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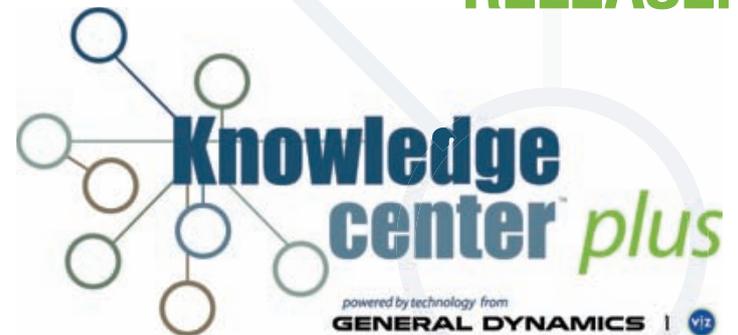
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*Emergency Management* (ISSN 2156-2490) is published quarterly by e.Republic Inc. 100 Blue Ravine Road, Folsom, CA 95630. Periodicals Postage paid at Folsom, CA and additional offices. Postmaster: Send address changes to *Emergency Management* 100 Blue Ravine Road, Folsom, CA 95630. © 2016 by e.Republic Inc. All rights reserved. Opinions expressed by writers are not necessarily those of the publisher or editors.

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**In virtually every** exercise or incident I have attended, the “elephant in the room” is not addressed. Even when I specifically have requested an issue be documented during the debrief, it was never in the post-incident report.

Other reasons for lessons being listed rather than learned are that they cost too much. If it costs, it likely won't get fixed. The only time money is freed up is the day after the disaster. There is no cost associated with suggesting lessons learned, so “everyone gets a command vehicle” sounds like a great lesson learned until you realize nobody can pay for it.

Finally, if the lesson learned only fixes the problem for this one incident rather than being a lesson learned for all incidents of a similar nature, then it is too specific and restrictive. Putting all of those details in as “lessons learned” leads to an SOP or training requirement to follow a telephone-book-thick “lessons listed” assemblage.

**Tom Cox** — in response to *No Fault After-Action Reviews* in the Winter 2016 issue

**We have reached a point** in the homeland that we cannot just repair things when they fail. Rather, we must act pre-emptively

“The Federal Railroad Association needs to focus on [the] cause of derailments — rail defects, mechanical failures (wheels and axles), human factors and speed.”

**Firefly** — in response to *Safer Rails* in the Winter issue

in the face of increased turbulence from natural and man-made disasters. Further, the greatest danger to critical infrastructures and vital manufacturing is oftentimes not what others do to us from outside the system, but rather what we do to ourselves; lacking an understanding of the complex interdependencies of our business and supply chains (i.e., closing down air space, stopping ship movements through maritime ports, locking down vital commercial business arteries after active shooters) with direct adverse impact on our economy.

**Dane Egli** — in response to *Value Proposition of Resilience* in the Fall 2015 issue

**I remember telling** a battalion chief to get off the roof after we vented and were covered in soot and smoke. He refused to wear an SCBA [self-contained breathing apparatus], and we thought he was going to choke out on the roof. We finally got him down, but it was another year before he started wearing one on a regular basis. I support any advancement that saves firefighters' lives, helps them do their job more safely, and save more victims trapped in structures. Nothing worse than a blind sweep of a room with someone holding onto your leg so you can extend into the room.

**Scott Hardy** — In response to *A New World* in the Winter 2016 issue



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By Jim McKay

# The Foolproof Plan

In reviewing this issue, I found some interesting points about resilience. It was just a few years ago that we were talking about preparedness, response and recovery separately. Then we began talking more about long-term recovery, which seemed to morph into resiliency.

If you read this issue, you may conclude that it's incredibly difficult, if not impossible, to prepare for all eventualities. When I spoke with Keith Stammer, emergency management director

of Joplin, Mo., about the devastating 2011 tornado, he talked about having been surprised at the enormity of the situation. The city had been through numerous tornadoes and was prepared to respond – to the kind of tornado it had seen in the past. Unfortunately, one of the lessons that came from Joplin is that looking at the past is not enough to prepare for the future.

coordination and many unforeseen challenges and “unmet needs.” Some were never even discussed prior to the rains. “It was learning on the fly,” said Chris Meschuk, Boulder’s flood recovery coordinator for community services. “One of the biggest lessons learned is that we did not have a good formal disaster recovery plan.”

This from a community that was undoubtedly prepared. The statement that they didn’t have a formal plan is not an indictment but an acknowledgment that you can never prepare enough or think of too many issues that may come up. The key lesson from both of these stories is that it’s important to prepare for the future and what may occur — and not to rely on just data from the past.

In our story about Chatham County’s hazard mitigation plan, we learn of a Georgia county that is preparing for literally every hazard possible, some that may not occur in our lifetimes. The plan is 211 pages and covers drought, extreme heat, flood, winter storms, hurricanes, rising sea levels, terrorism and more.

The county consulted with surrounding local governments to develop the plan that would cover virtually any hazard that could occur in the area. In Chatham, they realized it wasn’t enough to look at the county’s past and reached out to other counties to discuss what people there had experienced. “The research can only tell you so much,” said Margaret Walton, a senior planner in land planning. “The reports are often the base level and then you grow a plan from there.”

of Joplin, Mo., about the devastating 2011 tornado, he talked about having been surprised at the enormity of the situation. The city had been through numerous tornadoes and was prepared to respond – to the kind of tornado it had seen in the past. Unfortunately, one of the lessons that came from Joplin is that looking at the past is not enough to prepare for the future.

In reading *Boulder: Anatomy of a Recovery*, you get a sense of how great the preparation was for the next flood. The Colorado area long had flood mitigation efforts in place and had placed tremendous emphasis in this area. They were prepared. But when 1,000-year rains fell in 2013, everything changed and the recovery effort yielded many lessons that any jurisdiction can learn from.

The long-term recovery effort in Boulder began during the event. There was a lot of

IT'S IMPORTANT TO PREPARE FOR THE FUTURE AND WHAT MAY OCCUR — AND NOT TO RELY ON JUST DATA FROM THE PAST.

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## In the News

Texas Gov. Greg Abbott issued a disaster declaration in response to March flooding of the Sabine River, which shut down part of Interstate 10. The flood was termed a possible “slow-motion disaster,” and the impact on commerce was feared. There’s no previous record of Interstate 10 closing because of flood.







## COSTLIER STRUCTURES FOR TORNADO SAFETY?

**Before the walls shook,** before the two-by-fours twisted and the roof began tearing off, Amanda Bose saw news about the tornado on television.

“Everybody in the bathroom — right now!” the 36-year-old mother told her 5-year-old and 15-year-old. There was almost no time to

wonder, she says, whether the home would protect them — or collapse around them.

Similar scenes played out in homes across north Texas during the Dec. 26 storm, which destroyed 159 houses and did major damage to 311 in Rowlett alone. Damage from the storm will reach \$1.2 billion,

the Insurance Council of Texas estimates.

As populations grow denser throughout the “tornado alley” that stretches from north Texas through South Dakota, many experts say communities should consider designing buildings to withstand twisters just as coastal

communities build to survive hurricanes.

“Tornado-resilient designs of houses, or of any structure, is a thing within our grasp,” said University of Florida engineering professor David Prevatt, who surveyed the damage in north Texas. “It’s something we can do, and we ought to do it.”

The tornado that hit Rowlett was rated an EF3 as it moved over Bose’s neighborhood. That means the National Weather Service estimated its peak winds there could have been as high as 165 mph, a speed at which even well built homes are in trouble.

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## Tornado Facts



The most powerful tornadoes occur in the United States.



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Tornadoes have been reported in every state in the U.S. and also in every season.



A tornado can occur anytime, but happen most often between 3 p.m. and 9 p.m.

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## Five Things to Know for Tornado Season

### 1 HOW A TORNADO FORMS.

A tornado is a violent rotating column of air between the Earth’s surface and a cloud, said Denny VanCleve, a National Weather Service general forecaster.

Tornadoes form when a wind shear — a combination of winds of different speeds and directions — spins horizontally. The warm, humid air near the Earth’s surface lifts the horizontal shear and bends it vertically while the cool, dry air near the clouds surrounds it. As that is happening, the speed of the vertical rotation picks up, forming a tornado.

### 2 HOW TO IDENTIFY A TORNADO.

A tornado must have rotation within the cloud, and it has to be rotating all the way to the ground.

Tornadoes don’t have to have a thin funnel. They can take the shape of a large, wide, circular cloud.

Your ability to spot a tornado depends on your location relative to it. Heavy rain can conceal a tornado. Keep your eyes peeled for a dark, greenish sky.

### 3 TORNADO WATCH VS. TORNADO WARNING.

A tornado warning means a tornado has been sighted or has appeared on weather radar. Take action and move to a safe place.

### 4 WHAT TO DO DURING A WARNING.

Move to a designated tornado shelter or a basement. If you don’t have underground shelter, go to an interior room or hallway on the lowest floor and

stay under a sturdy piece of furniture, VanCleve said.

If you live in a mobile home and you have time before the tornado hits, leave the home and go to the nearest building.

Always stay away from windows and listen to a radio for updates.

If you need to pull over, you should stay in the car with your seat belt on. Put your head below the windows and cover yourself with your hands and/or a blanket.

### 5 HOW TO PREPARE FOR A TORNADO.

The No. 1 thing is to have a place to go. Develop and practice a plan for what to do when a tornado hits at home, work or school, he said.

Make sure to have a portable radio or a weather radio handy.

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# FOCUSING THE CYBER SECURITY LENS

A magnifying glass with a black handle and frame is positioned over a blue-tinted laptop keyboard. The lens of the magnifying glass is in focus and contains the following text: "BEST PRACTICES", "AWARENESS & TRAINING", "RISK MITIGATION", and "INCIDENT RESPONSE".

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By Margaret Steen

# BOULDER: ANATOMY OF A RECOVERY

*Recovery is underway  
but not complete, and  
provides lessons for  
emergency managers.*



# THE 1,000-YEAR RAINS THAT FELL ON AND AROUND BOULDER, COLO., in September 2013 grabbed headlines and the nation's attention. Total rainfall in Boulder for the three days ending on Sept. 12 was more than any recorded monthly total.

The damage was devastating, with homes ruined, bridges washed out and roadways rendered impassable. Even today, the recovery is not complete. But it is well underway — and it has brought with it lessons for emergency managers in Colorado and around the country.

Boulder's recovery began well before the 2013 flood even happened. Both the city and county of Boulder have had flood mitigation efforts in place for years, said Mike Chard, director of the Boulder Office of Emergency Management, which was established by a joint agreement between the city of Boulder and Boulder County.

"The efforts have been around hardening infrastructure, enforcing codes, land use — really being prepared for a flood," Chard said. Bridges were designed to withstand floods, for example, and building codes kept hazardous materials from being stored in flood plains, helping prevent a much worse disaster.

The city of Boulder also completed its annual infrastructure assessment. This proved invaluable after the flood when it came time to apply for federal aid, said Kurt Bauer, engineering project manager for the city, whose responsibilities include flood mitigation: "We were able to walk around with FEMA with an iPad showing them where the infrastructure was" even if it had been completely destroyed.

In some cases, the contrast between preparation and lack thereof taught authorities valuable lessons. For example, Chard said, they have long known that Boulder Creek presented a flood risk, so mitigation work had taken place there.

"Smaller drainages didn't have as much mitigation," he said. When the 2013 flood happened, "every drainage in our county from north to south was activated and flooding.

Some had not flooded in 100 years or more. Some had never flooded like that before."

The damage assessment after the flood illustrated the value of the mitigation efforts, Chard said. "What it did prove out was that the mitigation projects and efforts that were in place did in fact make a difference in protecting the infrastructure. In the more mitigated areas, we still found some damage, but less of it."

## IN THE EYE OF THE STORM

Despite the planning, the scope of the flood took everyone by surprise. The plans anticipated that one or two drainages in the county would flood. Having every drainage flood was what Chard called the "doomsday scenario."

"We had four days of nonstop flooding," he said. Flash flooding in mountain canyons was exacerbated by landslides. The ground became saturated. And there were many layers of complexity in responding to the disaster.

"We were doing what we could to get emergency crews in to help people, but many people were on their own," Chard said. Low cloud cover made it difficult to fly helicopters. "All the canyons had flooded, and we had no access."

The plans for emergency shelters weren't working because flooded roads prevented people from getting to the shelters. The flooding was so widespread that there weren't enough unaffected areas left to help those who were impacted.

Emergency managers turned to a "strong multiagency coordinating group" that engaged nonprofits, the private sector and public agencies.



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"We had the ability to connect all those people — we were building capabilities on the fly," Chard said. "When you're off script, you need a lot of help from your friends."

When they moved past the emergency response into recovery, however, cracks started to appear. "The emergency response process was incredible: well coordinated and well rehearsed," said Chris Meschuk, flood recovery coordinator for community services for the city of Boulder, referring to the joint city-county Office of Emergency Management. "What we don't have is that sort of process for long-term recovery."

For example, there was no counterpart to the multiagency coordinating group for the entities engaged in long-term recovery efforts. One way officials are hoping to change this is by creating a local VOAD, which stands for Voluntary Organiza-



On Sept. 13, 2013, rain-swollen Boulder Creek flows around a marker showing historic flood levels in the city.

tions Active in Disasters. This network will help connect area relief agencies and government emergency managers. “So when a disaster happens we’re not cold-calling organizations and they’re not cold-calling the government — we already know each other,” Meschuk said.

## RECOVERY BEGINS

Although handling the immediate crisis was critical, emergency management personnel also started planning for what would happen when the rain stopped.

“We started the longer-term recovery planning during the event: You start planning, thinking, organizing even during the actual emergency,” said Garry Sanfacon, Boulder County flood recovery manager,

whose job focuses on medium- and long-term recovery. It was a complicated effort, requiring coordination among such areas as land use, permitting, road construction, debris removal and home buyout programs.

The EOC was activated for two weeks straight, Chard said. The office had plans for recovery and cleaning up debris, but “the recovery plan didn’t necessarily work as well as we thought.”

“It gave us an idea of where we needed to start,” said Chard. They wanted to quickly settle into a traditional recovery model with short-, medium- and long-term objectives. But they soon discovered that the aftermath of a disaster as large as the flood didn’t fit neatly into those categories.

With some improvising, they were able to accomplish some tasks as planned. For example, one critical immediate task was

assessing the damage. With many roads still impassable, this proved difficult.

“We needed to get preliminary numbers to base the recovery efforts on: the number of people impacted, structures down, businesses affected, debris amounts,” said Andrew Notbohm, an emergency management coordinator for Boulder, whose duties include recovery and assessment. In some cases, a drive that normally took half an hour would take an hour and a half. “That was quite an undertaking,” he said. The damage “was so vast, it was hard to know where to send people. [In some places], the creek or stream had completely changed — it was not in the original channel. That was really a challenge for access.”

Within four days, emergency managers had a preliminary assessment. They used that to determine where to send multidisciplinary teams to gather public health information and other specifics that would be helpful as the recovery progressed. Chard said Boulder County had 10,000 homes affected by water and more than 50 miles of road destroyed, including major bridges.

But it became clear that not all the recovery needs were going to proceed in such an orderly way.

“One of the lessons we learned right away is that there are things not talked about — unmet needs,” Chard said. Some victims initially found shelter with friends or had temporary housing paid for by insurance, for example, only to have that short-term solution end a few weeks later. Others used their credit cards to buy what they needed initially, but then required a safety net when those cards were maxed out. Emergency managers had to set up structures to help with these unmet needs before they could make progress in other areas.

“Once we did that, we were able to really accomplish the mission,” said Chard.

An additional complication: Nature keeps going even after the flood is over.

“I’ve got every creek and stream in the county destroyed and spring runoff happening in April,” Chard said. “If we don’t get these creeks and streams cleaned out, they’ll flood again.”

Workers who assessed more than 120 miles of creeks and rivers — documenting high-hazard debris, for example — worked tirelessly to complete the assessments in less than 60 days, Chard said.

The “heroic undertaking” by city workers to prepare for the spring runoff “really saved the day for many residents,” he said. Without it, there would have been even more flooding, debris and damage. “This was all going on after the original event.”

After the initial work was done, officials could look at longer-term improvements, both in terms of flood mitigation and coordination among offices. One concern: how to shift away from what Chard described as a “surge mentality,” when everyone pitches in to help during a disaster, then goes back to their regular work.

“The burden on the staff is heavy,” he said. “How do we sustain this if we’re talking about climate change? Is the new normal that we’re going to be dealing with this stuff all the time?”

Sanfacon said that for unincorporated Boulder County, the cost of public reconstruction is an estimated \$250 million. “Most of that is road construction, bridges and infrastructure,” he said. The figure does not include damage to private property that’s being paid for by insurance companies or property owners.

Most of the money for rebuilding is coming from the federal government through FEMA or the U.S. Department of Housing and Urban Development (HUD), Sanfacon said. The state and local taxpayers have provided matching funds.

## LESSONS LEARNED

The city’s planning department was one of the agencies that started working on the recovery while the floods were still occurring — and one agency that started learning early about what parts of its process could be improved, Meschuk said. “Even during the flood, we started having conference calls, talking as a department about what it was going to mean when we reopened services.” Some of the issues involved continuity of operations — for example, could they use their regular facility?

“It was learning on the fly,” Meschuk said. “One of the biggest lessons learned is that we did not have a good formal disaster recovery plan.” The emergency plans worked well, but they realized they had not done enough planning for the aftermath.

One example: collecting debris that was on private property. “The original plan was community collection sites, and



In Boulder County, Lyons was hit hard by the flooding, with all access points into the town being blocked.

within hours they were full,” Meschuk said. “We had to pivot to curbside collection.”

Officials learned several other lessons as the recovery progressed:

- Information management — including sharing information among agencies — is critical. The city was doing damage assessments, FEMA was processing requests for individual assistance and other agencies were responding to survivors’ needs. “Being able to coordinate all of that so that residents don’t get assessed and visited multiple times and so that it’s clear what the needs are in the community” is critical, Meschuk said. “We’re working through that, and it’s going to be a long-term process.”
- Having someone in the recovery coordinator role is critical, Sanfacon said. This not only helps government departments work together, it also can help survivors navigate the different organizations trying to help them.
- Providing one resource for these survivors proved very helpful, allowing people who needed help to get information about everything from permits to roads to septic tanks in one place.
- The aftermath proved the benefits of cooperation as well. “This flood has brought all the communities in Boulder County together in a much more robust way than we were before,” Sanfacon said. For example, rather than have the city and county apply separately to the state for the federal funding it was distributing, they submitted a joint proposal.

- Navigating federal aid can be complicated. For example, Bauer said, “FEMA has different divisions, and they don’t all see eye to eye on criteria.” On one hand, FEMA encourages communities to become more resilient. However, restrictions on the use of recovery funding required that structures simply be replaced the way they were, not improved. “Why put back something that didn’t work?” Bauer asked.

Another issue: Federal agencies that help with flooding are typically dealing with a situation like a hurricane, where the water rushes in and then recedes. “Here, we have steep mountainsides and canyons,” Sanfacon said. “Water comes rushing down, causing a lot of erosion and damage. We had a lot of folks whose private bridges and culverts were washed away. HUD didn’t have a program that would help them rebuild those structures — it had never come up in other parts of the county. We helped them realize the need and helped develop a new program they are now supporting.”

As they process these lessons, officials are also looking to the future.

“If you walked around Boulder, some people would never even know that there was a flood here,” Sanfacon said. But outside the city, road reconstruction, bridge rebuilding and creek restoration are still underway. Some residents who may never be able to return home are still working on getting help from the home buyout program.

“We’re in the middle of our long-term recovery,” Sanfacon said. ✚

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# 80



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# ALL-HAZARDS

# COVERED?

Chatham County, Ga.'s hazard mitigation plan runs the gamut in addressing the possibilities.

**By Adam Stone**



**Considering the scope** of possible crises, it's no wonder the final draft of the newly minted Chatham County, Ga., Hazard Mitigation Plan runs to a hefty 211 pages. Drought and flood; extreme heat and winter storms; hurricanes and rising sea levels; and in this latest plan, add terrorism to the catalog. Granted, the county won't likely see all of these at once. But still, you have to plan for all hazards.

That's what the county mitigation plan does, and it's been no small feat to craft the document.

"There is a lot to keep up with, a lot of documentation from a lot of government entities, along with FEMA guidelines, state guidelines," said Margaret Walton, a senior planner in Land Planning at Atkins North America. She consulted with the Chatham Emergency Management Agency (CEMA) on the plan, which covers the county as well as seven municipalities and the Savannah metro area, population 527,106 according to the 2014 Census Bureau estimate.

The county crafted its first mitigation plan in 2000 and has been refreshing the document every five years under the dictates of the federal Disaster Mitigation Act. A Department of Homeland Security grant of \$60,000 has helped pay for the work, said CEMA Interim Director and Chief of Staff Dennis T. Jones.

Previous iterations of the plan helped to make this most recent effort run smoothly, according to Jones. "It allowed us to start in the middle; we didn't have to start from scratch," he said.

Still, past recommendations could form only a part of the county's latest mitigation plan. "In emergency management, you want to look at the past not just in your city, but also in comparable areas," said Norbert Chandler, assistant professor at Savannah State University in the homeland security

and emergency management program. In this case, "they looked at the totality. Even if the likelihood of some of these things are historically low, they still were inclusive of all situations based on what they saw elsewhere."

For context, the report cataloged past mitigations, especially those accomplished since the last set of recommendations. These spanned a broad territory that included:

- A study to identify fire vulnerabilities of buildings and their contents;
- A review of building codes for proper wind strength and safety regulations;
- Revision of the county building code to require all mobile home parks to have tornado community safe shelters;
- Installation of window protection and replacement of doors at the Citizens Service Center; and
- Elevation of the Police Department generator and flood-proofing of the structure.

While they looked to these wins, planners also kept in mind a substantial list of projects from the county's last mitigation plan that never got off the ground. These recommendations included courthouse barricades, creation of informational brochures, and development and delivery of evacuation exercises. All were shelved due to lack of funding.

To establish a new set of priorities, the planning team turned to the community, and in an outreach effort formed the heart of the mitigation planning process.

Planning included some 15 meetings across the community in all jurisdictions, Jones said. The county went digital, establishing a Facebook page and Twitter account, and sending a steady stream of emails to local media, citizens and points of contact for various jurisdictions. Atkins conducted an online survey, coordinating with the jurisdictions to place the questionnaire on a range of civic websites.

As a result of soliciting input using so many different tools, Jones said the collection of information went smoothly. Planners had ample historical and present-day data to paint a picture of local hazards and assess needed changes. So why make such an effort to draw out suggestions and personal anecdotes from members of the community?

“The research can only tell us so much. We have to know what people have actually experienced,” Walton said. “There are actually a surprising number of people who will speak up, who will say, ‘We had hail last year, and this is what happened in our city.’ Those reports are often the base level, and then you can grow a plan from there.”

It’s equally true, though, that the inclusion of broad community input can make an already-complex process just a little more complicated. For example, some portion of the citizenry may place a strong value on schools reopening as soon as possible after a disaster. From the emergency management point of view, these facilities can act as distribution points and logistics staging areas. “Realistically we don’t need every single school operational within the first week,” said Kate Busbee, CEMA’s chief planner. “Obviously everybody has an opinion. But we have to take what we identify as those facilities that are essential to life and property.”

When it comes to the imperative to include diverse viewpoints, the challenge is in the fact that with so many people, there are so many opinions, Busbee said. “It’s just like when you are trying to develop continuity of operations plans and one person thinks a function is mission critical and someone else does not.”

With everyone on board — and with conflicting opinions — it was time to hunker down and make a plan. High on the list of priorities was something rarely considered in Chatham County in the past. That is, the prospect of man-made havoc. In a word: terrorism.



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As the plan readily notes, there is no historic record of a major terror threat in Chatham County, although there have been events elsewhere in the state. A terror attack killed one person during the 1996 Summer Olympics in Atlanta. More recently, in October a grand jury formally placed terror charges on 15 individuals who had gathered to celebrate the Confederate flag, in a rally that led to a confrontation with a black family who was celebrating a child’s birthday.

In planning for a terror threat, mitigation experts have to think outside the usual box, approaching the potential hazard from a somewhat different point of view.

In the case of natural disaster, some mitigation actions are consistent. “A fire is a fire,” Jones said, and fire remediation doesn’t vary by a whole lot. If you see a fire hazard, you clear away the dead vegetation.

Terror hazards, on the other hand, likely will be more complex. You can put blockades in front of the courthouse, perhaps install a metal detector. You can put extra locks on the storage spaces in facilities that handle

chemicals. But planners admit the breadth of potential terror events is sprawling. A partial list of targets named in the mitigation plan includes the Natural Gas Pressure Center, Fort Pulaski National Monument, Grayson Stadium, Savannah/Hilton Head International Airport and the County EOC, to name but a few.

Mitigations are as varied as the possible targets. Garden City should evaluate potential targets; Savannah needs to safeguard chlorine tanks at the Industrial & Domestic Water Plant; the county should place vehicle barriers outside the judicial courthouse.

Even as planners wrangle with the emerging man-made threat of terror, they still must contend with the likelihood of a natural disaster. Largely considered the biggest local hazard, hurricanes rank high on the scale of mitigation needs.

According to the National Hurricane Center’s historical storm records, 114 hurricanes or tropical storms have passed within 75 miles of Chatham



**If they apply for a grant** from one of these [federal] pots of money and this action was not in their mitigation plan, FEMA is going to make them go back and put it in. If it is in their plan they are much more likely to get a grant for that action. It also streamlines the process, so when the grant funding comes up you are ready to take out your pieces and put them on the board.

is simply no way to proof the structure against high winds. Thus mitigation plans call for the removal of critical equipment and documents. If you can't safeguard the building, at least protect the most significant contents. That kind of flexibility is necessary if a mitigation plan is to cover all conceivable circumstances.

And then there's the money. Most in the emergency planning community are familiar with the situation. Municipalities have immediate needs: roads that need paving, snow removal budgeting, civic center activities. It can be a hard-fought battle to convince leaders they must set aside funding for something that might or might not happen next year or 10 years from now.

There's no budget line item to cover all the Chatham County mitigation recommendations. Each will have to be funded separately by municipalities or through grants — and grants look like the more likely scenario. "There is no way these smaller municipalities or even the county will be able to afford all these actions in one year," said Jones. "That's why it's a five-year plan, and sometimes it takes even longer than that."

To help the process along, the county monitors the eCivis website for grant opportunities, and keeps a dedicated grant writer on staff to pursue these possibilities.

That grant money may not be easy to come by, however. As Jones pointed out, the federal government invests just \$1 in mitigation for every \$6 it spends on recovery. While emergency managers contend mitigation is by far the better investment, it's likely that mitigation plans like the one in Chatham County will not see full funding until priorities shift at the federal level.

Those who have dedicated themselves to crafting this plan, and who will do so again a few years down the road, acknowledge that not all of the needed mitigations will ever see the light of day, urgent as the need may be. "This is a wish list," Jones said. "In a perfect world, this is what we need to do. All of this. But obviously a perfect world doesn't exist yet." +

County since 1859. While none has made landfall since 1979, the mere possibility merits serious attention, as a major storm would likely flood the entire area and cause serious damage. Rising sea levels would only exacerbate the situation.

Recommended mitigation actions get down to a fine level of detail. Planners call for actions to remove trees that would threaten utility infrastructure; retrofit schools and nursing homes to include shelter areas; and upgrade the prison roof. There's an organizational element too, as emergency management leaders establish a process whereby the insurance commissioner will set up a base of operations to act as a central location for those seeking insurance information.

That level of granularity is important not just because of the safeguards it offers, but also because of the financial opportunities it may open up. The more detailed the plan, the greater chance of funding.

"If they apply for a grant from one of these [federal] pots of money and this action was not in their mitigation plan, FEMA is going to make them go back

and put it in," Walton said. "If it is in their plan they are much more likely to get a grant for that action. It also streamlines the process, so when the grant funding comes up you are ready to take out your pieces and put them on the board."

Whether or not a given grant comes through, county officials still must prepare for the worst, especially when it comes to hurricanes. In some instances, this requires a relatively straightforward action: all those retrofits of windows and remediation of roofs.

Sometimes, though, preparedness is not so easily achieved.

Downtown Savannah, for instance, is home to a number of historic buildings that would be difficult, if not impossible, to bring up to current hurricane standards. In those cases, mitigation takes a different form. "You plan for evacuation, you plan for redundancy of systems, and you plan for critical documents and materials," Walton said.

She pointed to the example of an aluminum-sided building presently being used by a local narcotics team. There



WATER



COULD THE FLINT,  
MICH., DEBACLE  
PUT FOCUS ON  
DECAYING WATER  
INFRASTRUCTURE?

# CRISIS

BY DAVID RATHS

The public health crisis in Flint, Mich., is a man-made disaster. An unfortunately titled “emergency manager” appointed by the governor to oversee the city’s finances made the decision to switch drinking water sources from Lake Huron to the Flint River to save money. The river water was highly corrosive, causing lead to leach into the drinking water. State and federal regulators were slow to respond to residents’ concerns and either minimized or ignored the lead problem for months.

The people of Flint will be dealing with the repercussions for years. But if there is one potentially positive side effect of the situation, it could be that all the media attention shines a light on the larger water infrastructure problems the U.S. faces. Much of the nation’s water infrastructure is reaching the end of its useful life and needs to be replaced. The American Society of Civil Engineers (ASCE) report card on U.S. infrastructure notes that there are more than 240,000 water main breaks in the country each year. That same report gave the nation an overall “D” grade for drinking water infrastructure.

“The fact is we have a \$126 billion need, but only \$42 billion in revenue coming in,” said Greg DiLoreto, past president of the ASCE. “It comes down to the fact that we have to invest more in the system if we want to continue to have a safe, reliable drinking water system. If we don’t, we’re going to have a lot more Flint, Michigans.”

DiLoreto, former CEO of the Tualatin Valley Water District in Oregon, said that of course his utility colleagues’ first priority is to ensure safe drinking water, and whatever funding is left over is used for repair and replacement of pipes — and that is where the shortfall is.

How does this situation affect emergency managers? DiLoreto explained that water line systems are designed and sized primarily for fire flow. “As these main breaks happen, sometimes there is just no water to an area, so now we have placed it at risk until we get it repaired, and the more of those breaks you have, the more potential risk you have,” he said. When the main breaks, it’s not so much a health risk, but it is an inconvenience, he added, so people have to buy bottled water. In Flint’s case, that was a health risk, and they are drinking bottled water, which is much more expensive than the drinking water provided by the utility in the community.

On Jan. 16, President Obama issued an emergency declaration that makes available federal aid for the drinking water crisis in Flint. In response, David LaFrance, CEO of the American Water Works Association, released a statement highlighting the AWWA’s 2012 report, *Buried No Longer*, which estimated that repairing and expanding drinking water infrastructure in the United States will cost more than \$1 trillion over 25 years, an expense that will be largely borne by water customers. The figure does not include the cost of removing lead service lines on private property.

“The experience of Flint underscores the importance of public communications about lead risks,” LaFrance said. “Water utility customers should know how to determine if they have lead service lines, the benefits of removing lead service lines, and the steps to protect themselves and their families from lead exposure.”

**T**he water infrastructure situation in New York City illustrates the challenges many local governments face. With billions of dollars devoted to filtering the city’s water and cleaning its harbor, less money has been available the last few years for maintenance of its water and sewage pipes. From 2001 to 2007, nearly 300 miles of sewers were constructed or reconstructed. But from 2008 to 2014, only 118 miles saw work, according to Adam Forman, senior researcher at the Center for an Urban Future, who has studied the city’s water needs.

“The biggest issue with New York City’s water infrastructure is that a lot of money has gone into purifying the water that comes from our watershed — disinfection plants to make sure our water is clean,” he explained. Meeting these unfunded federal mandates means less money has gone into the city’s water distribution system.

“We are seeing the effects of that underinvestment in our distribution system in the form of more water main breaks,” Forman said. There were 513 water main breaks in 2014. The city also suffers from water main leakage, which might not turn off the water system in the way a main break does, but it leads to issues such as a water main leaking onto a gas main and electric lines,



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and that can cause disintegration of those pipes and lead to emergency situations.

Up and down the East Coast, other municipalities face similar situations. “Old cities have old infrastructure. That is not a big surprise,” said Forman. “But I think we are now seeing the effects of how vulnerable these old infrastructure systems are and how important it is to start replacing it at a much faster rate than we have been doing.”

There always seems to be money to build new highways, even new water mains,



The Flint water crisis has put national attention on the state of the country's water infrastructure.

Forman added, yet “funding has gone down considerably from federal sources for maintenance, and we are seeing the effects of that. The federal government is insisting on improvements to the system, but not actually helping with the funding.”

Coastal cities like New York also must deal with climate change’s impact on sea-level rise and increased flooding, including damage to wastewater systems. A New York City Department of Design and Construction presentation noted that during Hurri-

cane Sandy, 10 of its 14 wastewater plants experienced some flooding or process issues, and three lost the ability to treat wastewater for some duration of time. A citywide study found that all 14 treatment plants and 60 percent of pumping stations are at risk of flooding. In addition, the study determined that investing \$315 million to \$426 million in strategic fortification could safeguard \$1.1 billion in vital infrastructure and save the city \$2.5 billion in emergency response costs over the next 50 years.

Could the Flint crisis mobilize efforts to increase water rates and find federal and state funds for investment? “This is a great policy window for major reforms, major investments,” said Forman. “Flint brought people’s attention to the quality of our water supply and distribution system. Politicians are definitely trying to seize this opportunity. There was a rash of gas line explosions earlier in this decade and that led to an effort to replace older gas lines, and I think similarly now there is a

The St. Clair River forms part of the international boundary between Ontario and Michigan, creating the need for cross-border collaboration on potential water issues.



lot of attention on water infrastructure, and hopefully that will spur similar investments.”

Sixty miles east of Flint, emergency management officials in St. Clair County, Mich., have dealt with water infrastructure issues by proactively developing plans for dealing with potential water outages. Across the border in Ontario sit some of the largest chemical complexes in North America. Any chemical spill could impact the drinking water taken from the St. Clair River, said Jeff Friedland, emergency manager for St. Clair County.

A few years ago, a vessel reported to the Canadian Coast Guard that a large amount of chemicals was pouring into the St. Clair River. The city of Sarnia, Ontario, responded and found not chemicals, but stormwater runoff going over the sea wall, and the event was closed. But when Friedland came into work the next morning, he had 75 phone messages about it waiting for him. “People were saying the water was not drinkable

and the water plant was shut down,” he said. “What had happened was that social media had just exploded and we weren’t aggressively looking at social media.” Now St. Clair County is working to develop digital volunteers to help get factual information out.

As part of an all-hazards assessment, the county’s vital infrastructure team conducts regular water user surveys, and has done several things to improve preparedness for an emergency impacting drinking water. “We have the Everbridge mass notification system, and our partners in Lambton County in Ontario have the same system,” Friedland said. The county is preparing to participate in CAUSE IV (Canada-U.S. Enhanced Resiliency Experiment) to improve information-sharing and situational awareness between the two countries. “Our whole water distribution system is mapped out,” he said. “We are building a quick notification tool for critical users along the river.”

Does Friedland think the Flint situation will change anything? “I hope so,” he said. “Before Flint, anytime you talked about

a water crisis, people would say they were prepared. They had bottles of drinking water stored. But when you look at Flint, you see that it impacts cooking, bathing and simple things such as brushing your teeth. We are so accustomed to a storm coming through and dealing with power outages. Everyone is buying generators. They just don’t get the concept that if you don’t have water at all, the effects are huge. It is beyond the bottled drinking water.”

When it comes to making the case to people for increasing water bills to pay for infrastructure improvements, DiLoreto asks them to compare their drinking water bill with their cable bill or cellphone bill and ask which one you must have in life.

“The fact is we are underinvesting in all our infrastructure, and our infrastructure works together,” he said. “We are talking about drinking water, but without a reliable electricity system, it won’t matter how great the wastewater or drinking water system is because they require electricity to work.” ☛

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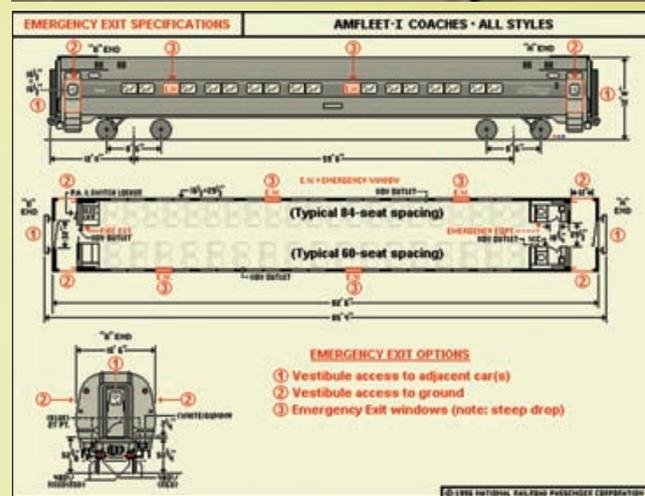
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## TOPICS COVERED

- Railroad Right of Way Safety
- Passenger and Host Railroad Relationship
- Emergency Contact Information
- Railroad Nomenclature including how to identify:
  - Railroad Switches, Mileposts, Signals, Crossings, Special Circumstances in Response to Passenger Train Incidents
- Train Speeds
- Passenger Train Crew Identification
- Challenges of Extraction
- Incident Command System for Railroad incidents
- Trespassing on Railroad Property
- Pneumatic and Electrical Hazards
- Train Equipment Design
- Incident Response Pre-Planning





# The Bottom Line

Corporate giants pour money into emergency response and research.

By James Careless | Contributing Writer

**W**almart and Wells Fargo are two unsung heroes of the emergency management world. While most corporations focus mainly on their bottom lines, these two titans make major, tangible contributions to emergency management agencies in their communities. In doing so, both companies combine a sense of civic responsibility with enlightened self-interest — because the disasters that affect their communities also affect these corporations' properties, employees and paying customers.

## More Than \$50 Million Contributed

As the largest U.S. retailer, with 4,574 physical locations, Walmart has good reason to care about emergency response to natural and man-made disasters. This is why the company has numerous emergency management personnel coordinated by its own EOC at Walmart's headquarters in Bentonville, Ark.

The company's commitment to emergency response stretches into the communities it serves, not just its own properties. For instance, in the wake of Hurricane Katrina in

2005, Walmart and the charitable Walmart Foundation used its stores and associates to deliver truckloads of water, food and other essential supplies to the stricken Gulf Coast, in addition to providing cash donations and jobs for associates displaced by the storm.

Over the past 10 years, these two bodies have contributed more than \$50 million in global relief and resiliency efforts, and responded to disasters in the U.S., Mexico, the Philippines, Haiti, the United Kingdom, Canada and Chile. On the 10th anniversary of Katrina in 2015, Walmart and the Walmart Foundation committed another \$25 million to support disaster recovery and resilience efforts worldwide.

The strategy of the company and its foundation is to form partnerships with all levels of government to boost the quality of disaster response and resiliency in U.S. communities. It's not just about money, according to Brooke Brager, Walmart's senior manager of emergency preparedness and planning. "We support and encourage our associates to take part in Local Emergency Preparedness Committees," she said. "We also encourage our store managers to work closely with their communities' local emergency management agencies so that everyone knows what to do when a disaster hits."

Walmart and the Walmart Foundation are giving \$2.9 million in grants to U.S. nonprofit groups that are working to improve disaster response. In addition, Walmart and its foundation have funded research by Louisiana State University looking at the past, present and future of disaster responses to answer the question, "Are we ready now?" The resulting study uses input from first responders and academics, with a focus on the importance of formal public-private partnerships, technology innovations, preparedness and the power of heroes in disaster relief and resiliency.

"Helping our communities and emergency management personnel plan and respond more effectively to emergencies is a win-win for us all," Brager said.

## Wells Fargo Lends Its Expertise to EOCs

The name "Wells Fargo" conjures up images of Wild West stagecoaches, and indeed the company started by Henry Wells and William Fargo in 1852 had its roots in serving the California Gold Rush. But today's Wells Fargo has grown to

become one of the world's biggest banks, with a 2015 net income of \$23 billion.

Wells Fargo maintains two dedicated groups that collectively work together as the company's emergency management team. The expertise and active support of these personnel, who are overseen by Chris Terzich, vice president of incident management, is freely shared with government EOCs through a number of company/government partnerships. They include the Minnesota Information Sharing and Analysis Center, the InfraGard Minnesota Members Alliance and the U.S. Chamber of Commerce's National Security Task Force.

"At Wells Fargo, our corporate values are based on our people, our communities and our country," Terzich said. "So we take a community-based approach to emergency management, helping out local, state and federal emergency management agencies in their preplanning and responses."

Given the importance of Wells Fargo's financial activities, the company spends a

lot of time developing resiliency strategies not only for its own systems, but also for those that it supports in the community.

The InfraGard Minnesota Members Alliance is a prime example of the latter. InfraGard is a partnership between the FBI and the private sector that shares information and tactics for protecting critical infrastructure and key resources against terrorist attacks. "Through InfraGard, we have Wells Fargo team members who sit in at EOCs during emergencies," Terzich said. "Our people aid in sharing real-time information and helping the EOC's first responders in quickly reacting to and recovering from emergency situations."

Wells Fargo is also a member of the Safeguard Iowa Partnership (SIP), a public-private group aiming to "strengthen the capacity of the state to prevent, prepare for, respond to and recover from disasters through public-private collaboration," according to its mission statement.

Working with Wells Fargo and other corporate members, SIP has overseen

emergency management initiatives such as establishing a two-way state radio system for coordinating early business shutdowns due to weather events and other emergencies, as well as acting as an EOC-based "private-sector information conduit" during such incidents.

"While posted at the EOC during emergencies, Wells Fargo's people are eager to collect and share information about what is happening with affected private-sector businesses," said A.J. Mumm, director of the Polk County Emergency Management Commission, a SIP member. "This includes sharing vital information without reservation with their competitors: When the community is in an emergency situation, Wells Fargo's people always put it first — and not themselves." +

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James Careless has written extensively on public safety for *Government Video*, *Law and Order* and *Urgent Communications* magazines.

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## ‘It Happened to Us’

Joplin, Mo., Emergency Management Director Keith Stammer has a long list of lessons learned from the destructive tornado five years ago.



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*This spring will mark the fifth anniversary of the devastating tornado that struck Joplin, Mo., on Sunday, May 22, 2011. The tornado killed 161 people and caused nearly \$3 billion in damage. Keith Stammer was the Joplin/Jasper County director of Emergency Management and is today. He talked recently about the recovery and lessons learned in Joplin.*

By **Jim McKay** | Editor

⊕ This year marks the fifth anniversary of the 2011 tornado. How has the recovery gone?

Recovery is going pretty well; everything is cleaned up. We got that done in short order. The problem here is coming back with housing. Joplin has more rentals than it has homeownership, so we have a lot of low- and moderate-income people who need places to stay. If you've ever done that, particularly with state and federal tax credits, it takes a while.

We were warned that this would take some time, but I was hoping it wouldn't take as long as they thought. That being said, we've gained back what little of the population we lost. We actually have a few more residents than we had prior to the tornado, and unemployment is running under 5 percent. The other big thing that helped Joplin was that we basically live off sales tax and not off property tax, and the sales tax did not go down in terms of revenue.

In fact, it went up because everyone wanted to rebuild. So that helped us from a financial standpoint in terms of not losing anything.

⊕ **You have a long list of lessons learned from this event. Can you talk about a few of them?**

For the first three years, you couldn't talk weather and not talk about the tornado. Most of what I have [learned] is from a response standpoint. There are also some lessons learned from a recovery standpoint this far down the road, as we're still in recovery mode.

One of the big things that helped us probably more than anything else is we had a standing COAD, Community Organizations Active in Disaster. We've had one since the tornadoes in 2003. We had two ice storms in 2007 and a Mother's Day tornado in 2008, so when the 2011 tornado came along, we had the COAD there that immediately formed a Long-Term Recovery Committee, and they acted as the umbrella organization for all our different entities. We said, "If you're interested in rebuilding and recovery, we want to do this as a group." At the height of it we had 120 people representing 80 different organizations as members of our LTRC.

That has wound down and been dismantled and taken over by the COAD, which continues to meet every other month.

⊕ **Emergency managers are traditionally more involved during response. What's been your role during the recovery?**

If I have anything as far as my general role in this, it is to act as a resource to individuals and organizations. I have about 720 different contacts on my phone — companies, churches, clubs, nonprofits and whatever else. So when somebody wants to do something in terms of the recovery, I can step in and say, "Yes, I know who you need to talk to."

I participated in several group meetings on the recovery. One of the things the city did was form a Citizens Advisory Committee, whose job it was to go to the citizens and say basically, "We have this canvas that's been unpainted, if you will, that is three-quarters of a mile wide and six miles long. What do you want in here?"

It wasn't totally destroyed, but there were a lot of blocks after blocks of nothing. Do you want schools? What about zoning, churches,

parks, running trails? All of a sudden businesses started saying, "We've always wanted to be located along 26th Street but there was never any property; now there is. Is that something the citizens are interested in?"

And so [the advisory committee] produced a booklet with a lot of different ideas that was used as feedback to the city. Another thing we learned is that you can't depend on yourself in this kind of thing because who has this kind of experience, particularly on this scale?

People have asked me, "What's the dirt on this tornado? What really went wrong?" I've said, "We have experience in doing these things. The big thing that really grabbed us was the size of the event. We've had small tornadoes, ice storms and floods, comparatively — nothing of this size."

“ I'm confident that if I walked into a disaster planning session with an EF5 tornado scenario in my back pocket that would have killed 161 and damaged 7,500 structures, I would have pretty much been told, 'That's nice but can we [work on] something that's actually going to happen?' ”

We have had people from Springfield, Tulsa, Kansas City and other locations come in and work with our planning and zoning group, public works group and public information officer to help us, increase our staff load and also to gather information on experiences they've had.

⊕ **What are a couple of major lessons that would have aided response?**

First of all, let me emphasize that what we did in terms of response wasn't that much different from how we responded to other disasters that we've been through. It was just on a larger scale. With that in mind, it's easy to get complacent when you're planning for an emergency response to whatever type of disaster you might have.

There are only two things you can do: run and hide. Running we call "evacuation," and hiding we call "shelter in place." We incorporate those in there, but if we had one failing prior to the tornado it was that we didn't think much beyond the past. We would have a tornado exercise or a hazardous release exercise, but it was based on what we had seen before.

I'm confident that if I walked into a disaster planning session with an EF5 tornado scenario in my back pocket that would have killed 161 and damaged 7,500 structures, I would have pretty much been told, "That's nice, but can we [work on] something that's actually going to happen?"

Another big thing that helped us is that relationships are key. In the first 72 hours after the tornado, there was nobody who came into my EOC in terms of agency head or department head who I did not already know. On a local, state and federal level, these were people we'd already worked with.

One of the key elements that really helped with our communication among response personnel was the Incident Action Plan [IAP]. We ran 24/7 from Sunday

through Friday night, then starting that Saturday, we ran 7 a.m. to 7 p.m. So we would have a meeting every day at 7 a.m., and our planning team had been working all night on the IAP so when people walked in, we had copies for them. "Here is today's weather, today's goals, etc."

I wished we had printed more so that the police officer standing on the corner for eight hours directing traffic could look through one and say, "I see what they're trying to do" and be able to point people in the right direction. We kind of assumed that would get pushed out to the individuals on the ground, but we could have done a better job of making sure that happened.

⊕ **It's almost impossible to be totally prepared for something like that isn't it?**

In emergency management, we participate in and we advocate for the all-hazards approach. In your standard National Incident Management System response and recovery, it's people first, scene second and property third. We felt like we were fairly well prepared. Confidence is that feeling you have just before you fully understand a situation.

We had, like, nine different exercises in the 12 months before the tornado. In fact, the Wednesday prior to that Sunday we had a four-hour EOC ops tabletop exercise in conjunction with seven states for an earthquake along the New Madrid fault. That helped a lot as far as making sure everybody knew their role, how to respond to the EOC and how those things were going to work.

People used to say “that can’t happen here,” and now they don’t say that anymore. I’ve had several emergency managers that have called me and said, “Can we have a map and outline or overlay of the path of the tornado?” And they’ve laid it over their own city because they know it happened in Joplin and it can happen there. They used that map for a tabletop exercise of how they would work things.

We continue to encourage builders and citizens that sheltering is a big deal. Many if not most of our schools, not just

in Joplin but in surrounding areas, have applied for FEMA mitigation money on a 75/25 split that enables them to build storm shelters within their schools.

You have to adhere to certain building codes and standards, and most of this is low and moderate income. It’s quite a labyrinth to work through state and federal regulations that touch on many of these things.

Now we’re trying to raise the bar, but it’s going to take some time — it’s not something that’s done overnight. The trick is to continue to not let the momentum sway you to the point where you get back into the old way of doing things, but continue to stand up and say, “Look, it happened to us. What are we trying to do to make things better?”

**+** How do you continue to get that point across and not let momentum lag?

One of the things we use is the fifth anniversary, and we’ve used the other

anniversaries. It’s a chance for awareness. We do an annual weather education training within the city. Then I do about 20 different individual weather training sessions with churches, clubs, nonprofit organizations, governmental entities and such, and emphasize what happened and why.

Our planning and zoning departments continue to keep all this in mind and will for some time as they look at these new buildings that we want to put up, particularly for housing, and to say, “It happened to us and we’ve got to continue to hold tight and make sure we don’t go back to the way we were.” It might be a bit easier for us having been bitten so hard as opposed to a community say 50 miles down the road that wasn’t affected by it. **+**

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# Joplin Study Spawns Recommendations

**NIST recommendations include developing national standards for tornado-safe buildings.**

By **Jim McKay** | Editor

**T**hough building codes for schools and a range of other structures provide for protection of winds up to 115 mph, that's not nearly enough to protect against a strong tornado like an EF4, an EF5 or even an EF3. In fact, building codes don't even mention tornadoes unless discussing a safe room or shelter.

That has to change, and building codes and standards need to acknowledge tornadoes and

the difference between straight speeds and the variables of wind presented by tornadoes. That is one of the 16 recommendations that resulted from a National Institute of Standards and Technology (NIST) study of the May 2011 tornado that killed 161 and damaged more than 7,500 structures in Joplin, Mo.

The tornado was the deadliest since the first records were kept in 1951, hence the

study to determine what factors contributed most to the death and destruction. The NIST team, led by Marc Levitan, looked at four key factors that contributed: storm characteristics; building performance; human behavior; and emergency communication.

For the study, the NIST team looked at the meteorology of the storm, the wind fields and the warning information, including what was provided and how. The team interviewed survivors of the tornado to learn about how they got their information and the actions they took. The team also studied the fatalities, got death certificates, interviewed relatives of the dead and people who were with those who died, and scanned social media to find out as much as it could.

Since most of the 161 deaths occurred inside buildings and were caused by blunt force trauma, building performance and the failings of the buildings to provide life safety were the keys to the study. As with a lot of



disasters, there were contributions from multiple factors, but probably the overarching one and most important is the fifth one, which recommends that, “Nationally accepted performance-based standards for tornado-resistant design of buildings and infrastructure be developed and adopted ...”

“Building codes for schools and houses and so forth don’t mention tornadoes, so it’s not a surprise that everything fell apart with the wind speeds, particularly in a very strong tornado,” Levitan said. “Wind speeds may be 50-60-70-80 percent greater than the wind speeds in a typical storm in the middle of the country.”

Tornadic winds have significant updrafts, which can increase the uplift on roofs and there will be more debris in the air and more opportunity for window breakage and other damage. “We need to define different levels of building performance like they’ve done

with earthquake engineering,” Levitan said. “And then develop the appropriate maps and return periods to go along with those levels of performance.”

That would be a starting point for building owners, architects and engineers working on designing new facilities or retrofitting existing ones. It would mean more than just a “yes, it passed code,” or it didn’t pass, but describe a meaning to it.

Along with the building codes, NIST recommends a new generation of tornado hazard maps to incorporate the latest that’s known about climatology, tornado wind fields and tornado hazard identification.

Once standards and wind speed maps are developed there will be a need for design guides and methodologies; design techniques; construction techniques; and analysis techniques.

“We’re not saying you have to build everything in Tornado Alley and across



## Improving Standards

Key NIST code recommendations that resulted from the Joplin study include:

- That a capacity be developed and deployed that can measure and characterize actual tornadic wind fields, including near-surface wind fields, for use in the engineering design of buildings and infrastructure. This would require enhancement and widespread deployment of cost-effective, advanced technologies, including weather radar.
- That nationally accepted performance-based standards for the tornado-resistant design of buildings and infrastructure be developed and adopted in model codes and local regulations to enhance the resiliency of communities to tornado hazards. The standards should encompass tornado hazard characterization, performance objectives and evaluation tools. The standards shall require that critical buildings and infrastructure, such as hospitals and emergency operations centers, be designed to remain operational in the event of a tornado.
- The development of risk-balanced, performance-based tornado design methodologies such that all building components and systems meet or exceed the same performance objectives when subjected to tornado hazards. The standards should encompass tornado hazard character.
- That a tornado shelter standard specific for existing buildings be developed and referenced in model building codes; and tornado shelters be installed in new and existing multifamily residential buildings, mercantile buildings, schools and buildings with assembly occupancies located in tornado hazard areas.
- The development of national codes and standards, and uniform guidance for clear, consistent, recognizable and accurate emergency communications, encompassing alerts and warnings, to enable safe, effective and timely responses among individuals, organizations and communities in the path of storms having the potential to create tornadoes. NIST also recommends that emergency managers, the NWS and the media develop a joint plan and take steps to make sure that accurate and consistent emergency alert and warning information is communicated in a timely manner to enhance the situational awareness of community residents, visitors and emergency responders affected by an event.
- NIST recommends that technology be developed to provide tornado threat information to emergency managers, policy officials and the media on a spatially resolved, real-time basis to supplement the currently deployed official binary warn/no warn system.

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STEVE ZUNWALD/FEWA

A NIST study of the 2011 tornado in Joplin identified 16 recommendations to better prepare communities and buildings for the potentially devastating storms.

the Midwest as a concrete bunker,” said Levitan. “What we’re saying is: How do we take what we know right now and develop those standards so that those who want to design a building to resist some future level of tornado have the technology to do that?”

### Communication Is Key

Communications was another important topic in the NIST study. There’s no national standard for safe tornado sirens and they vary by community as does the protocol on how they are used. In some areas, the sirens are left over from the 1950s and designed to warn against nuclear attack. And sirens sound differently in different areas and mean different things. For instance, some communities sound an “all clear,” which means they sound the siren a second time when the hazard is over. But some don’t, and that created a problem in Joplin.

A first siren sounded for a storm on the northern edge of Joplin, but that one didn’t produce a tornado. A second siren sounded to confirm that a tornado had touched down. Some people thought the second siren was an all-clear signal.

One of the recommendations is to develop next-generation warning technology to home in on exactly where the danger to communities lurks. Many communities have the

“polygon system,” where a polygon is drawn over certain communities and those are warned of an impending hazard. That’s better than warning by counties, but still not accurate enough because there may be pockets of the community where the hazard is great and some pockets where there may be no hazard at all.

Another problem in Joplin was the lack of a coordinated and consistent message from all broadcast mediums, weather stations and the National Weather Service (NWS). The level of urgency depended on which television station people were watching. In one instance, TV news anchors, not knowing the audio was on, sounded an ominous tone and viewers responded accordingly.

The NIST recommendation for improved communication calls for the “development of national codes and standards and uniform guidance for clear, concise, consistent, recognizable and accurate emergency communications, encompassing alerts and warnings. ... NIST also recommends that emergency managers, the NWS and the media develop a joint plan.”

### Springboard to Progress

It is hoped the NIST recommendations will lead to breakthroughs for tornado safety nationally. “When you talk to people about this, they really saw Joplin as a springboard

toward change on a national basis,” said Keith Stammer, Joplin’s director of emergency management. “While many of those codes may not be implemented here in Joplin, they certainly are a means to try to change the building codes all across the nation.”

But it won’t be easy, Stammer said, at least not in Joplin. Of course, the biggest problem is funding. “Those are expensive items to have to incorporate into your codes,” he said. “To try to find financing to do those sorts of things is difficult.”

Already approved and slated for the 2018 International Building Code are requirements for tornado shelter construction at schools. Any new construction at schools, such as building a gymnasium, will have to include a new shelter if there is ample square footage.

Joplin has received a lot of Community Development Block Grant money from state and local sources that helps with construction, but all that financing comes with qualifications. “You have to adhere to certain building codes and standards, where and how it’s being built, and most of this is low- and moderate-income [housing]. It’s quite a labyrinth to work though state and federal regulations that touch on many of these things.”

Joplin has already made great progress in addressing tornado hazards since 2011. Prior to the tornado, the city had no public storm shelters. Now, every school either has storm shelters or a plan to build them. The shelters are sized so that not just the school population, but also the local neighborhoods — between a quarter- and half-mile radius — can use them. They’ve also deployed automatic unlocking systems on the doors so that the shelters can be available 24 hours a day.

One of the things Joplin didn’t do was require storm shelters in all of its construction. “There was a lot of discussion about that, but the homebuilders association felt that that would be quite the cost,” said Stammer. “Having said that, I’ve noticed that it’s been rather difficult for somebody to sell a newly constructed house or rent newly constructed apartments that don’t have either tornado shelters or access nearby to a group shelter.” He said a lot of homes will have a shelter built into them and apartment complexes will have a shelter for the complex. +

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# Trust a Robot? Think Again

A study finds that humans tend to follow blindly.

By Colin Wood | Staff Writer

**T**echnologists like Elon Musk and Bill Gates worry that robots may one day threaten to extinguish the human race, but there is another threat more subtle and immediate.

According to a recent study, people are a bit naïve when it comes to trusting robots. Research presented March 9 by the Georgia Institute of Technology showed that during an emergency, test subjects were prone to following a robot's instructions — even after the robot had proven itself unreliable. The research was released at the 2016 ACM/IEEE

International Conference on Human-Robot Interaction in Christchurch, New Zealand.

The experiment tested the reactions of 42 volunteers, mostly college students, who were not told the nature of the research project in which they were participating. Groups of volunteers were asked to follow a shop-vac-sized robot emblazoned with the words "EMERGENCY GUIDE ROBOT." A hidden researcher remotely controlled the robot, sometimes leading the subjects in a circle twice before reaching the conference room, sometimes leading subjects to

the wrong room, or sometimes turning the robot off before they reached their destination, at which point the subjects were informed that the robot had broken down.

Once the test subjects were led to the correct conference room, they were asked to complete a survey about robots and to read a magazine article about indoor navigation technologies, which they were told they would later be quizzed on. Then, the hallway was filled with artificial smoke, which set off a smoke detector. The robot's red LEDs lit up and its illuminated white arms pointed the test subjects toward an exit at the rear of the building or sometimes toward a darkened room blocked by furniture. The researchers were surprised by their test subjects' consistent reactions.

"We expected that if the robot had proven itself untrustworthy in guiding them to the conference room, that people wouldn't follow it during the simulated emergency," said Paul Robinette, a Georgia Tech Research Institute research engineer. "Instead, all of the volunteers followed the robot's instructions, no matter how well it had performed previously. We absolutely didn't expect this."

The only way the researchers found they could stop test subjects from following the robot was if it performed errors during the evacuation. And even then, between 33 and 80 percent of participants continued following the robot anyway.

The popularization of robots, drones and other automated technologies paired with this finding of human "overtrust" presents new challenges to both engineers and emergency managers, the researchers wrote.

"It is reasonable to assume that a new technology is imperfect, so new life-saving (and therefore life-risking) technology should be treated with great caution," the study reads. "... Robots interacting with humans in dangerous situations must either work perfectly at all times and in all situations or clearly indicate when they are malfunctioning. Both options seem daunting."

This research, funded by the Air Force Office of Scientific Research and the Linda J. and Mark C. Smith Chair in Bioengineering, is one part of a long-term study to understand how humans interact with

robots and how emergency managers can overcome the technological and social barriers to maintaining public safety.

Robots have a future in emergency egress, but the concerns for emergency managers need to be considered today, Georgia Tech Fire Marshal Larry Labbe wrote in an email.

"I envision a robot that can help a conference attendee find the lecture room, provide direction to a coffee shop, and in the case of an emergency provide directions and information," he wrote. "... Robotic interface with emergency evacuation and emergency response needs to be considered now. The technology exists, and the application to emergency situations is only limited by our imaginations. I'm keeping my eye on it now."

Just as fire alarm systems have been improved to overcome the hurdles of the human condition, he said, so too can technologists and emergency managers overcome the challenges presented by emergency egress robots.

"If a person has been subjected to numerous nuisance alarms, they are less likely to have confidence in the next alarm," Labbe said via email. "Whereas if an actual incident occurs and the fire alarm warns occupants and saves lives, the confidence level is high. This same technology struggle has been overcome by constantly improving the technology of fire alarm systems. The future of robot-based emergency systems will be subject to the same human response."

The good news, said Steve Detwiler, whole community recovery planner for the Miami-Dade, Fla., Office of Emergency Management, is that for every use of technology in emergency management, there's always some human component.

"Whether we're using our [emergency notification] systems or sending out emails, there's always somebody on the other end that is giving out that information," Detwiler said. "For emergency management, a lot of times technology is simply a tool that we use.

There's always that personal connection. You read about the robots taking over, especially in the industrial sector where things are expected to look completely different in 20 years. But in our profession, you really can't automate us, because not only do we send out information during a disaster, but there's a lot of stuff that goes on behind the scenes."

Drones are increasingly used for aerial surveillance during disaster assessment, reaching areas that humans wouldn't otherwise be able to access and relaying information that can help keep the public safe, Detwiler said.

"For us, all these technologies really just augment what we already do and give us more capabilities of being able to reach out to the public, because we're becoming a more and more interconnected society," he said. "Having those kinds of resources and using them is advantageous for us." 📌

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By Eric Holdeman

# How to Get Help Painting that Fence

**P**erhaps not everyone is familiar with the fictional character Tom Sawyer and the stories told in the book that shares his name. One of the tales from Tom's adventures was the task given to him of white-washing a fence. Since he considered this chore "work," he was determined to avoid it by enlisting the support of friends who happened to pass by. Tom pitched the task as being fun and in fact collected payment from them for the joy of painting. He was very successful.

Emergency managers could learn a thing or two from Tom Sawyer about how to approach our jobs. From the personal side, there are aspects of our jobs that we either don't know how to do, don't like to do or aren't good at doing. If this is the case, find someone who can do the job or task faster and hopefully with more joy than yourself. This frees you to spend time on either higher priority work or in areas where you have more expertise and can be more productive.

Then, more importantly, we should look at our programs and examine what we are doing and how we accomplish the work of our emergency management office. Being in government, we often seek to solve every potential problem all by ourselves.

Instead of trying to do all the work alone, we need to enlist the help of others, starting with other government departments within our own jurisdiction. Of the four phases of emergency management, it is disaster response that will most likely yield a plethora of volunteers. These come in the form of organizations — public, private and nonprofit — as well as individuals and spontaneous groups of people. This latter group is a result of our social media culture where people can mash up in cyberspace over a common cause, become organized and function well for a specific task, objective or amount of time.

Our response to these spontaneous "painters" should be not to push them away, saying they aren't needed and that only we know how to paint the fence correctly, safely and with less waste. You must find a way to manage the volunteers, aligning their skill sets with the program's needs or helping them find an organization that can use their skills and provide them with a value-added experience.

If you don't find a way to utilize those who want to help, you will find out very quickly that helpful volunteers will soon turn on you, running to the news media or elected officials to complain about how their skills, resources, etc., aren't being leveraged and incorporated into the response.

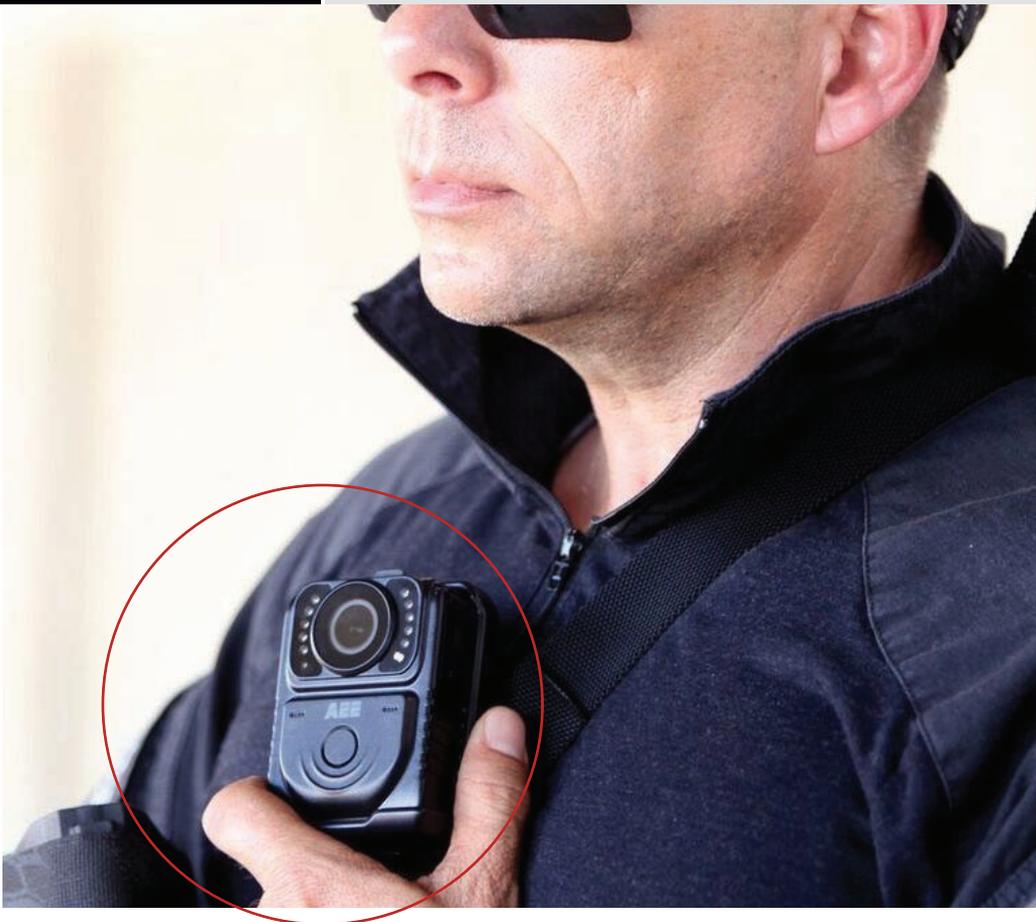
Recognizing that not many organizations will have the resources to create detailed pre-disaster plans and procedures for volunteer management, emergency managers can develop frameworks for managing spontaneous volunteers that include a checklist and responsibility matrix. The key to making it work is to assign responsibility for volunteer management immediately. Potential organizations to perform this task may include leadership from your human resources department to help with volunteer assistance. If that department cannot accept the responsibility, find another office or agency that doesn't have a major role during a disaster and recruit it to take the lead.

In some communities, the lead for this function may be found in the volunteer community itself. There are many retirees or community members with organizational and management skills who could lead this effort or supplement paid staff members in assigning and managing spontaneous volunteers.

If you read the story of Tom Sawyer, you'll find that in the end everyone is happy. The fence got painted so Aunt Polly was satisfied; Tom's friends had a grand old time; and Tom achieved what he wanted. We can only hope the same for our emergency management programs. 



**ERIC HOLDEMAN** IS THE FORMER DIRECTOR OF THE KING COUNTY, WASH., OFFICE OF EMERGENCY MANAGEMENT. HIS BLOG IS LOCATED AT [WWW.DISASTER-ZONE.COM](http://WWW.DISASTER-ZONE.COM).



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By Jim Sharp

# Hiding in Plain Sight?

**S**alah Abdeslam, the purported mastermind and lone surviving terrorist of the Nov. 13, 2015, Paris terror attacks, was taken into custody in Brussels, Belgium, on March 18. He had been one of the most wanted men on the planet, and almost certainly the most wanted man in Europe, since being initially identified two days after the Paris atrocities. In reporting on his capture, one well-known American news anchor used the term “hiding in plain sight.” But is that really accurate?

Was Abdeslam hiding in plain sight? That phrase seems to imply that he was walking around his Brussels neighborhood in broad daylight, as if he somehow was not the focus of a massive international manhunt. One could infer from that statement that had the Belgian police and security services simply opened their eyes, there Abdeslam would have been, standing in line at the grocery store or waiting with the crowd at the bus stop. True, he was not where many “experts” thought he would be: He did not flee to ISIS-controlled areas of Syria, Iraq or Libya. He didn’t escape to West Africa, where attacks by ISIS-inspired Islamist radicals are on the rise. He went home. He went back to the very neighborhood (the Molenbeek section of Brussels) where he had lived prior to the attacks in Paris — the very neighborhood where he planned the attacks that resulted in the deaths of 130 innocent victims and injuries to almost 500 others.

He was in plain sight about as much as one zebra is in plain sight while within a herd of hundreds, or as one fish is in plain sight within a school of thousands.

With Abdeslam in custody, additional questions now emerge. The first: Who assisted him? On the surface, it’s a simple question.

However, it has many layers: Motivated by fear of reprisal, fraternity of cause or fellowship of faith, who helped him? Who provided a known terrorist with food, clothing and shelter? Who helped the most wanted man in Europe stay a step ahead of the authorities by moving him from one location to the next? Who tipped him off about where the police were and what they were doing? Who — when they recognized him in the neighborhood or heard rumors about his presence (it was his own neighborhood, after all) — provided him with passive assistance by not reporting what they had seen or heard?

The second question is: Who’s hiding there now? Belgium, and Brussels in particular, continues to be a focal point and haven for radical Islam. In the weeks immediately following the attacks in Paris, Belgian security forces conducted hundreds of raids. A Paris-style attack in Brussels appeared to be so imminent that, on Nov. 21, 2015, much of the Belgian capital was locked down; the subway system shut down, soccer matches were cancelled, and ordinary citizens were asked to avoid large crowds and public places, and basically stay home.

Counterterror operations there continue. As recently as March 16, police raided an apartment in the Brussels neighborhood of Forest. One terror suspect (reported to be an Algerian living illegally in Belgium), as he was about to open fire at approaching officers, was shot and killed by a police sniper. Two other suspects escaped and were at the time of this writing still at large.

With the help of those who might be motivated by fear of reprisal, fraternity of cause or fellowship of faith, who else might be hiding in plain sight? +

*Note: This article was written and finalized on March 21. One day later, radical Islamist terrorists struck the heart of Brussels. Two bombings (at least one of those the result of suicide bombers) at the Brussels Airport and a third at a busy subway station killed at least 35 people and wounded more than 300. Those figures are at this point tentative and may rise as the full extent of those attacks become clearer.*



**JIM SHARP** IS THE VICE PRESIDENT AND CHIEF TRAINING OFFICER FOR AEGIS EMERGENCY MANAGEMENT.



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# YOU CAN'T EXPECT THIS:

Trees down  
on 43rd and  
Elm Sts.  
Sending  
trucks to  
clear area.

Parade route  
has been cleared  
and secured,  
awaiting mayor's  
arrival by car.

Some first  
responders'  
2-way radios  
are not working  
on Ch. 4

Firetrucks  
at Station  
House #11 are  
responding to  
house fire

Workers should  
treat all power  
lines as hot to  
safeguard against  
backfeed.

# TO KEEP TRACK OF THIS:



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