Modernizing the Nation's Public Alert and Warning System

Report from the FEMA National Advisory Council

February 15, 2019

FEMA

Message from the Chairman

February 15, 2019

Dear Administrator Long:

I am pleased to submit this report, *Modernizing the Nation's Public Alert and Warning System,* on behalf of the National Advisory Council (NAC), as required by the IPAWS Modernization Act of 2015 (Public Law 114-143).

In October 2018, the FEMA NAC Integrated Public Alert and Warning System (IPAWS) Subcommittee provided the NAC with a report for an integrated public alert and warning system. The NAC considered and voted on 17 recommendations in a session held during its public meeting on November 7, 2018.

In its discussion and deliberation of the IPAWS Subcommittee's recommendations, the NAC made edits to and approved 14 recommendations. This report contains the recommendations that the NAC approved.

As required by the IPAWS Modernization Act of 2015, the NAC is also providing this report to:

- The head of each agency represented on the Subcommittee;
- The Committee on Homeland Security and Governmental Affairs of the Senate;
- The Committee on Commerce, Science, and Transportation of the Senate;
- The Committee on Homeland Security of the House of Representatives; and
- The Committee on Transportation and Infrastructure of the House of Representatives.

Inquiries related to this report may be directed to Jasper Cooke, Director, Office of the NAC, at (202) 646-2700.

Sincerely,

Nim Kidd
Chairman, FEMA National Advisory Council

Modernizing the Nation's Public Alert and Warning System

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I. Legislative Requirement

This document responds to the reporting requirements set forth in the IPAWS Modernization Act of 2015 (Public Law 114-143), Section 7, subsection (b), which states:

If the National Advisory Council approves the recommendations contained in the report submitted, the National Advisory Council shall submit the report to—

(i) the head of each agency represented on the Subcommittee;

(ii) the Committee on Homeland Security and Governmental Affairs and the Committee on Commerce, Science, and Transportation of the Senate; and

(iii) the Committee on Homeland Security and the Committee on Transportation and Infrastructure of the House of Representatives.

II. Introduction

The IPAWS Modernization Act of 2015 (Public Law 114-143) required FEMA to establish a NAC IPAWS Subcommittee with the goal of ensuring that the public alert and warning system:

1. Incorporates multiple communications technologies;
2. Adapts to and incorporates future technologies for communicating directly with the public;
3. Provides alerts to the largest portion of the affected population which includes nonresident visitors and tourists; individuals with disabilities, access and functional needs; individuals with limited English proficiency; and improves the ability of remote areas to receive alerts;
4. Enhances community preparedness and response through local and regional public and private partnerships;
5. Reaches the greatest number of people through redundant alert mechanisms; and
6. Protects individual privacy.

The IPAWS Subcommittee is comprised of 45 members, including representatives from the broadcasting industry, State, local, tribal, and territorial (SLTT) emergency management agencies, emergency response providers, advocates from the disability, access, and functional needs community, consumer advocate groups, and subject matter experts (SMEs) from various alert and warning systems, practices, and platforms. The Subcommittee held its inaugural meeting in August 2017. From its first meeting in August 2017 to the production of this report in October 2018, the 45-member Subcommittee received 76 presentations from SMEs representing all parts of the IPAWS community.

The Subcommittee submitted its findings and proposed recommendations to the NAC in October 2018. The NAC deliberated, considered, and voted on these recommendations at the public meeting held November 7, 2018. This report contains the final recommendations from the NAC to the FEMA Administrator for the improvement of IPAWS and national emergency alerting capabilities. These 14 recommendations are divided into five themes related to emergency alerting:

1. Improving Alerting Authorities' Ability to Transmit Effective Alerts;
2. Improving Public and Congressional Understanding of Emergency Alerting;
3. Optimizing Technology;
4. Identifying and Adopting Current and Future Technologies; and
5. Initiating Cross-Functional Management and Administration of IPAWS.

The implementation timeline provides an approximate overview of what it will take to enhance emergency alerting capabilities with short-term and long-term efforts, so alert originators (AOs) remain current with evolving and diverse populations and alerting technologies (See Figure 1).

Figure 1 – Recommendation Implementation Timeline

IMPLEMENTATION TIMELINE														
Recommendation #														
Themes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
1	**M**	**M**	**M**	**M**	**S**									
2						**M**	**S**							
3								**L**	**S**					
4										**M**	**S**	**S**	**S**	
5														**S**
Key														
S = Short-term: 12-24 months (should be able to use existing practices and staffing)														
M = Mid-term: 24-36 months (may require development of new practices or staffing)														
L = Long-term: 36-48 months (may require additional policies, staff, or funding)														

III. Recommendations by Theme

Theme 1: Improving Alerting Authorities' Ability to Transmit Effective Alerts

Theme Statement: These recommendations create a set of standards for AO training and certification with annual updates, so preparation and resources are current and consistent. To promote consistency, a centralized "Help Desk" (online and staffed 24/7) will feature cross-functional tools and best practices for new and experienced AOs to draw from during preparation and emergency situations.

Recommendation 1

FEMA should identify, develop, promote, and provide education, guidance (including message templates and a message handbook), and best practices on modern and accessible alert/warning message content to enhance AOs' emergency messaging using IPAWS capabilities (e.g., 360-character long format for Wireless Emergency Alert {WEA} messages). Based on research into alert message effectiveness, such message guidance should stress the inclusion of source, hazard, location personalization, consequences, protective action, protective action time, how protective action reduces consequences, expiration time, style (e.g., specific, clear, and accessible), and dissemination to AOs across the nation.

Estimated Implementation Timeline
Mid-term: 24-36 months (may require development of new practices or staffing).

Discussion
AOs should be familiar with how to develop actionable and timely alerts for the public to take appropriate protective actions. Core message characteristics AOs need to be familiar with include the style with which the message contents are presented, how alert messages are disseminated to the public, and how to cancel or retract messages and report false alerts. In addition, AOs should be accustomed to how alert messages are most effectively disseminated to the public, including the use of multiple and redundant modern and traditional public alert communication channels and technologies.

Implementation Considerations

- Ask Collaborative Operating Groups (COGs) to require that their AOs complete FEMA-defined IPAWS training.
- Maintain records of training and certifications.
- Enhance the capability of the IPAWS Lab to provide exercises and training for AOs.
- Prepare a public alert and warning guidance handbook for AOs.

Recommendation 2

FEMA should develop simple alert and warning jurisdictional and multi-jurisdictional plan templates and tools to provide guidance and best practices for emergency alerting. FEMA should also assist SLTT governments to implement and coordinate alert and warning jurisdictional and

multi-jurisdictional plans. The development and adoption of clear functional plans that specify public alert triggers based on risk, recommended public action, and alert types will increase audience penetration and understanding.

Estimated Implementation Timeline
Mid-term: 24-36 months (may require development of new practices or staffing).

Discussion
Public alerting procedures often follow ad-hoc processes rather than specific plans.[1] Conflicting information in alert messages from multiple AOs leads to confusion and inhibits public response. The public is more likely to take appropriate action if AOs in neighboring jurisdictions coordinate the alert content issued across all platforms instead of issuing independent, potentially contradictory messages.

Implementation Considerations

- Encourage local jurisdictions to develop jurisdictional alert plans that distinguish between different levels of threat and the guidance that would be associated with them.
- Ensure simple alerting plan templates include guidelines about what events trigger different public protective action recommendations.
- Include reciprocal operating agreements between jurisdictions, authorizing those jurisdictions to issue public alerts that do not conflict with each other, across jurisdictions.
- Specify any limits, conditions, or procedures regarding how such alerts are shared between agencies for coordination and situational awareness.
- Add a capability within the IPAWS software to authorize AOs to send alerts outside of their jurisdiction (e.g., counties' geographic boundaries); this implementation consideration should require a "joint" IPAWS COG.

Recommendation 3

FEMA should work with the SLTTs to increase broad awareness and knowledge of IPAWS by preparing and implementing a multi-media alert and warning campaign to target potential authorized alerting authorities.

Estimated Implementation Timeline
Mid-term: 24-36 months (may require development of new practices or staffing).

Discussion
The nation needs an integrated public alert and warning system, adopted nationwide, which provides continuity of alert and notification capabilities across the country. Currently, many public safety incident response plans do not include IPAWS. Specific and tailored awareness campaigns are therefore needed to widen IPAWS awareness, adoption, and use among current and potential alerting authorities.

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[1] Dennis Mileti, Ph.D., and John Sorensen. "Communication of Emergency Public Warnings: A Social Science Perspective and State-of-the-Art Assessment." 1990, doi:10.2172/6137387, and Dennis Mileti, Ph.D. and Hamilton Bean, PhD., "RCPGP Warning System Integration Research Project Los Angeles / National Capitol Region / New York Final Report." November 2010.

Implementation Considerations

- Do not limit training to "emergency management" personnel but also address any emergency management or potential authorized alerting authority officials who may have an alerting role under the National Incident Management System (NIMS).
- Capitalize on existing campaigns (e.g., Ready.gov) and include material/sections on emergency alerts.
- Take into consideration the needs of diverse populations supported through partnerships to promote and distribute preparedness content consistently across platforms.

Recommendation 4

FEMA should provide SMEs to develop training, testing, credentialing, and re-credentialing of AOs including message writing and emergency warning planning. FEMA shall update the IPAWS MOA to require SLTTs and AOs (credentialed individuals or system operators) to complete continual comprehensive training. Methods of instruction should include distance learning, coursework, and practical applications requiring initial credentialing and re-credentialing terms to access IPAWS systems. Such training should fit into the NIMS framework and be accessible through existing NIMS education and training resources.

Estimated Implementation Timeline
Mid-term: 24-36 months (may require development of new practices or staffing).

Discussion
AOs require proper training and qualifications so they can write and disseminate effective, actionable, and timely alerts through IPAWS. Currently, there is a lack of continuing education opportunities—including programs on technology, policy, and procedural areas on the use of IPAWS—that hinders effective alerting. Key gaps in AO continuing education include:

- Lack in variety of interactive, educational programs in various distribution formats.
- Insufficient training and continuing education programs that incentivize compliance with alignment through available grant funding eligibility and/or stakeholder support.
- Insufficient online, staff, and if necessary, on-site training to ensure effective use of the IPAWS system.
- Lack of content capable of fitting varying educational needs (e.g., technical, procedural, and awareness).

Implementation Considerations

- Include continuing education for technology, policy, and procedural advancements.
- Create a variety of interactive and educational distribution formats.
- Improve the efficacy of training and continuing education programs by incentivizing compliance through available grant funding eligibility and/or stakeholder support tools.
- Update the MOA to require continual comprehensive training.
- Suspend COGs if they fail to meet training/re-certification requirements.
- Provide online and on-site support to ensure effective use of IPAWS.
- Develop content to fit varying educational needs (e.g., technical, procedural, and awareness).
- Take into consideration the IPAWS Modernization Act of 2015 (Public Law 114-143), which precludes FEMA from limiting the authority of the National Oceanic and

Atmospheric Administration (NOAA) and National Weather Service (NWS) warning processes within the Department of Commerce.[2]

Recommendation 5

Establish 24/7 FEMA IPAWS Help Desk to support AOs in the use of the system. These resources will provide staffed support, subject matter expertise, and online content when problems or questions arise.

Estimated Implementation Timeline
Short-term: 12-24 months (should be able to use existing practices and staffing).

Discussion
AOs do not have access to 24/7 technical support when accessing IPAWS for training and/or when sending a live message. Comprehensive IPAWS 24/7 resources will give IPAWS users access to user-friendly content and assistance to issue timely and actionable alerts.

Implementation Considerations

- Establish an inventory of existing resources and access to 24/7 staffed support from stakeholders, if needed, to support the implementation of current technological capabilities, best practices, alert origination templates, vendors, and other applicable resources to support AOs.
- 24/7 staff will proactively monitor alerts in the US for failed alerts or errors in alerting protocols with the capability to contact AOs directly to offer a course of action for rectification.
- Develop a flow chart that identifies the roles, responsibilities, and resources at the SLTT levels.
- Raise AO awareness of the availability and capabilities of the 24/7 resources.

[2] Public L. Section (d)(2)(A)(i) of the law, "Limitations on Statutory Construction. April 11, 2016. Accessed September 26, 2018. https://www.congress.gov/114/plaws/publ143/PLAW-114publ143.pdf).

Theme 2: Improving Public and Congressional Understanding of Emergency Alerting

Theme Statement: These recommendations bolster public trust with government-branded education and outreach campaigns for diverse audiences across multiple platforms, promoting awareness of what to do, where to go, and how to find help when IPAWS alerts are activated. Lawmaker briefings will improve awareness of IPAWS-related policy and technical developments and emphasize the importance of separate public versus AO campaigns for understanding and use of alert systems.

Recommendation 6

FEMA should work with the necessary partners including but not limited to the Federal Communications Commission, AOs and IPAWS distributors to effectively differentiate authentic IPAWS-distributed alerts from authorized originators so they stand out from other non-IPAWS distributed alerts.

Estimated Implementation Timeline
Mid-term: 24-36 months (may require development of new practices or staffing).

Discussion
Currently, it is not easy for the public to recognize the difference between an IPAWS-distributed and private sector-distributed alert. Several private sector-distributed alerts have confused the public and eroded confidence in (and compliance with) alert guidance. Given recent high-profile incidents of false alerts, it is important to restore public confidence and knowledge of IPAWS-distributed emergency alerts.[3] For example, in 2016, a privately-owned roadway operator sent out tornado warning alerts to their nearly 12,000 subscribers when there were no official government warnings. The situation caused public confusion.[4]

Branded campaigns targeting diverse populations with consistent, conversational messaging and outreach illustrating ways recipients can receive alerts from multiple platforms may help ensure content serves FEMA's whole community approach as well as encourage compliance by alert recipients.

Implementation Considerations

- FEMA can research branding strategies and best practices to identify IPAWS-distributed alert branding(s) that will be recognized by all members of affected populations.

[3] Adam Nagourney, David E. Sanger, and Johanna Barr, "Hawaii Panics After Alert About Incoming Missile is Sent in Error." *NYTimes*, January 13, 2018, https://www.nytimes.com/2018/01/13/us/hawaii-missile.html, and Dance, Scott, "University of Maryland Tells Students to Shelter from Tornado Despite No Official Warning Being Issued." *The Baltimore Sun*, September 17, 2018. http://www.baltimoresun.com/news/weather/bs-md-umd-tornado-warning-20180917-story.html.

[4] Brian Dulle, "KTA Issues Statement After False Tornado Warnings." *KSNT*, October 5, 2016, https://www.ksnt.com/news/kansas/kta-issues-statement-after-false-tornado-warnings/901441598. Accessed May 15, 2018.

- Once branding is finalized, FEMA will have to conduct a public outreach campaign to familiarize the public with IPAWS-branding and who an IPAWS-branded notification is from.
- FEMA should work with NWS to ensure this in no way precludes the weather enterprise from issuing warnings.

Recommendation 7

FEMA should engage and educate lawmakers on needed improvements to the Nation's emergency alerting systems by:

- Clarifying the need for multiple and redundant cellular, broadcast radio and television, data-cast alerting technologies in mobile devices, vehicles, smart cities infrastructure, and future alerting devices to maximize reliability;
- Highlighting the lack of WEA access in Pacific U.S. territories and other underserved communities to encourage adoption; and
- Encouraging use of public media broadcast capabilities to expand alert, warning, and interoperable communications capabilities to fill gaps in rural and underserved areas.

Estimated Implementation Timeline
Short-term: 12-24 months (should be able to use existing practices and staffing).

Discussion
As technology evolves, lawmakers need to be educated about technical developments and how the nation's alert and warning systems can take advantage of new capabilities. For example, Next-Gen broadcast television deployments present opportunities to provide enhanced alerting capabilities to Americans.[5] Lawmakers and industry should explore ways to integrate enhanced alerting technologies in these systems. Additionally, not all U.S. residents, particularly those in the Pacific Territories, have access to emergency alerting technologies.

Implementation Considerations:

- Inform lawmakers about the benefits of enabling multiple and redundant technologies such as the Public Broadcasting Service (PBS) WARN system, which integrates broadcast data technologies into the primary WEA system to provide an economical, secure, and reliable path.[6]
- Use public media initiatives with other alerting authorities to demonstrate the value of building public-private partnerships by using broadcast capabilities to expand alert, warning, and interoperable communications.
- Explore current initiatives to increase lawmaker understanding of the complexities of integrating current and evolving technologies promoting industry growth.
  Investigate the addition of EAS Common Alerting Protocol (CAP) data to public media broadcasts as one such technology to supplement the national "Primary Entry Point" (PEP) strategy.

[5] Advanced Television Systems Committee, "ATSC Standard: ATSC 3.0 System," October 19, 2017, https://www.atsc.org/wp-content/uploads/2017/10/A300-2017-ATSC-3-System-Standard-5.pdf.
[6] United States. Cong. Warning, Alert, and Response Network Act of 2006. 109th Cong. HR 5785. https://www.congress.gov/bill/109th-congress/house-bill/5785/text.

Theme 3: Optimizing Technology

Theme Statement: These recommendations aim to ensure the updating, maintenance, and creation of standards and technologies are identified, tested, validated, and planned in the most effective and appropriate manner.

Recommendation 8

FEMA should lead the development of a comprehensive standard set of visual symbols/pictograms, transcripts, and captioning so diverse populations receive and understand alerts.

Estimated Implementation Timeline

Long-term: 36-48 months (may require additional policies, staff, or funding).

Discussion

As populations become increasingly diverse, continued development of IPAWS capabilities are paramount to ensure people with disabilities and access and functional needs and those with limited English proficiency receive and comprehend alerts in a timely manner. California's Office of Emergency Services recognized during the occurrence of wildfires in 2018 that "local agencies, which originate most alerts, vary widely in their capacity to generate alerts in languages other than English. In many cases, this capability varies depending on which language-skilled staff happens to be on duty when an alert is required."[7] Additionally, CAP currently provides the capability to issue alerts in multiple languages.[8]

Implementation Considerations

- Advance current technological capabilities (e.g., hardware and software, including use of CAP to include alerts in multiple languages) by supporting closed captioning, translation, and interpreter services/utilities that enable the best improvement over the next 3-5 years and meet compliance standards as defined by current IPAWS policies.
- Research, develop, and propose a nationwide, standardized hazard symbol set for use by AOs, Federal agencies, and for public education/outreach. A team comprised of representatives from FEMA, Department of Homeland Security Science and Technology Directorate (DHS S&T), the National Alliance for Public Safety GIS Foundation, the Office of Science and Technology Policy Subcommittee on Disaster Reduction, the National Institute of Standards and Technology (NIST), and others may help define a standardized set of symbols for IPAWS distribution.
- Coordinate with other agencies, such as the FCC, to advocate for, or support implementation of symbols, captioning, and other support to diverse populations.
- Alternative transcripts are necessary in addition to live captioning.

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[7] California Office of Emergency Services. "Wireless Emergency Alerts: Amendments to the Commission's Rules Regarding the Emergency Alert System." *FCC Filings*, December 15, 2016. Accessed May 15, 2018. https://www.fcc.gov/ecfs/filing/121636750820.

[8] FEMA. "Common Alerting Protocol Fact Sheet." January 1, 2016. Accessed May 15, 2018 https://www.fema.gov/media-library-data/1450108807753-9a5ba3b082b719d9a63d54b500df8193/CAP_Implementation_Fact_Sheet_2016.pdf.

- Ensure that symbols and all other content are Section 508 compliant.

Recommendation 9

FEMA should work with the Federal Communications Commission, Federal Trade Commission, and any other SMEs to determine guidelines and requirements to ensure consumer protection and individual privacy. FEMA, in consultation with relevant SMEs, should develop enforcement actions, informed by consultation with relevant SMEs, to address potential misuse and/or breach of IPAWS for consumer fraud and/or abuse with updates to policies and procedures.

Estimated Implementation Timeline
Short-term: 12-24 months (should be able to use existing practices and staffing).

Discussion
Privacy and data security are core public concerns. As technological capabilities evolve, updates to privacy implications and subsequent agreements must maintain protection of the privacy of individuals receiving alerts. There have been privacy abuses and consumer fraud from solutions developed to protect personal safety (e.g., mandating cell phone geo-location support for 911 calls).[9] Also, there are continued public concerns that the government or others may inappropriately track individuals using technology solutions such as these.[10]

Implementation Considerations
- In coordination with the FCC, FTC and SMEs, develop privacy guidance for application developers aimed at protecting individual privacy.
- Develop a framework for what WEA privacy expectations are and define consumer privacy rights regarding WEA.
- Include cybersecurity and consumer advocacy groups in this discussion.
- Commit resources to support ongoing consumer protection efforts.

[9] Goran M. Djuknic, Robert E. Richton, "Geolocation and Assisted GPS," *Computer* Vol. 34 Issue 2 February 2001. Accessed May 18, 2018. http://www.cs.columbia.edu/~drexel/CandExam/Geolocation_assistedGPS.pdf.
[10] Geoffrey D. Smith, "Private Eyes Are Watching You: With the Implementation of the E911 Mandate, Who Will Watch Every Move You Make?" 57 Fed. Com. L.J. 705 (2006). Accessed May 18, 2018. https://www.repository.law.indiana.edu/cgi/viewcontent.cgi?article=1459&context=fclj.

Theme 4: Identifying and Adopting Current and Future Technologies

Theme Statement: These recommendations design and develop improvements to the nation's emergency alerting capability.

Recommendation 10

FEMA should establish a technology solutions lab and/or partner with key and non-traditional alert and warning stakeholders to support the display and delivery of IPAWS messages through as many pathways as possible, including emerging technologies.

Estimated Implementation Timeline
Mid-term: 24-36 months (may require development of new practices or staffing).

Discussion
Current and future technology changes will enhance the delivery of messages on individual devices and make systems more compatible and available to people with disabilities and access and functional needs. An ideal future state would enable a single message origination to transmit automatically to multiple types of devices and channels based on each device's ability to present the input to the user in the most accessible manner.

Implementation Considerations

- Minimize the difficulty of issuing alerts in English, Spanish, and languages commonly used in various areas.
- Establish a technology lab to research, prototype and demonstrate the distribution of IPAWS messages through multiple pathways, including emerging technologies.
- Work with DHS S&T to continually evaluate automated translation technologies for alerts and develop metrics for the accuracy and effectiveness of translated alerts.
- Develop graphics, pictures, and symbols.
- Identify regulatory issues that might be implicated by this recommendation (e.g., the WEA voluntary framework).
- Include key stakeholders and platforms that would include, but are not limited to, the following:
    - Gaming platforms
    - Wireless device manufacturers
    - Billboards and kiosks
    - Instant messaging platforms
    - Streaming media
    - Connected and autonomous vehicles
    - Next-gen television
    - Artificial intelligence (AI) personal assistants
    - Telecommunications relay services
    - Assistive communication platforms

Recommendation 11

FEMA should develop the capacity and policy(s) for redundant alert origination capability to issue alerts at the request of alerting authorities or when they are unable to do so based on established standard operating procedure (SOPs) (e.g., delegation/succession of authority).

Estimated Implementation Timeline
Short-term: 12-24 months (should be able to use existing practices and staffing).

Discussion
Considering that a jurisdiction's primary alerting capability can be compromised and/or fail during a catastrophic event, alternate alert origination is a critical life-saving capability. For example:

- During Hurricane Harvey, the alert system in Fort Bend, TX froze because it could not send an evacuation notice to the large area officials tried to notify.[11]
- Hurricane Maria critically damaged the Caribbean Islands' communication infrastructure, and emergency management officials were unable to issue a WEA alert to notify residents of where to find shelter, food, and water.[12]

Implementation Considerations

- Create template Memoranda of Understanding (MOUs) between alerting authorities and potential redundant/back-up AOs (e.g., states, neighboring jurisdictions, etc.).
- Ensure these redundant/back-up AOs are capable of disseminating alerts to the area designated in the MOU.
- Encourage alerting authorities to establish SOPs that allow for another alerting authority to issue an alert on their behalf if required.

Recommendation 12

FEMA should deploy a high-availability, high-capacity capability to host and permit the retrieval of files containing multimedia content material or resources referred to within CAP messages provided by AOs.

Estimated Implementation Timeline
Short-term: 12-24 months (should be able to use existing practices and staffing).

Discussion
The 2016 New York City Chelsea bombings highlighted difficulties in sending linked information through WEAs.[13] Since then, the ability to send links has been added to WEA messages. To maximize the benefits of this capability, it would be helpful for FEMA to provide

[11] Amelia Brust. "Houston Area Emergency Phone Alerts Getting Longer, More Local and Bilingual." *Community Impact*, January 31, 2018. Accessed May 13, 2018. https://communityimpact.com/houston/katy/city-county/2018/01/31/houston-area-emergency-phone-alerts-getting-longer-local-bilingual/.
[12] Rodrigo Moscoso. "In Search of Infrastructure-Proof Emergency Alerts." *Domestic Preparedness*, April 18, 2018. Accessed May 10, 2018. https://domesticpreparedness.com/resilience/in-search-of-infrastructure-proof-emergency-alerts/.
[13] J. David Goodman and David Gelles, "Cellphone Alerts Used in New York to Search for Bombing Suspect." *NYTimes*, September 19, 2016. Accessed May 10, 2018. https://www.nytimes.com/2016/09/20/nyregion/cellphone-alerts-used-in-search-of-manhattan-bombing-suspect.html.

hosting services (internally or externally) for the multi-media information that AOs distribute through links.

Implementation Considerations

- Develop a how-to guide to implement these capabilities, including best practices on file format and size.
- Consider data security, privacy, and consumer protection implications when determining how to host the data, and especially when including links to external sources.

Recommendation 13

FEMA should provide guidance, specifications, and best practices to make alert and warning more effective by doing the following:

- Provide guidance to Alert Origination Software Providers (AOSPs) to apply social science research and best practices to deliver alerts to the public, including people with disabilities and others with access and functional needs.
- Provide guidance for alerting tools to ensure tools are designed to minimize potential for unauthorized access, errors, or willful sending of errant messages.
- Engage standards-development organizations to define the range of multimedia formats for alert messages and to provide guidance on which multi-media formats are most useful, and what can be included/not included.
- Work with standards-development organizations to update standards to ensure interoperability and compatibility across devices and other channels like social media to support user experience.
- Explore how alert origination applications can use FirstNet to have a more resilient and reliable ability to send alerts to IPAWS.
- Work with dissemination systems operators, developers, and consumer device manufacturers to enable consistency and personalization of messages using the device's capabilities (e.g., geo-targeting, text-to-speech, and symbology).

Estimated Implementation Timeline

Short-term: 12-24 months (should be able to use existing practices and staffing).

Discussion

IPAWS needs to improve both the alert sender and the alert recipient experience to achieve the goal of reaching as many individuals as efficiently and effectively as possible with emergency alerts. To achieve this goal, IPAWS needs to improve alert sender and recipient experiences by:

- Enhancing security, workflow, and access control;
- Engaging with relevant industry leaders;
- Providing uniformity of messaging and enhancing geo-targeting;
- Enhancing standards, developing tools, and capitalizing on the use of multimedia; and
- Considering accessibility needs.

Implementation Considerations

- Refer to Web Content Accessibility Guidelines 2.0, and other recommendations described in the National Council on Disability's 2016 Progress Report.[14]

[14] National Council on Disability, "National Disability Policy: A Progress Report." *National Council on Disability*, October 7, 2016. Accessed May 18, 2018. https://www.ncd.gov/sites/default/files/NCD_ProgressReport_508_0.pdf.

- Provide guidance on file types and media formats to promote maximum interoperability.
- Provide best practices/guidance to system operators, application developers and device manufactures on how to display consistent alert information on all kinds of devices for an optimal alert recipient experience.
- Ensure people can receive and understand geo-targeted IPAWS messages in numerous ways, including social media, mobile apps, automotive GPS units, driverless cars, and intelligent in-home automated systems (e.g., Smart Speakers).
- Ensure recipients can view a range of multimedia associated with the alerts regardless of their device, including images, videos, maps, web pages, and audio clips, where technically feasible.
- Ensure alerts can be multilingual and understandable to all, including persons with access and functional needs, and people with limited English proficiency. For example, vibrations and lights can be used to get the attention of deaf or hard-of-hearing persons, videos can be captioned, and American Sign Language (ASL) interpretation can be included and available to transmit alert messages.

Theme 5: Initiate Cross-Functional Management and Administration of IPAWS

Theme Statement: These recommendations initiate a cross-functional body of experts responsible for recommending policy, strategy, and addressing alert system issues with routine meetings and responsive action to ensure the best practices, resources, and training to support an effective IPAWS system.

Recommendation 14

FEMA should continue engagement with stakeholders involved in alert and warning notification systems. These engagement efforts will include:

- Addressing topics of technology, strategic planning, standards development, research, resilience, and end to end operability.
- Seeking non-consensus input from stakeholders to apply and improve current capabilities and practices for the development and distribution of alerts reaching people with disabilities and access and functional needs.
- Exploring ways to minimize number of false or erroneous alerts, including identifying capabilities and procedures to send cancellations, corrections, and clarifications to targeted groups.
- Researching how to leverage existing public, private, and non-profit partnerships to improve outreach and awareness.
- Working with the National Weather Service (NWS) and SMEs to evaluate the costs, feasibility, and rationale of delayed dissemination of certain weather, non-weather, and non-imminent hazard alerts.

Estimated Implementation Timeline
Short-term: 12-24 months (should be able to use existing practices and staffing).

Discussion
A dedicated initiative (for example, a working group) proactively capitalizing on current and new technologies to enhance alerting capabilities will help FEMA address gaps and evolving technology supporting IPAWS systems. Industry and SMEs, including futurists, can provide the FEMA Administrator with near-term and long-term actionable areas, with a specific focus on repurposing off-the-shelf technologies and platforms, supported and informed by research capabilities. This initiative will also engage with stakeholders, including relevant traditional and social media platforms, to encourage incorporation of IPAWS.

Implementation Considerations

- Include AOSPs, social scientists, people with disabilities and other access and functional needs, SMEs, international partners, and AOs.
- Gather feedback and advice about emerging technologies (e.g., wearables, Internet of Things, AI, machine learning, etc.) and how they relate to IPAWS enhancements, including accessibility for people with disabilities and access, and functional needs.

- Engage relevant social media and streaming media platforms (e.g., Netflix, Hulu) and device manufacturers with plug fests (where devices are tested for interoperability) to encourage innovative incorporation of IPAWS alerts into their platforms to ensure interoperability and accessibility. Plug fests should be hosted by government agencies, or industry partners.
- Support a study to determine feasibility of research and development of technologies, including those developed internationally, that detect threats and hazards (via sensors, Internet of Things, machine learning, etc.) that could automatically trigger alerts (e.g., early earthquake warning sensors and alert messages).
- Work with NWS to review transmission policy and modify internal warning software.
- Evaluate what software updates would be required to process different warning categories in different fashions.
- Determine impacts to the private sector (e.g., cell phone carriers, etc.).
- Fund social science research and work with policy and social science experts.
- Consider current and updated NWS warnings that are distributed over WEA.[15]

[15] National Weather Service, "Weather Warnings on the Go!" Accessed September 26, 2018, https://www.weather.gov/wrn/wea.

IV. Conclusion

Since its inception in 2011, IPAWS has experienced both a growing number of AOs, as well as an increasing number of alerts. The creation of the IPAWS Subcommittee has provided FEMA the opportunity to examine where IPAWS is in 2018, and to identify areas of concern and opportunities for improvement. IPAWS is a collection of policies, procedures, technical specifications, and systems that can assist AOs in reaching the public, but it is only useful to the extent that originators use it, and that it can reach the public with information in formats that they can understand.

As IPAWS moves into the future, FEMA must continue to promote the integration of alerting into existing and new dissemination technologies. It must expand IPAWS reach into the special needs and multi-lingual communities, and support multimedia presentation, while maintaining the capability to deliver simple text and audio when and where needed. FEMA must work to improve ease of use of IPAWS, training for practitioners, and education for the general public as well as public officials. It must continue to promote multiple platforms and redundant delivery methods. The IPAWS Subcommittee offers these recommendations with the goal of improving the reach and reliability of IPAWS, for the benefit of all.

Appendix A: Acronyms

AI	Artificial Intelligence
AO	Alert Originator
AOSP	Alert Origination Software Provider
CAP	Common Alerting Protocol
COG	Collaborative Operating Group
CMSP	Commercial Mobile Service Provider
DHS	Department of Homeland Security
DHS S&T	DHS Science and Technology Directorate
EAS	Emergency Alert System
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
IPAWS	Integrated Public Alert and Warning System
MOU	Memorandum of Understanding
NAC	National Advisory Council
NIMS	National Incident Management System
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
PEP	Primary Entry Point
PBS	Public Broadcasting Service
SGE	Special Government Employee
SOP	Standard Operating Procedures
SME	Subject Matter Expert
SLTT	State, Local, Tribal, and Territorial
WEA	Wireless Emergency Alert

Appendix B: Presentations

Allen, Donica, IPAWS PMO, "IPAWS PMO Engagement and Outreach Initiatives." Webinar. October 10, 2017.

Barry, Tom, CACI Inc, "Emergency Preparedness." Webinar. April 24, 2018.

Baudendistel, Becca, NYC Emergency Management, "Distributing Communications Across Multiple Systems and Technologies." Webinar. October 4, 2017.

Baudendistel, Becca, NYC Emergency Management, "NYC Emergency Management." Webinar. May 12, 2017.

Botterell, Art, California Governor's Office of Emergency Services, "Minimizing Barriers and Developing SOPs." Webinar. November 30, 2017.

Botterell, Art, California Governor's Office of Emergency Services, "History of the Common Alerting Protocol." Webinar. October 4, 2017.

Boucher, Trevor, NWS, "Warning Messaging Considerations for the Hearing Loss Population." Webinar. November 15, 2017.

Brown, Sulayman, Fairfax County OEM, "NCR Test." Webinar. April 16, 2018.

Bushman, Ed, Director of Emergency Management, Los Angeles World Airports, "IPAWS Usage at LAX." Webinar. December 14, 2017.

Cooke, Greg and Nicole McGinnis, FCC, "FCC's Public Alert and Warning System." Webinar. December 13, 2017.

Cyrille, Charles, Miami-Dade Office of Emergency Management, "Practitioners' Perspective: Hurricane Harvey Preparation and Recovery." Webinar. November 7, 2017.

Czarnecki, Ed, Monroe Electronics, "Advanced Emergency Information Applications via Digital TV Broadcast." Webinar. October 31, 2017

Davis, Andrea, Disney Global Crisis Management and Business Continuity, "Visitor Alerts." Webinar. October 18, 2017.

El-Dinary, Ashruf, Xperi, Inc., "Digital Radio Alerting." Webinar. February 6, 2018.

Fila, Mike, Cocopah Indian Tribe Office of Emergency Management, "Distributing Communications Across Multiple Systems and Technologies." Webinar. October 4, 2017.

Fischer Liu, Brooke, University of Maryland, "Comprehensive Testing for Imminent Threat." Webinar. December 12, 2017.

Ford, John and Lucia Schmit, FEMA National Incident Management System, "NIMS Capabilities." Webinar. April 24, 2018.

Gage, Kevin, OneMedia, Inc. "Advanced Emergency Information Applications via Digital TV Broadcast". Webinar. October 31, 2017.

Gerard, Alan, NOAA National Severe Storms Lab, "NWS Forecasting a Continuum of Environmental Threats (FACETs) Project." Webinar. October 3, 2017.

Gerber, Mike, NOAA, "User Stories." Webinar. January 25, 2018.

Gerber, Mike, NOAA/NWS, "NWS Warning Dissemination." Webinar. November 29, 2017.

Glick, Debra, UCLA School of Public Health, "Assessing WEA Effectiveness." Webinar.

Golub, Dana, PBS, "Public Television and Public Safety." Webinar. February 21, 2018.

Graham, Ken, New Orleans NWS Office, "NWS Alert and Warning." Webinar. October 19, 2017.

Gusty, Denis and John Lawson, DHS Science and Technology Directorate, "Future of Emergency Alerting Workshop Findings." Webinar. April 3, 2018.

Hagerson, Eric and Shellie Blakeney, T-Mobile, Inc. "T-Mobile Capabilities." Webinar. March 21, 2018.

Harned, Rebecca and Tari Martin, National Alliance for Public Safety GIS Foundation, "Overview of the National Alliance for Public Safety GIS Foundation." Webinar. January 10, 2018.

Hill, Steven, Satellite and Broadcast Communications Association (SBCA), "Training and Certification Recommendations." Webinar. January 30, 2018.

Jacks, Eli, NWS, "NWS Hazards Simplification Program. Webinar. November 15, 2017.

Jones, Gay, FEMA Office of Disability Integration and Coordination (ODIC, "Alert Accessibility." Webinar. November 2, 2017

Karim, Syed, Outernet SATCOM Inc., "Outernet Satellite Capabilities." Webinar. February 6, 2018.

Kenyon, Al, IPAWS Customer Service Branch, "Help Desk Information." Webinar. March 27, 2018.

Kenyon, Al, IPAWS Customer Service Branch, “Insights from the 2016 IPAWS National Test.” Presentation in Washington, D.C., August 8, 2017.

Kenyon, Al, IPAWS Customer Service Branch, “Insights from the 2017 IPAWS National Test and Planning for 2018 Test.” Presentation in Charleston, S.C., March 6, 2018.

Kenyon, Sandy, Federal Emergency Management Agency, “FEMA IPAWS Lab Demonstration.” Webinar. December 5, 2017.

Khatibi, Farrokh, Qualcomm Inc., “WEA-related Enhancements – FCC’s Communications, Security, Reliability, and Integration (CSRIC VI Working Group Progress.” Webinar.

Kidd, Nim, Texas Emergency Management, “Limits to IPAWS Implementation.” Webinar.

Kuligowski, Eric, FCC, “Development Guidance for Community-Wide Public Alerting.” Webinar. November 29, 2017.

Lawson, John and Fiona James, Advanced Warning and Response Network Alliance, “Distributing Communications Across Multiple Systems and Technologies.” Webinar. October 4, 2017.

Lawson, John, AWARN Alliance, “AWARN Demonstration.” Webinar. April 3, 2018.

Lewin, Robert and Brian Uhl, Santa Barbara County Office of Emergency Management, “2017 California Fires.” Webinar. February 8, 2018.

Lewis, Mark, Amazon Web Service Inc., “Amazon Web Services.” Webinar. November 14, 2017.

Lucero, Mark, IPAWS Engineering Branch Chief, “IPAWS Symbology Initiative.” Webinar. September 20, 2017.

Lucero, Mark, IPAWS Engineering Branch, “Current and Planned Future State of IPAWS.” Webinar. August 22, 2017.

Lucero, Mark, IPAWS Engineering Branch, “WEA Best Practices.” Webinar. January 16, 2018.

Lupe, Paul, Fairfax County OEM, “Local Perspective on IPAWS with Fairfax County OEM.” Webinar. January 9, 2018.

Mahon, Lauren, New York Office of Emergency Management, “WEA Deployment and Distribution.” Webinar. December 5, 2017.

Marinho, John and Brian Daly, CTIA Wireless Foundation (Marinho) and AT&T (Daly), “Presentation on whether Locked Phones Receive IPAWS Alerts.” Webinar. October 10, 2017.

Mayfield, Jennifer and Courtney Page, Nextdoor Inc, “Nextdoor Capabilities.” Webinar. March 16, 2018.

McDonald, Lillian, Managing Director, Emergency Response Services, Twin Cities PBS, “Best-Practices for Engaging Diverse Communities in Multi-lingual Warning and Alerting.” July/August, 2018.

Mileti, Dennis, University of Colorado at Boulder, “Social Science of Alert and Warning.” Webinar. October 24, 2017.

Mitchell, Helena, Georgia Tech Center for Advanced Communications Policy, Webinar. October 18, 2017.

Okulski, Rich, Meteorologist in Charge of Columbia, S.C., NWS Office. Webinar. October 19, 2017.

Perry, Tiffany, FirstNet, “FirstNet Capabilities.” Webinar. October 17, 2017.

Perry, Tiffany, FirstNet, “FirstNet.” Webinar. March 20, 2018.

Platt, Donna, North Carolina Division of Services for the Deaf and Hard of Hearing, “Personal Sound Amplification Products (PSAPs)’ Use of IPAWS.” Webinar.

Rao, Ramesh, Jacky Jeoung, Jon Eisenberg, Katira Ortiz, UC San Diego and National Academies of Sciences, “Emergency Alert and Warning Systems.” Webinar. January 10, 2018.

Ray, Richard, City of Los Angeles, “City of LA.” Webinar. February 22, 2018.

Sanchez, Francisco and Lizeth Hernandez, Harris County TX Office of Homeland Security and Emergency Management, “Distributing Communications Across Multiple Systems and Technologies.” Webinar. November 15, 2017.

Sanchéz, Francisco, Harris County Office of Homeland Security and Emergency Management, “Practitioners’ Perspective: Hurricane Harvey Preparation and Recovery.” Webinar. November 7, 2017.

Sanchéz, Francisco, Harris County Office of Homeland Security and Emergency Management, ‘Communications Security, Reliability, and Interoperability Council (CSRIC) Update.” Presentation in Washington, D.C., August 8, 2017.

Schauer, Jessica, NWS Tropical Program Lead, “Provision of National Weather Service Tropical Cyclone Alerts.” Webinar. November 1, 2017.

Schmitt, Lucia, National Integration Center National Preparedness Directorate Federal Emergency Management Agency, “NIMS Training and Certification.” Webinar. April 24, 2018.

Serrano, Nixsa, Miami-Dade Office of Emergency Management, “Practitioners’ Perspective: Hurricane Harvey Preparation and Recovery.” Webinar. November 7, 2017.

Sheppard, Ben, IPAWS, “Insights from Alerting Authorities Interviews.” Webinar. December 4, 2017

Singer, Gary, Los Angeles Emergency Management Department, “City of Los Angeles Alerting.” Webinar. November 29, 2017.

Straeb, Matthew, Global Security Systems Inc., “Broadcast Based Emergency Alert System.” Webinar. February 20, 2018.

Sullivan, Patrick, NTIA, “FirstNet.” Webinar. March 20, 2018.

Sutton, Jeanette, University of Kentucky, “Use of Social Media for Alert and Warning.” Webinar. October 10, 2017.

Taylor, Vance, California Governor’s Office of Emergency Services, “California Disaster Season.” Webinar. February 8, 2018.

Tiernan, Heather, Community Warning System Manager for Contra Costa County, CA, “Community Warning System, Contra Costa County.” Webinar. November 16, 2017.

Tyler Maryfran, NPR, “NPR Emergency Alert Testing.” Webinar. February 7, 2018.

Vogler, Christian, Gallaudet University Technical Access Program, “Ensure Accessibility of Alerts.” Webinar. October 18, 2017.

Witmer, Wade, IPAWS, “IPAWS Developments.” Presentation in Charleston, S.C., March 6, 2018.

Witmer, Wade, IPAWS, “Near, Mid and Long-term IPAWS Considerations.” Presentation in Washington, D.C., August 8, 2017.

Wood, Michele, National Consortium for the Study of Terrorism and Responses to Terrorism -- START, “Assessing WEA Effectiveness.” Webinar.

Appendix C: Publications

Brust, Amelia. “Houston Area Emergency Phone Alerts Getting Longer, More Local and Bilingual.” *Community Impact*, January 31, 2018. Accessed May 13, 2018. https://communityimpact.com/houston/katy/city-county/2018/01/31/houston-area-emergency-phone-alerts-getting-longer-local-bilingual/.

California Office of Emergency Services. “Wireless Emergency Alerts: Amendments to the Commission’s Rules Regarding the Emergency Alert System.” *FCC Filings*, December 15, 2016. Accessed May 15, 2018. https://www.fcc.gov/ecfs/filing/121636750820.

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Executive Office of the President of the United States, “Effective Disaster Warnings.” Report prepared by National Science and Technology Council Subcommittee on Natural Disaster Reduction Working Group on Natural Disaster Information Systems (2000).

FEMA Office of Disability Integration and Coordination. “Language Guidelines for Inclusive Emergency Preparedness, Response, Mitigation and Recovery” (2015).

FEMA. “Common Alerting Protocol Fact Sheet.” January 1, 2016. Accessed May 15, 2018 https://www.fema.gov/media-library-data/1450108807753-9a5ba3b082b719d9a63d54b500df8193/CAP_Implementation_Fact_Sheet_2016.pdf.

Gerber, Michael. “Wireless Emergency Alerts (WEA) – Proceeding 15-91 and 15-94.” *FCC Filing*, July 2018.

Mileti, Dennis, and John Sorenson, J. “First Alert or Warning Issuance Time Estimation for Dam Breaches, Controlled Dam Releases and Levee Breaches or Overtopping,” *U.S. Army Corps of Engineers* (2014).

Moscoso, Rodrigo. “In Search of Infrastructure-Proof Emergency Alerts.” *Domestic Preparedness*, April 18, 2018. Accessed May 10, 2018. https://domesticpreparedness.com/resilience/in-search-of-infrastructure-proof-emergency-alerts/.

Moy, Laura. “Re: PS Docket No. 07-114, Wireless E911 Location Accuracy Requirements.” *FCC Filings*, January 13, 2015. https://ecfsapi.fcc.gov/file/60001013237.pdf

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Nagourney, Adam, David E. Sanger, and Johanna Barr. “Hawaii Panics After Alert About Incoming Missile is Sent in Error.” *NYTimes,* January 13, 2018. Accessed May 4, 2018. https://www.nytimes.com/2018/01/13/us/hawaii-missile.html.

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O’Neil, James P. “WEA Improvements.” *FCC Filing*, January 16, 2018. Accessed May 10, 2018. https://www.fcc.gov/ecfs/filing/101162498208374.

Partnership for Public Warning. “Protecting America’s Communities: An Introduction to Public Alert and Warning.” *PPW Report 2004-2* (2004)

United States Census. “Nearly 1 in 5 People Have a Disability in the U.S., Census Bureau Reports.” July 25, 2012. Accessed May 10, 2018. https://www.census.gov/newsroom/releases/archives/miscellaneous/cb12-134.html.

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Wood, Michele M., Dennis S. Mileti, Hamilton Bean, Brooke F. Liu, Jeannette Sutton, Stephanie Madden. “Milling and Public Warnings.” *Environment and Behavior* (2017).

Wood, Michele M., Dennis S. Mileti, Megumi Kano, Melissa M. Kelley, Rotrease Regan, and Linda B. Bourque. “Communicating Actionable Risk for Terrorism and Other Hazards.” *Risk Analysis* 32, no. 4 (2011).

Appendix D: Subcommittee Key Milestones

Between August 2017 and October 2018, the IPAWS Subcommittee held three in-person meetings, three full Subcommittee webinars, 107 working and theme groups webinars, and received presentations from 76 SMEs representing all parts of the IPAWS community.

April 11, 2016	The IPAWS Modernization Act of 2015 became Public Law 114-143 upon signature of the President of the United States.
September 15, 2016	A Federal Register Notice was published, requesting qualified individuals who are interested in serving on the IPAWS Subcommittee to apply for appointment. FEMA received 106 applications.
October 2016	A Review Panel selected top candidates for the FEMA Administrator and Deputy Administrator to consider for appointment to represent 13 categories as required by Public Law 114-143.
May 10, 2017	The IPAWS Subcommittee members were appointed by the FEMA Administrator (Acting).
July 7, 2017	FEMA publicly announced the selection of the FEMA NAC IPAWS Subcommittee Members, which included 28 appointed members, six current NAC members, and eight Senior Federal Leaders or their designees.
August 8-9, 2017	The Inaugural in-person full Subcommittee meeting was conducted at FEMA headquarters, Washington, D.C.
November 7, 2017	The first full Subcommittee webinar was held.
March 6-7, 2018	The second in-person full Subcommittee meeting was held in Charleston, S.C.
June 12, 2018	The second full Subcommittee webinar was held.
September 12-14, 2018	The third in-person meeting of the full Subcommittee was held in Washington, D.C. It reviewed and approved all 17 final recommendations.
October 2, 2018	The third full Subcommittee webinar was held.
October 15, 2018	The Subcommittee submitted the final report to NAC members for their review.
October 18, 23, 29, 2018	Three joint Subcommittee-NAC webinars were held to brief the NAC members on the Subcommittee's recommendations.

November 7, 2018	The IPAWS Subcommittee Chair presented the recommendations to the NAC. After deliberating and voting, the NAC passed the 14 recommendations included in this report.
February 15, 2019	The FEMA NAC will prepare and submit the final IPAWS Subcommittee Recommendations Report to the FEMA Administrator; the Senate Committees on Homeland Security and Governmental Affairs and Commerce, Science and Transportation; and the House Committees on Homeland Security and on Transportation and Infrastructure.
April 11, 2019	The IPAWS Subcommittee is to terminate not later than three years after the date of enactment of Public Law 114-143.

Appendix E: FEMA NAC IPAWS Subcommittee Membership – October 2018

Subcommittee Leadership

Mr. Antwane V. Johnson
Washington, DC
Title: Director, IPAWS
Category: Named Federal Official (Designee)

Subcommittee Members

Mr. John Archer
Washington, DC
Title: Vice President and General Manager Operations, Sirius XM Satellite Radio
Category: Satellite Industry (SGE)

Captain Brett Bailey, PhD.
Tulsa, OK
Title: Investigations Commander, Tulsa Police Department
Category: Other Stakeholders and Interested and Affected Parties (SGE)

Dr. Meloyde Batten-Mickens
Largo, MD
Title: Director of Facilities Operations (Trades), Prince George's Community College
Category: Other Stakeholders and Interested and Affected Parties (Representative)

Mr. Art Botterell
Mather, CA
Title: Consultant
Category: State and Local Governments; Emergency Management Agencies; Emergency Response Providers (SGE)

Mr. Thomas Crane
Arlington, VA
Title: Senior Solutions Consultant, Everbridge, Inc.
Category: Communications Service Providers (SGE)

Dr. Edward Czarnecki
Lyndonville, NY
Title: Senior Director, Strategy and Government Affairs, Monroe Electronics, Inc.
Category: Vendors, Developers, and Manufacturers of Systems, Facilities, Equipment, and Capabilities for the Provision of Communications Services (SGE)

Mr. Darrell Darnell
Washington, DC
Title: Senior Associate Vice President for Safety and Security, George Washington University
Category: Other Stakeholders and Interested and Affected Parties (SGE)

Mr. Robert DeLeon
Chandler, AZ
Title: Emergency Manager/Emergency Operations Director, Gila River Indian Community
Category: Federally Recognized Indian Tribes and National Indian Organizations (Representative)

Ms. Jeanne-Aimée De Marrais
Fairfield, CT
Title: Senior Director, U.S. Emergencies, Save the Children
Category: Other Stakeholders and Interested and Affected Parties (SGE)

Mr. Mark Demski
Ft. Myers, FL
Title: Senior Account Executive, Veoci, Inc.
Category: Vendors, Developers, and Manufacturers of Systems, Facilities, Equipment, and Capabilities for the Provision of Communications Services (SGE)

Mr. Gerard Dio
Worcester, MA
Title: Fire Chief (Ret.), Fire Department, City of Worcester
Category: State and Local Governments; Emergency Management Agencies; Emergency Response Providers (SGE)

Mr. Harold Feld
Washington, DC
Title: Senior Vice President, Public Knowledge
Category: Consumer or Privacy Advocates (Representative)

Mr. Michael Fila
Somerton, AZ
Title: Emergency Manager/Public Health Officer, Office of Emergency Management, Cocopah Indian Tribe
Category: Federally Recognized Indian Tribes and National Indian Organizations (Representative)

Mr. Peter Ginaitt
Warwick, RI
Title: Environmental Health and Safety Officer and Emergency Manager, Rhode Island Public Transit Authority
Category: NAC Member (Representative)

Ms. Dana Golub
Arlington, VA
Title: Vice President, Programs Management, WARN, Public Broadcasting Service (PBS)
Category: Broadcasting Industry, Including Public Broadcasting (Representative)

Ms. Suzanne Goucher
Augusta, ME
Title: President and Chief Executive Officer, Maine Association of Broadcasters
Category: Broadcasting Industry, Including Public Broadcasting (Representative)

Mr. Denis Gusty
Washington, DC
Title: Program Manager, First Responders Group, Science and Technology Directorate, U.S. Department of Homeland Security
Category: Named Federal Official (Designee)

Mr. Don Hall
Ormond Beach, FL
Title: Government Solutions Director, OnSolve, LLC
Category: Communications Service Providers (SGE)

RADM Ronald Hewitt, USGC (retired)
Washington, DC
Title: Director, Office of Emergency Communications, Office of Cybersecurity and Communications, U.S. Department of Homeland Security
Category: Named Federal Official (Designee)

Mr. Steven Hill
Washington, DC
Title: Chief Executive Officer, Satellite and Broadcast Communications Association (SBCA)
Category: Satellite Industry (Representative)

Ms. Gay Jones
Washington, DC
Title: Strategic Communications Access Specialist
FEMA Office of External Affairs
Category: Named Federal Official (Designee)

Ms. Lisa Jones
Phoenix, AZ
Title: Director, Office of Homeland Security and Emergency Management – City of Phoenix
Category: NAC Member (Representative)

Mr. Benjamin Krakauer
Brooklyn, NY
Title: Assistant Commissioner, Strategy & Program Development, New York City Office of Emergency Management
Category: State and Local Governments; Emergency Management Agencies; Emergency Response Providers (Representative)

Mr. John Lawson
Alexandria, VA
Title: Executive Director, Advanced Warning and Response Network (AWARN) Alliance
Category: Vendors, Developers, and Manufacturers of Systems, Facilities, Equipment, and Capabilities for the Provision of Communications Services (SGE)

Mr. Frank Lucia
Frederick, MD
Title: Consultant, Georgia Tech Rehabilitation Engineering Research Center
Category: Other Stakeholders and Interested and Affected Parties (SGE)

Ms. Marsha MacBride
Washington, DC
Title: Deputy Associate Administrator, Office of Public Safety Communications, National Telecommunications and Information Administration, U.S. Department of Commerce
Category: Named Federal Official (Designee)

Mr. John Marinho
Washington, DC
Title: Vice President Technology and Cybersecurity, CTIA Wireless Network
Category: Commercial Mobile Radio Service Industry (Representative)

Mr. Sam Matheny
Washington, DC
Title: Executive Vice President and Chief Technology Officer, National Association of Broadcasters
Category: Broadcasting Industry, Including Public Broadcasting (Representative)

Mr. Hutch McClendon
Baton Rouge, LA
Title: CEO and President, Advanced Computers and Communications, LLC
Category: Vendors, Developers, and Manufacturers of Systems, Facilities, Equipment, and Capabilities for the Provision of Communications Services (SGE)

Ms. Lillian McDonald
St. Paul, MN
Title: Managing Director, Emergency Response Services, Twin Cities PBS
Category: Organizations Representing Individuals with Limited-English Proficiency (Representative)

Ms. Nicole McGinnis
Washington, DC
Title: Deputy Bureau Chief, Public Safety and Homeland Security Bureau, Federal Communications Commission
Category: Senior Federal Leader or their Designee

Dr. Dennis Mileti
Rancho Mirage, CA
Title: Professor Emeritus, University of Colorado at Boulder
Category: Other Stakeholders and Interested and Affected Parties (SGE)

Ms. Jacqueline Nguyen
Orange, CA
Title: Senior Project Specialist, CalOptima Health Care System
Category: Organizations Representing Individuals with Limited-English Proficiency (Representative)

Ms. Amy Nicholas
Washington, DC
Title: Attorney Advisor, National Council on Disability
Category: Named Federal Official (Designee)

Ms. Donna Platt
Raleigh, NC
Title: Emergency Preparedness Coordinator, North Carolina Division of Services for the Deaf and the Hard of Hearing
Category: National Organizations Representing Individuals with Disabilities; Blind, Deaf, and Hearing-Loss Communities; Individuals with Access and Functional Needs; Elderly (Representative)

Mr. Harold Price
Rye Brook, NY
Title: President, Sage Alerting Systems, Inc.
Category: Vendors, Developers, and Manufacturers of Systems, Facilities, Equipment, and Capabilities for the Provision of Communications Services (SGE)

Mr. Craig Saari
Riverview, FL
Title: Principle Video Engineer, Charter Communications
Category: Cable Industry (SGE)

Mr. Francisco Sanchez
Houston, TX
Title: Liaison and Public Information Officer, Harris County Office of Homeland Security and Emergency Management
Category: State and Local Governments; Emergency Management Agencies; Emergency Response Providers (Representative)

Mr. Andy Scott
Washington, DC
Title: Vice President of Engineering, NCTA – The Internet & Television Association
Category: Cable Industry (Representative)

Mr. Michael Sprayberry
Raleigh, NC
Title: Director, North Carolina Office of Emergency Management, Department of Public Safety
Category: State and Local Governments; Emergency Management Agencies; Emergency Response Providers (Representative)

Mr. Andrew Stern
Washington, DC
Title: Director, National Weather Service (NWS) Analyze, Forecast, and Support Office, National Oceanic and Atmospheric Administration (NOAA)
Category: Named Federal Official (Designee)

Mr. Richard Strack
Boise, ID
Title: Chief Engineer, Boise State Public Radio
Category: Third-Party Service Bureaus (SGE)

Ms. Tafaimamao "Tafa" Tua-Tupuola
Pago Pago, American Samoa
Title: Director, University Center for Excellence on Developmental Disabilities (UCEDD), American Samoa Community College
Category: Other Stakeholders and Interested and Affected Parties (Representative)

Mr. Bryen Yunashko
Chicago, IL
Title: DeafBlind Advocate and Owner, Access256 Productions, LLC
Category: National Organizations Representing Individuals with Disabilities; Blind, Deaf, and Hearing-Loss Communities; Individuals with Access and Functional Needs; Elderly (Representative)

Former Members

Ms. Samantha Brear
Windsor Heights, IA
Title: Alert Iowa Program Manager and E911 Program Planner, Iowa Department of Homeland Security and Emergency Management
Category: State and Local Governments; Emergency Management Agencies; Emergency Response Providers (Representative)

Mr. Daniel Cotter
Washington, DC
Title: Director, First Responders Group, Science and Technology Directorate, U.S. Department of Homeland Security
Category: Named Federal Official (Representative)

Mr. Brian Josef
Washington, DC
Title: Assistant Vice President, Regulatory Affairs, CTIA
Category: Commercial Mobile Radio Service Industry (Representative)

Mr. Roger Stone
Washington, DC
Title: Deputy Assistant Administrator, FEMA National Continuity Programs
Category: Named Federal Official (Representative)