

The Senate Subcommittee on Flooding and Evacuations -- Interim Report

Table of Contents

Acknowledgements.....	2
Interim Charge One.....	3
Background.....	4
The Unique Geography of the Lower Rio Grande Valley	5
Current Organization of Local Authorities.....	6
The Notion of a Regional Drainage Plan.....	6
Recommendations.....	10
Interim Charge Two.....	12
Background.....	13
Emergency Notification Systems (ENS)	13
Next Generation 9-1-1 and 9-1-1 During Times of Disaster	15
Emergency Alert Systems (EAS).....	17
Recommendations.....	18
Interim Charge Three.....	20
Background.....	21
Recommendations.....	24
Interim Charge Four.....	25
Background.....	26
Recommendations.....	27
Appendix.....	28
I. Witness List -- August 24, 2010	
II. Witness List -- October 18, 2010	
III. Written Testimony: Dr. Gordon Wells	
IV. Written Testimony: Dr. Sharon Wood	
V. Written Testimony: Larry J. Tanner	
VI. Written Testimony: Dennis Quan	

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Interim Charge One

Study the benefit of legislation that would require coastal regions, when making routine improvements to drainage systems and other infrastructure, to take into account probability of future flooding and any upgrades necessary to prevent future flooding.

Background

The Senate Subcommittee on Flooding and Evacuations met in Austin, Texas on Monday, October 18, 2010, in the Capitol Extension Room E1.016 to hear testimony pertaining to the subcommittee's Interim Charge One.

Shortly after receiving this charge, the subcommittee was encouraged to specifically investigate planning and mitigation efforts related to coastal drainage issues. More specifically, to look at vehicles that have been successful in certain coastal areas of Texas in planning drainage infrastructure on a large-scale or regional basis. Furthermore, the subcommittee was advised that researching different models could potentially have applicability in different regions of the Texas Coast. However, the subcommittee was specifically directed to research flood control and drainage issues for the Counties of Hidalgo, Cameron and Willacy in the Lower Rio Grande Valley.

Initial research revealed a general shift that has been occurring in flood management circles over the past several years -- trending away from drainage planning based on political boundary lines and instead focusing on watershed boundaries or larger geographical regions that face similar problems and risks. This shift has generally resulted in a regionalized approach in the planning of drainage infrastructure.

The storm season of 2010 served to illustrate issues of drainage and flood control along the Texas Coast. On September 19, 2010, the heavy rains associated with Hurricane Karl descended on Corpus Christi with disastrous results. The high-impact rain event brought flooding to nearly 200 Corpus Christi area homes. Unfortunately, the majority of impacted residences were not in a designated 100-year flood plain. As such, very few of the damaged homes had flood insurance. Residents of certain neighborhoods described the unfortunate and disastrous effects as "typical." In the wake of the flooding, area residents and local elected officials publicly spoke about forming an organization that could implement flood control and drainage solutions.

In addition to Hurricane Karl, the Lower Rio Grande Valley (LRGV) was also subjected to major storm events in the Summer of 2010. Hurricane Alex arrived in South Texas on June 30, 2010, producing widespread flooding across Northern Mexico, which was exacerbated by the arrival of Tropical Depression #2 only days later. Saturated soils compounded the arrival of additional precipitation with Tropical Depression #2. The effects of Hurricane Alex ultimately affected the LRGV region for over 40 days. During this time, floodwaters in the Rio Grande reached levels that had not been measured in over 40 years and the system of internal floodways was used for the first time since 1988 to divert a regional flood. Because of the wide distribution of water and complex drainage patterns present in the LRGV, the region ultimately faced a serious threat of inundation from three flood waves converging on the area.

While flooding was serious and major damage occurred, most commentators seemed to indicate that the effects of Hurricane Alex could have been potentially worse if the path of the storm would have been only slightly different. Many local observers recall the challenges of dealing with the large amount of precipitation received during Hurricane Dolly in July of 2008,

which left over \$1 billion in damages, making it the fourth most destructive hurricane in Texas history.

Correspondence with local authorities quickly revealed that the notion of a regionalized drainage plan for the LRGV has been in existence for some time. Indeed, in the wake of Hurricane Dolly and Hurricane Alex, the Lower Rio Grande Valley Development Council (LRGVDC) stated a need for "a regional or multi-jurisdictional plan to meet the needs of a growing population to mitigate and/or minimize any economic impacts of the LRGV area from flooding and damage from natural disasters." In fact, studying drainage in the LRGV appears as a recommendation in the report authored by the Governor's Commission for Disaster Recovery and Renewal in January of 2010.

In 2009, the LRGVDC was awarded a sizeable federal grant from the Economic Development Administration. The overall goal of this grant is to study geographical and topographical conditions and the propensity for flooding, leading to recommendations for a framework to collaboratively plan and manage current and future public works infrastructure and storm water systems. Ultimately, the end goal is to make recommendations on prioritizing projects that would efficiently address the drainage and flood control needs of South Texas.

The Unique Geography of the Lower Rio Grande Valley

Providing the foundation for complex drainage and mitigation planning is the actual physical landscape of the LRGV. The geography is unique in Texas. The region is located in the center of a large, naturally subsiding fan of sediments comprising the Rio Grande Delta. The primary complicating factor resulting from this geography is the elevation of the River when compared with the surrounding elevation inland -- the River actually stands at a higher elevation. In describing this geography to the subcommittee, Dr. Gordon Wells from the University of Texas specified that the LRGV is "our New Orleans" and that such conditions "don't occur anywhere else in Texas."

The Lower Rio Grande Valley can be impacted by three types of flooding: coastal storm surge from hurricane landfall, local sheet flooding from torrential rainfall and river flooding from the main stem of the Rio Grande. Unfortunately, it is rare that only one type of flooding would affect the area during a heavy rainfall event. In fact, it is more likely that a combination of all three would occur.

Complicating matters -- particularly in areas vulnerable to inland sheet flooding -- is the rapid development that has occurred in the LRGV over the past several years. Intense residential and commercial development has led to the increase of impervious cover, changing both how flooding occurs and the results of models that attempt to provide accurate predictions. Furthermore, development of certain colonias has occurred in areas that tend to be particularly prone to sheet flooding. In such areas, stormwater drainage is inadequate and local officials must resort to pumps to remove water and provide relief.

Another complicating matter in the LRGV is the international border with Mexico and the International Boundary and Water Commission's (IBWC) control of the Rio Grande and several local floodways. Water flow and diversion along the river is controlled by the IBWC,

not by local governmental entities, presenting an obvious obstacle to removing local pools of floodwater that need to be drained.

Yet another major concern in planning for flooding and drainage events is water that comes from the interior of Mexico, flowing into the Rio Grande and presenting flooding concerns to the American side of the border. During Hurricane Alex, the vast majority of water received in the River came from the Mexican side of the border. While the fundamental nature of these drainage patterns will not change, the reporting on the amount of water destined for the Rio Grande could potentially be improved. With few exceptions, the amount of water flowing from the interior of Mexico to the River is unobserved or “under-observed” until it reaches the main stem of the Rio Grande. This makes predictions for the IBWC, the National Weather Service, the Texas Division of Emergency Management (TDEM) and local authorities almost impossible. Without proper data and resulting flow predictions, it is impossible for local authorities to accurately plan and mobilize for impending disasters.

Current Organization of Local Authorities

Currently, local authorities with flood control and drainage responsibilities in the LRGV are organized in different ways. In Hidalgo County, a single Drainage District operates, encompassing the majority of the County. The Commissioner's Court serves as the board of directors for the District, keeping county authorities constantly aware of current issues. The District encompasses approximately 65% of Hidalgo County.

In Cameron County, four Drainage Districts and two Irrigation Districts operate within the County. The majority of infrastructure was initially installed by Irrigation Districts and communities eventually formed around the boundaries of the drainage infrastructure. Willacy County currently has three Drainage Districts, but is considering a process of consolidation to form a single district, with an organization similar to the Hidalgo County Drainage District.

In addition to the individual entities named above, the Rio Grande Regional Water Authority (RGRWA) also exists, operating in a total of six South Texas Counties. The RGRWA was created in 2003 with relatively broad authority, but was primarily created to supplement the services provided by local municipalities, districts and other political subdivisions, specifically in the areas of water treatment, wastewater treatment, water conveyance and desalination. In addition to these powers, the RGRWA was also designated with authority in drainage, flood control and eminent domain. The Board of Directors is diversely populated with technical experts, all of whom have a local water or drainage interest and are appointed by the Governor.

The Notion of a Regional Drainage Plan

In researching this interim charge, support was nearly unanimous for some sort of regional entity to oversee efforts in regional drainage planning. The question simply becomes one of implementation. Regional drainage planning has achieved marked success in many

different formats throughout the State of Texas. One primary advantage of working in concert towards a common regional plan is the identification and prioritization of infrastructure projects that are most necessary for local communities. However, several other advantages exist. By bringing together leaders of similar ilk, best practices can be traded and exchanged. Training sessions can be easier and more affordably coordinated on a broader scale. Perhaps most importantly, practices for drawing down funding from various sources can be exchanged between members.

The subcommittee took several recommendations that the RGRWA assume the lead role in coordinating a regional drainage plan. This notion is both practical and sensible on many levels. First, the entity already exists. While additional authority may need to be granted or existing powers revised to accomplish this goal, this certainly would be preferable to creating a new organization. Furthermore, as noted above, the RGRWA already has drainage and flood control powers designated in its authority and is currently staffed with technical experts. There would be no need to go through a political appointment process or election of officials. A thorough review of its existing authorities would be necessary. Should any powers need to be tweaked, expanded upon or clarified, an opportunity to do so would likely be present during the next legislative session.

In addition to researching the RGRWA, the subcommittee also conducted research on how other jurisdictions of Texas have handled regional flood control and drainage projects. One very successful operation that has evolved in recent years in the San Antonio area is the Bexar Regional Watershed Management Partnership (BRWM). The BRWM formed in 2004, on the heels of massive localized flooding across the Bexar County area. Public sentiment indicated the need for a large organization to improve flood control, storm water management and water quality.

Initially, popular sentiment favored the formation of a formal, legislatively-created flood control district. But after additional research and discussion, local partners decided that a large-scale interlocal agreement could be formed that would essentially form a "virtual flood control district." This interlocal agreement would specifically allow for a cooperative effort, whereby all local partners have a very specifically designed role in the agreement. After several successful years, the agreement continues to be effective and dynamic, remains voluntary, and holds all partners accountable.

The BRWM consists of Bexar County, the City of San Antonio, the San Antonio River Authority and 20 suburban cities in Bexar County. The cooperative efforts result in a reduction in duplicative efforts and allow each entity to focus on its specific area of expertise. Prioritization of projects undergo a thorough evaluation process, including a matrix of input from citizens, elected officials and technical experts. This process has allowed for an objective method to prioritize flood mitigation projects and has been successful since its inception.

Created out of similar circumstances to the BRWM, the Fort Bend Flood Management Association (FBFMA) was essentially created in 2006. The FBFMA is primarily composed of Levee Improvement Districts (LID's). During 2006, FEMA released a preliminary study of Fort Bend County, indicating that numerous repairs would have to take place across their extensive

levee system in order to maintain existing accreditation for the purposes of Flood Insurance Rate Maps. Numerous options were examined for implementing repairs that would need to be completed in a period of 18 months, including dissolving existing LID's and increasing the sizes of other LID's. Additionally, it was also proposed that each district should simply deal with the re-mapping issue on an individualized basis. Eventually, through the cooperation of all interested stakeholders, the LID's adopted a regional solution to the problem, entering into several interlocal agreements to improve the "perimeter levees" closest to the Brazos River. By focusing on the "perimeter levees," the total amount of costly improvements was greatly reduced, the entire system was certified in a more expeditious fashion and regional cooperation and communication were generally promoted.

After initially coalescing around the need for levee certification, the members of the FBFMA realized the benefits of their cooperative efforts and officially formed a Texas 501(c)(6) corporation in December of 2009. The members continue to discuss best practices for maintaining their systems, Federal and State regulatory developments, and the activities of other regional and national stormwater management agencies. Additionally, they actively coordinate flood control efforts to ensure best practices. At this year's first annual FBFMA conference, they provided annual required training classes for their members and hosted several noted elected officials, bringing visibility to their efforts. They continue to expand their scope, as they consider the collective purchase of large industrialized equipment to be shared by all members. While completely voluntary and locally formed, the FBFMA has emerged as a model of success, resulting from their member's unique ability to work together towards a common goal.

Another model worth examining is that of the Harris County Flood Control District (HCFCD). The HCFCD was legislatively formed to encompass Harris County in its entirety in 1937. Local sentiment, combined with The Federal Flood Control Act of 1936, made the formation of a single Harris County entity necessary. By the time the HCFCD was created, 11 other local drainage districts were operating in Harris County. Unfortunately, the boundaries of the drainage districts did not follow natural drainage patterns or watershed boundaries. The drainage districts continued to operate until 1947, when the HCFCD assumed their assets and responsibilities. HCFCD currently manages the 22 primary watersheds that exist within Harris County. Only a very small amount of the flood waters in the most populated portions of the county originate from areas outside of the county.

HCFCD was vested with several key authorities upon creation, allowing it to become very effective in its drainage and flood control responsibilities. First, the power to acquire lands via eminent domain -- in fee or easement -- for flood control purposes. Additionally, a revenue base was created with the authority to collect ad valorem taxes. Finally, the District was given the ability to contract with federal and state agencies and adjacent counties and cities to cooperatively implement flood control plans. Partnerships with groups such as FEMA and the Texas Division of Emergency Management have helped implement projects that have documented more than \$2 billion in avoided flood damages. Partnerships with local cities have resulted in complimentary drainage design criteria and policies, joint investment in drainage infrastructure and other cost savings measures via the consolidation of financial resources.

There is much local sentiment in the Lower Rio Grande Valley in favor of regional drainage planning. However, there are serious questions as to what body or organization would be best suited to oversee such efforts. The descriptions of the localized bodies described above represent successful local efforts to overcome very specific local issues. Certainly, the issues faced in these jurisdictions do not exactly mirror those of the LRGV or any other part of Texas. But in investigating what sort of avenues are available to implement large-scale drainage efforts, these organizations demonstrate that flexibility and different options to address regional drainage issues do exist. In implementing their local efforts, each of these organizations has demonstrated a nuanced and balanced approach in addressing the needs of its constituency and implementing solutions. As such, studying their formation and execution of day-to-day practices serves as a beneficial exercise.

Creating a structure to oversee the implementation of a regional drainage plan in the LRGV is a distinctively sensitive and local issue. There has been much support voiced for the Rio Grande Regional Water Authority in both public testimony offered to the subcommittee and research conducted outside the scope of our hearings. From an authoritative statutory perspective, a thorough examination of existing authorities would be prudent. This would ensure that the RGRWA would have necessary powers, if local authorities decided that it is the proper vehicle for coordinating a local drainage plan. Regardless of what entity is chosen to carry such an effort locally, this subcommittee stands to support locally autonomous groups and the decisions that are made to designate a regional authority on designing and implementing a drainage plan.

Recommendations

1. The Subcommittee recommends that regional drainage plans continue to be studied throughout flood-prone and coastal areas of Texas. Approaching regional drainage issues from a larger perspective allows for the consolidation of resources and the sharing of best practices between jurisdictions, serving as a benefit to all parties involved.
2. The Subcommittee recommends that local leaders in the Lower Rio Grande Valley develop a regional drainage plan that best suits their unique needs. Research has shown that the LRGV faces very unique challenges in drainage and flood control issues. No one is better suited to address these concerns than the local technical experts and elected officials.
3. The Subcommittee recommends a thorough examination of the powers and authorities granted to the Rio Grande Regional Water Authority. Numerous local experts suggest that the Water Authority would be the proper vehicle to oversee and coordinate a regional drainage plan. If local experts and elected officials do indeed decide that the Water Authority is best suited for this task, it is imperative that their authority is properly defined and that any necessary powers be granted. Should it be decided that the Water Authority is best suited to serve this purpose, the subcommittee recommends granting any necessary authority that will enable the Water Authority to effectively operate.
4. The Subcommittee recommends state and local leaders continue to work with both Mexican authorities and the International Boundary and Water Commission to improve communication and information sharing during high impact weather events. Without proper data, predicting water flow, flooding and potential impacts becomes nearly impossible. By working at the local, state and federal level, any improvements that can be made in obtaining data from the Mexican side of the border will be beneficial to those attempting to run predictive models regarding volume of water affecting the U.S. side.
5. The Subcommittee recommends the creation of drainage districts in areas where repetitive flooding issues have occurred. Drainage districts provide a vehicle for improving drainage infrastructure. Most drainage districts have a funding mechanism to provide funding for repairing or improving existing infrastructure. Creation of such a district(s) would provide relief to recently developed or historically underserved areas.
6. The Subcommittee recommends that counties utilize current statutory authority that does exist regarding development in areas designated as "100 year floodplains" on FEMA Flood Insurance Rate Maps (FIRM's).
7. The Subcommittee recommends that any jurisdiction considering a regional drainage plan study the models introduced in this report. By all accounts, the Bexar Regional Watershed Management Partnership, the Fort Bend Flood Management Association and the Harris County Flood Control District have all enjoyed immense success in their respective jurisdictions. While no two jurisdictions are exactly alike and no "model plan" exists, these three groups all represent successful local responses to drainage and flood control needs. As each model is unique, the subcommittee recommends that any coastal region considering a

regional drainage plan should study each model to understand the purposes behind its formation and the way that each group ultimately enacted a successful plan.

8. The Subcommittee recommends the continuing education of children and the public at large with the "Turn Around Don't Drown" program. In many areas prone to flooding -- be it coastal flooding or flash flooding -- motorists have consistently made improper choices when driving in flooded areas. As flooded roadways are distinctively related to drainage and flood control issues, continuing to promote education via the "Turn Around Don't Drown" program ultimately serves to save local jurisdictions costly swift water rescues. But more importantly, educating the public about the dangers of driving through moving water serves a vital purpose: saving lives.

Interim Charge Two

Study and make recommendations on methods of emergency notification during a natural disaster. Look into alternative systems and new technologies for rerouting 911-type calls to become more efficient and effective. Study and make recommendations to streamline the process of informing citizens impacted by an emergency or disaster prior to the event about re-entry and aid.

Background

The Senate Subcommittee on Flooding and Evacuations met at The University of Houston in Houston, Texas on Tuesday, August 24, 2010, in the Melcher Room of the Alumni Athletic Building to hear testimony pertaining to the subcommittee's Interim Charge Two.

The Subcommittee's Interim Charge Two is effectively three charges rolled into one, with each portion of the charge addressing a different form of emergency communication. First is the Emergency Notification System or ENS. The second portion of the charge addresses 9-1-1 and prompts research on the implementation of the next generation 9-1-1 system (NEXT GEN). The final portion of the charge addresses the Emergency Alert System or EAS. The charge calls for the subcommittee to consider and evaluate the past usage of these communication systems during times of natural disaster, to consider the efficiency and effectiveness of these systems in their current state, to inquire as to what improvements are necessary, and to suggest the best way to implement these improvements.

A common theme emerged after talking to numerous elected officials and subject matter experts with regard to communication during a time of natural disaster -- effective communication must take place on all platforms available to ensure that emergency communication is received by as many citizens as possible. While certain platforms are very successful in certain situations and reach a significant portion of the population, alternative platforms exist that reach a different portion of the citizenry. In researching these issues, emergency management experts consistently stressed the need for clear and coherent messaging that would reach as many members of the population as possible. Effective communication during a time of natural disaster represents more than a government communicating effectively with its citizens. It also involves the ability of local governments to correspond effectively with state and federal leaders, for law enforcement groups to effectively communicate with each other, and for both local and state leaders to understand the methods of communication available to reach out to citizens and keep them informed. The following is a review of the individual platforms of communication the subcommittee studied.

Emergency Notification Systems (ENS)

An emergency notification system (or Service) is a platform of communication that is typically utilized by local authorities to inform residents of a localized disaster. Typically, computer software allows a user to define an affected geographic area. After the region is defined, a pre-recorded message is then delivered to homes and businesses that have a telephone number associated with their physical address in the 9-1-1 database. Emergency notification systems can be utilized to warn the public of various problems, dangers, and issues, including toxic releases at chemical plants, fires, a shooter or dangerous individual(s) located in a neighborhood setting, flooding, or even decisions to evacuate. Occasionally, the usage of ENS is referred to as "Reverse 9-1-1."

An emergency notification system typically requires numerous dedicated telephone lines to effectively operate. As such, efficiency ultimately becomes a key consideration when attempting to convey a message to a large amount of the population. Because of the large

amount of dedicated telephone lines that are necessary and the time associated with making each call, large scale public messaging via an emergency notification system is not always practical. For example, local authorities in Harris County indicated that attempts to promote evacuation orders via ENS were largely inefficient due to the extremely large volume of calls required. They were unable to effectively convey the message to such a large portion of the population in an efficient amount of time utilizing ENS, even with the most modern technology.

However, when utilized in smaller communities, such systems remain very effective. For instance, the communities of Alvin and Kemah utilized their emergency notification systems to brief residents on the approach of Hurricane Ike, provide details of city preparations and issue instructions to shelter in place. Local officials from these communities reported that ENS continues to be a very reliable form of mass communication during times of disaster.

One key component that greatly affects the overall effectiveness of ENS is the data that supports it. More specifically, the known phone numbers and associated physical addresses in local databases. In Texas, many emergency notification systems utilize the Commission on State Emergency Communications' (CSEC) 9-1-1 database to determine relevant phone numbers in a specific geographic area. CSEC's data is populated uniquely with landline information. Currently, there is no method of associating a cell phone number with a physical address at the state level.

Modern trends of telecommunication show a distinctive move towards the use of cellular and mobile technology. This trend has been ongoing for years and clearly will not be reversed. Estimates suggest that the amount of landlines in major metropolitan areas shrink by approximately 10% each year. In sum, fewer and fewer telephone numbers are associated with physical addresses in the CSEC 9-1-1 database. In an attempt to mitigate this issue, some communities have begun programs that allow residents to register their cell phones at a specific physical address in their databases. This expands upon the landline-based data that makes up local 9-1-1 databases and allows for cell users to receive ENS alerts.

Because of the general shift in telephone usage from landline to cellular, emergency management coordinators tend to discount the effectiveness of ENS in its current state. In fact, testimony from our Houston hearing indicated that during recent events that required emergency communication in the San Antonio area, the highest success rate achieved -- defined by an actual user actually receiving the intended message -- with local emergency notification systems was approximately 17%. That said, certain jurisdictions report continued success with ENS, particularly for smaller, localized events.

It is important to note that technological developments related to ENS could greatly expand the effectiveness, impact, and scope of ENS use in the very near future. As noted above, decline in the effectiveness of landline-based ENS in recent years is primarily attributable to the increased use of cellular and mobile technology. Currently, researchers are attempting to develop the ability to isolate and identify cellular users in a particular geographic area -- very similar to current ENS -- and relay emergency messages based on geographic location. Testimony taken on this topic at our Houston hearing was not conclusive on when this technology would be widely available.

In August of 2010, the State of California announced a pilot program that would test such a system. The Commercial Mobile Alert System (CMAS) will be tested in San Diego County, where wildfires are an annual concern for local authorities and emergency management coordinators. This will allow for testing across urban, suburban and rural areas. By all indications, this pilot program is the first of its kind. Estimates currently state that the technology behind the pilot program could potentially be available for public use in the Fall of 2011.

During the time period that research took place on this interim charge, another form of cellular based ENS technology was successfully used during an emergency event very close to The Capitol in Austin. On Tuesday, September 28, 2010, a gunman was present on The University of Texas-Austin campus during the mid-morning hours. Thousands of students and faculty members were either on or traveling to campus. After confirming initial reports, The University began disseminating messages via their emergency communications system.

Part of The University of Texas's emergency communication system integrates cellular technology and texting. When students and faculty become associated with The University, a cellular number is requested for the purposes of emergency communication. This database was successfully utilized during this event, as thousands of text messages were sent and successfully received. To date, University of Texas officials have not been able to quantify the numerical success rates of those contacted. However, the results seem to indicate a very successful effort.

In addition to communicating via text message, University of Texas emergency management officials also posted warnings through social media outlets, such as Facebook and Twitter. Overall, messages were communicated on nine different platforms. While local governmental authorities may not be able to build a database for text messaging that mirrors that of The University of Texas, the emergency communications utilized by UT officials demonstrate a successful effort by a large state organization to promptly and effectively notify thousands of individuals of emergency conditions via numerous communication platforms.

Next Generation 9-1-1 and 9-1-1 During Times of Disaster

The second portion of the subcommittee's Interim Charge Two calls for an examination of 9-1-1 systems during times of disaster, specifically with the purpose of improving efficiency and effectiveness. Currently, 9-1-1 systems throughout the State of Texas operate on what is referred to as the legacy system. 9-1-1 service throughout the State is typically administered by local authorities. Call centers are often housed in the offices of local police departments or sheriff's offices.

One of the biggest issues facing current 9-1-1 service providers is the transition from the existing legacy systems to what is termed Next Generation 9-1-1 (NEXT GEN 9-1-1). Although the term NEXT GEN 9-1-1 has essentially morphed into a generalized notion of how our future 9-1-1 system will function, there are definitive characteristics that our future systems will certainly contain. Specifically, NEXT GEN 9-1-1 will be Internet Protocol (IP) based, changing the basic format of 9-1-1 services and greatly enhancing the forms and amount of data that can

be received by 9-1-1 call takers. In addition, NEXT GEN 9-1-1 will expand the ability of local authorities to transfer 9-1-1 calls.

However, in hearing testimony regarding 9-1-1 during times of disaster, local authorities provided numerous details on transferring calls in the current system and the importance of retaining local calls whenever possible. With the existing legacy systems, contingency operations are pre-programmed to occur if and when local systems fail. As such, if a single call-taking center goes down, calls are automatically re-routed to another facility within the same jurisdiction. If for any reason the secondary facility is down, another contingency is pre-programmed for re-routing. Additionally, calls can be dynamically re-routed as necessary. These capabilities and contingency plans are typically audited on an annual basis.

Testimony made it very clear that the effectiveness of local responders is greatly enhanced by having local 9-1-1 calls received at local call centers. As it pertains to both current conditions and infrastructure, local call takers know their jurisdictions best. Similarly, local radio communication is much more likely to be effective if handled by a local user who is familiar with local procedures. Thus, doubt was cast on the notion that a 9-1-1 operator would ever want to transfer a 9-1-1 call from the Houston area to San Antonio, even during a major storm. In fact, hardened facilities exist within the jurisdictions of many coastal 9-1-1 groups, providing a safe, local facility to handle calls in the event of a large scale natural disaster. So while NEXT GEN 9-1-1 will provide enhanced ability to transfer calls, locals operators made it clear that existing systems have been very effective during recent natural disasters.

It is worth noting that certain weather issues associated with natural disasters affect the ability of a local 9-1-1 system to operate. First, not all of the coastal call centers are in hardened facilities that can withstand hurricane winds and large amounts of precipitation. Thus, if the integrity of a building's structure is compromised, call takers must evacuate and move to another facility. Similarly, call taking facilities are often on public power grids and are susceptible to power outages. While most facilities prepare in advance with generators, funding and maintenance of the generators are potential issues. Moreover, a fuel supply must be kept or procured to ensure generators can operate as long as necessary during times of disaster.

In sum, testimony to the subcommittee indicated that local 9-1-1 groups have already integrated some of the IP-based aspects of NEXT GEN 9-1-1. Furthermore, it was demonstrated that these groups do an extremely effective job of networking, sharing best practices and planning for the upcoming systemic changes to the existing systems. NEXT GEN 9-1-1 will ultimately bring greater capabilities to those choosing to call 9-1-1, including the ability to text for help and/or provide streaming video or photographs. Local authorities will also have the capability to transfer calls to different regions of the State with ease, if desired. While NEXT GEN 9-1-1 will provide a greater amount of flexibility to local operators, it is clear that there is a distinctive preference among local operators to keep 9-1-1 calls within their jurisdictions whenever possible. In viewing the success that operators have had with the existing legacy systems, it is likely that local operators will continue to successfully administer local calls as the industry transitions to NEXT GEN systems.

Emergency Alert Systems (EAS)

The Emergency Alert System is a national warning system that superseded the previously used Emergency Broadcast System. The necessity of such a system was prompted during the Cold War as a way to warn the nation of an event of war or national crisis. It has never been utilized on a nationwide basis. The EAS covers AM and FM radio and VHF, UHF and cable television, in addition to other radio and television platforms.

EAS is predominantly used at the local level to warn residents of school or road closures, hazardous weather conditions, and to issue warnings pertaining to localized dangers -- such as a fire or plant explosion. The most common use of the EAS is by the National Weather Service for hazard weather warnings. One of the distinct advantages of EAS is the ability to immediately communicate with a large audience in a specific geographic area.

As discussed above, the definitive advantage of communicating via the EAS is the ability to connect with a very large percentage of the population. As such, the EAS is not always a practical form of emergency communication for smaller, localized events. Additionally, the EAS is only effective if an individual is using a radio or television at the time of the communication. There are certain times, such as during an evacuation, where the typical citizen would be tuned in to radio or television, expecting emergency communication from authorities. However, many disasters happen on a moment's notice. As the EAS requires citizens to have a radio or television on, it cannot be considered a foolproof method of communicating with citizens.

The Emergency Alert System in Texas is administrated by the Texas Association of Broadcasters. As a part of Federal FCC regulations, local television and radio broadcasters are required to test their systems regularly to ensure functionality. As such, from a technical perspective, the public can rest assured that our systems are operable as necessary. However, testimony taken during our hearing revealed that emergency events have occurred in Texas and the EAS was not used when it probably should've been. It is important for local authorities to be cognizant of the Emergency Alert System and to activate it whenever necessary.

The decision to utilize the EAS is typically made at the local level by a county judge or mayor. It is worth stating that, with the evolution of a seemingly omnipresent news media and the ability to immediately disseminate information and images in real time, the media often directly reports on hazardous events immediately. Information that could potentially be conveyed in an EAS message is often disseminated via news reports. Thus, official usage of the EAS is potentially redundant if the same event is being covered by local media. That said, real time reporting does not always occur, such media markets do not exist in every part of Texas, and viewers/listeners are never guaranteed to be watching/listening to a station that would be providing such updates. In sum, although the use of EAS can be highly specific, it is an important tool for authorities in emergency communication and its usage must be properly understood and utilized.

Recommendations

1. The Subcommittee recommends that authorities continue to use all appropriate methods to communicate during times of disaster. Whether by Emergency Notification Systems (ENS), the Emergency Alert System (EAS), mainstream media or some other form of communication, the goal is to reach the widest audience possible. By ensuring that all avenues of communication are utilized, state and local authorities can ensure that emergency messages reach as many citizens as possible.
2. The Subcommittee recommends that state and local authorities closely monitor the piloting of the Commercial Mobile Alert System (CMAS) in San Diego County, California. The effectiveness of traditional ENS systems continues to erode as landlines are replaced by cellular phones and other mobile devices. The ability to isolate cell users in a specific geographic area and convey an emergency warning stands to be a huge step forward in the realm of emergency communication.
3. The Subcommittee recommends that local emergency communication groups implement plans to collect cellular telephone numbers of local residents to correspond with physical addresses. As ENS systems work off of landline-based geographic data, most homes without landlines cannot be reached via ENS communication. By encouraging local residents to register their cell phone numbers at specific physical addresses, the overall efficiency of existing ENS can be improved.
4. The Subcommittee recommends that any public group with the responsibility of emergency communication stay well advised on modern formats of communication and utilize all appropriate formats as necessary. The introduction of social media websites -- such as Facebook and Twitter -- and mobile devices have revolutionized normalized communication in our society. It's imperative that local and state authorities understand modern methods of communication and utilize them to warn citizens during times of emergency.
5. The Subcommittee recommends that the State of Texas continue to monitor and encourage improvements in the field of interoperability. Research indicates that great strides have been made over the last several years in terms of how first responders communicate with each other. However, questions still exist on whether first responders from different jurisdictions can effectively communicate, if necessary. Effective communication during times of disaster is quintessential to success. By continuing to progress in promoting issues of interoperability, we can ensure effective emergency communication between our first responders.
6. The Subcommittee recommends that 9-1-1 call centers located in areas subject to natural disaster be housed in hardened facilities. Research has indicated a definitive local preference for retaining the ability to take 9-1-1 calls in home jurisdictions during times of disaster. This ability is compromised when conditions force evacuation of facilities with 9-1-1 call centers.

7. The Subcommittee recommends thorough preparation efforts with regard to backup generators and fuel at 9-1-1 call centers. By procuring equipment and supplies in advance, local operators can ensure that 9-1-1 calls are received by the intended local jurisdiction during times of disaster.
8. The Subcommittee joins the Sunset Advisory Commission in recommending that the Commission on State Emergency Communications establish an advisory committee for the development, implementation and management of NEXT GEN 9-1-1 systems. The Subcommittee's research indicated that many local jurisdictions are well prepared for the implementation of NEXT GEN 9-1-1 systems. However, having a centralized authority to assist in the development and implementation of NEXT GEN 9-1-1 systems on a statewide basis will help to provide necessary coordination and assist in establishing best practices for all interested parties.
9. The Subcommittee recommends that local jurisdictions be required to conduct annual drills to ensure proper understanding of how the EAS functions and the proper time to utilize such systems. Local broadcasters are required by federal law to conduct regular testing to ensure their emergency alert systems are effective. Testimony revealed that, in certain cases, local authorities were either unaware of the existence of the EAS or did not know how to activate the EAS. As the systems are regularly tested for effectiveness, it seems prudent to require local authorities to establish a plan or protocol for using the EAS and to regularly test this plan to ensure effectiveness.
10. The Subcommittee recommends that locals issuing emergency communications be cognizant of relevant language issues in their area. Research has indicated that the EAS is utilized in both English and Spanish at least some of the time in certain areas of Texas. However, there are also portions of the State with a significant number of Spanish-only speakers -- or speakers of other languages -- that only issue alerts in English. This is simply an issue of informing the largest portion of the public as possible and ensuring effective, targeted messages to those who receive them.
11. The Subcommittee recommends that local television and radio stations be prioritized when power is re-connected after a natural disaster. Prioritization would be similar to that currently given to critical care facilities. However, stations would not be prioritized ahead of critical care facilities. As local stations provide vital information to citizens concerning recovery in the aftermath of a storm, they should be prioritized for electricity re-connection accordingly.

Interim Charge Three

Study and make recommendations relating to cost effective options to either retrofit or require new building structures to be built as shelters for use during future evacuations.

Background

The Senate Subcommittee on Flooding and Evacuations met in Austin, Texas on Monday, October 18, 2010, in the Capitol Extension Room E1.016 to hear testimony pertaining to the subcommittee's Interim Charge Three.

Interim Charge Three addresses the need for either constructing or retrofitting large public buildings in evacuation zones to house local populations during times of natural disaster. While retrofitting or building fortified new structures could potentially benefit different regions of Texas, the primary portion of the state that would stand to benefit from such construction is along the coast. Specifically, these structures would stand the forces of hurricane winds and the precipitation that would accompany such an event.

Research on this topic has revealed that the State of Texas has enjoyed success as a "coastal evacuation state." This conclusion is reached by measuring the mobility of the population and the transportation infrastructure in place. Recent evacuations in the State of Texas have revealed that coastal populations have evacuated in a successful fashion. Unfortunately, other Gulf states have not fared as well in recent evacuations and instead typically shelter in place as opposed to evacuating. This is illustrated in certain parts of Florida, where large percentages of the population are elderly and lack the mobility to evacuate. Similarly, other areas along the Gulf Coast do not have the transportation infrastructure in place to successfully evacuate.

However, coastal evacuation does not serve as the best answer for every region of the state and every member of the population. As an example, for three distinctive reasons, the population of the Lower Rio Grande Valley tends to evacuate at a lower rate when compared with the rest of the State. First, mobility issues affect the ability of the local population to evacuate. Concerns about existing transportation infrastructure and sufficient vehicular mobility serve to compound this issue. Secondly, the amount of necessary emergency vehicles is not in place to evacuate the amount of citizens in the Lower Rio Grande Valley that are considered to have medical special needs. Finally, due to immigration checkpoints along evacuation routes, certain portions of the population decline to evacuate based on fears of going through immigration checkpoints. With such concerns, entire families decline to evacuate based on concerns for one individual family member.

Issues limiting coastal evacuation are by no means limited to the Lower Rio Grande Valley. Evacuation is both difficult and costly for special needs populations throughout coastal Texas. Evacuating special needs populations can be very expensive, as the methods of transportation are highly specialized and limited in the number of service providers available. But more importantly, such evacuations can be complex and difficult when coordinating medical care, doctor's orders, and prescriptions. Additionally, evacuating patients with serious medical conditions ultimately serves to jeopardize their health.

Testimony at our hearing highlighted the notion that evacuations are a highly localized issue. Evacuation orders are issued by either local mayors or county judges. Furthermore, an overwhelming majority of the buildings that are used to house evacuees are owned by local

governmental entities. As such, while the Texas Division of Emergency Management plays a very centralized role in terms of supporting local jurisdictions, the actual anatomy of an evacuation is specifically local in nature.

Policymakers and elected officials alike seem to support the notion that additional public evacuation facilities need to be constructed in coastal evacuation zones. Furthermore, testimony indicated that by reducing the amount of medical special needs evacuations, an overall cost savings will be realized over time. From both a practical and financial perspective, there seems to be considerable support for additional construction of facilities that could be used as evacuation centers during future hurricanes or high-impact storm events.

With due consideration of this notion, policies must be considered to ensure that any such facilities that are constructed are done with proper, established standards for hurricane evacuation shelters. Standards for the construction of evacuation shelters to be used in coastal areas originated with policy recommendations by the American Red Cross. These standards were then utilized and extended by the State of Florida in their sweeping course of policy changes following the storm season of 2004 and 2005. FEMA standards then evolved with regard to the construction of evacuation shelters.

Structural requirements go well beyond structural design considerations. There are specific elevation requirements, relating to both storm surge and 500-year floodplain designations. Additionally, standards are established that address dangerous high speed winds, addressing concerns of roof uplift. Moreover, roofs, windows and walls must all be debris impact resistant to ensure that uplifted objects do not damage the structures. As well, emergency vehicles must be able to access buildings without traveling through a floodplain area. (*See additional materials on specific design requirements in the Appendix*)

In addition to the various design requirements, hurricane shelters in Florida undergo frequent inspections. Inspections are mandated prior to each season and following any significant high-impact weather event. Additionally, shelters must be re-certified every five years to ensure that all engineering and materials are compliant with current techniques and methods. Unfortunately, the integrity of a hurricane shelter containing 1,400 evacuees was compromised in Florida during Hurricane Charley. The building had yet to be evaluated for compliance with enhanced hurricane protection and design requirements, illustrating the necessity of a frequent inspection schedule.

Interim Charge Three also directs the subcommittee to examine the costs of building hurricane shelters, addressing both retrofitting existing shelters and constructing new shelters. General consensus seems to indicate that retrofitting existing structures is generally not a cost effective option. However, testimony indicated that buildings constructed after the late 1980's can be retrofitted at much more reasonable costs when compared to older buildings. The primary consideration in such a determination relates to a structure's ability to withstand high speed winds associated with a hurricane.

Costs of retrofitting tend to fluctuate greatly depending upon original construction. However, more uniform cost estimates can be established for new construction. Such an

estimate depends specifically on which code or standard is used to determine the extent of mitigation measures used in construction. New construction that is built to standards established by Florida Building Codes would add 3-6% to the total cost of a new facility. Complying with FEMA/ICC-500 standards could add an additional 6-8% in cost.

It is worth noting that FEMA matching grants are available for many construction projects involving hurricane safe evacuation shelters. However, due consideration must be given to the specific standards that would apply when designing such a facility. Another applicable issue related to FEMA funding involves which governmental entity applies for the applicable grant(s). In Texas, potential shelters are often in the form of school gymnasiums or other multi-use facilities. Typically, the independent school districts who own these facilities do not have a hazard mitigation plan on file with FEMA and must partner with a local governmental body in order to receive such grants. This issue is not unique to coastal regions, but is also relevant for host jurisdictions where evacuees are ultimately sheltered. It is important for school districts to partner with local governmental entities when attempting to draw down federal funding to offset construction costs of hurricane shelters.

Recommendations

1. The Subcommittee recommends the construction of additional hardened facilities in coastal areas that can be used as evacuation shelters during times of natural disaster. While mobility and infrastructure allow for inland evacuations, evacuation is not the best option -- or even possible -- for every member of the population. Providing a safe local option for shelter ultimately serves to save money over time and reduce potential complications in evacuating certain members of the population.
2. The Subcommittee recommends local authorities refer to the relevant written testimony included in the appendix of this report, including structural standards established by FEMA, the State of Florida and the authors of the International Building Code. Relevant engineering standards must be followed to ensure structural integrity during times of heavy impact storms. Additionally, compliance with established standards is often mandatory when attempting to solicit federal financial assistance for construction costs.
3. The Subcommittee recommends the aforementioned inspection model established by the State of Florida relating to evacuation shelters. This would include inspections at the beginning of each storm season and after any high impact event. Given the importance of structural integrity at such facilities, it is imperative that local authorities frequently ensure that buildings are certified and inspected to meet all established standards.
4. The Subcommittee recommends continued cooperation between local school districts and local governmental entities in applying for FEMA grants. As school districts typically cannot apply directly for these grants (requirement of a local hazard mitigation plan), it is imperative that local entities foster cooperative relationships to ensure they are prepared for potential natural disasters. This cooperation is not just imperative in jurisdictions where populations are evacuated from, but also in host jurisdictions where evacuees are routed to.
5. The Subcommittee recommends that local authorities prudently evaluate retrofitting existing structures against building new structures with elevated design standards. Testimony taken during our hearings revealed that the costs of retrofitting can vary greatly, depending on the time and method of the original construction. While different engineering standards exist that ultimately affect projected cost, the general rule seems to be that new construction is more practical and predictable in terms of overall cost. This should be given due consideration when evaluating whether to retrofit or undertake new construction.
6. The Subcommittee recommends that local construction of hardened facilities be taken in the context of other necessary local construction. Although more expensive, hardened facilities can also serve as small gymnasiums and/or recreational centers. Evacuation shelters need not be viewed as limited use facilities that incur exclusive costs. Even when built to the most stringent standards, proper planning can ensure that such shelters function as multi-use facilities.

Interim Charge Four

Monitor the implementation of legislation addressed by the Senate Subcommittee on Flooding & Evacuations, 81st Legislature, Regular and Called Sessions, and make recommendations for any legislation needed to improve, enhance, and/or complete implementation.

Background

The Senate Subcommittee on Flooding and Evacuations met at The University of Houston in Houston, Texas on Tuesday, August 24, 2010, in the Melcher Room of the Alumni Athletic Building to hear testimony pertaining to the subcommittee's Interim Charge Four.

The Subcommittee heard specific testimony regarding SB 361, which was authored by Senator Patrick and was passed out of the subcommittee during the 81st Legislative Session. The bill was originally filed with the following description, "Relating to the requirement that certain water service providers ensure emergency operations during an extended power outage." Effectively, the bill called for certain water providers to acquire a backup electrical generator for use during times of disaster. In so doing, the provider ensures that water service will continue, even if residents are without power and coping with the effects of a natural disaster.

Testimony regarding the bill revealed that most of the affected entities have been able to comply with the legislation with little issue. Furthermore, very little sentiment against the requirements of the bill existed amongst the affected operators. Many utilities that had experienced problems during Hurricane Ike or other events were eager to comply and worked promptly to correct any issues. Additionally, there was little sentiment indicating that the requirements of SB 361 instituted a financial hardship on any district. In fact, testimony at the hearing indicated that, in many cases, compliance with SB 361 resulted in no cost increases to the customers of individual districts.

As passed, SB 361 was intended to target water providers in Harris and Fort Bend County. However, after passage of the bill, determination of affected areas eventually utilized the 2000 census. Using the 2000 Census data as the standard, a determination was made by the Texas Commission on Environmental Quality (TCEQ) that only districts providing water in Harris County were subject to the requirements of the bill. It is likely that affected counties will change with the release of the 2010 Census data.

Following passage of the bill, it was determined by the TCEQ that 695 utilities were affected. Each affected utility was required to submit a plan of compliance. The TCEQ has gone to great lengths to inform affected districts of impending changes, attending trade affairs, conferences and taking telephone calls regarding compliance. As of August 11, 2010, 549 plans had been received, 344 of which had been approved. Certain utilities have requested an extension and/or a financial waiver. At the time of our hearing, a total of 45 affected utilities had failed to respond. The next step in the process for the TCEQ will be enforcement. The non-compliant districts will be contacted and ultimately referred to the TCEQ's compliance department as necessary.

Recommendations

1. The Subcommittee supports the efforts of the Texas Commission on Environmental Quality in implementing SB 361 -- communicating with affected districts and ensuring compliance with the bill's requirements.
2. The Subcommittee encourages all non-compliant districts, as defined by the TCEQ, to come into compliance as soon as possible. Should districts fail to comply, the subcommittee supports the TCEQ's plan to refer such districts to their compliance division.
3. The Subcommittee recommends ongoing and continued monitoring of the implementation of SB 361. This will ensure efficiency and keep officials informed of any modifications or enhancements that are necessary.

The Senate Subcommittee on Flooding and Evacuations -- Interim Report

Appendix

- I. Witness List -- August 24, 2010**
- II. Witness List -- October 18, 2010**
- III. Written Testimony: Dr. Gordon Wells**
- IV. Written Testimony: Dr. Sharon Wood**
- V. Written Testimony: Larry J. Tanner**
- VI. Written Testimony: Dennis Quan**