to properly manage, the large percentage of respondents answering affirmatively to this question would seem to validate the need for this to occur.

Table 8

Question #8: Is there a person or group of people specifically tasked with managing this system or systems for your agency?

	Response Percent	Response Count
Yes	74.2%	46
No	21.0%	13
I don't know	4.8%	3
	<i>answered question</i>	62
	<i>skipped question</i>	7

Question nine was asked to determine how long these systems have been in place within the participants' jurisdiction. . This question was formed to determine the relative age of systems and technologies supporting agencies in performing public notifications. The majority of responses indicate that the time period of use is between one and five years. Supported by the literature research, this response is indicative of the growth in public notification systems since the September 11, 2001 terrorist attacks. Six respondents chose to skip this question.

Table 9

Question #9: How long has this system or systems been in place?

	Response Percent	Response Count
Not applicable	4.8%	3
Less than 1 year	14.3%	9

Between 1 year and 5 years	41.3%	26
Between 5 years and 10 years	19.0%	12
Greater than 10 years	20.6%	13
	<i>answered question</i>	63
	<i>skipped question</i>	6

Question 10 was designed to solicit information as to how the technology that supports many public notification systems is maintained. The question specifically asks whether the system, if relying on technology, has redundancy built in. Eight respondents did not answer the question but the remaining responses indicated by a large majority, that the systems that their agencies use did have redundancy built into the system.

Table 10

Question 10: If your emergency notification system(s) rely on technology (batteries, phone systems, computers, etc.) does the system have redundancy built in for back up purposes?

	Response Percent	Response Count
Yes	78.7%	48
No	6.6%	4
I don't know	14.8%	9
	<i>answered question</i>	61
	<i>skipped question</i>	8

Question 11 was constructed to determine whether the public notification systems that were referenced in previous questions had actually been used to conduct notifications. Of the 61 respondents that participated in this question the vast majority indicated that the system in their

jurisdiction had actually been used. The question did not attempt to qualify what constituted use; just that notifications had occurred using the system(s). Analysis of this response would tend to indicate that investment in notification systems and technology is validated by need. Eight of the original respondents that participated in the survey did not respond to this question.

Table 11

Question 11: Has your system been used in real situations to conduct emergency public notifications prior to or during a large scale event?

	Response Percent	Response Count
Yes	68.9%	42
No	24.6%	15
I don't know	6.6%	4
	<i>answered question</i>	61
	<i>skipped question</i>	8

With question 12, the questionnaire participants were asked their opinion as to whether they felt that notifying the public of critical information prior to or during large scale emergencies was of benefit in managing the incident. Of the 64 respondents that answered this question, a slight majority answered that the use of these systems made managing the incident somewhat easier. Twenty five percent of the participants responded that using these systems made incident management much easier. This response of 78% of the participants answering positively shows that public notification efforts appear to result in positive outcomes for officials managing emergency incidents. Five people did not answer the question.

Table 12

Question 12: In your opinion does notifying the public of critical information during large scale emergencies make managing the incident easier or more difficult?

	Response Percent	Response Count
Much easier	25.0%	16
Somewhat easier	53.1%	34
Neither easier or more difficult	14.1%	9
Somewhat more difficult	6.3%	4
Much more difficult	1.6%	1
	<i>answered question</i>	64
	<i>skipped question</i>	5

The final question asked also solicited an opinion of the participants. Question 13 asked if the respondents felt that the use of public notification systems by their agency was effective when used in real situations. The vast majority (i.e. 84%) answered positively noting the system to be very effective or somewhat effective. Eight percent of the participants answered negatively noting that the system was not very effective. Of the 65 original participants in the questionnaire, 19 or 28% did not answer the question. The response to this question indicates that public notification systems were felt to be effective as well as beneficial to the outcome of these efforts.

Table 13

Question 13: If your agency has conducted notifications during real situations were the notifications effective in communicating critical information to the public?

	Response Percent	Response Count
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Very Effective	32.0%	16
Somewhat Effective	52.0%	26
Neither effective nor ineffective	8.0%	4
Not very effective	8.0%	4
System failed to function as designed - public was not notified	0.0%	0
	<i>answered question</i>	50
	<i>skipped question</i>	19

Discussion

Research conducted for this paper inclusive of literature review, an interview and a questionnaire answered by emergency services agencies reveal that the process of notifying the public during large scale emergencies is a complex and sometimes difficult emergency management issue. The numbers of natural and manmade disasters that have affected humanity in the past decade have only served to increase the public's appetite for information during times of crisis. This is further exacerbated by communications technology that the public uses today which creates instantaneous and almost constant connectivity among humans (Friedman, 2002). This, in turn, creates an expectation that governmental agencies should be effective in reaching out to the public during times of crisis. However, successfully communicating critical information to the public in today's social environment is not an easy task. In spite of these difficulties, public officials, particularly those serving in the emergency services fields, have an obligation to conduct risk reduction activities and communicate information to their citizens when a crisis looms or strikes a community (Coleman & Granito, 1988, USFA, 2007b).

Even with a well developed system inclusive of solid strategies and processes coupled with up to date technology to perform notifications, reaching out to humans is and will remain a

complex undertaking. While technological developments allow people to be more connected to each other than ever before, the ability for public officials to reach out to them to convey emergency notification messages remains a daunting problem. The vast number of different communications systems that exist and the highly refined nature of some of these systems mean that communicating a local problem to a specific population may not be as easy as it seems (Allen, 2004; Botterell, 2003).

Researching the social aspects of conducting public notifications during emergencies there are a number of implications for public safety officials to consider. Under good circumstances communicating with people can be difficult. There are a number of considerations such as language barriers, personal bias, filtering and other subconscious human traits that may lead to the message failing to be received as intended. During times of crisis, these character traits are exacerbated by others such as fear, denial and mistrust making the task of communication all the more difficult (Covello, 2006; Kasperson, et. al., 2005; Quarantelli, 2002; Wessely, 2005).

Studies show that people do react in somewhat predictable ways when confronted with stressful situations. Although fear among people is a factor, (Wessely, 2005) it is not the most prevalent issue that officials need to be concerned with when conducting public notifications. One of the most important aspects to consider is how humans process information when under stress. One primary factor, known as mental noise, is the inability for people to process complex information when confronted with perceived personal threats. Research indicates that people processing complex information under stressful situations tend to oversimplify and or not process some of the information. Simplifying the messages and communicating small pieces of

information (e.g. warnings, instructions, etc.) over a period of time may be more effective under these circumstances (Covello, 2006; Kasperson, et. al., 2005; Wessely, 2005).

Another factor working against the effective receipt of emergency notifications is optimistic bias or the human characteristic of believing that bad things only happen to other people. This phenomenon, identified through academic research and personally experienced by many in the emergency services fields, leads to people taking no action when given adequate warning of pending disaster and potential personal harm (Gray & Ropelk, 2002). This form of denial is not only frustrating when conducting public notification in advance of a significant emergency but also places first responders in danger when they are forced to respond to those people who eventually become victims of the event of which they were forewarned about. Emergency officials tasked with developing risk communication strategies and associated public notification messages should be aware of these human behaviors. The need for a message that overcomes optimistic bias by clearly communicating the severity of an emergency without setting off widespread fear among the public is what is recommended. This balanced type of communication requires forethought and planning by public officials (Faerber & Hall, 2007). However, the most effective and widespread public notification system devised cannot overcome public apathy (Macenka, 2007). Officials tasked with communicating with the public during times of crisis need to understand and account for these phenomena.

At a higher sociological scale, communities each have a unique profile or personality (Barr & Eversole, 2003) which public officials should be aware of when designing and implementing emergency notification systems. This profile is influenced by a number of social factors such as the age of the population, ethnicity trends, housing, educational levels and household incomes. The methodologies and associated technologies employed to conduct

emergency public notifications should be influenced by these factors otherwise officials risk being ineffective in conducting these communication efforts.

One additional and significant social factor for consideration is the news media. Most emergency public notification systems rely, at least in part, on the media to assist in communicating information to the public (Chesterfield County, 2004). In doing so public officials need to be aware of media bias. As defined in books and academic studies, media bias is the tendency of the news media to color or slant coverage of an event to meet some internal need (e.g. influence ratings) or address a social agenda commonly held by the media members (Goldberg, 2002; Quarantelli, 2002). This often works against the public notification process in that the media is producing news coverage which primarily focuses on negative event outcomes or human interest stories while emergency officials have the immediate need to convey accurate, factual information to the public.

Media bias is increasingly being recognized (Goldberg, 2002) and has resulted in the public developing a progressively negative viewpoint of the media. Surveys of the public often place the news media in the bottom tier of those professions that people deem most trustworthy. This doubt that the public places in the national media presents problems for emergency officials in that when information is presented in an accurate and timely fashion, it may be ignored or viewed with skepticism by the general public (Quarantelli, 2002).

One final sociological consideration for personnel who conduct public notifications is an increasing tendency for public officials to undermine their own efforts through disaster mythology. Defined as misinformation, rumor or innuendo communicated as fact by public officials, (Arnold, 2006) this phenomenon can vastly undermine notification and ongoing communication efforts. When Mayor Ray Nagin began to project vast numbers of casualties in

New Orleans following Hurricane Katrina, the media and public took these numbers and some of the stories (i.e. myths) associated with them as fact. Much of this information turned out to be inaccurate however emergency officials spent countless hours after the fact trying to refute the misinformation. Timely and accurate information conveyed in a coordinated effort by public officials during times of crisis is one of the most important factors to address for emergency management personnel tasked with conducting emergency public notifications (Kasperson, et. al., 2005).

Jurisdictions which perform public notifications during emergency situations should have an understanding of the social and technological implications of doing so and design their systems with specific outcomes in mind. First and foremost, public officials should understand the need and acknowledge the responsibility to provide this service (Coleman & Granito, 1988; Henning, 2004) and that these systems typically function best at the local level (Ward, 2003). In spite of a growing demand for communication to the public during crisis events, many communities do not perform well in delivering this service (Voisard & Meissen, 2006).

When designing and implementing a public notification system at the local or regional level, officials should begin with the basic understanding that the United States does not have a national strategy for doing so (Rudman, 2003). And even for the national systems that are in place, public awareness and participation is questionable at best (Knight, 2005). Further, the large numbers of different technologies upon which these systems are based have led to calls for common communication protocols. Proponents of a standard protocol wish to enable the present disparate technologies to become uniform to enhance coordination efforts. As of today, this has yet to happen (Botterell, 2003).

At a very basic level, public notification systems should be designed to provide for two way communication (Miasnik, 2005; Wray, et. al., 2006). It is important for public safety agencies to be able to ensure that important messages which are transmitted during emergencies are received and that receipt can be verified. The feedback mechanism designed into a system may also serve as a way for situation status reports to be gathered for ongoing incident management planning functions.

All too often communities hire consultants, and purchase sophisticated, highly technical notification systems without developing the overall goals and objectives for conducting these communications. A notification system or systems developed solely by consultants, social scientists or technicians without the involvement of local emergency management personnel, well versed in local needs and conditions, tend to fail at their mission (Faerber & Hall, 2007; Henning, 2004; Michael, 2003). Notification systems should account for local conditions (e.g. community profiles) (Barr & Eversole, 2003) and take an all-hazards approach to the design of the system (Allen, 2004; Coleman & Granito, 1988).

Given today's society, where it seems that everyone has constant connectivity, reaching people when needed to communicate critical information is not as easy as it would seem. Today's society is highly mobile and people's connectivity is often times to large national wireless data networks (e.g. Blackberry®), peer to peer social networks (e.g. My Space), or satellite television and radio services rather than the local media (Ward, 2003). This presents problems when officials are trying to warn people about a local or regional problem (Allen, 2004; Henning 2004). Public officials designing and implementing notification systems should understand that these systems are only effective if the message is able to reach the local population effected by the event (Miasnik, 2005).

In addition to studying the social implications of conducting emergency public notifications and identifying potential desired outcomes, the research conducted for this paper also focused on the methodologies and systems used for doing so. As previously cited, there are no present standard methodologies or standards in place at the national level for conducting emergency public notifications (Botterell, 2003; Rudman, 2003). The federal government does maintain two national public emergency notification systems. The National Weather Radio (NWR) system and the Emergency Alert System (EAS) are managed by federal agencies but accessible by local governments for use during emergencies. The NWR, which was originally only used for weather warnings, is now increasingly being used in an all-hazards approach for more wide spread emergency notifications (Allen, 2004; Henning, 2004; Leggiere, 2005). However, research conducted on the reach of these systems and their ability to readily transmit emergency information in a timely fashion question the overall effectiveness of them at the local level (Allen, 2004; Henning, 2004). This concern is due to the broadcast of emergency information by local media services being voluntary; the questionable number of people tuned in at any given time; and the ability for local emergency officials to quickly access the systems to input information for broadcast.

Officials that develop and manage emergency notification systems also must consider all of the potential stakeholders involved. In addition to the general public at least two other constituencies exist that should be accounted for. Many businesses maintain their own emergency notification systems for business continuity purposes (D'Arcy, 2006). With people spread out over different states and in many cases foreign countries, protecting employees and business infrastructure is a critical aspect for companies providing this service. Public officials

conducting the same types of tasks should be aware of this business activity and actively seek to develop methods to integrate public notification systems with private.

Another often overlooked group of people who have notification requirements is the special needs population (Allen, 2004). These people may have disabilities that prevent them from receiving emergency notifications in traditional formats. This population may also need advanced notification in order to allow enough time to prepare and or evacuate in anticipation of a pending event. Emergency notification systems should be designed to account for the special needs population in a given community in order to reach the entire population that may be at risk.

The explosive nature of communications technology development in the past several decades has led to a vast number of systems and technologies for public officials to use in conducting emergency notifications. Led by the Internet and closely followed by wireless communication network development, the ability for people to instantly connect with each other is like nothing that the human race has experienced before (Friedman, 2005). Emergency services officials are now beginning to see the blending of these technologies that create even more complex communications systems like those that use the Internet to access wireless communications devices for the transmission of messages. At first glance this seems to be a positive development for public officials tasked with emergency notifications. However, the sheer number of different systems and technologies employed to conduct notifications can be problematic as there are no agreed upon standards for allowing these systems to integrate and cross-communicate with each other (Allen, 2004; Henning, 2004; Larson, 2005; Leggiere, 2005).

The technology and processes available to conduct public notifications during emergencies range widely from the old standard methodologies (e.g. door to door contacts) to

tapping into the most cutting edge personal wireless communication devices (Allen, 2004; Henning, 2004; Hoffman, 2004; Larson, 2005, Voisard & Meissen, 2006; Weaver, 2004). These can typically be categorized to include wide broadcast systems like the National Weather Radio, Emergency Alert System and broadcast media sources. Increasingly narrowcasting is also an option and is achieved through the technologies that use the Internet to communicate to wireless personal devices (i.e. cell phones, Blackberries®, and PDAs). Blending or merging of different methods and technologies is occurring in some communities where older style systems, such as outdoor sirens, are being used as the initial alert prompting people to access other systems such as the local broadcast media or personnel communications devices for more detailed information and instructions (Macenka, J., 2007).

The evolution from personnel intensive door to door contact by emergency workers to the ability to now click a mouse and send out thousands of focused messages using a number of different communications systems has been a great development for emergency management officials. However, as noted by Curt Nellis, Deputy Emergency Management Coordinator for Chesterfield County, the effectiveness of conducting emergency public notifications is not dependant on a single system or technology. Rather, effective notification systems take into account a community's unique profile and then use multiple methodologies to ensure that officials conducting these notifications reach as many people as possible.

The results of a questionnaire developed to support research for this paper indicate that many agencies are using formal public notification systems in their jurisdictions. The types of systems and technology employed range widely but the most prevalent type of system cited was an automated calling system sometimes known as reverse 911 systems. This response is supported by the literature research that shows that automated calling systems, particularly those

that are able to integrate with wireless communications devices, are the most frequently developed systems in the industry today. The questionnaire responses also indicated that there is value in using these systems with most of the respondents indicating that use of a notification system in their jurisdiction had been advantageous to both the public and those managing the incident.

In studying the social consequences of conducting public notifications, the methodologies for doing so and the specific systems and technology employed to communicate with people, one overarching problem must be considered. Catastrophic events almost always adversely affect a community's infrastructure which is typically inclusive of communications networks. Short of door to door (i.e. face to face contact) methods, most notification processes use some type of technology based communication system to transmit messages to the public. When these systems become inoperable due to damage, lack of electrical power or become overloaded, as witnessed during September 11, 2001 and other more recent events, even the best public notification system can become ineffective. Public officials tasked with developing and managing public notification systems must acknowledge and plan for these contingencies less their system be branded as useless when the technology upon which it is based fails.

The research conducted for this paper validates that Chesterfield County has taken a number of positive steps to ensure that the county's populace is notified prior to and during large scale emergency events. The county readily acknowledges the need to perform this vital service and has taken steps to do so. Planning and investment has occurred and the Chesterfield County emergency management structure maintains strategies for conducting emergency public notifications for its 300,000 plus citizens and visitors. Taking a multifaceted approach, the

present methodologies and associated systems utilized by the county have proven successful in the past during significant emergency situations.

However, this research also reveals some less than positive implications for Chesterfield County. The county presently relies on three primary communications methods for reaching the public. These include use of the Emergency Alert System and National Weather Service radio networks, local media outlets (managed through press releases and media briefings), and a recently implemented low power AM radio network. This research indicates that using the nationally managed emergency radio systems and the local media for notifications have some inherent flaws and limitations. And admittedly, the county's financial investment in the low power AM radio network has not resulted in complete coverage for the county's population.

With the growth in wireless personal communications devices and in attempting to communicate with a largely suburban, mobile population, Chesterfield County has not leveraged one of the primary methodologies in use today for conducting public notifications. This research indicates that the most prevalent systems used in many jurisdictions are automated notification technologies such as reverse 911 systems and subscription based services capable of contacting multiple personal communication devices (e.g. cell phones, pagers, PDAs, etc.). Failing to employ these types of systems appears to have limited Chesterfield County's notification outreach to its population and deters from the positive aspects of the county's current efforts. Mr. Nellis so much as acknowledged this during his interview with his opinion that automated calling systems seemed to him to be the most effective notification systems in place at this time. This outcome corroborates the problem statement contained herein; that the county is not utilizing all potential resources to conduct public notifications. This is certainly a consideration for county leaders and emergency officials.

Conducting effective notifications to the public prior to and during emergency events which strike a community is a difficult and multifaceted undertaking. Public officials should understand the complexities of research, planning and implementation which must go into these efforts. Although some jurisdictions have tried the simplistic approach of purchasing out of the box technology to address this need, these types of implementations often lead to failure. Officials tasked with managing notifications must identify their community profile, assess needs, determine which systems will work best to reach the highest number of people, and strive to integrate these systems and processes into their emergency management system for quick and effective activation.

Recommendations

Specific to the problem statement that formed the basis for this research, Chesterfield County has taken a number of proactive steps to ensure that the public has been notified prior to and during emergencies. However, this research effort has confirmed that the county has not taken all of the actions needed to ensure that a comprehensive public notification system is in place for its citizens.

The *Chesterfield County Emergency Operations Plan* (EOP) maintains a section which documents emergency public information management (Chesterfield County, 2004). It stipulates the Chesterfield County Administrator, the Coordinator of Emergency Management and or Director of Public Affairs as the responsible personnel for disseminating critical information during emergencies. It is recommended that the primary Chesterfield County public safety officials, namely the police chief, fire chief and sheriff, be included as responsible parties enabled to initiate emergency public notifications.

The current language in the EOP does not stipulate that these primary public safety officials have the authority to conduct these notifications or the ability to access the systems for doing so. A large scale, catastrophic event that strikes the county without warning has the potential to temporarily disable the county's emergency management structure inclusive of the three officials tasked with emergency notifications. This change in the EOP language would permit the recommended officials to take rapid action when faced with an impending event without having to consult first with the County Administrator, Coordinator of Emergency Management or Director of Public Affairs as presently inferred in the EOP.

Additionally, the emergency public information management section of the Chesterfield County EOP was last updated in 2004. The media outlets listed (e.g. local television and radio stations) and process for conducting notifications (i.e. press releases) do not reflect recent developments the county has initiated to improve the notification system; namely the purchase and implementation of a low power AM radio station. It is recommended that the emergency public information section of the Chesterfield County EOP be updated to include reference to the low power AM radio station.

The updated language should be comprehensive and address an overview of the radio system, its capabilities, the intended outcomes of using the system, the system transmitter locations and signal coverage, how the system is accessed and who is authorized to initiate emergency public notifications via the system. As the EOP serves as the primary planning document guiding actions during large scale emergencies striking the county, it is important that all available notification resources are listed for awareness and use.

The research conducted for this paper also revealed a number of recent developments in the field of emergency public notification. Among the technology-based systems that now exist

are automated calling systems that contact people via landline based telephone networks, subscription notification systems that integrate with multiple wireless communications technologies, and the integration of older technology such as outdoor warning systems with wireless communication devices (Allen, 2004; Henning, 2004; Hoffman, 2004; Larson, 2005, Voisard & Meissen, 2006; Weaver, 2004).

It is recommended that Chesterfield County invest in additional communications technology to enhance current emergency public notification efforts. The Chesterfield County Public School System, which is one of the largest in the Commonwealth of Virginia, routinely uses an automated telephone notification system that communicates focused information specific to certain county schools and or geographic areas. Building on the successful use of this technology, county government should investigate the use of a similar system for public notifications during emergencies. These systems, when properly designed and implemented, have proven successful and are in use in hundreds of communities across the United States. Chesterfield County should look at these emerging technologies to ensure that their investment of tax dollars is put to the best possible use for the protection of their population.

The research conducted herein validated the original problem statement noting that Chesterfield County currently uses limited means in which to conduct emergency notifications to the public. Given a solid understanding of the social aspects of communicating with people during times of crisis, clearly defined strategies and methodologies for doing so, and utilizing available technology to carry out these notifications, there is no reason why Chesterfield County could not enhance present efforts to better ensure the safety of their protected population.

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Appendix I

Questionnaire

Table 1

Question 1: Please describe your organization (check the primary type if there are multiple services)	Response Percent	Response Count
Career Fire Department	50.7%	35
Combination Fire Department	36.2%	25
Volunteer Fire Department	2.9%	2
Fire District	1.4%	1
Emergency Medical Services	0.0%	0
Police Department	0.0%	0
Emergency Management Agency	4.3%	3
Other (please specify)	4.3%	3
	<i>answered question</i>	69
	<i>skipped question</i>	0

Table 2

Question 2: Describe your type of government agency	Response Percent	Response Count
City	55.9%	38
County	22.1%	15
Municipal (Township / Borough)	19.1%	13
State	2.9%	2

Federal	0.0%	0
	<i>answered question</i>	68
	<i>skipped question</i>	1

Table 3

Question #3: Describe the population served by your agency	Response Percent	Response Count
1 to 10,000 People	14.5%	10
10,001 to 50,000 People	31.9%	22
50,001 to 100,000 People	24.6%	17
100,000 to 250,000 People	10.1%	7
Greater than 250,000 People	18.8%	13
	<i>answered question</i>	69
	<i>skipped question</i>	0

Table 4

Question #4: Does your agency conduct widespread notifications to the public prior to or during large scale emergency events? (i.e. storms, hazmat, terrorism, etc.)	Response Percent	Response Count
Yes	80.0%	52
No	20.0%	13
I don't know	0.0%	0
	<i>answered question</i>	69

	<i>skipped question</i>	0
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Table 5

Question #5: Is your agency or government currently developing an emergency notification system or planning to develop one or more systems in the future?	Response Percent	Response Count
Currently developing / constructing / purchasing a system	53.2%	33
Planning on developing / constructing / purchasing a system	14.5%	9
No plans to develop / purchase a system	22.6%	14
I don't know	9.7%	6
	<i>answered question</i>	62
	<i>skipped question</i>	7

Table 6

Question #6: If your agency is conducting public notifications during large scale incidents what type(s) of systems are used to conduct these notifications? (Check all that apply)	Response Percent	Response Count
Emergency Broadcast System (EBS)	60.0%	36
Emergency Sirens	51.7%	31

National Weather Service Alerts	38.3%	23
Call Out System (Reverse 911)	65.0%	39
AM / FM Radio Stations	51.7%	31
Phone Trees	1.7%	1
Loudspeakers / door to door contact	15.0%	9
Other (please describe)	20.0%	12
	<i>answered question</i>	60
	<i>skipped question</i>	9

Other responses:

- EAN System (Emergency Alerting Network)
- Internet, paging, cell phone
- Emergency info phone number/internet
- Cable override
- Subscriber based e-mail and SMS text notification systems
- EOC located/based public notification via cable channel
- Local television station
- Some of the above are done on a regional basis by NWS
- Code Red software which is a reverse 9-1-1 program
- This is currently in place. We always strive to improve
- Public Access Cable Television
- EBS on local cable channels
- Mapstorm

Table 7

Question #7: Which agency is responsible for initiating the emergency public notifications? (Check all that apply)	Response Percent	Response Count
Emergency Communications Center (911)	54.7%	35
Fire Department	45.3%	29
Police Department	37.5%	24
Emergency Management Agency	57.8%	37
Other (please describe)	7.8%	5
	<i>answered question</i>	64
	<i>skipped question</i>	1

Other responses:

- Colorado State University
- EOC can also activate these systems
- We have two systems, one within the county, one within our city.
- This is a problem that we hope to resolve

Table 8

Question #8: Is there a person or group of people specifically tasked with managing this system or systems for your agency?	Response Percent	Response Count
Yes	74.2%	46
No	21.0%	13

I don't know	4.8%	3
	<i>answered question</i>	62
	<i>skipped question</i>	7

Table 9

Question #9: How long has this system or systems been in place?	Response Percent	Response Count
Not applicable	4.8%	3
Less than 1 year	14.3%	9
Between 1 year and 5 years	41.3%	26
Between 5 years and 10 years	19.0%	12
Greater than 10 years	20.6%	13
	<i>answered question</i>	63
	<i>skipped question</i>	6

Table 10

Question 10: If your emergency notification system(s) rely on technology (batteries, phone systems, computers, etc.) does the system have redundancy built in for back up purposes?	Response Percent	Response Count
Yes	78.7%	48
No	6.6%	4

I don't know	14.8%	9
	<i>answered question</i>	61
	<i>skipped question</i>	8

Table 11

Question 11: Has your system been used in real situations to conduct emergency public notifications prior to or during a large scale event?	Response Percent	Response Count
Yes	68.9%	42
No	24.6%	15
I don't know	6.6%	4
	<i>answered question</i>	61
	<i>skipped question</i>	8

Table 12

Question 12: In your opinion does notifying the public of critical information during large scale emergencies make managing the incident easier or more difficult?	Response Percent	Response Count
Much easier	25.0%	16
Somewhat easier	53.1%	34
Neither easier or more difficult	14.1%	9

Somewhat more difficult	6.3%	4
Much more difficult	1.6%	1
	<i>answered question</i>	64
	<i>skipped question</i>	5

Table 13

Question 13: If your agency has conducted notifications during real situations were the notifications effective in communicating critical information to the public?	Response Percent	Response Count
Very Effective	32.0%	16
Somewhat Effective	52.0%	26
Neither effective nor ineffective	8.0%	4
Not very effective	8.0%	4
System failed to function as designed - public was not notified	0.0%	0
	<i>answered question</i>	50
	<i>skipped question</i>	19