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Bay Area Emergency Public Information and Warning Strategic Plan

Bay Area UASI

10 Lombard Street

Suite 410

San Francisco, CA 94111

BAY AREA PUBLIC INFORMATION AND WARNING STRATEGIC PLAN

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SECTION 1: INTRODUCTION

Homeland security is the coordinated effort to ensure we are prepared to prevent, protect against, mitigate, respond to, and recover from threats and acts of terrorism, and other human-caused or natural incidents. It requires a risk management process in order to ensure the right capabilities are in place to manage those hazards that pose the greatest risk to a region, its people, the environment, and its critical infrastructure and key resources.

In 2003, the United States Department of Homeland Security (DHS) established a new program designated to enhance regional preparedness in major metropolitan areas – the Urban Areas Security Initiative (UASI). Since 2003, the UASI program has provided financial assistance to address the unique multi-jurisdiction, multi-discipline planning, organization, equipment, training, and exercise needs of high-threat, high-density urban areas. In doing so, the UASI program has been instrumental in assisting urban areas in enhancing and sustaining capabilities to prevent, protect against, mitigate, respond to, and recover from threats or acts of terrorism and other major incidents.

As part of the UASI program's creation, DHS designated seven cities from across the country as original members of the program. The City and County of San Francisco was part of the original group of seven, which also included New York, Washington, DC, Chicago, Los Angeles, Seattle and Houston. The cities of Oakland and San Jose were later added to the list of jurisdictions within the UASI program. In 2006, DHS combined the three previously independent Urban Areas (Oakland, San Francisco, and San Jose) and formed the Northern California Bay Area Urban Areas Security Initiative (Bay Area UASI) region for preparedness purposes under the grant program.

The people and infrastructure of the Bay Area face risks from a variety of sources including acts of terrorism, such as terrorist use of explosives; natural disasters, such as earthquakes, floods and wildfires; and industrial accidents, such as hazardous materials spills. A key element of homeland security needed to address these risks is the ability to provide prompt, clear, specific, accurate and actionable emergency public information and warnings before, during and after any incident.

The following Emergency Public Information and Warning Strategy (*EPI&W Strategy or Strategy)* outlines the Bay Area's approach to developing the structures, plans, procedures, tools, training, education and exercises needed to build and sustain the ability to provide effective emergency public information and warnings that will help save lives and property in an all hazards environment.

SECTION 2: BAY AREA DESCRIPTION AND STRUCTURE

2.1 Bay Area Overview

The current Bay Area UASI region is comprised of twelve counties (Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma, Monterey and San Benito) and the two major cities of Oakland and San Jose. The twelve counties are inclusive of over 100 incorporated cities and a combined total population exceeding 7.5 million people. In addition to the 7.5 million residents, the Bay Area attracts 15.9 million visitors annually who spend more than $16.6 million per day in the region. The Bay Area is one of the most culturally diverse regions in California. With just over 800,000 residents, San Francisco is the 4th most populous city in California and the most densely populated major city in the State. San Jose is the third largest city in California with Oakland being the eighth largest in the State. A map of the current Bay Area UASI is set in Figure 1.

Figure 1
12 County Bay Area UASI Region

2.2 Operational Areas

Each county in the State of California is defined as an Operational Area (OA) under the California Emergency Services Act. The OA includes all political subdivisions within the county. The Emergency Services Act designates each county as an OA to coordinate emergency activities and resources of its political subdivisions. The governing bodies of political subdivisions within each county coordinate to establish the lead agency for the OA. The operational area lead agency serves as a coordinating link between the local government level and the regional level of State government. OA responsibilities involve coordinating with the jurisdictions and organizations to deploy field-level emergency response personnel, activate emergency operations centers and issue emergency information and warnings to protect the public. There are twelve OAs in the Bay Area.

2.3 Bay Area UASI Management

The Bay Area homeland security program is comprised of the UASI grant program, COPS Technology Grant, Interoperable Emergency Communications Grant Program (IECGP), Regional Catastrophic Preparedness Grant Program (RCPGP), and the Public Safety Interoperable Communications (PSIC) grant program. These grants serve as both terrorism and all hazards preparedness programs.

Governed by a multi-year Memorandum of Understanding (MOU) between the participants, the Bay Area UASI is managed through a three-tiered governance structure. The Bay Area's governance structure is widely viewed as having an important, groundbreaking regional approach that has been recognized across the country as a homeland security best practice. The Bay Area UASI is not an operational entity and does not exercise governmental authority under the California Emergency Services Act before, during or after an incident or disaster.

2.2.1 Approval Authority

The top tier is the eleven-member Approval Authority that includes representation from each of the three major cities of Oakland, San Francisco, and San Jose and the County of Alameda, County of Contra Costa, County of Marin, County of Monterey, County of San Francisco, County of San Mateo, County of Santa Clara and County of Sonoma. An Appointee from the Secretary of the California Emergency Management Agency (CalEMA) is also a non-voting member. The Approval Authority provides policy direction to the program and is responsible for final decisions.

2.2.2 Advisory Committee

The eleven-member Approval Authority works collaboratively with an Advisory Group which acts as the second tier of the governance structure. Advisory Group members include one representative from each of the twelve Bay Area OAs, plus the three major cities (San Francisco, San Jose and Oakland), the regional fusion center, and an appointee from the Secretary of CalEMA. The Advisory Group makes policy and programmatic recommendations to the Approval Authority and ensures there is broad representation, input and participation in the regional planning process.

2.2.3 Management Team

Managing the day-to-day work of the Bay Area UASI is a Management Team comprised of a general manager, an assistant general manager, several project managers, a finance manager, and grants managers. The City and County of San Francisco is the fiscal agent for the grants managed by the Bay Area UASI. Given the size and scope of the Bay Area, the Bay Area UASI has further organized itself around four sub-regional planning hubs – North, East, South and West.

2.2.4 North Bay Planning Hub

The North Bay planning hub consists of Marin, Sonoma, Napa, and Solano counties and is the least urbanized portion of the Bay Area. The City of Santa Rosa in Sonoma County is the North Bay's largest city, with a population of approximately 156,000. The City of Vallejo in Solano County is the second largest city. Within the North Bay, there are many areas of undeveloped open space, farmland, and vineyards. The North Bay is the only section of the Bay Area that is not served by a commuter rail transit service. Much of it is isolated from the rest of the Bay Area by water. The major access points are the Golden Gate, Richmond-San Rafael, Carquinez, and Benicia-Martinez Bridges.

2.2.5 East Bay Planning Hub

The East Bay consists of Alameda and Contra Costa counties. The East Bay is further split into two regions, the inner East Bay, which sits on the bay shoreline, and the outer East Bay, consisting of inland valleys separated from the inner East Bay by hills and mountains. The inner East Bay includes the cities of Oakland, Hayward, Fremont, Berkeley, and Richmond, as well as many others. The outer East Bay includes the San Ramon and Amador valleys and cities such as Walnut Creek, Concord, and Pittsburg. The East Bay is urban and densely populated with a large amount of older building stock built before World War II.

2.2.5 South Bay Planning Hub

The South Bay is made up of the counties of Santa Clara, Santa Cruz, Monterey and San Benito. Although Santa Clara County is urban, Santa Cruz County remains somewhat rural in nature. Several notable technology companies are headquartered in the South Bay, giving it the designation, "Silicon Valley." Santa Clara County includes the City of San Jose and other outlying high-tech hub cities, such as Santa Clara and Sunnyvale. Monterey sits directly on the Pacific coast with San Benito directly to the West.

2.2.6 West Bay Planning Hub

The West Bay planning hub consists of the City and County of San Francisco and the County of San Mateo. The City and County of San Francisco is surrounded by water on three sides and is bordered by the County of San Mateo (often referred to as the Peninsula) to the south. Transportation routes into the city include bridges, rail (overland and underneath the Bay), water, and overland vehicular routes.

2.2.7 Work Groups

The Bay Area also engages a variety of stakeholders throughout the region to move projects and initiatives forward and to provide essential input for decision makers of the Bay Area's homeland security efforts. Each work group meets on an as needed basis to address identified projects and issues. Work groups generally organize themselves around the Bay Area Homeland Security Strategy's goals and objective. Work group members represent diverse interests and areas of expertise at the local, regional and state level. For example, the CBRNE/Training and Exercise Work Group manages issues related to the CBRNE and Training and Exercise goal. In the past, the Bay Area had maintained a public information and warning work group, but as discussed later in the *Strategy*, that work group is no longer in place.

SECTION 3: PURPOSE

3.1 Purpose Overview

The purpose of the *Bay Area Emergency Public Information and Warning Strategy* is to provide a clear roadmap for the region and its component jurisdictions and agencies to integrate, sustain and enhance the EPI&W capabilities across the region for all hazards that pose a risk to its people and critical infrastructure. Having such a document will ensure the Bay Area is in the best possible position to clearly track and articulate its progress in building the EPI&W capability. Defining the purpose of the *EPI&W Strategy* is the first step in a series designed to sustain and strengthen the Bay Area's EPI&W capabilities. These steps are outlined in Figure 2 below.

Figure 2 Strategy Flow Chart

Purpose → Vision → Focus/Mission → Goals and Objectives → Implementation Steps
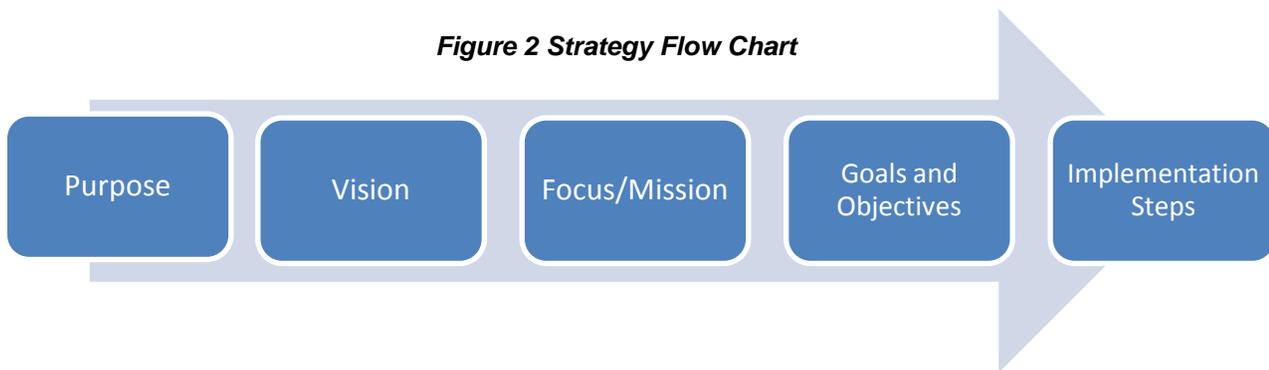
The *EPI&W Strategy* purpose involves a comprehensive system for enhancing regional capability and capacity that will guide the Bay Area's efforts to:

- Use effective and accessible warning systems to communicate significant hazards to involved operators, security officials, and the public (including alerts, hazard detection capabilities, and other necessary and appropriate assets).

- Communicate appropriate information on the risks faced by the region based upon the Bay Area's all hazards risk profile.

- Inform all affected segments of the whole community by all means necessary of critical lifesaving and life-sustaining information and aid the public to take protective actions.

- Deliver credible emergency public information and warning messages to inform the public about protective measures and other life-sustaining actions to be taken.

- Reach all necessary populations within the whole community with emergency public information and warnings to include those with disabilities and people with access and functional needs[1] and limited English proficiency.

- Support affected populations with a system that provides appropriate, current information about any continued assistance, steady state resources for long-term impacts, and monitoring programs in an effective and accessible manner.

In a region as large and diverse as the Bay Area, this is an exceedingly complex mission requiring coordination, cooperation, collaboration, and focused effort from the whole community – residents, government, as well as the private and non-governmental organization sectors. The Bay Area region will apply the resources available from DHS to address unique planning, organizational, equipment, training, and exercise needs to assist in building an enhanced and sustainable EPI&W capability to address all hazards. However, this *Strategy* is not a grant strategy; it is a comprehensive *EPI&W Strategy* that will be implemented through projects funded by Federal grants, general funds and such other funding opportunities that may become available.

3.2 The Whole Community Approach

In 2011, the Federal Emergency Management Agency (FEMA) formally developed a concept of "Whole Community" emergency preparedness. Whole community is a means by which private and nonprofit sectors, including businesses, faith-based, access and functional needs organizations, residents, visitors, and government agencies at all levels, collectively understand and assess the needs of their respective communities and determine the best ways to organize and strengthen their assets, capacities, and interests.[2]

The purpose of using the whole community approach is to ensure the public health and safety community engages and works *with* the community and not just *for* the community. The challenge for those professionals engaged in public health and safety is to understand how to work with the diversity of groups and organizations and the policies and practices that emerge from them in an effort to improve emergency public information and warning concerning any type of threat or hazard. Engaging the whole community will likely mean

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[1] Those with access and function needs may include individuals who have physical, sensory, mental health, and cognitive and/or intellectual disabilities affecting their ability to function independently. See, Federal Emergency Management Agency, *Guidance on Planning for Integration of Functional Needs Support Services in General Population Shelters* (November 2010), at page 8.

[2] Federal Emergency Management Agency, *A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action* (December 2011) at page 3.

different things to different groups within different communities. This is especially true in the 12 county Bay Area, which includes diversity in geography, demography and risk. Therefore, a community's needs and level of ability in emergency public information and warning will vary across the Bay Area. Going forward, the purpose is to ensure that regardless of level of ability those capabilities across the region are built and sustained on common standards of practice, plans, procedures, tools and technology and other preparedness activities.

3.3 Strategy Development Process

The *Strategy* was developed through a comprehensive process of stakeholder engagement and data collection and analysis. This involved a review of existing plans and procedures governing EPI&W in the Bay Area followed by a series of assessment workshops covering all 12 OAs plus the cities of Oakland and San Jose. These workshops centered on a self-evaluation by the participants based on a number of focused questions on EPI&W capabilities in the areas of planning, organization, equipment, training and exercises.

Following the workshops a series of interviews with allied local, state and federal agencies were conducted. These allied agencies (special districts, State and Federal agencies) were chosen on the basis of their role in the EPI&W mission space in the Bay Area and included the Bay Area Rapid Transit (BART), CalEMA, National Weather Service, and several others. Following the assessment, the region engaged in meetings and discussions to review the data and recommended corrective actions that should be taken. For a more detailed discussion on the assessment process see Section 9 of the *Strategy*.

3.4 Relationship to Other Plans

The *EPI&W Strategy* is not an operational or tactical plan. It does not alter the statutory or regulatory authority or responsibility of any entity or agency in the Bay Area related to public safety, health, and security. Nor does the *Strategy* impose any affirmative duty on any agency or entity in the Bay Area to take any specific action or inaction. Rather, the *EPI&W Strategy* is an integration tool and guide to better coordinate and focus disparate authorities and resources necessary to strengthen and sustain EPI&W across the entire region.

> *The Bay Area EPI&W Strategy is an integration tool and guide to better coordinate and focus often disparate authorities and resources necessary to strengthen and sustain EPI&W across the entire region.*

Plans such as local Emergency Operations Plans often describe functions, authorities, and operational responsibilities during an emergency. While distinct, the *EPI&W Strategy* and such operations plans should be mutually reinforcing by providing a consistent framework and taxonomy of hazards and capabilities the Bay Area (and its component jurisdictions) must be prepared for and build and sustain, respectively.

Finally, the *EPI&W Strategy* not only guides the implementation of local priorities and initiatives, but serves as a mechanism to steer the implementation of state and national priorities and programs at the local level such as the Federal Integrated Public Information and Warning System (IPAWS) and the related Commercial Mobile Alerting System (CMAS) discussed in greater detail in Section 6.

3.4.1 The Bay Area Homeland Security Strategy

The Bay Area Homeland Security Strategy is the region's overarching strategic plan concerning all facets of homeland security from prevention to protection to mitigation, response and recovery. It outlines the framework and strategic end state related to a variety of goals and objectives each of which is linked to national and/or State of California priorities and Target Capabilities. This includes a strategic objective tied directly to Emergency Public Information and Warning. It also serves as the tool and guide by which a variety of projects funded by federal homeland security grant funds must directly link with.

In the past, in addition to the Bay Area Homeland Security Strategy, the region has conducted assessments and developed several capability based or subject area based strategic level plans that have produced valuable data to help drive the region's homeland security policies and programs in specific areas. Most notably, in 2008, the Bay Area produced an assessment and strategic plan for regional interoperable communications along with a CBRNE assessment and strategic plan. Similar to those assessments and plans, the *EPI&W Strategy* serves two purposes concerning the Bay Are Homeland Security Strategy:

- First, it provides valuable data and strategic input into the Bay Area Homeland Security Strategy; and
- Second, it serves as an implementation plan, outlining far more detailed policies and procedures for emergency public information and warning under the umbrella of the larger region-wide Bay Area Homeland Security Strategy.

The relationship between the *EPI&W Strategy* and the Bay Area Homeland Security Strategy is outlined in Figure 2 below.

Figure 3 Strategy Relationships
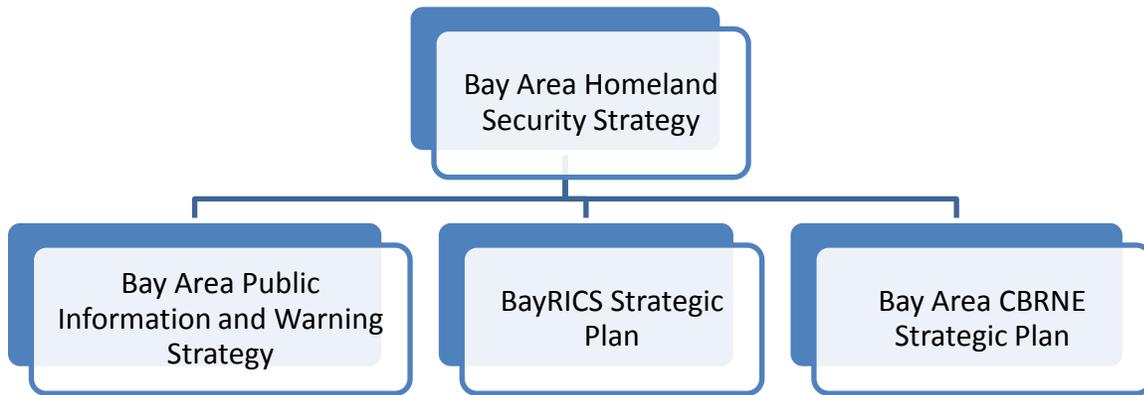
While the Bay Area Homeland Security Strategy serves as an umbrella over other homeland security strategic plans in the region, the *EPI&W Strategy* and the Bay Area Homeland Security Strategy should be mutually reinforcing by providing a consistent planning framework, risk analysis, and taxonomy of elements that make up emergency public information and warning in the Bay Area as a whole and its component jurisdictions.

SECTION 4: VISION AND GUIDING PRINCIPLES

4.1 Vision

The Bay Area's Vision for emergency public information and warning is:

An interoperable and standards based system of multiple emergency public information and warning systems that allows Bay Area leaders and public health and safety personnel to disseminate prompt, clear, specific, accurate and actionable emergency public information and warnings to all affected members of the community in order to save lives and property concerning known threats or hazards.

4.2 The System of Systems Approach

At the center of the Bay Area's vision for emergency public information and warning is the system of systems approach. Given the size and diversity of the Bay Area, developing a single centrally managed EPI&W system is not feasible or necessary. Rather, through common standards and implementing structures the region can achieve an effective system of emergency public information and warning systems. Such an approach may be defined as follows:

> A system of systems exists when a group of independently operating systems comprised of people, technology, and organizations are connected; enabling emergency responders to effectively support day-to-day operations, planned events, or major incidents.[3]

A key factor to understanding the system of systems approach is to recognize that compatible EPI&W technology between jurisdictions alone *will not* make OAs in the Bay Area interoperable. Indeed, the OAs and other jurisdictions and allied agencies must connect *standards based - technology, people, and organizations to achieve true interoperability.*[4] Moreover, a system of systems recognizes that the Bay Area can connect independently operated and managed emergency public information and warning systems among it OAs while not forcing the OAs to lose their independence.

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[3] U.S. Department of Homeland Security, Office of Interoperability and Compatibility, *The System of Systems Approach for Interoperable Communications,* at page 1. While this definition was used for the purpose of interoperable emergency radio communications, it is a universal principal of multi system interoperability that may be applied to the emergency public information and warning capability (and other capabilities).

[4] Id at 2 (emphasis added).

The benefits of adopting the system of systems approach are many. As outlined by the DHS Office of Interoperability and Compatibility[5] these include:

- **Increased Capability** – Systems based on standards can connect to other systems without compromising functionality.

- **Increased Efficiency** – The need for additional equipment and technical resources to improve interoperability decreases.

- **Increased Flexibility to Upgrade** – Each system can make changes or adopt new technology without affecting other connected, standards-based systems.

- **Decreased Reliance on Proprietary Technology** – Jurisdictions can choose from multiple vendors.

- **Decreased Cost** – Price competition increases and the need for expensive customized interoperability solutions is reduced. Training can be standardized across jurisdictions, thus reducing training costs.

- **Increased Capacity to Expand** – Standards-based solutions are more likely than proprietary solutions to be able to integrate the next system into the larger system of systems.

4.3 Guiding Principles

The Bay Area's vision for an interoperable system of emergency public information and warning systems will be implemented through a set of guiding principles that will help shape this *Strategy* and its implementation. These principles are:

- There is no single or one time solution to enhancing and sustaining the EPI&W capability. The ability to effectively provide emergency public information and warnings will require the integration of often complex capability elements involving plans, equipment, organization, training and exercises and consistent leadership.

- Emergency public information and warning capabilities will be built upon a framework that balances local control with regional collaboration and integration.

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[5] Id at 5.

- The whole community must be engaged in emergency public information and warning preparedness activities to include public awareness and education.

- The Bay Area is committed to ensuring the whole community receives necessary emergency public information and warnings to include those with access and functional needs and limited English proficiency.

- The Bay Area will strive to develop pre-vetted public warning messages based on the latest and best available social science and physical science data.

- The Bay Area will develop multiple methods and technologies for communicating emergency public information and warnings to ensure reliability and survivability and avoid a single point of failure.

- While Federal grant funding is important to sustain and build the region's public information and warning capabilities, the Bay Area is committed to strengthening and sustaining emergency public information and warning regardless of Federal funding.

SECTION 5: FOCUS AND MISSION

5.1 The National Preparedness Goal

Released in September 2011, the National Preparedness Goal (NPG) outlines the national focus for homeland security across the spectrum of homeland security mission areas including, prevention, protection, mitigation, response, and recovery. The NPG lists 31 "Core Capabilities" necessary to achieve the NPG with each capability aligned to a mission area or several mission areas in which case the capability may be defined as "common." The Core Capabilities are the successor to and replace the Target Capabilities List. Through the Core Capabilities, the NPG is achieved by:

- **Preventing,** avoiding, or stopping a threatened or an actual act of terrorism.

- **Protecting** our citizens, residents, visitors, and assets against the greatest threats and hazards in a manner that allows our interests, aspirations, and way of life to thrive.

- **Mitigating** the loss of life and property by lessening the impact of future disasters.

- **Responding** quickly to save lives, protect property and the environment, and meet basic human needs in the aftermath of a catastrophic incident.

- **Recovering** through a focus on the timely restoration, strengthening, and revitalization of infrastructure, housing, and a sustainable economy, as well as the health, social, cultural, historic, and environmental fabric of communities affected by a catastrophic incident.

As outlined in Table 1 below, the Public Information and Warning capability is categorized as a common capability under the Core Capabilities, whereas the Target Capabilities List accounted for the capability only in the response category.[6] Such a change reflects the fact that the public information and warning capability cuts across all mission areas whether the information or warning is intelligence-based designed to help prevent an incident, or results from an impending natural disaster or post-incident protective actions, etc.

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[6] In addition to moving the capability under the "common" mission area, DHS has removed the word "emergency" from the Core Capability's name. The Bay Area UASI will still use the word emergency when referring to this capability, but otherwise will look to Federal guidance to assist in building, sustaining and enhancing emergency public information and warning in the region.

Table 1 Core Capabilities by Mission Area

Common				
Planning				
Public Information and Warning				
Operational Coordination				
Prevention	**Protection**	**Mitigation**	**Response**	**Recovery**
Forensics and Attribution Intelligence and Information Sharing Interdiction and Disruption Screening, Search, and Detection	Access Control and Identity Verification Cyber Security Intelligence and Information Sharing Interdiction and Disruption Physical Protective Measures Risk Management for Protection Programs and Activities Screening, Search, and Detection Supply Chain Integrity and Security	Community Resilience Long-term Vulnerability Reduction Risk and Disaster Resilience Assessment Threats and Hazard Identification	Critical Transportation Environmental Response/Health and Safety Fatality Management Services Infrastructure Systems Mass Care Services Mass Search and Rescue Operations On-scene Security and Protection Operational Communications Public and Private Services and Resources Public Health and Medical Services Situational Assessment	Economic Recovery Health and Social Services Housing Infrastructure Systems Natural and Cultural Resources

5.2 Defining Public Information and Warning

The NPG defines Public Information and Warning as the ability to "deliver coordinated, prompt, reliable, and actionable information to the whole community through the use of clear, consistent, accessible, and culturally and linguistically appropriate methods to effectively relay information regarding any threat or hazard and, as appropriate, the actions being taken and the assistance being made available."[7]

While there is overlap and interconnectedness between "emergency public information" and "public warning" before, during or after an incident, there are relevant differences between immediate public warning and emergency public information and the *EPI&W Strategy* accounts for this distinction. For purposes of the *Strategy*, the terms "public warning" and "emergency public information" are defined as follows:

- "Public warning" refers to urgent communications intended to alert some or all of the public of an immediate threat or hazard and to recommend specific protective actions members of the public can take to reduce harm.

- "Emergency public information" accounts for various communications covering more extensive releases of information from agency spokespersons and subject matter experts prior to, during, or following an incident, intended to educate and guide members of the public, reduce losses, speed recovery and enhance resilience.

These distinctions are reflected in sources of information, objectives and operational tempo:

Sources: While public information messages are crafted by Public Information Officers, warnings tend to come from either scientific or intelligence-gathering sources external to the responsible agencies or from operational personnel (typically Incident Commanders) in the field. In particular, the need to get a warning to people at risk often precedes the activation of a Joint Information Center or even the arrival of a trained Public Information Officer.

Objectives: The focus of most emergency public information is to inform and, by informing, to reassure and guide the public. Public warning, on the other hand, is primarily concerned with redirecting the affected populations' attention to an immediate threat and eliciting immediate protective actions.

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[7] U.S. Department of Homeland Security, *National Preparedness Goal* (September 2011); accessed at
http://www.fema.gov/pdf/prepared/npg.pdf.

Operational Tempo: Pre-incident public information (sometimes described as education) is a continual gradual process over periods of weeks, months and years. Incident-specific emergency public information is a process that can continue for several hours, days or weeks. Public warning at the local and regional level, on the other hand, must be started and completed within minutes, and the entire warning period only rarely extends beyond an hour or two.

The distinction between public warning and emergency public information is also reflected in the State of California Emergency Plan, which outlines seven key elements for the response phase concept of operations with "alert and warning" listed distinctly as number three and "public information" listed distinctly as number five.[8]

Finally, the overall goals and messages of public warning need to be carefully aligned with those of emergency public information, and both activities use some of the same media of communication. However, those similarities do not negate the differences that also exist. A "one size fits all" approach cannot adequately guide both emergency public information and the specific function of public warning.

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[8] *State of California Emergency Plan*, July 1, 2009 at page 43.

SECTION 6: EMERGENCY PUBLIC INFORMATION AND WARNING STANDARDS AND TOOLS

6.1 The Evolution in Standards and Tools

The world of public warning in particular has recently and forever changed. At the center of this change is the national-level adoption of the Emergency Alert System (EAS) standards and tools known as the Common Alerting Protocol (CAP), the Integrated Alert and Warning System (IPAWS), and the Commercial Mobile Alert System (CMAS). These systems are designed to become the future backbone of public warning in the United States. They serve as useful tools to facilitate the standardization of warning practices throughout the Bay Area. However, as innovative and potentially powerful as these standards and tools may be, they are not a "silver bullet" that will finally "solve" the complex challenge of generating and delivering effective warnings to the public. Rather, they will serve to strengthen the Bay Area's efforts to build and sustain its vision for emergency public information and warning.

The following is a summary of certain of the essential standards and tools that operate nationally, in the State of California and specifically in the Bay Area. A complete list of the delivery tools is outlined in Appendix A – Message Delivery Tools.

6.2 The Common Alerting Protocol

The Common Alerting Protocol (CAP) provides a standard around which warning capabilities are being integrated. CAP provides an open, non-proprietary digital message format for all types of warnings. It does not address any particular application or communications method. CAP allows a consistent warning message to be disseminated simultaneously over many different warning systems, thus increasing warning consistency and effectiveness while simplifying the warning task. The CAP is analogous to the P-25 Standard for interoperable emergency radio communications among first responders.

Each "CAP Alert Message" consists of an "alert" segment, which may contain one or more "info" segments, each of which may include one or more "area" and/or "resource" segments. The CAP format is compatible with emerging techniques, such as Web services, as well as existing formats including the Specific Area Message Encoding (SAME) used for the National Oceanic and Atmospheric Administration (NOAA) Weather Radio and the EAS.[9]

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[9] Common Alerting Protocol Version 1.2 at page 6. Copyright© OASIS® 2010. All Rights Reserved.

Three documents currently define how CAP is implemented and used by IPAWS:

- OASIS CAP Standard v1.2;
- OASIS CAP v1.2 IPAWS USA Profile v1.0 (IPAWS Specification to the CAP Standard);
- EAS CAP Industry Group (ECIG) CAP to EAS Implementation Guide

The CAP is the basis for both IPAWS and CMAS discussed below. CAP can also be used as a format for post-EAS public information and distribution to the media and other public warning partners. This application is not constrained by word or character length. The standardized format it offers covers many important topics.

6.3 The Emergency Alert System

The Emergency Alert System (EAS) is a national public warning program that requires broadcasters, cable television systems, wireless cable systems, satellite digital audio radio service providers, and direct broadcast satellite providers to provide the communications capability to the President of the United States to address the American public during a national emergency. It is the successor to the Emergency Broadcast System. The EAS may also be used by state and local jurisdictions to deliver emergency information, such as AMBER alerts and dangerous weather information. FEMA implements the national-level activation of the EAS for emergency incidents, tests, and exercises. The first nationwide test of the EAS took place on November 9, 2011.

6.4 National Oceanic and Atmospheric Administration Weather Radio All Hazards

National Oceanographic Atmospheric Administration (NOAA) Weather Radio (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest NWR office. NOAA weather radio covers a major portion of the population within the United States. Its chief function is to provide continuous weather forecasts. The National Weather Service (NWS) can activate radio receivers to issue warnings regarding severe weather. This system can be used to issue warnings for other hazards when local emergency managers make arrangements with the NWS. The advantages of the tone-alert system include a quick dissemination time, the combination of an alerting signal with specialized messages, and around-the-clock availability. Disadvantages include maintenance problems, availability during power failures, limited broadcast range, and the difficulty of outdoor use.

6.5 Integrated Public Alert and Warning System (IPAWS)

The Integrated Public Alert and Warning System (IPAWS) is a FEMA-managed system created in response to Executive Order 13407, which required FEMA to develop "an effective, reliable, integrated, flexible, and comprehensive system to alert and warn the American people."[10] IPAWS is designed to allow the President of the United States to speak to the American people under all emergency circumstances, including situations of war, terrorist attack, natural disaster, or other hazards. One of IPAWS' goals is to diversify and modernize the EAS by expanding the traditional EAS to include more modern technologies such as cell phones and other mobile devices.

IPAWS is also being designed to enable other Federal, state, territorial, tribal, and local alert and warning emergency communication officials to access multiple broadcast and other communications pathways for the purpose of creating and activating alert and warning messages related to any hazard impacting public health and safety. Through the IPAWS Open Platform for Emergency Networks[11] (IPAWS-OPEN), the *goal* is for IPAWS messages to be sent through a series of communications pathways to include:

- EAS messages
- Commercial Mobile Alert System
- Local systems such as digital road signs
- National Weather Service All Hazards Emergency Message Collection System

Through IPAWS, the Federal government also hopes to enable the interoperable routing of messages between agencies to enhance collaboration, sharing and situational awareness. The vision is for agencies to exchange messages as along as each system or software they use is compatible with IPAWS and each agency is established as an IPAWS Collaborative Operating Group (COG). Each agency that becomes an IPAWS user is designated as a COG and each COG administers individual member accounts.

While it is yet untested, IPAWS holds great promise to very rapidly disseminate the same message to a multitude of public warning providers that will greatly enhance the standardization of messages the public hears during an event. This, in turn, will help people confirm risk and what actions to take more rapidly than before.

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[10] Executive Order 13407, Public Alert and Warning System, (June 2006). The Executive Order directly tasked the Secretary of Homeland Security who in turn delegated the responsibility to FEMA.

[11] IPAWS-OPEN is a set of securely hosted web services that enable the routing of standards-compliant messages from warning authorities to the public

6.6 Commercial Mobile Alert System

The Commercial Mobile Alert System (CMAS) is intended to allow warning authorities to use the IPAWS-OPEN platform to send geographically targeted, text alerts of up to 90 characters to members of the public through a person's wireless device. CMAS messages cover three topic areas: Presidential messages, America's Missing: Broadcast Emergency Response (AMBER), and imminent threat messages. While presidential and AMBER messages are reasonably defined, what constitutes an "imminent threat" is far from agreed upon by the homeland security community.

CMAS messages can be sent even if cellular voice and data services are overloaded. CMAS uses a unique signal and vibration to attract attention, which is designed to help those with access and functional needs become aware of the message. Members of the public do not need to sign up for CMAS messages, and, unlike most subscription based cell phone alerting programs, individual members of the public will not be charged for the delivery of CMAS messages.

While members of the public don't have to sign up for CMAS messages the public can "opt out" of receiving CMAS messages (except for Presidential messages for which people cannot opt out). Additionally, CMAS capable cellular phones or other mobile devices will a means of reaching registered people who are away from home. Commercial wireless carriers currently sell CMAS capable phones/hand-held devices with the service already intact.

CMAS also holds great promise. The "personal delivery" of alerts this system provides will greatly help the public understand that the alert is actually directed to them which has heretofore been an obstacle to public protective action taking. However, it too is in the early stages of development and remains untested in the state and local environment on a large and consistent scale.

6.7 National Threat Advisory System

The National Threat Advisory System (NTAS) is the federal government's primary means to provide terrorist threat advisories to the general public and professional security officials. The NTAS is the successor to the color coded Homeland Security Advisory System established in 2002 under Homeland Security Presidential Directive-3 and later codified in the Homeland Security Act of 2002. The NTAS is managed by the U.S. Department of Homeland Security. The Bay Area's Northern California Regional intelligence Center is a

primary recipient of NTAS alerts. The NCRIC then disseminates the information to its public and private sector partners.

NTAS Alerts are distributed when there is credible information concerning a terrorist threat. An alert may include specific information about the nature of the threat, including the geographic region of the country and/or the critical infrastructure sector that may be the target of the threat. Such threats under the NTAS come in two forms: an "imminent threat", which warns of a credible, specific, and impending terrorist threat against the United States, and an "elevated threat" which warns of a credible (but not specific or impending) terrorist threat against the United States. All NTAS alerts included recommended protective measures that can be taken by individuals, businesses and safety and security officials.

6.8 The National Warning System

The National Warning System (NAWAS) is an automated telephone line that connects each State emergency operations center to FEMA's Mt. Weather, as well as several military and other government facilities. NAWAS was originally designed as a Cold War tool to be used in the event of a missile attack on the United States by the Soviet Union or its allies. Today, it is used during major disasters. In California, there is a subset of NAWAS called CALWAS, which connects CalEMA in Sacramento to the emergency operations centers of the State's 58 OAs. In the Bay Area, the NAWAS/CALWAS circuit is connected to San Francisco's emergency 9-1-1 center.

6.9 Emergency Digital Information Service

The Emergency Digital Information Service (EDIS) delivers official information about emergencies and disasters to the public and the news media in California. EDIS has been in continuous operation since 1990. In 1999 the statewide EDIS network was upgraded to add image and sound capabilities and to use an advanced satellite data-cast technology for reliable statewide service.

6.10 California State Warning Center

The California State Warning Center (CSWC) is staffed 24 hours a day, seven days a week. The mission of the CSWC is to be the central information hub for statewide emergency communications and notifications. The CSWC is responsible for informing, communicating, alerting and notifying local governments, Operational Areas and state officials and the Federal Government of natural or human caused emergencies. The CSWC does not provide

direct warnings to the public. The CSWC maintains contact with County Warning Points, state agencies, federal agencies and the National Warning Center in Berryville, Virginia. Local governments and Operational Areas notify the CSWC of emergencies that affect their community in accordance with existing laws, protocols, or when State assistance is requested or anticipated.

SECTION 7: EMERGENCY RESPONSE STRUCTURES IN CALIFORNIA

7.1 Standardized Emergency Management System

The Standardized Emergency Management System (SEMS) is the NIMS-compliant system under the Emergency Services Act as set forth in California Government Code Section 8607(a) for managing responses to multi-agency emergencies in California. In order to be eligible for any State funding for response-related costs under disaster assistance programs, local agencies in California must use the SEMS to coordinate multi-jurisdiction or multi-agency incident operations. The four components of SEMS are the Incident Command System (ICS), Multi-Agency Coordination System (MACS), California Disaster and Civil Defense Master Mutual Aid Agreement (MMAA) and the Operational Area (OA) concept.

There are five SEMS organization levels as outlined in Figure 3: state, regional, operational area, local, and field. Together with the private sector, these comprise the California Emergency Organization. This organization represents all resources available within the State that may be applied in disaster response and recovery phases. SEMS operates from established

Figure 3 SEMS Organization Levels

Emergency Operations Centers (EOCs) at all five levels, as well as in many businesses and industries. SEMS fully incorporates the use of the ICS, which is a standardized organizational structure and process used to manage an incident through the use of resources and personnel. ICS is typically structured to facilitate activities in five major functional areas: Command, Operations, Planning/Intelligence, Logistics, and Finance/Administration. All of the functional areas may or may not be used based on the incident needs.

Under SEMS, emergency public information and warning is directly managed and controlled by the jurisdiction(s) with responsibility for the emergency incident. For emergency public information this is often done through a local public information officer who serves an adjunct to the incident commander and/or a senior official such as a mayor; and through a Joint Information Center (JIC). A JIC is a central location where personnel with public information responsibilities perform critical emergency information functions, crisis communications and public affairs functions.[12] When a JIC is established, it is supposed to be staffed with, among others, public information officers from the responding agencies that coordinate and act as a team.

Collectively, the activated JICs form the Joint Information System (JIS). The JIS provides the mechanism to organize, integrate and coordinate information to ensure timely, accurate, accessible and consistent messaging activities across multiple jurisdictions and/or disciplines with the private sector and non-governmental organizations. The JIS coordinates and communicates lifesaving measures, evacuation routes, threat and alert methods and other public safety information in an accurate, timely, accessible and consistent manner.[13]

7.2 Mutual Aid

For more than 55 years California has emphasized mutual aid operational plans as the center of emergency response augmentation. California's emergency assistance is based on a statewide mutual aid system designed to ensure that additional resources are provided to the state's political subdivisions whenever their own resources are overwhelmed or inadequate. The basis for this system is the MMAA, which is entered into by and between the State of California, its various departments and agencies and the various political subdivisions, municipal corporations and public agencies to assist each other by providing resources during an emergency.

The MMAA obligates each signatory entity to provide aid to each other during an emergency without expectation of reimbursement. Under specific conditions, Federal and State funds may be used to reimburse public agencies who aid other jurisdictions. If other agreements, memoranda and contracts are used to provide assistance for consideration, the terms of those documents may affect disaster assistance eligibility and local entities may only be reimbursed if funds are available. This plan promotes the establishment of emergency assistance agreements between public and private sector agencies at all levels.

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[12] *State of California Emergency Plan*, (July 1, 2009), at page 51.
[13] *Id.*

The agreement also provides detailed procedures for the approval of emergency operational plans

For mutual aid coordination purposes, California has been divided into six mutual aid regions. The Bay Area is in mutual aid region two. The purpose of a mutual aid region is to provide for the more effective application and coordination of mutual aid and other emergency related activities. Each party to the MMAA must ensure that their adopted and approved emergency plans document how they will mobilize public resources to render mutual aid during any type of emergency.

For mutual aid to be truly effective, the resources provided under the system must be interoperable. In the case of EPI&W this involves more than technology, but a larger array of standards of practice where the same terms and actions mean the same thing. For example, when a local population is told to "evacuate the area" or a siren is turned on, these terms and actions mean the same thing to the whole community in the Bay Area. Today, across jurisdictions and even within jurisdictions in the Bay Area key terms and actions related to EPI&W are not consistent and therefore the strength of mutual aid is diminished.

SECTION 8: BAY AREA RISK SUMMARY

8.1 Defining Risk

Risk is the expected negative impact of an adverse incident on an asset or population, considering both its likelihood and the magnitude of its impact. Risk can be expressed as a number or value in order to make comparisons. It is calculated by the U.S. Department of Homeland Security based on threat, vulnerability, and consequence: Risk = Threat x Vulnerability x Consequence. The Bay Area follows this equation in defining risk to the region. A more detailed explanation on defining risk is in Appendix B – Bay Area Risk Data.

8.2 Bay Are Risk Profile

The Bay Area's risk environment is a complex one involving terrorism, crime, natural hazards and industrial and other accidents. The Bay Area's approach to using the EPI&W capability is based on using common standards of practice to ensure compatible emergency public information and warning tools and procedures are in place regardless of the hazard. With a better understanding of the risks to the people and critical infrastructure assets, the Bay Area will be in a better position to understand what EPI&W capabilities are needed to protect its assets and the people who frequent them.

8.2.1 Critical Infrastructure

In 2012, the Northern California Regional Intelligence Center (NCRIC) compiled a list of over 7,000 self-identified critical infrastructure and key resource assets in the entire Bay Area. These assets cover all 18 National Infrastructure Protection Plan (NIPP) sectors. The NCRIC has further refined these assets into four priority levels for the region (level I being the highest and level IV being the lowest priority) with the vast majority of the assets (over 5,000) falling in priority level IV, the lowest priority level. A breakdown of assets into levels reflects the Bay Area's goal of accounting for as many assets as possible while recognizing that a smaller subset of those assets, if attacked or otherwise incapacitated by a natural hazard, could have a devastating impact on the region. Much of the Bay Area's high priority infrastructure is found in the government, banking, commercial and healthcare sectors.

8.2.2 Terrorism Scenarios

A terrorism incident is defined under Federal law as the "...unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian

population, or any segment thereof, in furtherance of political or social objectives."[14]   The Bay Area has identified sixteen terrorism scenarios that pose some level of risk to the region's people and critical infrastructure. These scenarios include cyber-attacks, terrorist use of explosives, biological attacks, a conventional armed assault team attack, and an improvised nuclear device, among others. A more detailed description of the sixteen terrorism scenarios is set forth in Appendix B.

8.2.3 Natural Hazards

The Bay Area's people and critical infrastructure also face significant natural hazards risk from earthquakes, wildfires and floods in particular. Earthquakes pose the greatest risk. This is based upon region's vulnerability to such an event and the consequences of a major earthquake concerning lives and property. The region rests upon one of the longest and most active earthquake fault systems in the world. This system includes the San Andreas Fault, the Hayward Fault and the Calaveras Fault. The U.S. Geological Survey estimates an 80% chance of a magnitude (M) 6.7 or greater quake striking the Bay Area within the next 30 years. Through its regional catastrophic planning team, the Bay Area is actually preparing for a quake as large as M 7.9. Based on the Bay Area's topography, tsunamis are also of major concern. A more detailed description of the natural hazards posing a risk to the Bay Area is also outlined in Appendix B.

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[14] 28 C.F.R. Section 0.85

SECTION 9: CAPABILITY ASSESSMENT

In March 2012, the Bay Area conducted a regional assessment of its EPI&W capability in order to identify strengths and gaps, and serve as the baseline from which to develop the *EPI&W Strategy*. The results of the assessment provide the Bay Area with a better understanding of priority capability areas and opportunities for investment, based on identified regional strengths and gaps. The report gives OAs and regional stakeholders an initial understanding of their overall EPI&W capability as a region by highlighting strengths in the Bay Area in developing these capabilities, and identifying areas in which regional coordination and support can be strengthened. Below is a summary of the methodology, approach and key findings from the assessment and report issued in May 2012.[15]

9.1 Capability Assessment Metrics and Measures

In order to assess the Bay Area's level of ability across the elements of the EPI&W capability, an assessment tool was developed that synthesized the social science research literature on imminent threats warning and created an overarching metric that described the requirements of the EPI&W capability, called the *Social Science Public Warning Metric*.[16] It is based on two social science themes: the organizational aspects of warning systems and understanding of what shapes public protective action warning response behavior. The region then used parts of that metric and combined it with public information and warning operational standards of practice and the results of a review of Bay Area plans and assessments to establish a framework to design practical questions with which to measure current capability of OAs and the region as a whole. The final metric consists of nine interrelated elements:

- **Element 1** Communication Linkage from Risk Detectors to Information Managers
- **Element 2** When to Warn
- **Element 3** Warning Impediment Abatement
- **Element 4** Salient Audience Profile
- **Element 5** Pre-scripted and Pre-vetted Science-based Public Messages
- **Element 6** Public Message Delivery and Dissemination
- **Element 7** Public Message and Public Information Management
- **Element 8** Pre-event Public Warning Education
- **Element 9** Adherence to General Planning Elements

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[15] The full report can be found at the Bay Area UASI, *Emergency Public Information & Warning Gap Analysis Report*, May 2012.

[16] Mileti, Dennis, Ph.D., *Social Science Public Warning Metric*. March 28, 2012.

As part of the metric, and to inform the establishment and implementation of the *Strategy*, three key terms and concepts were identified and defined:

- **Detection** – involves those who detect and then communicate risk data and information to those responsible for managing that data and information.

- **Managing the information** – involves taking the risk data and information and making decisions about how and when to warn the public. The people responsible for this element include local emergency public communication personnel.

- **Public response** – involves how the public responds to the warning and what motivates public warning response.

Real-world operators of public warning systems may be tempted to dismiss a scientific, evidence-based perspective as unrealistic or too abstract to be useful. Operational necessities may seem, at first glance, to be incompatible with best practice as identified through systematic research. However, a number of successful warning systems have been founded and operated on the basis of key social scientific findings about warning effectiveness. These include a number systems in the U.S. and abroad, including the federal Integrated Public Alert and Warning System (IPAWS) and, in the Bay Area, the Contra Costa County "Community Warning System" (CWS).

9.2 Capability Assessment Methodology

The methods employed to conduct the assessment were designed to provide an integrated planning approach, from data collection through analysis, to inform strategic planning and investment prioritization. This was done by collecting data and identifying gaps in plans, organization, equipment, training and exercises.

The Department of Homeland Security has defined the elements of capability as plans, organization, equipment, training and exercises (POETE).[17] These elements of capability also align with DHS allowable grant expenditure areas and grant investment justification budget sections. The POETE categories are defined in Table 2 below.

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[17] U.S. Department of Homeland Security, *Target Capabilities List*, September 2007.

Table 2: Overview of POETE Structure

Element	Definition
Planning	Development of policies, plans, procedures, mutual aid agreements, strategies and other publications that comply with relevant laws, regulations, and guidance necessary to perform assigned missions and actions.
Organization	Specific personnel, groups, or teams, an overall organizational structure, and leadership at each level in the structure that comply with relevant laws, regulations, and guidance necessary to perform assigned missions and tasks. Paid and volunteer staff who meet relevant qualification and certification standards necessary to perform assigned missions and tasks.
Equipment	Major items of equipment, to include those on the DHS Authorized Equipment and Standardized Equipment Lists, supplies, facilities, and systems that comply with relevant standards necessary to perform assigned missions and tasks.
Training	Content and methods of delivery that comply with training standards necessary to perform assigned missions and tasks.
Exercise	Exercises, self-assessments, peer-assessments, outside review, compliance monitoring, and actual major events that provide opportunities to demonstrate, evaluate, and improve the combined capability and interoperability of the other capability elements to perform assigned missions and tasks to standards necessary to achieve successful outcomes.

The Bay Area conducted several work-shops with representatives from each of the OAs in the Bay Area in order to collect baseline data. Participants generally included a cross-section of county or city employees who had expertise in EPI&W as well as in a wide variety of other areas, including public information officers, emergency managers, public health and first responder leaders and the access and functional needs community. During these workshops, the facilitator posed the set of POETE questions developed for the EPI&W capability, as well as two additional questions focused on sustainment and opportunities for improvement (see Appendix C – Operational Area Assessment questions for a list of all the questions).

OAs answered the questions with either a "Yes," "Partial," or "No" response, based on their understanding of the OAs current abilities. An OA answered "Yes" for capabilities it possessed or could perform. An OA answered "Partial" for capabilities not fully developed (for example, if written procedures were under development but were not yet completed). An OA answered "No" if they did not have or were unable to perform the ability in the question being asked. The project consultant team also asked OAs to provide an explanation for their answers to provide specific context.

Several interviews with key regional allied agencies from across the Bay Area were also held to answer questions and review regional strengths and weaknesses (questions for the allied agencies are listed in Appendix D – Allied Agency Assessment Questions). The list of allied agencies included:

- Bay Area Rapid Transit (BART)
- California Emergency Management Agency (CalEMA)
- California Department of Transportation (Caltrans)
- California Department of Forestry and Fire Protection (CAL FIRE)
- California Highway Patrol (CHP)
- Metropolitan Transportation Commission (MTC)
- National Oceanic and Atmospheric Administration (NOAA)
- Northern California Regional Intelligence Center (NCRIC)
- Santa Clara Valley Transportation Authority
- United States Coast Guard (USCG)
- Water Emergency Transportation Authority (WETA)

9.3 Summary of Capability Assessment Findings

The following is a summary of the key findings from the capabilities assessment and Gap Analysis Report. It outlines certain key findings in the areas of organization and standards of practice; planning and operational coordination; tools and technology; and training, education and exercises.

9.3.1 Organization and Standards of Practice

There is currently little formal regional coordination of EPI&W activities pre-incident, and there is no established and on-going pre-incident regional planning and coordination structure or personnel dedicated to managing it.

From Federal fiscal years 2006 through 2010, the Bay Area has allocated approximately $837,911 for public information and warning POETE activities out of approximately $150 million in UASI funds awarded to the region during that time frame. While other funding sources are used to support PI&W activities, current UASI funding levels for EPI&W represent approximately one half of one percent of total available funding under the covered time frame. This, despite EPI&W designated a priority capability for the region as a result of the Bay Area's risk management program.

The duplication of warning delivery systems combined with the lack of unified warning control systems creates avoidable delay, workload and opportunities for error for warning originators. In addition, there is a lack of consistency in how similar systems are used. For example, in one OA, a siren could be used for tsunami. Another OA uses a siren for an industrial accident, and a third uses a siren for general hazards. Almost all of the OAs' warning systems must be activated one-by-one and do not support activation using the CAP version 1.1 or 1.2

9.3.2 Planning and Operational Coordination

The Bay Area is adept at managing EPI&W activities for common, smaller cross-jurisdictional incidents and traditionally encountered response environments, such as wild fire, flooding and spills. However, there is currently little formal regional coordination of EPI&W activities, and there is no established and on-going regional planning and coordination structure.

While the region as a whole has a number of programs to minimize isolation from warning systems due to non-English-speaking language barriers, or access or functional needs, there is limited planning and coordination among OAs and with the various support agencies throughout the region. There is also a lack of training on customizing any warranted message additions for these populations.

The current patchwork of public warning systems among the OAs and other regional allied agencies causes great inconsistency in the type, content, and format of warnings received by the public. The duplication of warning delivery systems combined with the lack of coordination creates avoidable delay and additional workload and opportunities for error for warning originators.

9.3.3 Technology and Tools

Few OAs have agreements in place to access and integrate new and emerging EPI&W systems, such as IPAWS and CMAS. Many agencies have not certified that their equipment is IPAWS ready, and most of the warning systems do not support activation using the CAP version 1.1 or 1.2. In addition, most OAs have not completed any IPAWS training.

In general, most OAs recognized the value of providing and monitoring information via social media, and most OAs have social media accounts such as Twitter and Facebook. However, few OAs have a social media policy, and several are not monitoring social media or using their social media accounts. There is also a lack of training to assist public

information officers (PIOs) and warning originators to adapt to technological advancements and the use of social media.

9.3.4 Training, Education and Exercises

Although it is not consistent or coordinated across the region, there are training opportunities to varying degrees for PIOs. However, there is no standard or consistent training curriculum for warning issuers that might include, for example, risk communication training on how to prepare warnings and subsequent information that enhance public response. Similarly, public information is sometimes included in regional exercises, but there is currently no warning exercising at the regional level.

SECTION 10: GOALS AND OBJECTIVES

10.1 Introduction

The goals and objectives of the *EPI&W Strategy* serve as the core for what the Bay Area must do to build its system of systems over the next five years in the area of emergency public information and warning. The goals and objectives are the culmination of integrating risk and capabilities assessment data by establishing actions to be taken that are designed to enhance or maintain EPI&W capabilities in the Bay Area. Finally, the goals and objectives represent not only the priorities of the Bay Area but also the region's implementation of State of California and national level policy and programs on EPI&W at the Urban Area level, e.g., CAP, IPAWS and CMAS, etc.

Given the strain on local, state, and Federal budgets, the Bay Area's strategic approach in developing the goals and objectives is to ensure the goals and objectives are based upon what is actually and realistically achievable under the foreseeably long period of constricted public safety budgets. Such an approach distinguishes the perfect or ideal from the achievable and focuses on *closing priority capability gaps and sustaining priority capabilities that already exist* as opposed to trying to build capabilities in non-priority areas or entirely new, exotic and expensive regional systems and approaches that cannot be sustained.

The Bay Area's approach does *not* endorse keeping policies, structures and tools in place that are not working simply because they already in place. Rather, the region will seek to maximize efficiencies and scarce resources. This will be done by enhancing existing EPI&W systems and frameworks and their interoperability across jurisdictions and agencies to allow the Bay Area to perform the tasks necessary to provide effective emergency public information and warnings when needed.

The goals and objectives focus on the next five years, but will be reviewed and updated annually as necessary. Some of the objectives likely will carry over from year to year while others may be removed or updated based on the Bay Area's progress and actual needs. The goals and objectives will continue to be defined by risk analysis, identified capability gaps, and sustainment priorities.

10.2 Organization and Structure of the Goals and Objectives

The Bay Area's EPI&W goals and objective for the next five years are organized into four main areas:

- Goal 1 Organization and Standards of Practice
- Goal 2 Planning and Operational Procedures
- Goal 3 Technology and Tools
- Goal 4 Training, Education and Exercises

Each goal outlines a broad strategic end state the Bay Area will seek to achieve. The objectives that follow each goal outline further detailed actions that must be taken to help achieve the end state articulated in the goal. While each goal and objective is distinct they are all interconnected. Each serves a common purpose of driving the Bay Area to achieve its vision for EPI&W in the region.

The structure of the goals and objectives follows a logical progression of identifying the EPI&W challenge facing the Bay Area; outlining the causes behind the challenge; and providing a solution and associated benefits to address the

> **"My experience tells me if we wait and plan for people with disabilities after we write the basic plan, we fail."**
> *Craig Fugate, FEMA Administrator*

challenge and overcome its causes. As part of the structure, issues such as supporting community members with access and functional needs, and the use of social media, are fully integrated throughout the goals and objectives as opposed to treating the issues distinctly with their own goal(s). This approach is consistent with the whole community concept and avoids treating those with access and functional needs, for example, as an ancillary issue separate from the rest of the community. By fully integrating (or baking in) the needs of those with access and functional needs into various solution areas throughout the objectives, the Bay Area will increase the likelihood of actually addressing those needs.

The order of the goals and objectives is based on a sequence of events necessary to strengthen EPI&W in a coordinated and effective way.

➢ First, in order to act regionally in the development of policies, programs and initiatives, the regional structures, governance, means and mechanisms must be in place. These issues are addressed in Goal 1.

➢ Second, once the regional policy and program structures are in place, the region must have sufficient and integrated plans and operating practices. These issues are addressed in Goal 2.

➢ Third, with ever evolving technology, the Bay Area must ensure it has sufficient tools to deliver essential emergency public information and warnings, and achieve interoperability among the tools it has and will acquire in the future. Goal 3 addresses these issues.

➢ Finally, Goal 4 addresses the critical need to provide training, education and exercises on EPI&W to the whole community in order to effectively implement each of the prior three goals.

GOAL 1: ESTABLISH CONSISTENT STANDARDS OF PRACTICE AND ORGANIZATIONAL STRUCTURES FOR EMERGENCY PUBLIC INFORMATION AND WARNING

Moving toward an interoperable and CAP based emergency public information and warning "system of systems" in the Bay Area requires the region to establish common standards and the appropriate organizational structures, as well as provide the right leadership to coordinate adoption of those standards and guide those structures. Such standards, structures and personnel are fundamental first steps in building toward the Bay Area's vision for emergency public information and warning. All other goals and objectives in the *EPI&W Strategy* flow from this first step. These standards, structures and personnel are crucial to actualizing a "regional" approach to building and sustaining emergency public information and warning capabilities. Together, they break down stovepipes and provide the "glue" to bring together disparate jurisdictions and agencies and form the foundation for the systems of systems approach.

OBJECTIVE 1.1: ESTABLISH A BAY AREA EMERGENCY PUBLIC INFORMATION AND WARNING COMPACT AS A BASELINE AGREEMENT FOR INTER-AGENCY AND REGIONAL COOPERATION AND COORDINATION

Challenge: There is a lack of consistency across the Bay Area in how similar emergency public information and warning capabilities are developed and used. As a result, public expectations can be confused, especially for people who live, work and travel in multiple OAs. For example, people from different parts of the region may interpret the sound of a siren in a variety of ways, e.g., fire, hazardous materials release, tsunami, flash flood, school "lockdown," etc.

Additionally, the lack of shared standards can inhibit mutual aid and cooperation among agencies with warning or public information responsibilities. Each jurisdiction's staff must be custom-trained to their particular local systems and policies, and a responsible official from one OA or municipality cannot be assumed to have working knowledge of the warning and public information methods and policies in a nearby jurisdiction. For example, different OAs have reported different understandings as to when they might be permitted the use of CalTrans changeable message signs on freeways. Furthermore, in many cases OAs, municipalities, school districts and other entities have warning and public information capabilities of which adjacent and even inclusive jurisdictions may be largely or entirely unaware. This can lead to duplication and also to missed opportunities to use available capabilities effectively.

While some OAs have sophisticated all-hazard, multi-modal public warning systems, others rely almost entirely on a single technology. Even basic policy as to who has the

responsibility for public warning, or about when and how to issue a public warning or public information varies greatly from OA to OA.

While most emergencies are small enough to fall entirely within a single OA, municipality or special district, it is not unusual for even small incidents to affect multiple jurisdictions and involve multiple disciplines, e.g., fire, law, health, public works, etc. Larger emergencies and disasters frequently violate the boundary of a single OA. When that occurs, lack of standardization in policies and standards of practice for warning and emergency public information can complicate cross-jurisdictional and multi-disciplinary response.

For example, in the event of an airborne hazardous materials release that originates in one jurisdiction but travels into another, precious minutes can be lost in warning people at risk because there is no pre-arranged reciprocity agreement in place and no technical mechanism for activating an adjoining jurisdiction's warning delivery systems (sirens, telephone notification, etc.).

And even before the emergency, there is no existing mechanism for coordinating the development of warning and emergency public information capabilities for efficiency or cost-effectiveness. As such, potential efficiencies and budgetary savings are lost because there is no consistent framework for inter-jurisdictional sharing of warning or public information resources, joint procurements or long-term planning. The current fragmentation has led to duplicative and relatively small procurements of "commodity" services such as telephone-based notification services and the accompanying excess costs and loss of market power to responsible agencies.

Causes: The primary cause of this lack of coordination is the fragmented way in which local warning and emergency public information capabilities have developed over the years. There has been no generally accepted mechanism for setting common standards of practice or even the exchanging of information about warning capabilities and local policies. With a few notable exceptions, rather than viewing warning as an all-hazards function that cuts across disciplines, most local warning capabilities have been developed and funded in agency and jurisdictional "silos." These silos often focus on a single hazard, or the immediate concerns of the individual development teams and agencies, with little or no consideration of broader use or resource sharing.

The existing diversity is not entirely unjustified, nor is it entirely without benefits. It reflects local variations in government structures, risk profiles and resources among the OAs, municipalities, districts and other agencies in the region. Those variations, in turn, are largely artifacts of local history, and may reflect variety in local hazards, geography, demography and economy. It would be neither desirable nor productive to deny individual

jurisdictions the flexibility to make their own best choices and to adapt to changes as they occur over time. The system of systems approach recognizes this fact.

Finally, differences among OAs have been exacerbated, especially in recent years, by aggressive marketing of warning systems at the lowest possible governmental levels (e.g., municipalities and school districts.) Sales of multiple small systems are frequently more profitable for the vendor than sales of larger combined systems under more competitive conditions.   In the absence of a broad regional program of coordination, many local agencies and/or jurisdictions have judged they were "on their own" and have taken their own initiative to develop warning systems that might have been less expensive and more effective if they were shared.

Solution and Benefits: Operational Areas, municipalities, special districts and other organizations with emergency- and disaster-management responsibilities should be encouraged to subscribe to a Bay Area Emergency Public Information and Warning Compact (BAEPIWC), a joint interagency Memorandum of Agreement that will articulate a framework and standard for mutual aid, coordination and assistance in the planning and conduct of emergency public information and warning and in the strategic planning and coordination of ongoing capability development across the region.   A BAEPIWC MOU compact template is attached as Appendix E – BAEPIWC Regional MOU Template. The compact will serve as the foundation for establishing a regional approach to emergency public information and warning in the Bay Area and for more formal regional undertakings. The BAEPIWC document will outline:

- A basic standard of practice for public warning, setting a consistent expectation as to appropriate use of public warning systems;
- An acknowledgement that warning is a discretionary activity for government agencies and personnel and therefore protected from liability under the California Government Code;
- An agreement to consolidate Joint Information Centers (JICs) across jurisdictions and disciplines and to avoid the creation of multiple JICs for a single incident or disaster;
- A pledge to pursue development of a regional mechanism for support to OAs, municipalities and other entities with emergency public information and warning responsibilities in the areas of:
  - National Incident Management System (NIMS) requirements for CAP compatibility in federally-funded warning system procurements, and also to FEMA's "FY2012 Guidance on Public Alert and Warning" and its recommendation of regional, multi-jurisdictional and multi-disciplinary projects. This will include a move to forge a partnership with the State of

California and Silicon Valley in the development and deployment of CAP based all-mode warning control systems for both local systems and the IPAWS.

o Monitoring trends, technologies and legislation through established organizations such as Bay Area Emergency Public Information Network (BAEPIN) and the UASI Emergency Public Information and Warning Work Group.

o Development of requirements and evaluation of proposals for joint investments to include the integration of grant funds such as the UASI and Port and Mass Transit Security Grant Programs, among others.

o Development and execution of joint training and exercises in emergency public information and warning to include through the Bay Area Regional Training and Exercise Program.

o A common criterion for the use of public warning systems to establish a predictable basis for inter-jurisdictional cooperation and mutual aid in warning.

  ▪ For example, operators of siren systems in the Bay Area should refrain from trying to assign highly specific meanings to sirens; educating the public to such specific meanings is an expensive continuing task and, in such a mobile region, one ultimately doomed to limited effectiveness. Instead, sirens and other attention-getting devices (flashing lights indoors, brief text messages via CMAS, etc.) should focus primarily on alerting the public that an unspecified emergency is ongoing and that they should, after ensuring their own immediate safety, turn to broadcast and online media for more detailed information.[18] Contra Costa County has for several years used the basic criterion of "imminent hazard to human life or health" as a touchstone for evaluation of the appropriateness of using its public warning capabilities.

o Other matters the subscribers to the BAEPIWC may wish to address on a regional basis.

The Bay Area has had some notable success in developing capabilities, procedures and policies for public information and warning, particular concerning frequently occurring hazards, even those that cross jurisdictional borders. California has been a leader in the development of frameworks for cooperation among emergency management and public safety personnel and personnel. OA, municipal, special district and state agency staff point

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[18] For example, the Home Office of the United Kingdom uses the slogan "Go In, Tune In" as a simple formula for what Britons should do when they hear a siren.

with legitimate pride to practical successes in managing warning and public information during fires, floods, hazardous materials spills and other emergencies over many years. Much of this has been accomplished in the context of the California SEMS, ICS, the California MMAA, and other mature cooperative frameworks. California also led in the development and implementation of the Common Alerting Protocol, which is now a national and international standard. It is critical that the BAEPIWC build upon these frameworks and not duplicate or undermine those existing arrangements and practices.

OBJECTIVE 1.2: DEVELOP REGIONAL POLICY AND PROGRAM STRUCTURES AND ASSIGN A REGIONAL PROGRAM MANAGER FOR EMERGENCY PUBLIC INFORMATION AND WARNING INITIATIVES AND PROGRAMS

Challenge: There is presently no established and on-going regional coordination group(s) in the Bay Area for emergency public information warning policy and program development. Nor is there a program manager to steer a regional structure or group to include organizing meetings, overseeing project development and implementation, ensuring training and exercise programs include EPI&W, etc. This results in a fragmented EPI&W policy and program development process and a lack of focus on EPI&W capability enhancements in the Bay Area at the regional level.

Causes: While several attempts have been made in the past to develop forums and working groups to coordinate public information and warning policy and programs in the Bay Area, these organizations have fallen short for a variety of reasons. These include the lack of a dedicated person whose function was to help steer the group and track and oversee progress. For example, BAEPIN was originally established in 2008 under the Regional emergency Coordination Plan (RECP) as a network of Bay Area PIOs to facilitate professional engagement, information sharing, vetting and processing of information and training opportunities. BAEPIN designated a volunteer coordinator but no one has been able to fulfill that role as originally envisioned. As such, BAEPIN has not developed into a standing regional coordination group for EPI&W activities. Instead, multiple PIO coordination groups operate across the region resulting in a lack of consistency in coordinating and maintaining regional projects and activities.

In addition to BAEPIN, under the UASI program a regional EPI&W Work Group was established to share best practices and develop regional projects and programs involving planning, equipment purchases, training and exercises. However, this group also failed to sustain itself and is no longer in place. As with BAEPIN, a lack of dedicated resources to manage the EPI&W Work Group and ensure its functionality contributed to its demise. Both BAEPIN and the EPI&W Work Group were well conceived structures that simply lacked resources to ensure their viability.

Solution and Benefits: The Bay Area will reconstitute the BAEPIN and the EPI&W Work Group and assign a regional EPI&W Program Manager to serve as the coordinator for both bodies and to oversee implementation of the *EPI&W Strategy* and the BAEPIWC. The EPI&W Program Manager will be similar to those for interoperable communications, risk management, and the training and exercise programs in the Bay Area. Therefore, the Program Manager may be placed within the Bay Area UASI Management Team or could serve separately from the Management Team but work in close coordination with them. The Program Manager may be hired as a consultant/contractor or employee through any

number of jurisdictions in the region. However, in all cases the Program Manager must be seen as a regional position not beholden to any one jurisdiction.

Robust regional coordination structures will be vital for a region as large and diverse as the Bay Area to maintain a sense of unity and focus in strengthening EPI&W across the entire region. The BAEPIN and EPI&W Work Group will provide a consistent forum to share best practices and information, develop and adapt regional policy and initiatives, and serve as steering groups for the *EPI&W Strategy's* implementation. As part of this reconstitution, the region may include developing a virtual platform, e.g., SharePoint©,[19] to update and implement the BAEPIN as envisioned in the RECP, as well as the EPI&W Work Group. Given the size of the Bay Area, face-to-face meetings are not always practical and a virtual platform will allow for collaboration to occur even in the absence of in-person meetings.

The EPI&W personnel at the OA level have limited resources to manage their day-to-day responsibilities and can hardly be expected to manage regional policy and program issues as well. A Program Manager will ensure the region maintains focus regarding the *EPI&W Strategy* and its implementation. All too often, organizations spend precious resources on conducting assessments and generating plans only to see the results of that work wither due to a lack of implementation resources, chief among them program management.

The Program Manager will ensure that both BAEPIN and the EPI&W Work Group meet on a regular basis and that group activities are followed through on. The Program Manager will be the interface between the EPI&W community and the larger Bay Area homeland security and emergency management communities on major policy issues impacting EPI&W. This will include making sure policy makers at the regional level such as the Bay Area UASI Approval Authority and Advisory Group are kept informed as to progress in implementing the *EPI&W Strategy* and what challenges exist. This will help maintain executive engagement and resource allocation for *Strategy* implementation.

To ensure the long term viability of the Program Manager, the position should not be entirely federal homeland security grant funded. Rather, the region will seek to split the cost of hiring and sustaining the Program Manager with half the funds coming from federal grants and the remainder coming from local funds with each of the twelve OAs and the cities of San Jose and Oakland each providing an equal share. Such an approach will increase the likelihood that the region will be able to maintain the Program Manager even if, or when, the Bay Area no longer receives homeland security grant funds. The need for a strong EPI&W capability, strategy and program existed in the Bay Area before the allocation of federal homeland security grants and will exist long after such grants cease to be awarded.

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[19] The reference to SharePoint® is for illustrative purposes only and does necessarily represent an endorsement of the use of the product for this purpose.

OBJECTIVE 1.3: ESTABLISH A REGIONAL MECHANISM FOR MONITORING AND REPORTING ON TRENDS AND DEVELOPMENTS IN EMERGENCY PUBLIC INFORMATION AND WARNING

Challenge: There is limited and uneven understanding of trends, best practices and emerging developments within the Bay Area on the topic of emergency public information and warning. For example, the utilization of the Federal IPAWS, the CAP technical standard and the Joint Information Center (JIC) methodology are not uniformly known at a baseline level across the region.

Although both the established EAS and the new CMAS are migrating to the CAP-based IPAWS architecture during 2012, as of mid-year the majority of OAs in the region have yet to take required steps to ensure access to IPAWS for themselves and their municipalities. Only one OA has implemented an integrated control system for their local warning systems utilizing the CAP.

Causes: While resource constraints underlie this challenge, a simple lack of information or awareness about trends and developments in the fields of public warning and emergency public information also contributes to this challenge.

Historically, emergency management agencies have tended to rely on the expertise of their own professional staff in the area of emerging trends and innovations. As the rate of change in the media and technology landscapes has accelerated, those staff have come to rely increasingly on federal guidance, outside consultants and trainers, and vendor promotional presentations for updates to their knowledge. This strategy has not been consistent in its effectiveness, particularly concerning non-commercial tools and techniques, such as IPAWS, CAP and the JIC.

Likewise, the activities of public warning and emergency public information are frequently combined in planning with little appreciation of the significant differences in objectives, staffing, timeframe and techniques between those two related-but-distinct activities.

While some of these planning shortfalls may, again, be attributed to a simple lack of resources (or, more precisely, on a relatively low priority given these issues in competition for scarce agency resources) the problem is magnified by a lack of an independent and proactive source of information as to new developments and "best practices."

Solution and Benefits: The EPI&W Program Manager will be responsible for monitoring developments and trends in public warning and emergency public information technologies and practices, and for providing advisory updates, training and reference resources to Operational Areas, the Bay Area Regional Training and Exercise program manager, and allied agencies in the Bay Area. This will include canvasing other states and localities as well local subject matter experts from across the region through BAEPIN and

the EPI&W Work Group. These local groups provide regional expertise on the fast-advancing state of the art in the area of emergency public information and warning and can provide decision makers with a broad perspective from which to make policy choices and investments based on the *EPI&W Strategy*.

OBJECTIVE 1.4: DEVELOP A PROCESS FOR JOINT REGIONAL PROCUREMENT OF FUTURE EMERGENCY PUBLIC INFORMATION AND WARNING TOOLS AND FOR SUSTAINING CURRENT PUBLIC INFORMATION AND WARNING CAPABILITIES

Challenge: The Bay Area lacks an integrated regional approach to procuring emergency public information resources. It also lacks a consistent and reliable multi-year funding stream for emergency public information and warning equipment and maintenance. Without such an approach and funding stream the ability to integrate and sustain current and future equipment capabilities will be increasingly more difficult. At the same time, funding for public safety and homeland security is under significant budget pressure, shrinking the available funding pool for sustainment.

Causes: For sustainment, state and local budgets are under significant strain due a weak economy and lower tax revenues. This has a direct impact on public safety budgets down the line from personnel to equipment to training and exercises. As a result of tight local budgets, localities across the country including the Bay Area have relied increasingly on federal homeland security and public safety grants to help acquire homeland security resources including public information and warning equipment. However, these federal funding streams are unstable as the federal budget deficit forces Congress and the Executive branch to cut federal programs. For example, from federal FY 2011 to FY 2012, the Bay Area saw a 40% cut in its UASI funding as a result of federal cut backs.

The lack of integrated procurement is based, in part, upon the vendor-driven design of warning systems. Lacking expertise or specific independent guidance, many agencies and governing bodies have been guided in their procurements primarily by marketing presentations. However, the design priorities of vendors are not automatically aligned with those of government agencies. In particular, many vendors strive to maximize revenues by "locking in" their customers to proprietary products that do not interoperate with other systems.

A third component is the reactive context in which many local warning systems have been designed and deployed. High-profile incidents—for example, shooting incidents involving schools and colleges—have created powerful public, media and political pressure for quick action on warning systems. This has made it difficult, in many cases, for the responsible officials to take time to conduct a comprehensive or in-depth review of best practice in public warning. Instead, there have been strong incentives in some cases to adopt "quick fix" solutions.

Solution and Benefits: The Bay Area will develop and maintain a shared regional mechanism for pursuing economies of scale in equipment/system procurement,

maintenance and operation.   This will include a regional mechanism for developing additional funding sources to include from the private sector.

The Bay Area will pursue warning effectiveness and economies of scale through joint procurements and deployment of integrated warning capabilities. Both BAEPIN and the EPI&W Work Group will serve as the primary forums within which regional stakeholders can engage in ideas and best practices for effective procurement that benefits each jurisdictions, agency and the region as a whole. The regional Program Manager will facilitate these discussions and help ensure that stakeholders are provided the latest information on standards and technology. By collaborating on requirements development and pooling their market power the Bay Area can obtain financial and operational efficiencies and simultaneously improve service to the public.

Finally, training for warning and public information officers should address modern integrated approaches to public alert and warning and highlight NIMS requirements for CAP interoperability in new warning system procurements. Such training will provide decision makers with key background information they may not have time to research when events or funding opportunities require action on warning capability development.

OBJECTIVE 1.5: INCREASE CAPABILITY TO WORK WITH PARTNER ORGANIZATIONS TO REACH PEOPLE WITH ACCESS AND FUNCTIONAL NEEDS OR LIMITED ENGLISH PROFICIENCY

Challenge: The Bay Area is increasingly capable of communicating emergency public information and warnings to able-bodied English speakers. However, the Bay Area is highly diverse and home to growing populations of people with limited English proficiency as well as access and functional needs. There is a high risk that these populations will experience warning information isolation if they are unable to receive or understand emergency public information and warnings.

In order to integrate the needs and perspectives of people with access and functional needs, as well as limited English proficiency, into planning and exercise activities, some OAs work with organizations whose constituents include these populations. However, there is no regional strategic approach for doing so and few examples of formalized roles and agreements to work with such organizations.

Causes: Only recently have OAs begun to consider a wide range of community organizations as full partners in emergency management planning and response. In addition, many of the organizations that work with these populations are short-staffed, very focused on implementing their own mission, and do not have the resources to take responsibility to fulfill such an important role in emergency management.

Solution and Benefits: Bay Area emergency public information and warning leaders will develop sample contracts and MOAs between each of the OAs and community based organizations within each OA. OAs will develop and maintain a database of organizations whose constituents include people with access and functional needs or limited English proficiency. The database will include information about their mission, activities and which populations they serve. Most OAs across the region have done this already and it is simply a matter of updating what they have in their respective databases.

The community organizations then will be evaluated for their level of capability and interest to provide assistance in emergency public information and warning planning, public education, and message dissemination. OAs then will be able to execute a final contract or MOA to work with specific organizations that can assist in the mission.

Collaborating Agencies Responding to Disasters (CARD) has had success in helping non-profit organizations to integrate emergency preparedness education activities into their service organizations by showing the staff and volunteers how such activities align with the mission of their organizations. Such organizations can become partners with emergency managers in both warning education and warning message dissemination, if funding and technical support is provided.

In order to send warnings to access and functional needs and/or limited English proficiency populations that are most likely to result in appropriate protective action response, the Bay Area will focus on two areas:

- Build relationships with the staff and volunteer leaders of community-based organizations that serve access and functional needs and/or limited English proficiency populations
- Assist those organizations to build the capacity needed to communicate quickly with their own constituents through robust communication networks that use social media and other tools for transmitting primarily to cellular telephones

The CBOs are already trusted sources of information for the constituents they serve. So instead of solely working to convince their constituents to sign up to receive alerts and notifications directly from their local jurisdiction's system (as has been tried before with moderate success), the CBO staff and volunteer leaders would receive the alerts and warnings and transmit them to their constituents in a manner (or in the language) that is most likely to result in their constituents taking life-saving protective actions without delay.

Warning education designed to assist access and functional needs and/or limited English proficiency populations to be more familiar with warning systems and protective actions will be added to the curriculum for preparedness.

The benefit of collaboration with community-based organizations is that warning issuers will build their effectiveness in getting warning messages to otherwise hard to reach populations.

GOAL 2: STRENGTHEN REGIONAL PLANNING AND OPERATIONAL COORDINATION FOR EMERGENCY PUBLIC INFORMATION AND WARNING

Having emergency public communication plans, operational structures and procedures reduces the probability of errors by people who work as risk detectors and by emergency management actors in a public warning system. Plans and their supporting elements support operational efforts for several reasons. These include: (1) they help to eliminate *ad hoc* and sometimes counter-productive emergency warning provider behavior, (2) they reduce the likelihood that individual personalities and personal beliefs determine warning system performance in favor of thought-out procedures, and (3) they help agency and organizational actors to more appropriately fill the gaps presented by inevitable unplanned for problems that always seem to emerge in actual events based on knowledge of clear warning and response goals and objectives.

OBJECTIVE 2.1: INCREASE THE DETAIL AND CONSISTENCY OF PLANS FOR JOINT INFORMATION CENTER (JIC) OPERATIONS, AND DEVELOP NETWORK-BASED "VIRTUAL" JIC SUPPORT

Challenge: In the event of a multi-disciplinary regional event, formation of a Joint Information Center (JIC) would be complicated by a number of factors including:

- Overlapping or ambiguous responsibilities, especially in complex disasters, leading to delays in identifying a lead agency or a framework for joint management;
- Possible establishment of multiple JICs with overlapping responsibilities and/or inadequate coordination;
- Inconsistent procedures for mobilizing and assigning JIC personnel;
- Difficulties in transporting JIC personnel to a distant location;
- Shortage of skilled personnel for sustained operation over multiple periods, days or even weeks; and,
- Lack of consistent training of personnel in a common JIC structure and process

While organizations that operate JICs frequently, such as FEMA, have detailed and well-tested procedures for establishing, maintaining and ultimately demobilizing a JIC, most existing JIC plans in the Bay Area are much less complete and proven. Instead, great reliance is placed on the personal skills (and availability) of key personnel who have received various forms of JIC training at irregular intervals.

At the same time, while most of the OAs have nominal plans for the establishment of JICs during extended emergencies, few of these plans include detail as to JIC membership, structure or processes. Further, there is little or no consistency in the criteria for JIC

activation, nor is there a clear policy on the coordination of multiple JICs or the establishment of a single regional JIC during a large-scale event.

Causes: While JICs have been a standard feature of federal disaster response since the 1980s, their application at the regional and local level is a much more recent development and most OAs and other agencies in the Bay Area have little if any practical experience with them. As a result, much JIC planning at the regional and local level is at a fairly preliminary stage. Dwindling government funding at all levels has retarded detailed JIC planning as limited resources have been directed toward even higher priorities.

A PIO's expert understanding of the issues and priorities of their own jurisdiction may not always be helpful in another jurisdiction's JIC. Further, many PIOs are accustomed to working alone or in small teams and may not always be comfortable or fluent in a specialized role within a larger and more formally structured JIC.

For example, much of the planning for JIC operations in the Bay Area does not go much further than to specify that a JIC shall, under some circumstances, be convened. Very little detail appears to be provided as to specific criteria for JIC activation or particulars of JIC organization and procedure.

Solution and Benefits: The Bay Area should establish a joint regional program for expanding the level of specificity of JIC plans, standardizing JIC structure and roles, and providing JIC training and exercises at the regional level. This will help in familiarizing responsible personnel with the structure of the JIC and the specific roles they may be required to perform. Additionally, the Bay Area should partner with academic and industry partners in Silicon Valley to identify requirements and develop a network-based "virtual JIC" system to maximize coordination and utilization of remote personnel. Such a virtual system could provide a low cost capacity for coordination of public messages and sharing of information while reducing logistical burdens such as travel and workspace.

OBJECTIVE 2.2 ESTABLISH A REGIONAL OPERATIONAL SUPPORT CELL FOR EFFECTIVE PUBLIC WARNING

Challenge: Many potentially valuable public warnings are never issued because the field command personnel who have the information and the responsibility don't have the time or training to compose warning messages or activate warning systems.   This is an operational problem, not a technical one.

Causes: Most real-world public warnings originate from Incident Commanders (ICs) in the field, who are faced with an imminent threat to human life or health and need the public's prompt cooperation in taking protective action. ICs are generally field-level officers: sergeants and lieutenants in law agencies, captains and battalion chiefs in fire, and comparable ranks in other disciplines. Individually, most such officers will be called upon to issue a public warning only a relatively few times in their entire careers. At the same time, promotions and turnover make it impractical to train every possible warning originator fully in the science and practice of effective warning message composition and warning dissemination practice.

In addition, responders in the field rarely have time or space to craft a warning message text or to operate a computer application to issue one. Field officers are accustomed to delegating tasks to trained staff through concise voice interactions over radio or telephone. In the case of warning, though, most Incident Commanders in the Bay Area don't have anyone properly skilled to assist them in composing and disseminating a warning. Dispatchers, likewise, are already fully tasked, if not overloaded, and can't readily take on an additional duty that would distract them for relatively long periods from answering calls and managing radio traffic. Neither can emergency managers, who generally aren't staffed or trained to provide 24/7 warning support to ICs.

Advancing warning technology and growing public expectations are amplifying this challenge, and the deployment of near-universal public alerting over cellular telephones by the federal CMAS program will only accelerate that trend.

Solution and Benefits: Establish a regional warning officer program through the Contra Costa County Sheriff's Office through a single regional MOU. The Office of the Sheriff of Contra Costa County maintains a small dedicated staff of warning specialists, at least one of whom is on call at all times. Any Incident Commander from any agency in the county may request support from the on-call warning officer, who then attaches to the ICS structure as a Technical Specialist. The duty warning officer confers with the IC or designee (frequently the Operations Chief) to obtain relevant details, clarify the protective action strategy, compose a warning message, plan the distribution of the warning, and then activate the appropriate warning technologies at the IC's instruction.   In almost all cases this

coordination is done by radio or cellular telephone; however, in case of an extended response the warning duty officer may, at the ICs request, physically respond to the Incident Command Post.

Whether on-scene or "virtually" the warning duty officer remains attached to the incident until released by the IC, typically either when the incident closes or when the immediate warning phase is over and a Public Information Officer has arrived to deal with follow-on information and the media. This arrangement has enabled ICs throughout Contra Costa County to concentrate on the safety of people at risk without being distracted by the details and subtleties of warning technology and practice. At the same time, it has allowed a core staff of warning specialists to accumulate an unprecedented level of real-world public warning experience in addition to a level of specialized training that would not be feasible to achieve for every public safety officer.

The one major challenge for the Contra Costa County approach is that, even with that county's very active public warning program, its warning officers are arguably not always fully utilized. Thus, there is some bandwidth in Contra Costa from which the other OAs in the region could use to strengthen the generation and dissemination of immediate public warnings across multiple OAs to help save lives and property. It is unlikely to be able to support the entire region 24/7. It is estimated that an office of five or six warning specialists (there are currently three in contra Costa now) could provide reliable 24/7 service to the entire Bay Area while improving quality and reducing duplication, particularly since most of the OAs have, at present, less complex and extensive warning programs than Contra Costa. Training for additional warning staff could be done in a matter of weeks, but supervision of those new personnel over a period of months from an experienced warning officer would be essential.

A regional "warning officer" program established by subcontracting this service to Contra Costa's existing Community Warning System office will require minimal physical infrastructure as most of the region's numerous warning systems can be activated using a laptop computer with an encrypted data link.

OBJECTIVE 2.3: UPDATE OPERATIONAL AREA EMERGENCY PLANS AND THE REGIONAL EMERGENCY COORDINATION PLAN (RECP) TO REFLECT CURRENT PUBLIC INFORMATION AND WARNING PRACTICES AND TOOLS

Challenge: The RECP provides a basic overarching emergency response approach for the region but does not accurately reflect current emergency public information and warning practices and systems to include IPAWS and CMAS. In addition, the pre-scripted messages in the RECP Annexes need to be reviewed to ensure they are based on the latest social and physical science data.

The RECP base plan outline for the role BAEPIN does not reflect the current reality of the Network. Moreover, the anticipated role of BAEPIN going forward is focused more on program and policy development and less on operations (although this could change as the region reconstitutes BAEPIN). Finally, the RECP's description of the role of the Cal EMA Regional Emergency Operations Center (REOC) in support of EPI&W may not accurately reflect current Cal EMA resources and capabilities.

At the local level, just over half of the Bay Area's 12 OAs have an up-to-date emergency public information operations annex and/or an all-hazard alert and warning annex in their Emergency Operations Plan (EOP). However, many OAs address the EPI&W capability at various points within their EOPs or in hazard-specific annexes. Finally, IPAWS and CMAS are not accounted for in local EOPs.

Causes: Communications tools such as IPAWS and CMAS, and new practices have evolved rapidly over the years and many plans have not been reviewed or updated during that time frame. For example, the RECP and its subsidiary plans were under development at a time prior to many of these changes.

Solution and Benefits: The Bay Area will review and update as needed all sections of the RECP and its associated Annexes on the topic of emergency public information and warning.   During an actual incident, public warning and ongoing emergency public information should be completely integrated with the response in order to be effective. Therefore warning and public information planning should be integrated with response planning in order to foster the greatest level of preparedness. Once developed, the updated EPI&W components to the RECP will also help inform development of EPI&W training and exercises. The same is true for local OA EOPs.

OAs will ensure they have an up-to-date emergency public information operations annex to their EOP or ensure that throughout their EOP the emergency public information and warning function is fully and accurately accounted for in the plan. In either case, any

changes must be consistent with State and Federal guidelines. These changes will ensure the plans among the region's OAs are fully up to date and make best use of the latest in science and technology in the realm of EPI&W.

OBJECTIVE 2.4: ADOPT PROTECTIVE ACTIONS FOR ALL POTENTIAL BAY AREA HAZARDS AND DEVELOP SOCIAL SCIENCE-BASED WARNING MESSAGE TEMPLATES TO COMMUNICATE EFFECTIVE PROTECTIVE ACTIONS TO THE PUBLIC

Challenge: Most people go through life thinking that they're safe. Warnings about impending or occurring threats and hazards tell them that they're not and, consequently, compel most people to "mill" around interacting with others and to search for confirming warning information in an effort to form new ideas about personal safety, risk, and action. Milling intervenes between warning message receipt and initiating a protective action, and it operates regardless of the message delivery technology used. While the credibility of the source of the information can influence this, it is only on the margins as social science research shows that people are effectively hardwired to engage in searching for more information regardless of the perceived credibility of the source. The result of this natural human reaction to receiving a warning is that human beings are the hardest animal of all on the planet to warn.

Social science research has also found that warning messages are most effective in getting people to take necessary protective actions when the messages conform to a particular message structure and content that is shown to motivate the public to take protective actions. To develop warning message templates, message developers require sets of pre-established protective actions that have been adopted by Bay Area public health and safety personnel.

Although there have been various efforts by individual agencies to develop warning procedures and messages for use in communicating to the public about traditional Bay Area hazards, such as wildfires and flooding, they have not necessarily been completed with grounding in social science or with the benefit of vetted and adopted sets of protective actions. In addition, the Bay Area has not sets of protective actions and developed warning message templates for more unusual catastrophic hazards, such as an improvised nuclear device.

Causes: While numerous Bay Area public information and warning practitioners understand the need for development of pre-vetted, social and physical science-based warning messages, the organizational and funding challenges for Bay Area public information and have created limited opportunities to work as a region to develop a comprehensive set of warning messages. There often is insufficient time to write and vet messages in the time available before impact. In addition, many local emergency public information providers believe in factors that impeded their making appropriate public warning decisions. Some key impediments are belief in the popular (but false) myths that follow:

- Warning messages must be short
- People in the public may panic
- One-way warning message delivery is communication
- People will understand the warning message
- Warning messages can't be changed
- There's one public
- A credible warning message source exists
- People in the public will blindly follow instruction in a warning message
- One channel public warning delivery will work
- Great warning messages guarantee great public response

Solution and Benefits: Public warning providers in the Bay Area will develop social and physical science-based pre-scripted and pre-vetted messages to quickly adapt as needed during actual events. Bay Area public information and warning leaders will use the warning message matrix (attached as Appendix F – Public Warning Message Templates and Matrix) to identify the full range of hazards that require warning messages that still need to be developed in the region. Next, guidance on protective actions that correspond to the needed message topics will be identified and adopted by Bay Area public health and safety personnel. These actions will be assisted through potential warning practices outlined in Appendix G – Warning Practices.

With robust stakeholder participation and feedback, messages will be developed by message development professionals building off of the sample templates created during the course of the *Strategy's* development. The primary benefit of completing a full suite of social and physical science-based, pre-vetted warning messages is that, in the event of a disaster, Bay Area public information and warning practitioners can more quickly issue warnings with an increased probability of timely protective action response. Such messages should contain information on five topics:

- <u>What</u>: tell the audience exactly what to do.

- <u>When</u>: say by when (time) people should begin the protective action and by when they should have that action(s) completed.

- <u>Where</u> (who): include information about who should *and* shouldn't do it in terms of geophysical location.

- <u>Why</u>: inform people about the hazard's consequences so people know why they are being advised to take the recommended protective action *and* tell why people not advised to take action don't have to.

- <u>Who</u> (source): say who the warning message is from.

These messages should also be written and communicated with the following style elements:

- <u>Clear</u>: warning messages should be clearly worded and devoid of jargon

- <u>Specific</u>: warnings should be as specific, precise, and non-ambiguous as is possible regarding what they say.

- <u>Accurate</u>: errors cause problems and if any are detected they should be explained in subsequent warnings.

- <u>Certain</u>: warnings work better if they are worded and/or spoken authoritatively and with confidence.

- <u>Consistent</u>: both *externally* with previous or other information by explaining changes from what was said in previous messages or differences with what others are saying, and *internally* with any one message itself, for example, by never saying something like "the radioactive plume is blowing to the east, don't worry."

As part of the Bay Area's regional training and exercise program, the Bay Area will develop training for local emergency public information providers aimed at addressing each of the above listed warning impediments and methodology for crafting effective warning messages.

OBJECTIVE 2.5: PROVIDE TIMELY AND EFFECTIVE WARNING INFORMATION TO ISOLATED POPULATIONS IN THE BAY AREA

Challenge: Warning isolation can exist for a variety social or physical reasons, for example, being old or having a hearing disability. People are isolated from receiving warnings in relative degrees because of factors that include functional needs such as living independently but being mentally, hearing or sight impaired; by virtue of membership in socially isolated groups such as being homeless, living in a rural commune, and being old; being engaged in warning isolating activities such camping or hiking; and much more.

There is no comprehensive catalogue of warning-isolated people in the Bay Area with access and functional needs, no comprehensive Bay Area approach to provide them warnings in a format that is acceptable to them--an important part of the solution for some sub-populations but not all--and no comprehensive Bay Area catalogue of specialized communication tools and approaches available to use to overcome the diverse range of reasons for warning isolation. The extraordinarily diverse character of the population in the Bay Area exacerbates the challenge of reaching everyone who is isolated from warnings.

While many OAs in the Bay Area have developed programs to support some populations with limited English proficiency, for example, Spanish and Chinese speakers, or with functional needs such as the deaf, only limited and uneven planning for reducing warning information isolation for everyone is in place. In addition, the unique and somewhat different needs regarding warning isolation of populations in institutionalized care facilities lacks clarity.

Causes: Developing solutions to meet this challenge may seem insurmountable to anyone who has sought to fully consider and address its complexity. The bases or reasons for warning isolation are diverse, and some are obvious and others are less apparent. Many warning isolated access and functional needs groups do not have advocacy groups to represent their interests, many are in positions with little power to influence the political system, and many are simply unaware of their potential warning isolation. Moreover, the problem caused by warning isolation is not immediately apparent in all experienced warning and disaster events; clarifying consequences are most likely to be observed in infrequent rapid onset events in which members of warning isolated groups experience a lower probability of surviving.

Solution and Benefits: The Bay Area will reframe the issue of warning isolation stemming from access and functional needs. The traditional approach of addressing one isolation problem at a time (such as warning delivery isolation versus public warning education

isolation), one group at a time (such as people who speak one particular language), and one disability at a time (such as the hearing impaired at a time) will be replaced with a holistic approach that enables all warning isolation problems to be considered comprehensively.

This general and comprehensive approach will address the isolation problem by being fully informed about all isolation problems and all approaches currently available to solve them as follows. First, the full set of reasons for warning isolation will be brought together so that all the types of people who are warning isolated are known, for example, people isolated by social position, activity, impairments, language, location and more. Second, relationships will be built with the advocacy groups that exist for access and functional need groups to develop their outreach assistance to individuals within each of these groups who are warning isolated. These same relationships will be used to develop warning education outreach to reach the same people. Some of these advocacy group outreach efforts may be specific to individual Operational Areas while others may be Bay Area wide. Gaps in this approach may be identified in so far as it may be discovered that some warning isolated groups may not have advocacy groups. Approaches to reach warning isolated people without advocacy groups will be considered as they arise.

The Bay Area will develop dedicated means to communicate warnings to key decision makers in congregate care facilities housing institutionalized populations that go beyond assuming they will receive warnings issued to the general population. The related topic of warning isolation for people in institutionalized settings, for example, nursing homes, hospitals, prisons, and other congregate care facilities will be part of the general and comprehensive approach, but the solution may be different. Warning isolated people in institutionalized settings do not typically respond to warnings as individuals. Instead, the facility responds as a whole under the direction of facility decision makers. But experience shows that these decision makers can be isolated from generally issued warnings and that this isolation sometimes has consequences for many.

Once the isolation issue has been generally framed and is fully informed, the Bay Area will develop an approach that builds on an economy of scale and avoids duplication of effort across OAs. For example, some advocacy groups may serve constituents across different OAs. Successes and lessons learned regarding specific isolation abatement activities and solutions that have worked in OAs will be shared across OAs. Existing successful outreach activities, for example, for other non-warning topics such as general preparedness and mitigation, will be built on to reach isolated populations regarding warning and warning education. Special and unique warning and warning education delivery channels, special technology, culturally appropriate language and translations for both warning and warning education will be addressed comprehensively for all isolated populations.

GOAL 3: ACQUIRE TOOLS AND TECHNOLOGY NECESSARY TO PROVIDE EMERGENCY PUBLIC INFORMATION AND WARNING BEFORE, DURING AND AFTER AN INCIDENT

With the appropriate standards, structures and plans in place, the Bay Area will be in a much stronger position to integrate its existing tools and acquire new interoperable tools and technology for use across the region in the delivery of emergency public information and warnings. Today's tools and technology coupled with existing tools provide new and ever expanding opportunities to reach the public with emergency information and warnings. These tools include text messages through mobile devices, telephone notification devices, sirens, message signs, social media and much more. While technology and tools play a vital role in building the Bay Area's system of systems, these tools and technology are but one piece in the puzzle.

OBJECTIVE 3.1: INTEGRATE EXISTING AND FUTURE WARNING TOOLS IN THE BAY AREA

Challenge: Public warning systems in the Bay Area are a patchwork quilt of technologies, media, vendors and policies, and there are both duplications and gaps in its coverage. This has resulted not only in uneven service to the public but also inefficiencies in procurement and operations.

Causes: To some extent this patchwork approach is typical of the specialization and division of labor that characterized the Twentieth Century. Like public safety communications and other systems, individual warning capabilities sprang up ad-hoc to address various threats (civil defense, weather, fire, hazmat, etc.), using various technologies (sirens, broadcast radio and TV, indoor bells, etc.) under the auspices of a variety of agencies and authorities and funded for specific purposes from various sources. There was no emphasis on coordinated development, nor were there technical or organizational mechanisms for coordination.

While in the Twentieth Century having separate systems were the norm, the introduction of digital controls into all sorts of devices, including warning systems, triggered a broad movement toward interconnection and interoperability in the 21st Century. The Internet supplied both inexpensive technologies of integration and a compelling metaphor of an integrated world based on the assumption that technical systems were connected rather than separate by default.

This paradigm shift came brutally to the attention of the public safety community on 11 September 2001, when a variety of shortfalls of technical interoperability and related disconnects at the procedural and organizational levels became vividly and tragically clear.

Several other factors converged during the same period into a new integrated all-hazard approach to public warning practice. Social science research on warning effectiveness and public behavior was collected and brought to the forefront. A technical standard called the Common Alerting Protocol made it feasible for the first time to control a wide variety of different warning technologies with a single digital input. The Federal Communications Commission, the Federal Emergency Management Agency and the National Weather Service adopted CAP as a way to leverage federal warning systems through better coordination and all-hazard use. Not least important, with funding for government and public activities shrinking across the board, warning system operators began to search for efficiencies and economies.

Even so, during the post-9/11 and post-Virginia Tech periods powerful pressure toward fragmentation continued to come from the competitive marketing of commercial warning products. Driven by a need to maximize market share, many vendors began aggressive marketing of single-medium specialized systems, and much of the marketing was targeted at the potential customers with the least market power and the least access to independent expertise, including municipalities and school districts, in particular. Thus while the trend toward integration and efficient use of finite warning capabilities has been firmly established at the international and federal level and in a few pockets of technical sophistication, the Twentieth Century trend toward fragmentation and duplication of warning capabilities has only gradually slowed at the local level.

Solution and Benefits: The state of the art in public warning globally uses a single standard message in the CAP format from any authorized source, aggregated through a shared "clearinghouse" server that implements the open CAP standard, to activate multiple warning delivery systems concurrently with a common message. In this way the reach, reliability and increased persuasiveness of multi-modal warning delivery is achieved without duplication of effort or the risk of inconsistency in messaging inherent in operating multiple separate systems. Such is the design of the FEMA IPAWS program, of the State of California's Emergency Digital Information System (EDIS), of state-level systems in at least a dozen other states, and of the Contra Costa County warning system in the Bay Area.

A clearinghouse system serving the Bay Area will bind all the existing warning capabilities of OAs, municipalities and districts into a comprehensive system of systems. Among the numerous benefits of such an approach four are particularly noteworthy:

- In combination with inter-agency reciprocity under the Bay Area Emergency Public Information and Warning Compact it will provide a simple consistent mechanism for managing warnings when a hazard extends across OA boundaries;

- It will simplify the implementation of IPAWS by providing a single activation tool for both smaller emergencies and those of such scope and severity as to require automatic forwarding to federal warning systems (i.e., EAS broadcast interrupt, cellular alerting via CMAS, National Weather Radio) via IPAWS;

- It will simplify training, as alert originators need only master one alerting tool, which will be controlled by the users rather than by a warning system vendor; and,

- It will provide a "plug and play" architecture that minimizes the cost of changing warning systems or system vendors, thus ensuring competitive procurements not only initially but also in future years as old systems are retired and new ones introduced.

A CAP-based warning system has three basic components:

- Computer applications for creating the master CAP alert messages that in turn will activate all appropriate warning delivery systems. Such tools can be general purpose or they can be specialized for a particular hazard or agency. Such tools typically provide pre-scripted templates for common hazards and protective action patterns (shelter-in-place, evacuate, etc.) In most cases mapping tool is provided to allow the targeting of alerts to ad-hoc warning areas. The user tool can be a stand-alone application or a web application provided from the CAP Aggregator (see below.) User tools can connect to the Aggregator via encrypted Internet Protocol connections over commercial, wireless or agency-restricted networks and can operate on mobile wireless devices (smartphones and tablets) as well as laptop or desktop computers.

- The CAP Aggregator (sometimes called the "server") is a redundant high-reliability application running simultaneously on two or more computers. The primary purpose of the Aggregator is to authenticate alerts as coming from sources authorized to use the system. The Aggregator maintains a current collection of alerts that are currently in effect, as well as logs of all prior system activity. On receipt of an authenticated CAP message the Aggregator "pushes" the alert to the various connected Delivery System Interfaces.

- For each delivery system (telephone notification system, sirens, social media, IPAWS, etc.) a Delivery System Interface evaluates CAP messages to determine whether they meet usage rules set by the delivery system's owner. Such rules may restrict the use of a particular system on the basis of geography, severity and urgency of the hazard, source of the alert or any other of the many elements and

parameters in a CAP message. Provided an individual alert message passes the "policy filter" for a particular delivery system, the Delivery System Interface then converts the content into an appropriate format for the system (e.g., via text-to-speech conversion for telephone or other audio delivery system, to a brief text string for social media, to video for cable-interrupt systems, etc.)

As discussed below there are several Aggregator platforms already in operation in California, and those generally provide activation tools to registered users. There would be no immediate benefit from creating another such system. Aside from any funding contributions or fees for shared use of such an Aggregator, which would need to be negotiated with its operator, the main cost of CAP origination is for alert originator training, which could be minimized by providing an operational "warning center" support function to Incident Commands (discussed in Objective 2.2)

Any existing warning system can become part of the coordinated regional system by the activation of a Delivery System Interface. Most major commercial warning technology providers already include CAP interfaces to their products. For systems not already CAP-capable the cost of installing Delivery System Interfaces is typically on the order of a few thousand dollars per delivery system, with maintenance typically in the range of 10-15% per year. This cost could be offset over time by migrating toward joint regional procurements for "commodity" capabilities such as telephone notification.

The recommended Bay Area Emergency Public Information and Warning Compact sets forth a basic standard of practice for an integrated regional warning capability. A duly designated Incident Command will issue all warnings through the regional system. Operators of local warning systems will retain the freedom to use their own systems for additional purposes beyond those permitted under the Compact.

A standards-based, vendor-independent warning integration platform for the UASI region will map seamlessly to the existing Bay Area mass-media market while also integrating with emerging social media and more precisely targetable warning systems. By federating existing warning capabilities into a regional system-of-systems the region can begin to secure the benefits of integration without disrupting existing programs or arrangements. At the same time, the region can open the door to economies of scale in future procurements of "commodity" services such as telephone-based notification.

These benefits can be achieved even without the creation of a large new regional program or facility. Three alternatives are available, in order of preference:

- Contract with the existing operator of a local CAP-based warning system, the Office of the Sheriff of Contra Costa County, to make its server facilities available on a regional level;

- Partner with the California Emergency Management Agency to make its existing CAP-based EDIS network available as part of its next-generation RIMS deployment; or;

- Rely solely on the new federal IPAWS program to provide the aggregation service for local as well as federal warning systems.

Of these three options, the existing Contra Costa County control system is the most practical. It has been in stable operation for more than a decade, was one of the first operational systems using the CAP technology (in 2006) and has already been integrated with a wide array of local warning delivery systems.

The State's EDIS system has been in CAP-based operation even longer, but the State has very little experience in interfacing its CAP server to local warning systems and State budgets may not be entirely reliable. The federal IPAWS system is as yet untested and is operated by an office within FEMA that has no inherent programmatic responsibility for state or local emergency response; also, again, FEMA has no direct experience with integrating local warning systems.

OBJECTIVE 3.2 EXPEDITE IMPLEMENTATION OF THE FEDERAL INTEGRATED PUBLIC ALERT AND WARNING SYSTEM (IPAWS).

Challenge: Most of the OAs in the UASI region have not yet begun the process of gaining access to IPAWS, and only one has completed the process. This new federal "umbrella" system, which became active in June, 2012, is the new gateway to federal warning systems including the EAS, the new national CMAS and NOAA Weather Radio.

Causes: Although limited resources are frequently cited as a constraint, the primary reason for the current lack of IPAWS adoption appears to be a simple lack of awareness and information. In addition, uncertainty about technical aspects of the process appears to be a particular challenge for agencies not already using a Common Alerting Protocol (CAP)-based control system.

Solution and Benefits: Bay Area OAs and allied agencies will move to rapidly implement IPAWS across the Bay Area. IPAWS is designed to enable Federal, state, territorial, tribal, and local alert and warning officials to access multiple broadcast and other communications pathways for the purpose of creating and activating alert and warning messages related to any hazard impacting public health and safety.

Agencies with warning responsibilities in the Bay Area will gain access to IPAWS by completing each of the following steps as outlined in the FEMA Toolkit[20] for adopting IPAWS:

- Obtain an IPAWS-certified warning control software package. Access to IPAWS is free; however to send a message using IPAWS, an organization must procure its own IPAWS compatible software. Software should be successfully tested in the IPAWS-OPEN test environment. Each agency should consult its software developer to ensure its system is IPAWS-OPEN compatible. For a list of private sector developers, go to: http://www.fema.gov/pdf/emergency/ipaws/open_developers.pdf

- Apply for a Memorandum of Agreement (MOA) for IPAWS Access with FEMA. To request to become a COG, an MOA governing system security must be executed between the sponsoring organization and FEMA. Each MOA is specifically tailored to the sponsoring organization and interoperable software system. Agencies should download the MOA application, review the instructions, complete and return it to ipaws@dhs.gov. Agencies should indicate in the subject line of the email

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[20] A State Toolkit for Adopting IPAWS, Federal Emergency Management Agency, accessed at
http://www.fema.gov/library/viewRecord.do?id=5830

"Operational COG Application." To access the MOA Application, go to: http://www.fema.gov/pdf/emergency/ipaws/cog_moa_app.pdf

- Obtain State of California concurrence as to areas and types of warnings each agency will issue. Local authorities that want to send warnings to the public through IPAWS must complete an application defining the types of warnings they intend to issue and the extent of their geographic warning area. The application for IPAWS Public Alerting Authority is provided when an agency applies for a COG MOA, along with contact information for a designated state reviewer. In order to ensure consistency with appropriate state, territorial or tribal public alerting plans, the application must be reviewed and signed by a designated State of California official before it is submitted to FEMA.

- Have all authorized warning originators complete a two-hour online course on IPAWS procedures and appropriate use. FEMA's Emergency Management Institute offers the independent study course, IS-247 "Integrated Public Alert and Warning System." The course is online at: http://training.fema.gov/EMIWeb/IS/is247.asp

As part of the process of gaining access to IPAWS, the Bay Area will host an online training workshop with supporting reference materials. The workshop should center on an introduction to IPAWS, what it can do, what it cannot do and lessons learned from actual IPAWS users in the Bay Area, e.g., Contra Costa County. To the extent practical, this workshop should also involve Cal EMA and FEMA Region IX.

OBJECTIVE 3.3: EXPEDITE IMPLEMENTATION OF THE COMMERCIAL MOBILE ALERTING SYSTEM (CMAS)

Challenge: More and more people are using mobile wireless devices as their primary and sometimes sole means of communication. In order for warning providers to keep pace with this technology and get warning information to the people who need it, a means to deliver effective alerts and warnings to wireless mobile devices is critical. To address this challenge, many jurisdictions, including those in the Bay Area, have developed text messaging capabilities for mobile devices. While these locally owned and managed systems are a step forward, there remain gaps in their capabilities. Many of the locally managed systems are subject to network overload problems, the public must "opt-in" to receive the warning messages and regular text message charges may apply.

Causes: Many agencies in the Bay Area are simply unaware of CMAS, what it can do and how to avail themselves of it. In addition, uncertainty about technical aspects of the process appears to be a particular challenge for agencies not already using a Common Alerting Protocol (CAP)-based control system.

Solution and Benefits: Bay Area OAs and allied agencies can use the Commercial Mobile Alert System (CMAS) to provide warning text messages to the public in appropriate cases.[21] CMAS allows warning authorities to use the IPAWS-OPEN platform to send geographically targeted, text messages of up to 90 characters to members of the public through a person's wireless device. CMAS messages cover three topic areas:

- Presidential messages
- America's Missing: Broadcast Emergency Response (AMBER)
- Imminent threat messages.

While presidential and AMBER messages are defined, what constitutes an "imminent threat" is far from agreed upon by the warning community. The Bay Area will use the BAEPIWC to produce a consistent definition of that term for warning agencies in the region to operate under.

Unlike most subscription based warning services, CMAS will enable warning messages to be sent to any cell phone within range of a particular cellular communications towers. CMAS messages can be sent even if cellular voice and data services are overloaded. CMAS

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[21] Once an agency has been granted access to the IPAWS upon completing the four step sign-up process, that agency will be able to use CMAS.

also uses a unique signal and vibration to attract attention, which is designed to help those with access and functional needs become aware of the message.

Members of the public do not need to opt-in (sign-up) for CMAS messages, and, unlike most subscription based cell phone alerting programs, individual members of the public and the local warning agencies will not be charged for the delivery of CMAS messages. While members of the public don't have to sign up for CMAS messages the public can "opt-out" of receiving CMAS messages (except for Presidential messages for which people cannot opt out).

While CMAS can be an effective tool for the Bay Area to avail itself of, it has limitations. Each message, for example, is limited to 90 characters. This *may* result in increased delays in time for people to take protective actions as they take more time to find the information that is *not* in the 90 character message. The appropriateness of protective actions taken by the public may also go down as people receiving the warning search for additional information some of which may turn out to be wrong. There is no hard social science data on these possible negative results at this time. However, social science experts in the field have hypothesized on these results and research may be forthcoming in the future. The Bay Area regional EPI&W Program Manager will follow and track the social science data on this topic to ensure the region is kept fully informed.

In December 2011, FEMA and the DHS Science and Technology directorate partnered with the New York City Office of Emergency Management, and participating wireless carriers, to conduct an initial test of CMAS across New York City's five boroughs. The New York City test verified end-to-end connectivity of CMAS, and was specifically designed to examine the following points of warning delivery:

- Origination of a Common Alerting Protocol (CAP) message
- Authentication of this message through the Federal Alert Aggregator, also known as the IPAWS Open Platform for Emergency Networks (IPAWS-OPEN)
- Delivery of the message through participating Commercial Mobile Service Provider Gateways
- Dissemination of the message to mobile devices

The Bay Area will work with its partners in New York City to understand best practices and lessons learned from the CMAS test and the efforts that led up to it.

OBJECTIVE 3.4 DEVELOP POLICY AND GUIDANCE FOR SOCIAL MEDIA USE IN EPI&W AND FORMALLY INTEGRATE SOCIAL MEDIA ACTIVITIES INTO RESPONSE PLANS, INCLUDING THE ESTABLISHMENT OF COMMUNITY PARTNERSHIPS

Challenge: OAs and regional stakeholders are exploring the use of social media as a platform for EPI&W to varying degrees. Established policies for use of use social media in OAs across the region are relatively non-existent. Similarly, the role of these platforms in response has been largely relegated to ad-hoc usage, leading to uncoordinated messaging across public information events.

Causes: Monitoring and warning through social media varies across OAs. In general, the use of social media tools can be considered to support four distinct functions within individual OAs, progressing as follows:

1. Use as an awareness or listening tool (e.g. monitoring various platforms and pulling in relevant information and data)
2. Use as a one-way communications tool (e.g. pushing out warnings and related information to individuals)
3. Use as a two-way communications tool to engage with the community, creating a dialogue by both sending and receiving information (e.g. education and training opportunities)
4. Use as a tool to leverage the community as a resource in response efforts (e.g. mobilizing and achieving communal goals).

Most OAs recognize the value of providing information via social media and have media accounts on Twitter and Facebook, but many have not developed specific strategies to guide use across in support of these functional areas. Furthermore, OAs have not conducted a formal analysis to better understand the demographics of their social media audiences.
Issues of strategy development are compounded by the lack of existing policy. Few OAs reported that they have a social media policy in place, making it difficult to formally develop and incorporate the use of these capabilities into both day-to-day and response related EPI&W activities. Furthermore, information sharing between OAs around best practices and lessons learned has not been robust.

Solution and Benefits: The results from the San Mateo County Sheriff's Office of Emergency Services' survey of all OAs in California on the use of social media in emergency management should be used to help formulate approaches to utilize social media effectively. Common challenges in the use of social media should be identified and addressed at the OA and regional levels through development of policy and guidance documents. Specific attention should be given to how best to incorporate the use of social media tools into existing EPI&W activities and frameworks, such as integration into the

workflow of a Joint Information Center (JIC). Understanding how social media capabilities fit within the functions of a JIC will allow OAs and regional stakeholders to better synchronize messaging across all media during response. Reports such as the "2011 Social Media + Emergency Management Camp: Transforming the Response Enterprise," written by CNA[22]and "Disaster Relief 2.0: The Future of Information Sharing in Humanitarian Emergencies," written by the Harvard Humanitarian Initiative[23]point to some of the common challenges encountered by response organizations in adapting to the use of new technologies thus far.[24]Regional working groups should be established to review and incorporate existing guidance on the use of social media in emergency management into OA and regional policies. Examples of existing policy and guidance documents can be found through the U.S. Army,[25] the U.S. Navy,[26] the Center for Disease Control,[27] the International Association of Chiefs of Police Center for Social Media,[28] and the report, "Designing Social Media Policy for Government: eight Essential Elements," by the Center for Technology for Government.[29]

By defining how social media tools can be used, and who can use the tools, OAs will be able to better define strategies for the growth and sustainment of their social media capabilities. The effective use of social media platforms during response is dependent on OAs having established a credible *voice* on the relevant mediums. This type of reputation building is done through day-to-day engagement on the platform. By specifically defining guidance and policy, organizations will be able to more effectively leverage these platforms during response by better understanding their audience, and developing an increased awareness of the social media activities of regional stakeholders through day-to-day engagement. While tools such as Schmap (ww.schmap.it) for Twitter, and Insights for Facebook, can provide a demographic breakdown of an OAs social media audience, OAs should recognize that the most intimate knowledge of their community will come through sustained interaction with that community.

In addition, to aid in the formal integration of social media capabilities in support of public information activities during response, targeting and outreach of strategic community partners, such as local radio stations and well-known local personalities who might have

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[22] See:
http://www.cna.org/sites/default/files/news/2011/Social%20Media%20Emergency%20Management%20Camp.pdf
or http://www.wilsoncenter.org/event/social-media-and-emergency-management-transforming-the-response-enterprise
[23] See: http://unfoldsite.pub30.convio.net/assets/pdf/disaster-relief-20-report.pdf
[24] In addition, more information can be found at http://idisaster.wordpress.com/
[25] See: http://www.slideshare.net/USArmySocialMedia/army-social-media-handbook-2011
[26] See: http://www.cnrc.navy.mil/pao/socialnetwrk/soc_med_hnd_bk.pdf or
http://www.slideshare.net/USNavySocialMedia/sm-handbook-print
[27] See: http://www.cdc.gov/socialmedia/Tools/guidelines/pdf/SocialMediaToolkit_BM.pdf
[28] See: http://www.iacpsocialmedia.org/
[29] See: http://www.ctg.albany.edu/publications/guides/social_media_policy/social_media_policy.pdf

large audiences on social media, should occur in advance of response events. As an example, the Los Angeles Police Department partnered with Ashton Kutcher and several L.A. area celebrities to get alert messages out via Twitter about a significant freeway closure. The role and expectations of these partners should be explicitly communicated, and documented in response plans.

Because of the ease in which information can be published by individual participants on social media platforms, the ability of OAs to control messaging around an incident is somewhat limited relative to traditional mediums. Leveraging credible community partners to disseminate and reinforce OA messaging on social media platforms will help to drive messaging congruent with the overall public information strategy. In particular, as rumors and misinformation can quickly spread on social media platforms in the wake of a disaster, pre-established partnerships can help to quickly suppress these rumors and direct individuals toward more credible and verified sources of information. A related benefit to the development of community partnerships is that by identifying the appropriate partners ahead of an event OAs can better reach socially vulnerable populations.

GOAL 4: DEVELOP AND PROVIDE EMERGENCY PUBLIC INFORMATION AND WARNING TRAINING, EDUCATION AND EXERCISE PROGRAMS

Training, education and exercises will be crucial to effectively develop and sustain an interoperable standards based public information and warning system of systems across the Bay Area. This will include broad integration of public information and warning into regional training and exercise programs as well more discreet training, education and exercise steps that must be taken.

OBJECTIVE 4.1: FULLY INTEGRATE PUBLIC INFORMATION AND WARNING INTO REGIONAL TRAINING PROGRAMS.

Challenge: Training on public information and warning at the local level in the Bay Area is sporadic, as it depends on available funding and time. While most OAs have JIC and a Crisis and Emergency Risk Communication training course available for PIOs, only about half of the OAs have training opportunities for potential incident commanders or other first-level field response supervisors regarding warning capabilities, policies and procedures. While the Bay Area does have a Regional Training and Exercise Program, EPI&W does not have a significant role in it and few public information and warning courses have been offered as a result.

Causes: The Bay Area Regional Training and Exercise Program manages regional training and exercises for the entire 12 county Bay Area region. Training and exercise initiatives are organized by discipline: Law, Fire and Health, etc. However, since the EPI&W capability spans multiple disciplines, there are few specific regional training efforts focused specifically on EPI&W. In addition, dwindling resources and competition with other homeland security and public safety demands make emphasizing public information and warning even more difficult. This is further compounded by the cost and time needed to deliver effective training across the region.

Solution and Benefits: The Bay Area will develop and adopt coordinated curricula for covering the full range of topics for EPI&W. Courses should include:

- Basic Public Information Officers Course (G-290)
  http://training.fema.gov/stcourses/crsdesc.asp?courseid=G290

- Advanced Public Information Officer (E-388)
  http://www.training.fema.gov/emicourses/crsdetail.asp?cid=E388&ctype=R

- Advanced Incident Command System (ICS-400)
  http://training.fema.gov/stcourses/crsdesc.asp?courseid=G400

- National Incident Management Systems (NIMS), Public Information Systems (IS-702)
  http://training.fema.gov/EMIWeb/IS/is702.asp

- National Response Framework (NRF), An Introduction (IS-800)
  http://training.fema.gov/EMIWeb/IS/is800a.asp

- Community Warning Training for Incident Commanders

- Developing Warning Messages that Motivate Public Behavior

- Warning Systems and Technologies

- Using Bay Area Message Templates to Issue Warnings

- Using Social Media to Monitor Public Response and Refine Message Content

Specialized EPI&W training on access and functional needs as well as limited English skills should be incorporated into any program developed. Regional training efforts would also profit from organized programs delivered online or at sub-regional sites to minimize travel. To help achieve this, the PM for Training and Exercises and the newly designated PM for EPI&W will work together on an annual basis to update the Regional Training and Exercise Plan to ensure it adequately addresses EPI&W training (and exercise) needs.

With dwindling federal grant funds, the Bay Area will also seek to leverage partnerships between OAs and "allied agencies" in the region to include maritime ports, mass transit agencies and airports. These agencies have EPI&W responsibilities and capabilities of their own and the ports and mass transit agencies have access to federal grant funds that can be leveraged with UASI and SHSP funding to promote and fund joint training (and exercises) between OAs and the allied agencies.

To foster collaboration among the OAs, ports, transit agencies, airports and other allied agencies, the EPI&W PM will work to coordinate the development of federal investment justifications for each of the grant related programs in order to jointly fund EPI&W training (and exercises) activities that will benefit all stakeholders. In doing so, the PM will engage the Bay Area leadership within the UASI, port security and transit security grant programs and the SHSP. These collaboration efforts should also be fully integrated into and accounted for in the Regional Training and Exercise Plan.

Finally, not yet available new discoveries and knowledge in the social sciences are on the horizon. For example, a 2012 project is underway entitled "Setting the Standard in Risk Communication Trainings" to produce new knowledge about how to best train local emergency warning providers using the latest warning knowledge in the social sciences. This is being sponsored by the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T). A second project is entitled "Comprehensive Testing of Imminent Threat Public Messages for Mobil Devices." This project will subject social science evidence-based short-text public alert and full-text public warning messages to rigorous empirical laboratory testing—something that has never been done before. The results of projects like these cannot now be anticipated. However, the Bay Area will pay special attention to these and other projects as they reach conclusion.

OBJECTIVE 4.2: FULLY INTEGRATE PUBLIC INFORMATION AND WARNING INTO REGIONAL EXERCISE PROGRAMS.

Challenge: Large-scale, regional exercises do not always contain a EPI&W element or bring in EPI&W partners, and less than half of the OAs have participated in regional exercises that involved coordination of emergency public information activities or tested regional plans. For example, only one of three recent major exercises included testing of JIC plans. This lack of regional exercises focusing on public information and warning prevents the Bay Area from fully understanding cross jurisdictional capabilities and policies and building toward a more integrated and coordinated regional approach to public information and warning for major incidents. While some regional exercises include public information, but there have been few, if any, opportunities to exercise warning-related activities at the regional level.

Causes: The Bay Area Regional Training and Exercise Program manages regional training and exercises for the entire Bay Area region. Training and exercise initiatives are organized by discipline: Law, Fire and Health, etc. However, since the EPI&W capability spans multiple disciplines, there are few specific regional exercise efforts focused specifically on EPI&W. Moreover, the relative infrequency of major regional incidents results in few opportunities to test regional coordination in a real world environment.

EPI&W does not have a significant role in the Regional Bay Area UASI Training & Exercise Program. Planning for regional exercises focuses primarily on security and tactical scenarios. The cost of planning and conducting exercises contributes to a lack of focus on public information and warning. Coupled with dwindling resources and competition with other homeland security and public safety demands, emphasizing public information and warning in exercises becomes even more difficult.

Solution and Benefits: The Bay Area will identify opportunities for coordinated cross jurisdictional exercises and expand other exercise efforts in the region to test and evaluate the EPI&W capability. This will include exercises that include public information and warning as part of a larger scenario and capabilities to be tested, as well as designing exercises specifically around testing and evaluating EPI&W.

Collaboration between the PMs for EPI&W and Training and Exercises will also involve the design and execution of the annual Urban Shield Full Scale Exercise put on by the Bay Area UASI and administered by the Alameda County Sheriff's Department. Each year, Urban Shield tests and evaluates a multitude of capabilities from intelligence to urban search and rescue based on a wide array of hazards that pose a risk to the region. As such Urban Shield will provide an excellent setting to test and evaluate the region's ability to

craft and deliver a multitude of emergency public information and warnings based upon those differing hazards.

In addition to regional exercises, OAs across the region can also benefit from, "exercise mutual aid," such as sharing exercise templates and simulation resources to reduce the burdens on individual OAs in developing and putting on an exercise. Maximize economies of scale by sharing exercise templates and simulation resources.

Finally, most entities have an after-action analysis process, but the findings from these are not widely shared. To facilitate information sharing in this area, the regional EPI&W PM will develop, in coordination with the Regional Training and Exercise PM, a Sharepoint® or equivalent password protected database of AARs that can be accessed by regional stakeholders.

OBJECTIVE 4.3: SHARE AND COORDINATE PUBLIC WARNING SYSTEM TESTING SCHEDULES

Challenge: The frequency and schedule of testing for public warning systems varies greatly among the Operational Areas (OAs), municipalities and other warning system operators in the Bay Area. Some systems are tested weekly, while others are tested monthly or not at all, but rely instead on actual use for continuing operator training and verification of reliability. In addition some systems are not tested end-to-end but only partially.

As a result of disjointed testing, there is broad variation in the public's experience of warning tests and exercises from location to location, and system to system, across the region. This, in turn, has tended to confuse public expectations and political support for public warning systems. In addition, this lack of consistent practice has led to inconsistent training and procedures for warning system operators, and varying levels of confidence in the actual effectiveness of different systems and procedures.

Causes: A number of factors have contributed to the current situation:

- Historically, warning systems in different OAs and municipalities have developed independently with no mechanism or incentive for coordination.
- Some warning systems are subject to regulatory or procedural constraints on testing and exercise. For example, telephone notification systems utilizing 9-1-1 data are, by some interpretations of State law, prohibited from being exercised end-to-end in the absence of an actual emergency.
- Some warning systems (the broadcast EAS, for example) are tested by system operators who do not have actual responsibility for public alerting; significant parts of the actual warning procedure are therefore omitted from the test process.
- Several OAs and municipalities in the UASI region have multiple systems for delivering warnings (a highly desirable situation from warning reliability and effectiveness perspectives) but must follow separate activation procedures for each; this lack of technical integration makes consistent testing complex and laborious.

Solution and Benefits: As part of the regional compact, at a minimum, OAs and municipalities and other alert system operators (such as broadcasters participating in the Emergency Alert System) in the Bay Area will share their testing schedules. This could be done either peer-to-peer or through a shared clearinghouse overseen by the Regional EPI&W PM as regional coordination advances. Further, where opportunities exist for coordinated testing schedules they should be exploited. Such coordination will improve the calibration of public expectations regarding warning capabilities across OAs to inform

the adoption of exercise standards for equipment and systems. This also may lead to additional opportunities for regional exercises of warning procedures and policies.

OBJECTIVE 4.4: DEVELOP REGIONAL PUBLIC EDUCATION FOR WARNING AND PROTECTIVE ACTIONS

Challenge: There is no established and coordinated all hazards warning and public protective actions education strategy and outreach program for all the hazards for which warnings could be issued across the twelve OAs in the Bay Area. Members of the public may be unaware of changes in warning practices associated with the recent innovations such as the Common Alerting Protocol (CAP), the Integrated Public Alert and Warning System (IPAWS), and the Commercial Mobile Alert System (CMAS). Still others may be unaware of how they would receive warnings, where they would come from, and details about the protective actions they might need to take for different hazards when warnings are issued. Lack of familiarity with topics like these can increase public warning response delay and, for some particular hazards, reduce appropriate public protective action-taking. This challenge is magnified when dealing with rapid onset Bay Area hazards, e.g., tsunami or no notice terrorist attack, with protective action recommendations too detailed to include in an initial public warning.

Causes: Until recently, most public warning education activities have been conducted on a hazard by hazard basis. However, modernization of the public warning enterprise has recently re-formulated public warnings with an all hazards perspective. For example, innovations such as CAP, IPAWS, and CMAS now provide the opportunity for a standardized public warning approach across all hazards.

Solution and Benefits: The Regional Compact will ensure the Bay Area takes a consistent approach to public education for warnings and associated protective actions. The PM will help coordinate activities across Bay Area OAs, municipalities and allied agencies regarding public education for warnings.

The Bay Area will work together to develop consensus on a regional template for public warning education focused on generic information applicable across the Bay Area. This must include OAs, regional and state stakeholders, such as BART, Cal EMA, and Caltrans; and Bay Area NGOs that play or could play roles in pubic hazard warning education and outreach. This education campaign will not be confused with public hazards education to motivate public preparedness and mitigation activities such as *Putting Down Roots in Earthquake Country: Your Handbook for the San Francisco Bay Region.*

The public warning education template developed will constitute a standardized outline of topics which should include:
- A list and description of the hazards for which public warnings could be issued, and a full description of likely protective actions for each hazard that people could be

asked to take (with an emphasis on details too numerous to put in a warning, for example, the steps to take to appropriately shelter once inside building in an improvised nuclear device event, and how to shower if contaminated by radiation),

- An explanation of how the public would receive alerts and warnings, how to sign up for alerts delivered over mobile communication devices, and emergency alert radio and TV stations to turn to for more information during an actual warning event,
- Instructions on the appropriate use of social media during warning events,
- What people with special needs can do to receive warnings over special devices to reduce their warning isolation,
- Recommendations and information for people with functional needs about what they can do to obtain any needed protective action assistance and from whom (including want government can and cannot do to support them and what they can do to get assistance from others if wanted),
- What to do with pets,
- How evacuation routes and destinations might vary depending on the hazard, and planned public evacuation transportation
- What could happen with children in schools and day care facilities, etc.
- Emergency alert radio and TV stations to turn to get more information during an actual warning event, instructions on the appropriate use of social media during warning events, a full description of likely protective actions for each hazard that people could be asked to take (with an emphasis on details too numerous to put in a warning, for example, the steps to take to appropriately shelter once inside

Once this standardized template of public warning education topics is developed, each OA and allied agency will also be responsible for developing any additional OA or allied agency-specific information. Each OA and allied agency will ultimately produce their own specific public education "document" conforming to the consensus-based regional template that contains both OA-specific content as well as generic information applicable to the entire Bay area.

Development of the template will be informed by existing public warning education "documents" that others throughout the nation have already prepared (there are document like this, for example, in each county in each of the emergency planning zones around each of the nation's 104 operating nuclear power plants—the five counties around the Indian Point Nuclear power plant have particularly well developed documents) to take full advantage of ideas, information, approaches, and techniques used elsewhere. For example, those developed and in use to educate the public about warning and protective actions in areas close to nuclear power plants in the United States, and for other hazards in other places including in other nations.

Once this standardized template of public warning education topics is developed, generic information applicable across Bay Area OAs will be developed by consensus across the OAs of the Bay Area thereby providing an economy of scale. OA-specific information, however, will also be developed. Each OA will then produce an OA-specific public education "document" conforming to the consensus-based content template that contains both OA-specific content as well as generic information applicable to the entire Bay Area.

These "documents" will then be made available to the public. At a minimum, each OA will make them available on web sites and inform the public of their availability. Once this baseline is established, innovative ways to fund more aggressive and multiple channel public "document" outreach will be explored, developed, and used. For example, public service announcements, distribution by advocacy groups to public warning isolated people, enabling those who view or print the document from OA websites to forward copies to people they know, and more. This diverse effort will be performed keeping in mind that no public hazards education and outreach effort has ever been fully effective and that such efforts must be maintained over time. The documents will be updated over time as appropriate based on changes in warning technology, planning and practice. Leadership indigenous to the Bay Area will be needed to keep this activity alive over the long-haul.

OBJECTIVE 4.5: TRAIN AND EDUCATE ELECTED AND SENIOR OFFICIALS ON ADVANCES IN EMERGENCY PUBLIC INFORMATION AND WARNING PRACTICE

Challenge: Most Operational Areas (OAs) and many municipalities and other entities within the Bay Area have some ability to issue public warnings, but many have not yet adopted an integrated approach based on the Common Alerting Protocol (CAP) or taken steps to integrate the federal Integrated Public Alert and Warning System (IPAWS) into their systems.   As a result, the delivery of warning messages to the public is somewhat haphazard and inconsistent across the region and there is considerable duplication of investment as well as duplicate effort in warning system activation.

In addition to technology, many elected officials are often unfamiliar with the details of SEMS and the role of JICs in a multi-jurisdictional incident. For example, during a single jurisdiction incident, elected officials and their PIOs are accustomed to managing the media and public affairs. The SEMS also works well to integrate multiple agencies from a single jurisdiction. However, when multiple jurisdictions and associated elected officials become involved it becomes more challenging to coordinate emergency public information and warning among those jurisdictions.

Causes: Elected and other senior officials within the region are not consistently familiar with the benefits and requirements of the transition to CAP and, in particular, the CAP-based federal IPAWS. Unlike proprietary commercial offerings, there has been relatively little money spent on the marketing of these "open" lower-cost technologies. Additionally, most elected officials and their PIOs are not accustomed to having to coordinate with other officials from other jurisdictions when providing public information through the news media. A lack of training on JIC, ICS and the role of elected officials during a multi-jurisdictional incident compounds these facts and can result in disjointed emergency public information. This can be further compounded by inter-jurisdictional rivalries, which are common among cities, counties and states across the United States.

Solution and Benefits: The region should take advantage of the introduction of the cellular telephone-based Commercial Mobile Alerting System (CMAS) during 2012 as part of the federal IPAWS deployment as a highly visible public occasion for focusing policymaker and public attention on public warning issues. The IPAWS/CMAS "rollout" will provide a significant opportunity for mobilizing public and political support for regional collaboration in building a system of systems and for leveraging the experience of OAs that area already taking advantage of IPAWS and CAP.

As an immediate action the OAs, municipalities and other entities of the UASI region should bring the proposed Bay Area Public Warning and Emergency Public Information Compact

to the attention of their governing bodies. In addition to educating elected and other senior officials on the benefits of the BAEPIWC, this will serve as an opportunity to educate elected officials about modern public warning practice and inform them about regional issues and opportunities.

California's Senior Officials Workshop provides a forum to discuss strategic- and executive-level issues related to disaster preparedness and response, share proven strategies and best practices, and enhance coordination among officials responsible for emergency response to a disaster. Participants receive an Executive Handbook outlining the Emergency Management framework, as well as other key senior-level issues and discussions topics. In delivering this workshop, special focus should be given to the role of JICs and senior officials in coordinating the distribution of emergency information to the public through the media before, during and after an incident.

OBJECTIVE 4.6: INCLUDE REPRESENTATIVES OF THE ACCESS AND FUNCTIONAL NEEDS COMMUNITY IN EXERCISE PLANNING AND EXECUTION AT THE OA AND REGIONAL LEVELS

Challenge: Specialists and community organizations representing people with access and functional needs as well as people with limited English-language skills are often not engaged in the design of emergency exercises. Some have expressed concern that the warning and public information needs of their constituents may not be adequately addressed in such exercises. At the same time, many of those representatives have had only limited opportunities to become informed as to the details of existing emergency management and disaster response practices.

Causes: Emergency management offices and allied organizations struggle constantly to address the special needs of people with access and functional needs and others whose personal circumstances may tend to isolate them from emergency services including public warning and emergency public information. This has become particularly challenging in recent years, during which awareness of those needs has grown even as dwindling public resources have made addressing them in meaningful ways more difficult.

Additionally, recent regional and local disaster exercises in the Bay Area have included relatively little focus on public warning and emergency public information generally, even for the mainstream population. This has been due, in part, to resource constraints, as well as a post-9/11 emphasis on security-oriented exercises that have not always lent themselves to extensive public engagement.

Meanwhile, public expectations have also evolved under the influence of online and social media and of the increased availability of advanced personal wireless devices. Government agencies are expected to move swiftly to embrace new technologies and paradigms, but government is by nature an inherently conservative institution, one better suited to continuity than to rapid change. Thus many government agencies find themselves simultaneously ill-equipped and ill-funded to meet expectations for the "mass personalization" of communication to address individual needs.

A final consideration has to do with the lack of standards for the application of new and emerging tools to critical public safety applications. An example is the prospect of automated translation of alert messages. This capability appears to be coming close to reality. However, at present, there is no clear benchmark by which emergency and public-safety agencies can determine when the quality of translation becomes "good enough" for critical applications.   The same can be said of a wide range of new, potentially accommodative technologies. Thus, government officials often express concern that if they take the initiative to deploy a new technology they may be held at fault if it fails in some regard.

Solution and Benefits: Representatives from the EIAC and other organizations should become active in the design and execution of EPI&W exercises at the OA and regional level. These representatives will help set expectations and work with public safety and emergency management personnel on developing exercises jointly. The public safety community will work *with* the access and functional needs community and not *for* that community.

Specialists and community organizations can provide important expertise and resources in communicating with people with special communication concerns. Therefore, including representatives of such groups in the design and execution of future exercises is a crucial strategy in the search for feasible and effective measures to eliminate isolation from the general flow of public warning and emergency public information. Especially in a period of shrinking public resources, such involvement should not be merely an "advocacy" presence by representatives, but an active and creative participation by access and functional needs communities in devising and exercising their own solutions to this problem.

The Emergency Information Access Council should be viewed, therefore, not just as an advisory or advocacy group, but as an active emergency response organization in its own right. Active involvement in warning and public information exercises, with direct responsibility for the development of strategies and active participation in exercise play, is how organizations that are taken seriously in emergency management and disaster response behave, and the EIAC should be empowered and expected to do no less.

OBJECTIVE 4.7 INCREASE TRAINING OPPORTUNITIES IN SOCIAL MEDIA USE, AND ESTABLISH A REGIONAL PLATFORM TO EXCHANGE BEST PRACTICES AND DEVELOP REGIONAL AWARENESS AROUND EXISTING SOCIAL MEDIA CAPABILITIES

Challenge: There is a need for specialized training to adapt to technological advancements and the use of social media. Additionally, lessons learned and best practices around the use of social media to support EPI&W are not readily shared throughout the region.

Causes: Not all OAs are monitoring social media or using their social media accounts. Consequently, experience and comfort levels with using social media related technologies also vary across the region. Opportunities for training and specialization to adapt to technological advancements have not been provided. Furthermore, a mechanism for regional information sharing and best practice exchange around social media use does not exist.

Solution and Benefits: Personnel who use social media platforms to support EPI&W should be identified and provided with opportunities to attend trainings specific to the use of these tools. Several training opportunities are available through emergency management stakeholder organizations at the national level that can either be attended in person or virtually. Organizations that have provided webinars or conference related opportunities in the past have included the National Emergency Management Association, the Industrial Council of Emergency Technologies, and the Emergency Management Institute, the latter of which offered a webinar on social media use in emergency management in December 2011. Furthermore, websites such as www.sm4em.org and http://idisaster.wordpress.com provide numerous resources for self-directed learning.

By providing personnel with the time to attend webinars, or exploring the wealth of available materials related to the topic, general knowledge levels can be rapidly enhanced, leading to better use of the technologies within the organization. In addition to the many publicly available training opportunities, OAs could also consider having organization-specific training developed and delivered to their personnel. For example, one training consultant can provide tailored training at a rate of $200 per registrant.[30]

In addition, many of the skills necessary to effectively utilize social media tools during a response event can be developed in a "no-fault" environment by providing personnel the opportunity to use the relevant tools on a day-to-day basis. For instance, relevant personnel should be encouraged to participate in the weekly "#smemchat" conversations

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[30] See: http://www.engagingothers.com/social-media-training/

that occur on Twitter every Friday at Noon EST. This type of self-directed learning, or "learning by doing," can significantly increase personnel comfort with these tools.

In addition to increased training opportunities, opportunities for knowledge sharing across the region should be provided. This can be done through the establishment of a virtual platform for regional information exchange—similar to the Department of Homeland Security First Responders Communities of Practice Portal,[31] which is a medium where responders can exchange information around social media best practices for emergency management. Such a platform could be implemented at no cost and take the form of an e-mail group or discussion board comprised of regional stakeholders. This platform will not only provide a space to share best practices and lessons learned among relevant personnel, but it will contribute to providing increased awareness of the capabilities of OAs within the region. The dialogue generated through the platform will help enhance coordination and situational awareness during regional response efforts.

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[31] See: https://communities.firstresponder.gov/web/guest

SECTION 11 STRATEGY IMPLEMENTATION

11.1 Implementation Overview

EPI&W Strategy implementation is based primarily on implementing the goals and objectives within the *Strategy*. The regional program manager will have overall responsibility for managing and tracking execution and implementation of the *Strategy*. This will include working with appropriate stakeholders and through BAEPIN, the UASI PI&W Work Group and such other organizations and agencies as needed. The program manager will also be responsible for reporting to the Bay Area UASI Approval Authority and Advisory Group and other regional entities as needed on specific implementation tasks and ensuring that the *EPI&W Strategy* is followed and updated annually.

11.2 Sustainment and Integration

In FY 2011, the DHS grant programs experienced significant budget cuts. The UASI program in particular saw a 19% cut from FY 2010 levels with the State Homeland Security Program (SHSP) receiving a 35% cut that same year. While the *EPI&W Strategy* is not a grant strategy, grants will likely play a vital role in building the regional capabilities called for in the *Strategy*. The Federal budget for FY 2013 and beyond is under enormous pressure to incur cuts and grants to states and localities have been targeted for reductions that could eliminate numerous programs, including the UASI program. Coupled with tight local and state budgets, the need to develop a sustainment policy for the capabilities already developed in the Bay Area is vital.

11.2.1 Leveraging Multiple Funding Sources

Given the current fiscal reality, the Bay Area's investment strategy is to integrate and leverage all available funding sources. This is especially true as it relates to Federal preparedness and security grant programs, most of which drive toward a common purpose of enhanced preparedness and security in a given jurisdiction, region, or state, but often do so through stove-piped management and administration processes, which creates artificial barriers to collaboration. In order to better leverage scarce resources, it is the *Strategy* of the Bay Area to overcome these barriers and find ways to integrate programs while respecting the responsibilities and authorities vested in grantees. The Bay Area has received Federal grant funds each year from multiple programs that have a nexus to building EPI&W, including, but not limited to:

- Urban Areas Security Initiative

- State Homeland Security Program
- Metropolitan Medical Response System
- Citizen Corps Program
- Port Security Grant Program
- Transit Security Grant Program
- Assistance to Firefighters Grant Program
- Public Health Emergency Preparedness Program
- Hospital Preparedness Program
- Regional Catastrophic Preparedness Grant Program

Through the regional program manager, the Bay Area will work to coordinate the investments generated under these and other relevant programs to form a force-multiplying impact, allowing each grantee to implement investments and improve the interoperability of the EPI&W capability in the region in ways that could not be do independently. The intent is to do this through pre-existing planning structures and meetings already required by many of the grant programs. The integration of these programs and the EPI&W capability is outlined in Figure 4 below.

Figure 5 Program and Capability Integration Model
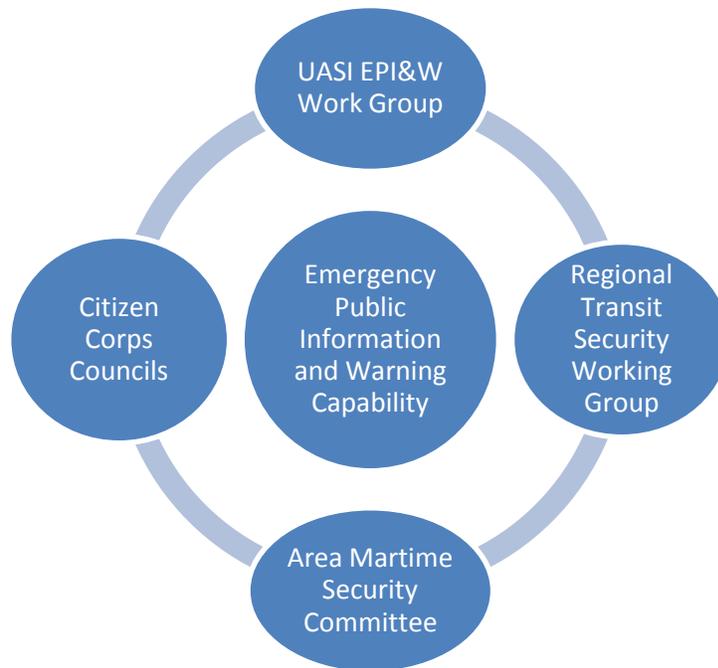
11.4 Projects for Implementation

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11.5 Investment Justifications

Since FY 2006, DHS has required states and urban areas to submit investment justifications in order to apply for SHSP, TSGP, PSGP and UASI funding. Both SHSP and UASI are part of the larger Homeland Security Grant Program and are very similar in terms of purpose and allowable spending areas. Investment justifications under each program may include a single project or multiple projects under a general topic, such as enhancing information analysis and infrastructure protection capabilities. The following principles will guide the Seattle Urban Area's approach to SHSP and UASI investment justifications:

- The investment justification process must be viewed as the culmination of a comprehensive homeland security planning and implementation process and not simply as a requirement in order to request money from DHS.

- The OAs, ports, mass transit agencies and the Bay Area UASI will integrate to the maximum extent possible the investment justification process when developing projects to sustain or enhance EPI&W. This approach will require significant up front planning and coordination between all effected entities.

- EPI&W investment justifications that fall outside the goals and objectives of the *EPI&W Strategy* will not be submitted. To this end, the Urban Area will strive to develop UASI, TSGP, PSGP and SHSP-funded projects simultaneously and through an integrated project planning and development structure with the regional program manager coordinating the process. While the overall time periods for each grant may be different, in most cases the timeline for each program *begins* at the same time even if the final deadlines for submitting investment justifications differ.

11.5 Role of the Program Manager

The EPI&W Program Manager will play a critical role in managing the overall implementation of each of the goals and objectives within the *EPI&W Strategy*. The Program Manager's core responsibilities for *Strategy* implementation are as follows:

11.5.1 Project Vetting

The Program Manager is responsible for leading the vetting of projects developed by OAs, regional planning hubs and other entities to ensure they comply with the *Strategy*. Project vetting should be done through the BAEPIN and/or the EPI&W Work Group. The exact vetting process shall be left up to the Program Manager and members of BAEPIN and the EPI&W Work Group.

11.5.2 Project Tracking

While the Program Manager is not an individual project manager for each project designed to implement the *Strategy*, the Program Manager will be responsible for ensuring that project managers develop project management plans and completion dates for approved projects related to the relevant *Strategy* goals and objective. Tracking projects will be critical to ensuring that goals and objectives within the *Strategy* are being achieved.

SECTION 12 STRATEGY EVALUATION

12.1 Evaluation Overview

Exercises are a critical means of determining whether the Bay Area is building towards its envisioned system of emergency public information and warning systems. As such, any assessment program must include a robust exercise and evaluation element to ensure data from simulated incidents are integrated with self-assessment data, and of course, real-world incident data collected both during and after the incident when available.

Figure 5 Planning and Evaluation Cycle
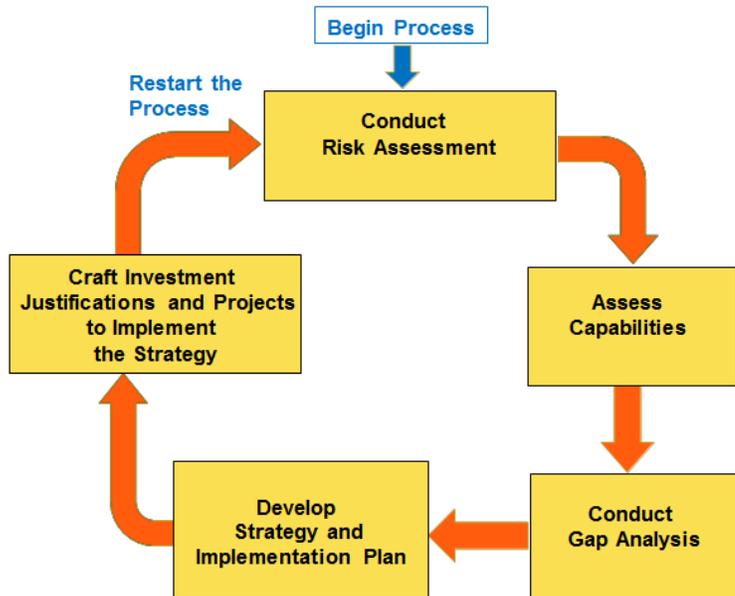
Figure 5 demonstrates the cyclical nature of the preparedness and risk management and planning process. This cycle demonstrates that the *EPI&W Strategy* is never truly finished, as new data emerges and updates to the *Strategy* are put into place.

In order to truly understand what value the Bay Area is getting for its EPI&W investments, the region must have a consistent mechanism for measuring the effectiveness of the EPI&W activities – plans developed, personnel hired, equipment purchased, number of people trained, and exercises conducted – generated through those investments.

12.2 Methods for Evaluation

There is no single method to assess capabilities. Rather, there are a number of data sources and methodologies to help with this process, each of which the Seattle Urban Area will utilize in the evaluation process:

- Self-assessments
- Performance-based assessments (real world and exercise events)
- Modeling and simulation

12.2.1 Self-Assessments

Self-assessments are those assessments that involve local subject matter experts answering a set of defined questions to determine the level of capability the region, or a part thereof, has relative to the risks faced by the region. The Bay Area and its component jurisdictions have undergone several self-assessments over the last several years, using a wide array of methodologies. Self-assessments are a useful way for subject matter experts to discuss and review data to make capability level determinations.

12.2.2 Performance-Based Assessments

Performance-based assessments are most common in the form of exercises, although an ability to track and measure performance during a real world incident would provide the most accurate picture of capability. For the Bay Area, performance-based exercises should be based on testing the region's ability to effectively use a system of emergency public information and warning systems to help prevent, protect against, mitigate, respond to, and recover from those terrorism and natural hazard scenarios that pose the greatest risk to the region. The Urban Shield full scale exercise is the Bay Area's premier performance based evaluation tool and will be a critical component to evaluating and testing improvements in EPI&W across the region.

12.2.3. Modeling and Simulation Assessments

Quantitative capability models can be used to assist with planning and resource allocation, and to help determine capability gaps. Models can provide an independent baseline estimate of required levels of capability for a given OA, jurisdiction or the Bay Area region, based upon national averages, demographic information, and risk criteria. These models can use quantitative data to inform investment decisions by estimating the full life-cycle costs of achieving a given level of a capability, identifying capability gains from investments, and optimizing placement of new resources.

Appendix A
MESSAGE DELIVERY TOOLS

A variety of different alert and message delivery systems exist in the Bay Area. Different Operational Areas (OAs) have different mixes of systems, and system additions and upgrades are in varied states of development across OAs. No one of these systems is without shortcomings, but each has its own individual merits. Moreover, each system has a role to play in public alert, warning, and emergency information delivery. The following is a summary of those systems which are not presented in any particular order.

Route Alerting

Route alerting involves using emergency personnel going door-to-door or to groups of people to deliver a personal warning message. It can also be performed by slowly driving streets with loud speakers. This old fashioned, low-tech, and often forgotten warning delivery mechanism is available throughout the Bay Area and can be effectively used in sparsely populated areas, in areas with a large seasonal or diurnal population (such as recreation areas), in areas not covered by electronic warning capabilities, and in areas with adequate numbers of emergency personnel. Route alerting is also a backup system to use when modern warning technology is not available, for example, when electricity is no longer available.

The chief advantage of personal contact that route alerting provides is that people in the public are more willing to respond to a warning delivered personally because they are more likely to believe that a danger exists to them. However, this method is time-consuming and requires the commitment of many vehicles and persons. To support the implementation of this method, emergency personnel should develop a plan for systematically traversing the threatened area and should issue the warning, beginning with the highest risk zone and proceeding to those of lower risk. A trial run as part of planning and training is useful for establishing the warning time needed to notify the population at risk in, for example, rural camp grounds or on beaches, and for determining warning time rates for different types of areas.

Loudspeakers and Public Address (PA) Systems

Existing public address (PA) systems exist throughout the Bay Area. It is feasible to use them to notify people in places which are covered by such systems. Schools, hospitals, prisons, nursing homes, sports arenas, theaters, or shopping centers often have PA systems. In addition, portable loudspeakers can be used from vehicles to warn nearby populations; these systems are best used in conjunction with other broader notification procedures. However, they are very useful in reaching small segments of the population in

confined or institutionalized settings. To be effective, PA systems need a good communications link to the operators so that messages can be disseminated quickly and accurately. Portable loudspeakers increase the speed of warning populations lacking other means to receive the warning. They are particularly useful during night-time hours when many people are asleep. Their chief disadvantages are that it is often difficult for people to hear a warning broadcast from a moving vehicle, that sometimes people only hear part of the message, and that it is difficult for people to confirm the warning.

The Emergency Alert System (EAS)

The EAS--which is currently being phased out and replaced with a third generation system--is a joint government-industry response to a Presidential requirement to have the capability to address the entire nation on very short notice in case of a grave threat or national emergency. In 1994, EAS replaced the Emergency Broadcast System (EBS), which was in use since 1963. At the national level, EAS can only be activated by the President or his constitutional successor. At the direction of the President or his successor the Department of Homeland Security/FEMA is contacted to activate the national-level EAS. After the President has used the system, it may be used by Federal agencies to provide official information such as disaster assistance, food availability, and other vital information.

In addition to national-level emergencies, EAS is used at the state and local levels including the Bay Area to provide emergency messages. Reports received by the Federal Communications Commission (FCC) reveal that the EAS is activated more than 100 times a month at state and local levels. EAS messages can be originated by the National Weather Service and state and local authorities such as the governor of California, and Bay Area emergency managers, police, and others, for natural or technological disasters posing an immediate threat to life and property.

All cable and wireless cable systems are mandated by the Federal Communications Commission (FCC) to have EAS equipment and to issue national alerts and conduct tests. Broadcast stations and cable systems may elect to participate in national-level activations (stay on the air) or not participate (go off the air). Over 99% have elected to participate. All broadcast station and cable system participation in EAS at the state and local levels is at the discretion of management.

EAS utilizes the Specific Area Messaging Encoding (SAME) technology which can be used to target different geographic areas within a county to provide more geographically precise warning message to the public. NOAA weather radios also use the SAME technology.

The EAS system is an important and effective way to quickly reach many, but not all, people to make them aware pending rapid onset events. It is constrained in the length of words that can be disseminated and, therefore, must be supplemented with additional information distribution to communicate more information to the public.

The Integrated Alert and Warning System (IPAWS)

The IPAWS is currently changing warning practice because of its national-level adoption and of the related Commercial Mobile Alert System (CMAS). Both systems are based on the Common Alerting Protocol (CAP). These systems are discussed at greater length elsewhere in our report and facilitate standardizing alert and warning practices in the nation, and they would do the same in the Bay Area. However, they do not solve all pubic alert and warning problems.

Radio

Radio is a major technology for disseminating warning information because it can quickly reach a large number of people, particularly drivers, during non-sleeping hours. FM carriers are required to have EAS capabilities Certain EAS radio stations have been designated as local primary stations and usually have arrangements with local civil defense offices or other government agencies to broadcast emergency warnings for most hazards. In most situations, other radio stations broadcast warnings as well. The use of radio as a warning channel will continue to be a major practice in emergencies nationwide and should also be in the Bay Area. Often plans for notification and the use of standardized messages accelerate the speed at which a warning can be issued over the radio. One disadvantage of the radio is that the broad area often covered by broadcasts may include areas not at risk. This underscores the need for warning messages to be clear about the boundaries of area at risk. Second, radio messages exclude the use of graphic materials. Third, radio reaches only a small portion of the population during late night-time hours.

Television

Warnings are also broadcast over commercial and cable television. All commercial and cable system must be EAS compliant This can be done by interrupting normal programming or by displaying scrolled text on the bottom of the screen. Television reaches a large number of people, particularly in the evening hours. Like radio, it is a poor communication channel during sleeping hours. Television is a particularly good channel for warnings about slowly developing events. It is likely to take longer to issue a warning over television stations except where prewritten scrolled messages are used. One major advantage of television is the ability to use graphic information such as maps or diagrams in the warning making it an important tool to effectively reach people with mental disabilities if appropriate graphics are presented.

The popularity of cable television means that local commercial stations may reach less of the public in the Bay Area than once was the case. As a result, systems have been developed to issue scrolled or broadcast messages over all cable channels. Thus, a person in Oakland watching a Chicago station or a movie channel could still receive a warning for their county. Usually the override systems are operated by emergency officials in coordination with a cable television station. This requires pre-arranged agreements on the use of such a system. The advantages and disadvantages of normal television apply, such as loss of operability when a power outage occurs.

Additionally, television is often turned to as major source of additional information by people after receipt of a first warning and before initiating a protective action. Moreover, is some events people are likely to watch non-local coverage, for example, from CNN, as local. Hence, in major events that are slow moving it is as important to distribute information to non-local stations as local ones.

Tone Alert and NOAA Weather Radio

The tone alert radio is a specialized warning device that can be remotely activated. These radios operate on a standby condition and provide a warning signal; some types can subsequently broadcast a verbal warning message. Upon receipt of a code, the radio emits a tone and broadcasts a prerecorded or read message. The code and message are broadcast from a radio transmitter which typically has a range of 40 miles. The radio receivers operate on normal electric power; some have battery back-up power.

Tone alert radios remain one of the most effective ways to reach key decision makers for institutionalized populations, for example, persons in positions of authority in congregate care facilities such as nursing homes.

There are four basic types of tone alert receivers in current use nationally. It is possible that each of these may also be in use in the Bay Area. These include models that are fixed tuned to the local EAS station and activated by the familiar EAS dual tone. There are also, models that are similar to EAS receivers but are tuned to the appropriate NOAA continuous broadcast radio station and that are activated by the special weather alert tone. Some models can be set to one of several commercial FM frequencies and then activated by a FM subcarrier frequency if present. And finally, there are models that are fixed tuned to a specific radio transmitter installed solely for the purpose of emergency warning.

NOAA weather radio covers a major portion of the population within the country and likely serves many in the Bay Area. Its chief function is to provide continuous weather forecasts.

NWS can activate radio receivers to issue warnings regarding severe weather. This system can be used to issue warnings for other hazards when local emergency managers make arrangements with the NWS. The advantages of the tone-alert system include a quick dissemination time, the combination of an alerting signal with specialized messages, and around-the-clock availability. Disadvantages include maintenance problems, availability during power failures, limited broadcast range, and the difficulty of outdoor use. The radio receivers are relatively inexpensive.

Telephone Automatic Dialers

Switching and automatic telephone dialing equipment that is currently available has the potential to reach a large number of people in a relatively short time frame. In most cases, current technology could allow a simultaneous call to about 20 to 30% of a local phone company's customers using the local system's resources and to a higher percentage by routing calls through distant switching stations. These systems make use of existing phone networks. Other systems can be specifically designed to issue emergency warnings. Most of the modifications and special equipment are installed at the phone company. These systems play prerecorded messages which can be updated fairly quickly to provide timely information. Advanced systems can automatically hang up phones in use or block out all incoming calls. It is also feasible to have them use a special ring that would act as an alerting function. They can also be combined with the use of telephone hotlines to provide specialized information.

Automatic dialing systems utilize a computer to make simultaneous calls using multiple lines. A system using 256 lines can presently make over 15,000 calls per hour. However, these systems can still serve only a fraction of local area phones at one time. Other problems exist. People are not always near a phone to receive a message, and busy phones would prevent warning if less expensive systems without the automatic hang up feature are used. Cellular telephones can also be used to receive warning messages using automatic dialing technology.

Sirens and Alarms

The technology of siren and alarm systems is such that an audible signal could be provided to most populations at risk, although it might be expensive to implement the technology. These types of warning devices are designed to provide rapid alert to the threatened population. Electronic sirens have public address capabilities as well although the quality of the message is usually poor. Siren systems are limited in their use by the lack of instructional messages. At best they alert people to seek further information unless there has been an intensive program of public education used to instruct people what to do when

the signal sounds. This is possible only in situations when the same response would be desired every time a warning is issued which is not likely in the Bay Area.

Multiple signals, such as a wavering signal versus short blasts, whoops and wails are rarely differentiated by the public. Consequently, reliance on different signals for diverse hazards is not supported. Other problems that constrain the use of sirens and alarms are false alarms because of technical failures, equipment failures in emergencies, maintenance problems, coverage problems (particularly in adverse weather), difficulties in propagating sounds into buildings, and sometimes public indifference to sirens in large urban areas such as the Bay Area. Nevertheless, siren systems remain a main component of warning systems nationwide and in Bay Area. Their main benefit is to create a signal that if heard interrupts a normal environment and are noticed by those who hear them.

Message Signs
Electronic message signs exist in the Bay Area and are particularly appropriate if there is a significant need to provide remotely controlled, changeable messages to motorists driving within or approaching the risk zone to provide them with instructions. Electronic signs can be permanently mounted over or beside major roadways or may be portable. Messages could be composed at a central location and transmitted to individual signs as needed to notify motorists of emergency situations and instruct them to take appropriate protective actions.

State-of-the-art changeable message signs use reflective disc message displays with fiber optic lighting. The highly reflective disc elements increase in visibility in bright ambient light conditions, unlike bulb signs that can become dim and unreadable in bright sunlight. The fiber optics collect light from redundant low-voltage halogen lamps and direct light to the individual reflective discs. Messages are generated and transmitted from a personal computer which can be located in a central control point. Messages can be transmitted to the individual signs via telephone leased or dial-up lines, twisted pair cables, coaxial cables, microwave, radio, or fiber optic cable. The sign messages can travel left or right, scroll up or down, and flash.

Aircraft
In special cases, airplanes and helicopters can be used as part of the warning process. This may be particularly appropriate in rapid onset high consequence events that have interrupted electricity, for example, the explosion of an improvised nuclear device. Low-flying aircraft can carry sirens or bullhorns to provide an alert or a warning message. In addition, they could drop prepared leaflets containing a warning message with detailed protective action instructions. This type of warning channel is also useful in reaching

remote populations or populations that cannot be reached through normal communication channels. Disadvantages include access to aircraft, maintenance, cost and the risk of accident in difficult flight terrain. A further problem is obtaining sound systems that can broadcast messages audible over the noise of the aircraft itself.

Visual Alerting

The use of visual alerting devices (e.g., strobes, flares, smoke) may be appropriate in some extraordinary and unusual circumstances. No evidence of such alerting channels in the Bay Area was reported in the interviews we conducted. Elevated strobe lights focused on large bodies of water could be used to assist in attracting the attention of persons on boats with loud motors and unable to hear a siren signal. Hunters, fishermen, hikers, and campers in normally uninhabited areas could be alerted by columns of colored smoke in the daytime and by airborne flares at night.

Internet Protocol (IP) Based Technology

Internet based technology is available to deliver emergency warnings to electronic devices with IP addresses. These systems provide reliable and scalable solution for emergency alert notification and communication. These systems are device and carrier agnostic and follow current Internet and wireless standards allowing interoperability with existing carriers and equipment. Reliable and fast alert delivery is made possible by simple web-browser based management

With these systems it is possible to send warnings and instructions to tens of thousands of citizens during an emergency via digital pagers, telephones, computers and personal digital assistants (PDA) through messaging and e-mail. Such systems have the capability to be scalable so one could deliver tens of thousands of alerts in minutes.

Social Media

The Bay Area is home to some of the largest and far reaching social media companies in the world, e.g., Facebook, Twitter, LinkedIn, etc. Social media is a relatively new technology for use regarding public alert and warning messaging. It has two distinct alert and warning applications, and research evidence has only now begun to accumulate on its practical use in public alert and warnings.

First, social media is yet another tool and channel to distribute public alert and warning messages, however, some social media limit the length of posted messages, e.g., 140 characters while others do not. The exciting use of social media for this purpose is that people need to interact with each other to confirm risk and the appropriateness of taking a protective action before acting. Social media, at least for those who use it, promise to

facilitate the basic human need to interact with others before taking action, but at an accelerated pace.

Second, social media gives alert and warning providers access to "view" what the people they have warned are thinking, doing, and not doing. As such, social media should be fully integrated into emergency operations plans and monitored after alerts and warnings have been issued to detect the presence of wrong information, the rate at which people have begun protective action taking and more. Problems in human perception and action or inaction could thereby be detected and then addressed in subsequent pubic messages to correct misinformation and public response deficiencies.

Appendix B
Bay Area Risk Data

***Threat*:** The likelihood of the occurrence of an incident, including those that are naturally occurring (e.g. floods, wildfires and earthquakes) and those that are human-caused (e.g. industrial accidents and terrorist attacks). *Likelihood* refers to the estimate of the potential of an incident or incident's occurrence as compared to other scenarios in a particular region and takes into account adversarial intent and capabilities.

***Vulnerability*:** Likelihood of the asset succumbing to a terrorist attack or naturally occurring hazard. This is a function of an asset's recognizability, resilience, and countermeasures effectiveness. The higher the vulnerability, the more likely a terrorist attack will succeed and a natural hazard will cause damage.

***Consequence*:** Consequences of an attack can impact one or all of the following:

- *Human:* The adverse impact of an incident on human health as measured by the number of fatalities and injuries the incident causes, as well as the resulting long-term health effects.

- *Economic:* The economic harm caused by an incident as measured by short-term costs of repair efforts, as well as the long-term impact of an incident on the economic activity of the asset attacked.

- *Mission:* The severity of the impairment of the mission of the asset that an incident inflicts. Mission interruption includes the degree of interruption, geographic scope, and mission criticality.

- *Psychological:* The adverse impact of an incident on the morale and confidence of the population. Such adverse impacts may include a reduced sense of general well-being, concerns about personal security, and reduced confidence in the government and the economy.

Terrorism Scenarios

The following scenarios are listed in alphabetical order used to help determine the Bay Area's terrorism risk profile as defined, in part, in the region's Digital Sandbox 7® risk analysis tool. These scenarios are based, in part, upon actual terrorist methods used in attacks around the world such as improvised explosive devices and conventional assaults as well as the DHS developed National Planning Scenarios, etc. While several of the attack scenarios listed have never been used by terrorists, e.g., an improvised nuclear device against a major U.S. city, the intent to acquire and use such weapons and tactics has been publicly articulated by certain terrorist groups.

Agro-terrorism

Agro terrorism may involve pathogens, chemical and biological contaminants, and other hazards that affect the safety of the food supply chain. Such attacks are usually designed to inflict large scale economic damage with associated deaths.

Aircraft as a Weapon

The aircraft as a weapon scenario consists of attackers taking over or using an airplane to inflict a direct impact on a target as was done on September 11, 2001. Damage to the asset is a result of the kinetic impact and initial explosion of the airplane's fuel supply, as well as secondary events like fires or building collapses. With three international airports and numerous regional airports, the assets in the Bay Area are at moderate risk from attacks involving aircraft as weapons. The risk of a large commercial aircraft being used as a weapon is relatively low given the security enhancements that have taken place on board commercial aircraft since September 11, 2001. However, general aviation remains less secure, e.g., the flying of a general aviation aircraft into an IRS office building in Austin, Texas in February 2010. While most general aviation aircraft are smaller, as was the case in Austin, there are some privately owned and chartered aircraft that are equal in size to commercial sized planes such as the Boeing 737 and 757.

The risk of an aircraft being used as a weapon is driven largely by the vulnerability of large buildings/structures, commercial facilities, such as sports stadiums, and government buildings to such an attack and the potential consequences resulting from an aircraft strike, which could vary significantly depending on the size of the plane used and whether the aircraft was retrofitted with explosives.

Arson/Incendiary Attack

Arson or incendiary attacks have been used widely throughout history by terrorist groups and criminals. Attacks vary widely in scope and intensity, from the use of one small

incendiary device such as a Molotov cocktail to setting a fire from multiple ignition points on one site using highly flammable fuel. In 2008, the Earth Liberation Front burned down a housing development in Woodinville, Washington. The Provisional Irish Republican Army made extensive use of Molotov cocktails in their fight against British control of Northern Ireland.

Biological Attack (Contagious)

Use of a biological agent that can be spread from human to human and results in negative health effects including possibly even death. Contagious biological attacks include the intentional release of communicable infectious diseases such as pandemic flu and Bubonic Plague. While the U.S. homeland has not been the victim of a known contagious biological attack by modern terrorist groups, contagious biological attacks do comprise a significant amount of relative asset risk due to vulnerability and consequence concerns, particularly within the healthcare sector, which far exceeds all other sectors in risk under this attack scenario. This is due to the very high likelihood, vulnerability and human consequences resulting from such an attack against a handful of healthcare assets. The large number of people, density of population, and the often enclosed spaces and relative ease with which to move freely about those facilities increases the risk such assets face involving a biological strike when compared to other assets in the region.

Biological Attack (Non-contagious)

Use of a biological agent that cannot be directly spread from human to human but results in negative health effects. Non-contagious biological attacks typically require direct contact or inhalation with a biological strain. The 2001 Anthrax attacks, which killed 5 people, are one such example.

Chemical Attack

A chemical attack may involve a chemical release on a population using toxic and corrosive chemicals that generate poisonous gases, liquids, and other hazardous substances. Chemical attacks may include the release of a nerve agent, blister agent, or industrial chemicals used against an asset's population. Scenario includes aerosol or other distribution of Mustard Gas, Arsenic, Mercury, Sarin or other similar substances. This attack method also considers the use of explosives against Chlorine tanks.

Conventional Attack

Conventional attacks include attacks executed with weapons that are not weapons of mass destruction. This can include grenades, bombs, mines, missiles, small firearms, and large-caliber artillery systems. LAX was the target of a conventional terrorist shooting at the El Al ticket counter in 2002. One of the most notable conventional attacks in recent history is

the 2008 attacks in Mumbai, India, in which terrorists affiliated with the Islamist group Lashkar-e-Taiba attacked multiple public sites, including hotels and mass transit stations, with bombs and guns. One of the most recent attacks involving this method occurred in 2012 in Toulouse, France when an al-Qaida inspired individual opened fire at a Jewish school killing 4, including 3 children.

Cyber Attack

Computer-based attack aimed to disrupt the function of an asset or obtain sensitive information from the asset's computer systems. Attacks may seek to compromise the target through service disruption or manipulation using destructive worms and viruses, Denial of Service exploits, and intrusions.

Hostage Taking/Assassination

Hostage taking involves an attack in which terrorists enter an asset and hold captives by force. For example, in 2004, Chechen rebels took over 1,000 people hostage at a school in Beslan in the Russian Federation killing well over 300 people including over 100 school children. Such attacks may also include the targeting and killing of key government or private sector officials.

Improvised Explosive Device (IED)

IEDs are bombs that are not of standard military construction, but may utilize components that are. Constructed using any type of explosive material, fuse, detonator, and container, they can also include biological, chemical, or other contaminants. IEDs have been used widely by terrorist groups; recent examples include use by the Taliban in Afghanistan against Coalition and Afghan forces and by the Liberation Tigers of Tamil Elam against the Sri Lankan government, most often via suicide bombers.

Improvised Nuclear Device

A nuclear device scenario involves the detonation of a weapon assembled using highly enriched uranium, most likely stolen or purchased from an unstable nuclear or former nuclear state. A device could be assembled near the Bay Area or transported via vehicle to a densely-populated downtown location for detonation. Overwhelming casualties within 12 miles can be expected, with decreasing casualty rates extending over a 150 mile radius. The DHS National Planning Scenarios describe a 10‑kiloton improvised nuclear device detonation scenario. The damage from this scenario would be catastrophic: the explosion would severely damage buildings within a 1,000‑meter radius; tens of thousands of people would likely die from the initial blast, radiation, and subsequent fallout of radioactive material; hundreds of thousands of people would be injured; nearly half a million people would need to be evacuated; and years later the effects of this scenario would continue to

be seen in the rate of cancer and other diseases caused by exposure to contamination. Although the geographic impact of such an event would depend on the movement of the radioactive cloud, radiation would reach areas within a 2 or 3‑mile radius of the blast. Upwards of 3,000 square miles would have to undergo some type of decontamination, including the destruction of the most contaminated structures. The economic impact would be in the hundreds of billions of dollars, and recovery would take years and possibly decades.

While the ability of terrorist groups to acquire and use nuclear devices is relatively low; nonetheless, the relative risk of such an attack against the region is high as it pertains to certain assets in the Bay Area when compared to other forms of attack based on asset vulnerability and the consequences of a nuclear attack. The risk of a nuclear device is aimed primarily against healthcare and commercial assets involving large public facilities because of the dense concentration of large numbers of people in a more vulnerable environment. However, a successful attack involving an improvised nuclear device against any asset in the Bay Area would have consequences that would be devastating with regional, national and international implications.

Maritime Attack

A maritime attack involves the use of a sea vessel or device to deliver explosives against a target, such as another ship or port asset directly adjacent to a waterway. In 2000, 17 people were killed when such an attack targeted the USS Cole in Yemen. In 2002 and 2010 French and Japanese oil tankers were attacked using a boat and a dinghy respectively.

Radiological Dispersion Device (RDD)

An RDD attack, also called a "dirty bomb" combines radioactive materials and conventional explosives. The explosives cause damage and casualties within the blast radius and spread radiation over a larger area. Although this scenario would cause few deaths and injuries (estimated as 180 and 270, respectively) compared to an improvised nuclear device, it is estimated that upwards of 20,000 people could be contaminated with radiation, and years later many of those exposed to radiation would be at high risk of developing cancer. Economic impacts would likely reach into the billions of dollars, and recovery could take months to several years.

Sabotage/Theft

Sabotage encompasses any act intended to prevent an asset from engaging in its mission. It can affect any sector and any level of an asset, and it may be carried out by any actor to include disgruntled employees or terrorists. Sabotage is often classified solely or simultaneously as other crimes, such as arson. An unidentified individual injected a glue-

like substance into a remote shutdown panel at a nuclear power plant in St Lucie, Florida in 1996. In 2006, the Salafist Group for Call and Combat vandalized and set fire to an Algerian cement plant and company vehicles.

Vehicle Borne Improvised Explosive Devices (VBIED)

VBIEDs are IEDs delivered via vehicles. A large sedan can yield up to 1,000 lbs. of explosives in the trunk alone; a small box truck can yield over 10,000 lbs. By comparison, the truck used in the Oklahoma City bombing was carrying 4800 lbs. of explosives. The VBIED method of attack is historically common and still used by groups such as al Qaeda, which describes the attack method in detail in its training manual. LAX was the focus of the millennium bomb plot involving a potentially devastating VBIED as was New York City's Times Square in 2010. The risk of VBIED attacks, e.g. car or truck bombings against critical infrastructure, is relatively high for the Bay Area based on the high likelihood of occurrence due to the comparative ease and low expense of carrying out such an attack. The VBIED method of attack is common around the world. In addition, many of the critical assets in the information technology, commercial, government and healthcare sectors across the Bay Area remain particularly vulnerable to a VBIED attack with the potential consequences having significant human, economic, mission, and psychological impacts.

Water Contamination

Poisoning or otherwise tampering with a water distribution point in such a way that causes harmful health effects. Poisoning may include the use of bacteria, viruses, and heavy metals. Attacks at a distribution point may spread among the population.

Natural Hazard Scenarios

The Bay Area's CIKR also face significant natural hazards risk from earthquakes, wildfires and floods in particular. As outlined in the figure below to the right, entitled "Natural Hazard Scenario Risk Profile," of all the scenarios, wildfires, floods and earthquakes pose the greatest risk to the Bay Area's CIKR with earthquakes leading based upon the region's vulnerability to such an event and the consequences of a major earthquake in terms of lives and property.

Earthquake

An earthquake is a phenomenon resulting from the sudden release of stored energy in the Earth's crust in the form of seismic waves The Bay Area rests upon one of the longest and most active earthquake fault systems in the world. This system includes the San Andreas Fault, the Hayward Fault and the Calaveras Fault. The U.S. Geological Survey estimates an

80% chance of a magnitude 6.7 or greater quake striking the Bay Area within the next 30 years.

Possible earthquake scenarios include a repeat of the 1906 earthquake on the San Andreas Fault (estimated to be about 7.8 magnitude), or an earthquake on the combined (north and south) Hayward Fault. The San Andreas Fault runs along the coast through moderately developed areas, whereas the Hayward Fault runs through densely populated and highly developed areas in the East Bay. Based on past earthquakes, and estimates from the Association of Bay Area Governments and the U.S. Geological Survey, a magnitude 6.9 earthquake on the combined Hayward Fault would cause nearly 6,000 deaths, and hundreds of thousands would be injured. Damage would be substantial: 155,000 dwellings would be destroyed, leaving 360,000 people displaced and about a third of those requiring public shelter, and about 1 million buildings would be damaged. The earthquake would be felt throughout the entire Bay Area, with the greatest shaking occurring in the most densely populated areas of the region. Economic impacts could reach $100 billion, and recovery would take years.

Wild Fire

Four wildfires in California have burned at least 200,000 acres since 2007. Though evacuations help limit casualties, significant economic loss can still occur. A wildfire is an uncontrolled fire spreading through vegetative fuels and exposing or possibly consuming structures. Humans start more than 80 percent of wildfires, usually deriving from debris burns, arson, or just carelessness. Lightning strikes are the next leading cause of wildfires. Such fires often begin unnoticed and spread quickly. Naturally occurring and non-native species of grasses, brush, and trees fuel wildfires. A wildland fire is a wildfire in an area with virtually no development except for roads, railroads, power lines, and similar facilities. An urban-wildland/urban interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

Occasionally, an urban/wildland interface fire causes significant damage and casualties. For example, the 1991 Oakland Hills Firestorm, also known as the Tunnel Fire, the Oakland-Berkeley Hills Fire, and the East Bay Hills Fire, burned about 1,520 acres, caused 25 deaths and 150 injuries, and destroyed over 3,000 dwellings. The estimated loss was about $1.5 billion. The fire, which occurred on October 20, 1991, began as a brush fire that quickly ignited surrounding trees and engulfed houses and apartments along the outskirts of Oakland. The 1906 earthquake in San Francisco caused the worst urban fire in history, outside of war. This 4‑day event burned more than 28,000 buildings, took more than 3,000 lives, and displaced more than 200,000 people. It is estimated that of the structures that

were destroyed in the disaster, 80 percent were lost due to the conflagrations that occurred following the earthquake.

Flood

The most common and damaging natural disaster in California, floods have caused more economic damage to the state than all other natural disasters combined. According to the National Oceanic & Atmospheric Administration a flood is any high flow, overflow, or inundation by water which causes or threatens damage. A flash flood is a rapid and extreme flow of high water into a normally dry area beginning within hours of the causative event (e.g. intense rainfall or dam failure). A regional flood occurs when high water inundates a large river valley for weeks, causing few deaths but extensive damages. (Abbott 346). While flooding is ranked third in terms of overall risk, it is actually the most likely hazard to occur in the region based on historical data.

All fifty eight counties have been declared under a "state of emergency" at least three times since 1950 because of flooding. Between 1992 and 1998, floods caused nearly $5 billion in damage statewide, and every county declared a flood-related disaster. In the last decade, several major floods caused severe damage in northern California — the New Year's storms in 1997; the El Niño events in 1997 and 1998; and the winter storms in 2006, which affected thirteen counties in Northern California and caused about $200 million in damage in Sonoma and Marin counties alone. In a severe flood, 100,000 or more people may need to be evacuated, with at least a third of those needing public shelter, and between 25,000 and 30,000 buildings would be damaged or destroyed. The economic impact could be as high as $2 to 3 billion, with recovery taking months to years, depending on the extent of the damage. Floods could easily lead to other disasters, including mudslides and breaks in levees and dams. Depending on the location of the flood, the entire Bay Area could be affected, as well as areas outside the region.

Tsunami

Tsunamis are seismic sea waves caused by movements along faults, undersea landslides, volcanic eruptions, or similar incidents. A seismic or other geological incident in the Pacific Ocean may cause tsunami activity along the California coast. Tsunami waves may travel across the ocean at speeds of up to nearly 600 miles per hour. Depending on the location of an incident, a tsunami can reach the California coast in as little as 10 minutes or take up to 12 hours.

The actual height of a tsunami wave in open water is generally only 1 to 3 feet and is often practically unnoticeable to people on ships. As the wave approaches land, the sea shallows and the wave no longer travels as quickly, so the wave begins to "pile up" as the wave-front

becomes steeper and taller, and less distance occurs between crests. Therefore, the wave can increase to a height of 90 feet or more as it approaches the coastline and compresses. Tsunamis not only affect beaches that are open to the ocean, but also bay mouths, tidal flats, and the shores of large coastal rivers. However, tsunamis generally propagate outward from their source, so coasts in the shadow of affected land masses are at less risk. The Alaskan earthquake of 1964 generated a tsunami that killed 12 people in Crescent City, California. In March 2011, a tsunami from the devastating Japan earthquake hit the coast of California causing damage in Santa Cruz as well as other parts of Northern California.

Appendix C
Operational Area Assessment Questions

The following the questions addressed within each Planning, Organization, Equipment, Training and Exercise (POETE) element, as well as the regional and moving forward questions for the Operational Areas. These relate to the figures throughout the report. For example, under the Planning element, 13 metrics were measured: P1, P2,...through P13.

Planning Questions

P1	Does the Operational Area (OA) have an up-to-date emergency public information operations annex to its EOP that is consistent with state and federal guidelines?
P2	Does the OA have an up-to-date all-hazard alert and warning annex to its EOP, that is consistent with state and federal guidelines?
P3	Does the OA have written agreements for coordinated emergency public information operations with other OAs?
P4	Does the OA have written agreements for coordinated warning operations with other OAs?
P5	Does the OA have written agreements with municipalities within the OA for coordinated warning operations?
P6	Does the OA maintain pre-approved templates for warning messages for anticipated hazards and/or protective action recommendations?
P7	Do OA plans and procedures for public warning specify criteria (trigger points) for when to provide the public with warnings and protective action recommendations?
P8	Does the OA warning policy provide general guidelines for warning message preparation in case of unforeseen hazards or unusual protective action requirements?
P9	Does the jurisdiction or agency maintain pre-approved templates for public information messages for anticipated hazards and responses?
P10	Does the OA have an ongoing program of community engagement aimed at minimizing isolation from warning systems due to non-English speaking, access or functional needs, or any other challenge?
P11	Does the OA have a plan and process in place to systematically monitor mass media during emergencies to assess the accuracy of their delivery of warnings and emergency public information messages?
P12	Does the OA have a plan and process in place to systematically monitor online "social" media during emergencies to assess the accuracy of their delivery of warnings and emergency public information messages?
P13	Does the OA have a plan and process for rapid response to misinformation or misinterpretation of warning or public information messages?

Organization questions

O1	Does the OA have a single "24/7" point of contact responsible for activating warning systems and providing assistance to responsible officials in utilizing its public warning capabilities for all hazards?
O2	Does the OA have a written user agreement (MOA) with FEMA for access to the Integrated Public Alert and Warning System?
O3	Does the OA have or have access to American Sign Language interpreters to support press conferences?
O4	Does the OA have and regularly update point of contact lists of access and functional needs community-based organizations?
O5	Does the OA have a process to ensure identification, authentication, and credentialing of key personnel to support public warning and dissemination of public information?
O6	Does the OA policy specify the organization and membership of the Joint Information Center (JIC)?
O7	Does the OA have written agreements with municipalities and other organizations within the OA for their participation in the JIC?
O8	Does the jurisdiction or agency have written agreements for Joint Information Center operation with other OAs at a regional or sub-regional level?
O9	Does the OA participate in an ongoing Bay Area region-wide forum or working group dedicated to public information and warning issues, e.g., BAEPIN?
O10	Do such regional organizations include participation of the access and functional needs and non-English-speaking communities?

Equipment questions

E1	Does the OA have multiple means of disseminating all warning messages to the public?
E2	Does the OA have equipment certified for activation of IPAWS (and thereby, of EAS, NOAA Weather Radio and cellular CMAS alerts)?
E3	Are the OA's systems for disseminating public information and warning messages interoperable with regional communications systems?
E4	Does the OA have the capacity to disseminate warnings and emergency public information through online "social" media (e.g., Twitter, Facebook)?
E5	Has the OA conducted an analysis of its current "social" media audience (e.g., those who are following you) to determine how that audience corresponds to the OA's population at large?
E6	Does the OA have a capability for delivering warnings to selected geographic areas at the neighborhood level?
E7	Does the OA have a single integrated mechanism for activating all its warning dissemination tools simultaneously and with a consistent message?

Equipment questions

E8	Does the OA require that its warning systems support activation using the Common Alerting Protocol version 1.1 or 1.2?
E9	Does the OA unit responsible for public warning have capability for direct monitoring of the National Alert and Warning System (NAWAS)?
E10	Does the OA unit responsible for public warning have capability for direct monitoring of NOAA Weather Radio?
E11	Does the OA unit responsible for public warning have capability for direct monitoring of the broadcast Emergency Alert System (EAS)?
E12	Does the OA have a mechanism for warning people outdoors in public spaces, such as public address systems, sirens and/or changeable signage?
E13	Does the OA provide or support any specialized technologies or methods for communicating warnings to people who do not speak English and with access or functional needs?

Training questions

T1	Have responsible warning staff completed IPAWS training course IS-247?
T2	Does the OA or UASI region provide local or regional training at least every two years to potential incident commanders or other first-level field response supervisors throughout the OA regarding warning capabilities, policies and procedures?
T3	Does the OA UASI region provide local or regional training at least every two years to Public Information Officers (PIOs) and public information staff at the OA and municipal level regarding JIC policies and operations?
T4	Does the OA provide training at least annually to all responsible staff on the operation of public information, alert/warning, and notification equipment?
T5	Does the OA or UASI region provide training at least every two years to PIOs (or similar personnel) on principles of Crisis and Emergency Risk Communication (CERC)?
T6	Does the OA provide or participate in public education/outreach campaigns to promote awareness and training to the community (e.g., general public, non-English-speaking communities, schools, access and functional needs populations), media, and partner agencies (e.g., training on warning and emergency information processes)?

Exercise questions

Ex1	Are all warning systems and procedures within the OA exercised (or activated) at least monthly?
Ex2	Are inter-jurisdictional warning systems and procedures exercised (or activated) at least quarterly?
Ex3	Is the OA's Joint Information Center exercised (or activated) at least annually?

Ex4	Do municipal and other partner agency representatives participate in OA JIC exercises?
Ex5	Do mass-media (especially broadcast news) representatives participate in OA JIC exercises?
Ex6	Do representatives of access and functional needs and non-English-speaking communities participate in OA-level JIC exercises?
Ex7	Do OAs participate in regional exercises that specifically examine the coordination of emergency public information and warning activities with other OAs in the region?
Ex8	Do multi-jurisdictional public information and warning exercises include testing regional plans such as the RECP and its associated annexes?

Regional and moving forward questions

1	Discuss any capability strengths that you would like to see sustained through future investments, in terms of planning, organization, equipment, training, and exercises (POETE).
2	Describe other opportunities to improve this capability with regional partners (e.g. regional coordination, standardization, outreach, resource sharing, mutual aid development).

Appendix D
Regional Allied Agency Questions

1	Please describe YOUR AGENCY's responsibilities for public warning in the Bay Area.
2	Please describe YOUR AGENCY's responsibilities for emergency public information in the Bay Area.
3	If YOUR AGENCY were to issue an immediate public warning, what means does it have (e.g., signs, sirens, public address systems, telephone notification, etc.) to disseminate the warning to people in the Bay Area?
4	When YOUR AGENCY distributes warning information to the Bay Area public, what topics do you typically cover and do you have any examples we could look at?
5	Does YOUR AGENCY use online media such as email, text messaging, Facebook, Twitter or other "social media" for immediate public warning in the Bay Area?
6	Does YOUR AGENCY use online media such as email, text messaging, Facebook, Twitter or other "social media" for emergency public information in the Bay Area?
7	Does your agency coordinate and share information with Operational Areas (OA) (county level) and other jurisdictions in the Bay Area when issuing an immediate public warning?
8	Does your agency coordinate and share information with Operational Areas (OA) (county level) and other jurisdictions in the Bay Area before, during and after providing emergency public information?
9	Does YOUR AGENCY participate in Joint Information Centers (JIC) at the Operational Area level in the Bay Area? If yes, what are some of the strengths and weaknesses of these JICs?
10	Does YOUR AGENCY participate in Joint Information Centers at the multi-OA or regional levels in the Bay Area? If yes, what are some of the strengths and weaknesses of these JICs?
11	Does YOUR AGENCY participate in Joint Information Centers at the intra-OA (e.g., municipal or special district) level in the Bay Area? If yes, what are some of the strengths and weaknesses of these JICs?
12	Does YOUR AGENCY have other important inter-organizational working relationships with agencies in the Bay Area for immediate public warning?
13	Does YOUR AGENCY have other important inter-organizational working relationships with agencies in the Bay Area for public warning or longer-term emergency public information?
14	Is YOUR AGENCY prepared and equipped to activate the federal Integrated Public Alert and Warning System (IPAWS)?
15	Is YOUR AGENCY prepared and equipped to activate the state's Emergency Digital Information Service (EDIS)?
16	Does YOUR AGENCY maintain any public warning or emergency public information dissemination systems of its own in the Bay Area?
17	How does YOUR AGENCY assess the effectiveness of its public warning and emergency public information activities in the Bay Area?

18	Does YOUR AGENCY take any special steps to communicate warnings or emergency public information to people with access or functional needs in the Bay Area?
19	Does YOUR AGENCY take any special steps to communicate warnings or emergency public information to people with limited English language capability in the Bay Area?
20	Does your agency participate in Bay Area regional or Op Area training program(s) for either emergency public information or public warning? If so, what are the programs' strengths and weaknesses?
21	Does your agency participate in Bay Area regional or Op Area exercise program(s) for either emergency public information or public warning? If so, what are the programs' strengths and weaknesses?
22	What are the greatest challenges YOUR AGENCY faces in generating and disseminating immediate public warnings with respect to an incident or threat in the Bay Area?
23	What are the greatest challenges you face in generating and disseminating emergency public information with respect to an incident or threat in the Bay Area?
24	What are the greatest opportunities you see for improving public warning or emergency public information over the next five years in the Bay Area?

Appendix E
Bay Area Emergency Public Information and Warning Compact
MOU Template

In order to maximize the effectiveness, efficiency and economy of public warning and public information during emergencies and disasters, the undersigned (referred to hereinafter as the "Signatory") agrees mutually with such other agencies, organizations and jurisdictions as may also sign this document (hereinafter referred to as the "Other Signatories") to the principles and goals set forth in this memorandum of understanding (hereinafter referred to as the "Compact.")

Purpose, Scope and Eligibility

Recognizing the extensive body of scientific and practical knowledge about communication between responsible organizations and the public, as well as the advances in technology and of organizations and practice, and mindful of the need for increased efficiency and cost-effectiveness, the Signatory along with the Other Signatories intends through this Compact to enhance cooperation and coordination in planning, training, operations and procurements.

This Compact is intended to document a basic set of agreements among public safety, homeland security and allied agencies in the San Francisco Bay Area as regards two closely related but distinct activities:

Public warning (hereinafter referred to as "warning") refers to urgent communications intended to alert some or all of the public of an immediate threat or hazard and to recommend specific protective actions members of the public can take to reduce harm.

Emergency public information (hereinafter referred to as "public information" or "EPI") accounts for various communications covering more extensive releases of information from agency spokespersons and subject matter experts prior to, during, or following an incident, intended to educate and guide members of the public, reduce losses, speed recovery and enhance resilience.

This Compact is intended for jurisdictions, public safety, public health, homeland security and allied agencies and specialized districts within the twelve-county Bay Area UASI. However, additional signatories are welcome.

References and Context

This Compact recognizes existing frameworks including:

- The California Disaster and Civil Defense Mutual Aid Agreement;

- The California Standardized Emergency Management System (SEMS); and,

- The National Incident Management System (NIMS).

All provisions of this Compact are pursuant and subject to the goals and provisions of the above frameworks.

Key Principles

The Signatory recognizes the following as core principles of good public warning practice:

1. The primary measure of effectiveness of a warning is the degree of compliance with protective action recommendations that is elicited from people at risk.

2. Both message effectiveness and the reach and reliability of warnings are enhanced by the concurrent delivery of a consistent warning message through multiple channels of communication.

3. Once issued, warnings should be followed by updated warnings and/or emergency public information for the duration of the emergency, as many recipients may have missed the initial warning.

4. It is preferable to issue an imperfect warning promptly than to delay warning in hopes of obtaining perfect information. Revisions and corrections in warning information should be made public as soon as they become available.

5. Warning effectiveness is enhanced, and the risk of public annoyance or fatigue reduced, when individual warnings are delivered to people actually at risk and not to people for whom the warning is not relevant.

6. Well-crafted warning messages do not cause panic, but the lack or incompleteness of official guidance during an emergency can. Warning messages should always include a specific and actionable recommendation as to action recipients can take to protect themselves and an explanation of why that action will help.

The Signatory further recognizes the following as core principles of emergency public information practice:

1. During an emergency it is important that official public information be as consistent and coherent as possible, while frankly acknowledging the inherent uncertainties and changes that can arise under exigent circumstances.

2. Public information that issues jointly from a panel of authoritative sources is more effective than information from a single source.

3. Emergency public information should be useful to the public at to the time it is issued, and should be relevant to immediate and near-future concerns.

4. Emergency public information should, as far as possible, be tailored and targeted to specific audiences according to their local needs.

Guidelines for Regional Cooperation

The Signatory agrees to the following as shared regional guidelines for public warning, provided that nothing in these guidelines shall be interpreted as restricting the Signatory from making more extensive use of its own warning and notification capabilities within its own jurisdiction:

1. Because of the wide variety of circumstances that may arise, warning is a discretionary activity of official agencies.

2. Public warnings should generally be issued in the event of an imminent threat to human life or health.

3. Warnings should be issued on the authority of an Incident Commander, a public health official or some equivalent responsible officer. In all cases an identifiable individual should be accountable for any warning message.

4. To the extent possible given available technologies, warning messages should be delivered to the people and/or region at risk, and delivery to people not at risk should be minimized.

5. Because hazards frequently cross jurisdictional boundaries, agencies that own or operate public warning systems should make advance arrangements for making them available to responsible officials in adjoining jurisdictions.

6. To maximize both technical interoperability and procurement economy, all warning and origination systems should utilize the OASIS Common Alerting Protocol standard version 1.2 or higher.

The Signatory further agrees to the following as shared regional guidelines for emergency public information, provided that nothing in these guidelines shall be interpreted as restricting the Signatory from making more extensive use of its own public information capabilities within its own jurisdiction:

1. Whenever an emergency involves multiple agencies or jurisdictions and cannot be effectively managed at an Incident Command Post, a Joint Information Center JIC (or Joint Information System (JIS)) should be established for collaboration and coordination among public information officers.

2. A Joint Information Center (or System) should, at a minimum, support the following activities:

   • Joint public information policy formulation and promulgation;

   • Liaison with Incident Command Posts, emergency operations centers and other operational centers;

   • Information gathering and newswriting;

   • Briefings and other interface with the news media; and,

- Monitoring of mass media and social media coverage.

3. When a large or evolving emergency or disaster leads to the establishment of multiple JICs, efforts should be made to consolidate them to the greatest extent possible and to maintain liaisons among them when consolidation is not possible.

4. All news releases, fact sheets, multimedia and other products from a JIC should be made available promptly and consistently via a website or an accessible Joint Information System, to public information officers not located at the JIC.

5. All public affairs officers should receive regular training and exercise in JIC/JIS operations and should demonstrate understanding of the specialized roles they may be called upon to play in a structured JIC/JIS environment.

Signatory's Undertakings

The Signatory agrees to:

- Incorporate the key principles and guidelines into its emergency public information and public warning practices;

- Pursue the development of a regional cooperation and resource sharing framework for emergency public information and public warning;

- Pursue the development of enhanced capabilities for making warnings and EPI accessible to people with Access or Functional Needs and to non-English speakers;

- Pursue the development of a regular program of regional training and exercises focused on emergency public information and public warning; and,

- Make prior arrangements with Other Signatories in adjoining areas for rapid access to its public warning capabilities on the authority of a duly designated Incident Commander in case of emergencies that pose an imminent threat across jurisdictional boundaries.

Term, Renewal and Revision

The Signatory agrees to the above until such time as the Signatory explicitly rescinds its agreement or until the Signatory agrees to a subsequent revised version of this Compact.

Signature   Date

Name

Title

Jurisdiction, Agency or Organization

Appendix F
Key Public Warning Messaging Considerations and Message Templates

KEY MESSAGING CONSIDERATIONS

The process of message writing and the content of the message templates contained herein brought forward key considerations regarding communicating alert, warnings, and other emergency communication to the public in the Bay Area. These considerations are diverse in topic and range from the link between response plans and message contents, the important role of messages in influencing change in public behavior, the role and character of pre-event public warning education, and more. These considerations are discussed below, followed by the message matrix, and then by eleven message templates of different types.

The purpose behind writing the 11 warning messages is to *increase the probability* that more people might take timely and effective protective action behavior. One important content element behind that purpose is telling people what to do, e.g., the specific protective action they should take given the hazard. Messages that leave this out are less effective from a public response viewpoint, but putting that information in the messages outline below presents an issue: the particular circumstances of an individual incident often determine the exact appropriate protective action recommendation. Therefore, the messages herein are *templates* designed primarily to demonstrate *how* to write a warning message as opposed to delineating the exact content of the protective actions in a message for use during a future incident. *The latter is something nobody can predict and is best addressed in the realms of operational pre-planning and, at the time of the incident, by incident command.*

Furthermore, a single course of action should not be dictated to the incident commander, emergency manager or elected official involved in the incident. Consequently, and for example, the shelter in-place message for use after an improvised nuclear detonation in the Bay Area is qualified with, *"if you decide that the public should shelter in-place here's a way in which to frame the message."*

Protective Actions Drive Messages
- Anticipated event consequences determine public protective actions that would result in consequence reduction for the population at risk. Those protective actions drive the content of communications (alerts, warning, press releases, and more) to

the public during emergencies; and the prime objective of those communications is to motivate public protective action-taking behavior.

- It is difficult to imagine any one single event in which the same public protective actions and messages would apply to the entire population of the Bay Area. A few events might come close, for example, a great earthquake or the detonation of an improvised nuclear device.

- The message templates are for different but certainly not all hazards. Message templates for an improvised nuclear devise were among those chosen because, among other reasons, that event comes close to one for which standardized Bay Area messages might apply.

- Detailed federal guidance exists for public protective actions over time concerning the detonation of an improvised nuclear device as such an event might unfold. The use of this guidance in the development of the messages is not a recommendation that the guidance be adopted by the Bay Area, nor is it an admission that the region agrees with everything that the federal government recommends. The federal guidance does provide a clear and relatively complete set of public protective actions the region's public health and safety professionals could apply to the entire Bay Area assuming that the federal guidance is adopted.

Response Plans Drive Messages

- Emergency response plans should drive public alert and warning messages, not vice versa. Message content must include topics about community level response as it relates to the protective actions the public is being asked to take in a message. For example, the presence or absence of traffic guides in an evacuation is based in response planning and should be included in a public evacuation message.

- Differences in response plans, implementing procedures, and annexes for different hazards are an additional constraint to being able to develop standardized Bay Area-wide public messages.

Motivating Behavior is the Purpose

- Public emergency messages of all forms, e.g., alerts, warnings, and press releases, should be viewed in terms of the "Big Picture" rather than in other ways such as providing information.

- Warning messages are mass communications about risk with the purpose of changing the behavior of the people who receive them from whatever people are doing when they hear a message to taking the protective actions in the message.

- Regardless of background and experience, public warning providers step into the role of applied social psychologist out to influence the behavior of masses of people.

- This is the frame that guided the development of the five full-text messages for the improvised nuclear device hazard (IND). Each of these messages is "fully-loaded" with the motivators discovered by social and behavioral science research to increase the probability that message recipients might take the protective action in the message appropriately and in a timely manner. This does not mean that everyone would; it means that the probability is increased based on the state-of-knowledge in the social sciences. We presented a theoretical list of these motivators

in the social science metric; the IND messages we prepared illustrate what those same motivators look like in actual messages. Some of the motivators can easily be included in a message. Others are also clearly elusive since they require information that may not be known during an actual event.

- The improvised nuclear device message templates illustrate that constraints exist to include some important public response motivators in messages in the Bay Area. Constraints are the things that keep message providers from including in a message what needs to be said to motivate public protective action-taking.

- An example is who the message is from or message source. A comparison of the named source in the first IND full-text message source to the source in the IND message in IPAWS/CAP/EAS-compliant message shows a difference in source attribution. The former attributes source to maximize its motivating potential, while the latter attributes source based on current law and practice. Planning ahead of time could develop the agreement needed to include source attribution based on *maximizing its contribution as a public motivator.* Another example is illustrated by comparing these same two messages. One message calls for "mandatory" compliance (illegal in the State of California); the other does not.

- Each of the five full text messages were written to include a full set of social science motivators for each of the key public protective actions as called for in the federal guidance. However, this resulted in some messages being too long to actually use, one short message, and others in between.

- All messages were kept regardless of length to illustrate behavioral motivators linked to all the public protective actions recommended in the federal guidance. Some of these messages will need to be divided into shorter messages for use in actual practice.

Communication Planning Informs Message Development

- Consideration could be given to the idea that ad hoc approaches to writing public emergency communication messages do not work as well as messages based on pre-event communication planning augmented by actual incident factors. An important part of planning is the content of messages.

- Message content plans should be inventories or lists of the content of future messages written in appropriate style for all hazards that could impact the Bay Area and across protective action sequences as each hazard unfolds.

- The message content lists should blend three things: likely appropriate public protective actions by hazard, elements of the appropriate response plan that applies, and public behavior motivators as documented in the social science research record.

- The five full-text improvised nuclear devise messages are examples of what such inventories might look like. They inventory the information the public needs at the time when different protective actions are to be taken. The more of this information that is disseminated to the public, the higher the probability of people performing protective action appropriately. This probability declines with less information.

- The public communication problem this presents is how to effectively get that information to the people who need it given the constraints imposed by different public communication technologies and devices.
- If lists like those illustrated by the five full text IND message templates were developed long before an event occurs, they could help to focus attention during events on what needs to be communicated as an event unfolds.

Some Specific Message Components can Be Written Now

- The IPAWS/CAP/EAS-compliant messages provide good examples of how preparing integrated message content inventories as discussed above can be a guide to identifying and filling gaps in message content inventories.
- The tsunamis message suggests that in addition to the standard "get to high ground" public protective action recommendation it would be useful to tell people in readily understandable terms about the run up zones in the Bay Area. This could be achieved in a variety of ways in emergency messages during an event or before through other forms of public communication.
- This is another example message gap that might be identified and filled now to help issue public messages that might be needed in the future.
- Consideration should be given to identifying all gaps that can now be identified, and to take actions to fill them now. Message gaps are likely easiest to discover after message content lists are developed as part of communication planning.

Warning Education Reduces Protective Action Response Delay

- The following messages make it clear that public messaging should not wait until a hazard is pending or has begun. Many of the protective action details the public needs to perform to appropriately respond to an alert or warning may not be provided during an incident. For example, when the electricity is out or when time is very short between event detection and impact and the only information people might receive is the brief information that can be provided over the Emergency Alert System.
- The role of pre-event public education in helping to fill these gaps is critical.
- Public alert and warning education should include items such as how people will get alerts and warnings, from whom they will come, where to listen for more information, what the range of protective actions are that people might be asked to take regarding different hazard types and more.
- Pre-event public education is never fully successful, and it is a task that will never be fully completed.
- Standard approaches to public warning education, such as, websites and brochures should be supplemented with non-traditional outreach approaches. For example, placing placards on buildings now to inform the public about which buildings have good shelter capacity in a radiological incident (not unlike the way it was done in the 1950s), placing pamphlets in building lobbies about what to do inside a building

while seeking shelter after a nuclear attack and for other hazards, posting outdoor signs in communities to mark where tsunami run up zones end, and more.

- Additional outreach approaches are needed to reach people in populations isolated from educational materials. Working with advocacy groups to help distribute educational materials to isolated populations would be needed and would likely have good results. Additionally, and as was the case with alert and warning message templates, educational materials should be read and revised as needed to enhance understandability for people with mental functional needs.

Warning Delivery Systems Pose Challenges

- A comparison of the first full-text IND message to its IPAWS/ACP/EAS-compliant message template counterpart reveals that many protective actions in the full-text message could not fit into the EAS-compliant message. This does not mean the nation's new alert and warning system is not useful. It does mean that a gap exists between what it can deliver and what the public needs to hear and know that should be filled in other ways.

- The CAP can be used as a format for post-EAS public information and distribution to the media and other public warning partners. This application is not constrained by word or character length. The standardized format it offers covers many important topics and is good reason to use it for post-EAS public messaging. However, the freedom the CAP format offers regarding, for example, public instructions about protective actions should be supplemented with either training in public motivators, the use of public message inventories discussed above, or both.

- Consideration should be given to the gaps these and other systems leave regarding the overall public alert and warning enterprise. Steps should then be taken to fill those gaps. For example, one possible gap is that these systems target people at risk. But people not at risk also need information in emergencies. "Shadow evacuation" is a well-documented phenomenon that refers to safe people evacuating when there is no real reason for them to do so. This can be a problem when shadow evacuees slow evacuation time for people at risk and delay their reaching safety. This can only be addressed by emergency communications to people not at risk that explains why they are safe and no action on their part is needed.

There are No Guarantees

- Research findings in the social sciences are categorically different from those in other fields of knowledge, such as engineering, in the following way: Application of social science knowledge comes with **no guarantees**. For example, there will always be organizational warning system actors who make mistakes, and people in the public who do not appropriately respond to even the best crafted warning messages. Application of the elements herein can, at best, only *"increase the probability"* of organization actors including emergency public information providers making fewer errors, and that more members of the public *might* take timely and appropriate protective action than *might* otherwise be the case.

Table 1
MESSAGE TEMPLATE DEVELOPMENT MATRIX

PROTECTIVE ACTIONS[1]	HAZARDS[2,3]					
	1	**2**	**3**	**4**	**5**	**6**
Shelter: in place	X	n/a	n/a	n/a	O	X
Shelter: in another place	X	n/a	n/a	n/a	n/a	O
Evacuate: leave area	X	X	X	O	O	O
Evacuate: leave site	X	n/a	n/a	n/a	n/a	O
Evacuate: leave building	X	n/a	n/a	n/a	n/a	O
Evacuate: vertical	n/a	n/a	X	O	n/a	n/a
Protect breathing: while sheltering	X	n/a	n/a	n/a	O	O
Protect breathing: while evacuating	X	n/a	n/a	n/a	O	O
Decontaminate: self	X	n/a	n/a	n/a	O	n/a
Decontaminate: objects	O	n/a	n/a	n/a	O	n/a
Refrain: do not evacuate	X	X	O	O	O	O
Refrain: do not return after evacuation	X	O	X	O	O	n/a
Refrain: do not pick up kids at school	X	O	O	n/a	O	n/a
Avoid: do not enter area	X	X	X	O	X	n/a
Avoid: do not enter site	n/a	n/a	n/a	n/a	n/a	n/a
Avoid: do not enter building	n/a	n/a	n/a	n/a	n/a	O
Contain: contaminated clothing	X	n/a	n/a	n/a	O	n/a
Contain: other contaminated items	O	n/a	n/a	n/a	O	n/a
Listen: for more information	X	O	X	O	X	X
All clear: resume normal activities	O	O	O	O	O	O
Abandon: area temporarily	X	O	O	O	O	n/a
Abandon: area permanently	X	n/a	n/a	n/a	n/a	n/a

[1] Protective actions could be single actions (one action), overlapping actions (different actions at the same time), or sequenced actions (different actions in a sequence); messages could address a single audience (one population) or multiple audiences (different populations and actions at the same time); and the time available for public action taking varies by hazard and event (none, minutes, hours, days). Where X = in a prototype message in this report, n/a = not applicable, and O = applicable to hazard but prototype message not written.

[2] The warning hazards represented in this matrix are 1= improvised nuclear device, 2 = mudflow, 3 = tsunamis, 4 = dam failure, 5 = anthrax release, and 6 = earthquake.

[3] A more complete list of hazards from a public message viewpoint that could be represented in such a matrix include: (1) natural hazards: asteroid impact 17 days, asteroid impact 30 years, avalanche watch, avalanche warning, blizzard,, dust storm, earthquake: aftershocks, earthquake: secondary hazards, earthquake: as foreshock, earthquake: post initiation early warning, earthquake: bogus psychic prediction, flood: flash flood watch, flood: flash flood warning, flood: coastal storm surge watch, flood: coastal storm surge warning, flood: river flood watch, flood: river flood warning, fog, hail, high wind: watch, high wind: warning, hurricane watch, hurricane warning, ice, landslide/ground failure: coastal erosion, landslide/ground failure: mud/debris flow, landslide/ground failure: rock fall, landslide/ground failure: sink hole, severe storm, severe thunderstorm watch, severe thunderstorm warning, snow: urban, temperature: extreme cold, temperature: extreme heat, tornado: watch, tornado: warning, tropical storm: watch, tropical storm: warning, tsunami: far field watch, tsunami: far field warning, tsunami: intermediate field watch, tsunami: intermediate field warning, tsunamis: near field, volcanic eruption, wildfire: wild land, wildfire: urban wild land interface, winter storm: watch, winter storm: warning, other; (2) terrorism hazards: cyber terrorism, detonation of IED: improvised nuclear device, detonation of IED: other explosive device, dispersal of radiological material, dispersal of biological agents: aerosol anthrax, dispersal of biological agents: other, sabotage, other; (3) technological hazards: dam failure, explosion: natural gas pipeline, explosion: other non-terrorist, hazardous material release: fixed land site, hazardous materials release: transportation land, hazardous materials release: transportation sea, levy failure, nuclear power plant, other; (4) civil disturbance hazards: riot, law enforcement activity with area closure: conventional attack shooter, law enforcement activity with area closure: conventional attack other, other; and (5) biological hazards: human disease: pandemic influenza, human disease: other, livestock disease, crop disease, other.

PROTOTYPE BAY AREA MESSAGES

<u>Improvised Nuclear Device Shelter Full Text Message</u>

NOTE: This message assumes that the Bay Area region adopts the protective action guidelines in: National Security Staff Interagency Policy Coordination Subcommittee for Preparedness & Response to Radiological and Nuclear Threats, 2nd Ed., June 2010 <u>Planning Guidance for Response to a Nuclear Detonation</u>. Washington, D.C. (Note: little if any federal guidance was provided for the content of this message.) The scenario is based upon the Department of Homeland Security's National Planning Scenario #1, Nuclear Detonation – 10-Kiloton Improvised Nuclear Device.

A nuclear explosion occurred at *[insert time here]* in *[insert location here]*. Radiation levels in the warning area are extremely dangerous now. They may decline in a few hours to days. Radiation is in the air, blowing in the direction of the wind, and falling to the ground. Exposure to radiation can cause illness and even death.

This "Mandatory Order to Take Shelter" is issued from the chiefs of the Bay Area's fire and police departments, health departments, and city and county government officials. It is based on plans for an event like this from some of our nation's best scientists and health professionals.

Everyone, including people in vehicles, in *[insert an easily understood description of the geographical boundaries]* can increase their chances of surviving if they immediately:

GO DEEP INSIDE
- The nearest accessible and stable appearing building and stay there.
- Good shelters include tall buildings, basements, underground garages, or tunnels. Look for buildings made of brick, concrete, or are covered by earth since they will give you the most protection.
- Current radiation levels are now extremely dangerous. They will not decline for a few hours to days.
- Radiation doses received will be lower inside than outside.
- If you are in a building, stay there unless you can reach a better shelter in a few minutes.

ONCE INSIDE
- Close all windows and doors.
- Turn off heaters, air conditioners, and all ventilation systems.
- Put out fires in fireplaces and close dampers.
- Go to the basement. If there isn't one, go to a middle floor such as floors 3-8 in a 10 story building.
- If there's only one floor in the building, stay there.
- Go in an inside room. Stay far away from outside walls and windows.
- These actions will reduce your exposure to radiation that gets in through the walls, windows, and roof.
- Keep listening to this and other media for information and instructions about other actions we will ask you to take in about an hour [*insert the time it will happen here*].

DO NOT GO OUTSIDE
- Until we tell you to.
- Do not leave the building you are in or evacuate unless told to do so by public officials. You are safer inside even if you drive fast.
- *[Only If Schools are in Session: Do not go to schools or day care facilities to get your children. Doing so will increase your radiation exposure; schools are in lockdown and children will not be allowed to leave. School children are being sheltered and cared for by their teachers. We will provide you with information later about how to reunite with your children.]*

REGARDING FOOD AND WATER
- Only bottled water may be free of contamination. Use a towel to wipe off the bottle to remove radiation on the outside.
- Water from your taps likely has a slight amount of radiation in it.
- If you have water pressure, save extra drinking water in clean containers.
- Sealed, packaged, and frozen foods are safe to eat.
- Rinse the package before opening.
- Wash your hands with soap and water before handling any food to remove radiation.
- Keep food off counters or anything else that could have radiation on it.

IF YOU AREN'T IN *[insert an easily understood description of the geographical boundaries]*,
- There's no reason for you to do anything since harmful amounts of radiation will not reach you. We will let you know if conditions change.
- But please stay out of the area.
- Going there will not be safe, and stay off the roads since unnecessary traffic will delay emergency response.
- Keep listening to this and other media for information and instructions.

USE TELEPHONES ONLY IF YOU HAVE A MEDICAL EMERGENCY
- (*This assumes the Bay Area OA's have plans, equipment and capability to conduct rescue operations during such an incident both in and around the impacted area.*)
- Call 911 *[insert the conditions under which people should call].*
- Otherwise, avoid using telephones, including cell phones, to prevent overloading the system and interfering with emergency use.

Improvised Nuclear Device Re-shelter Full Text Message

NOTE: This message assumes that the Bay Area region adopts the protective action guidelines in: National Security Staff Interagency Policy Coordination Subcommittee for Preparedness & Response to Radiological and Nuclear Threats, 2nd Ed., June 2010 <u>Planning Guidance for Response to a Nuclear Detonation</u>. Washington, D.C. (Note: little if any federal guidance was provided for the content of this message.) The scenario is based upon the Department of Homeland Security's National Planning Scenario #1, Nuclear Detonation – 10-Kiloton Improvised Nuclear Device.

Radiation levels remain high *[If possible, insert by whom current radiation levels were determined.]* Radiation is still in the air and continues to fall to the ground. The "Mandatory Order to Shelter" from the chiefs of the Bay Area's fire and police departments, health departments, and city and county government officials remains in effect.

DO NOT EVACUATE
- Sheltering remains the best way to reduce your exposure to radiation.

BUT IF YOU ARE NOT ALREADY IN ONE, RELOCATE
- Into a tall building, a basement, an underground garage, or a tunnel.
- Only relocate if you can do it without spending more than 30 minutes outside.
- While outside, always move in the direction away from the site of the explosion.
- Cover your nose and mouth with a cloth or mask while outside.
- Do not remove any clothing while outside.
- Do not go to schools and day care centers. They are still in lockdown. Children will not be allowed to leave and are still being cared for by their teachers.
- Relocating to a good shelter will reduce your overall radiation dose even though you will be exposed to higher levels of radiation while outside.
- Stay where you are if you can't get into a better structure in less than 30 minutes.

DECONTAMINATE WHEN YOU GET THERE
- Once you are under something so radiation has stopped falling on you, gently brush off any visible dust being careful not to breathe or swallow it.
- Once inside, remove your clothing and shoes.
- If you can't remove all your clothing, at least remove your jacket or coat and shoes.
- If you don't have an outer layer of clothing that can be removed, remove your shoes and keep dusting off your outer layer of upper clothing until you have a replacement.
- Put your shoes and clothing in a bag and place the bag far away from people and animals.
- If available, shower at the earliest possible time from head to feet with warm water and soap. Use shampoo but not hair conditioner because it will make radiation stick to your hair.
- If a shower isn't available, use a sink and wash as best you can. Pay particular attention to your hair and areas around your mouth, nostrils, and eyes. If no water is available, use moist wipes to clean your hands and face.
- Regarding pets
  - Dust off your pet outside while standing upwind to partially remove contamination

   o Wear a dust mask when brushing animals to avoid inhaling radioactive particles.
   o Bathe pets thoroughly to remove additional contamination.
   o Put your pet in a cage or on a leash if there is any risk of them becoming re-contaminated.

AND DO NOT FORGET TO
- Close all windows and doors.
- Turn off heaters, air conditioners, and all ventilation systems.
- Extinguish fires in fireplaces and close dampers.
- Go to the basement if there is one. If not, go to a middle floor such as floors 3-8 in a 10 story building.
- Then go in an inside room. Stay far away from outside walls and windows.

IF YOU AREN'T IN *[insert an easily understood description of the geographical boundaries]*,
- There's no reason for you to do anything since harmful amounts of radiation will not reach you. We will let you know if conditions change.
- But please stay out of the affected area. Going there will expose you to radiation.
- Stay off the roads since unnecessary traffic will delay emergency response.

USE TELEPHONES ONLY IF YOU HAVE A MEDICAL EMERGENCY
- (*This assumes the Bay Area OA's have plans, equipment and capability to conduct rescue operations during such an incident both in and around the impacted area.*)
- Call 911 *[insert the conditions under which people should call].*
- Otherwise, avoid using telephones, including cell phones, to prevent overloading the system and interfering with emergency use.

EVERYONE SHOULD
- Keep listening to this and other media for information and instructions about other actions we will ask you to take in about an hour *[insert the time it will happen here].* Current radiation levels remain high and are extremely dangerous. They will decline in anywhere from a few hours to a few days.

Improvised Nuclear Device Early Evacuation Full Text Message

NOTE: At least four evacuation messages are needed based on federal guidance to address: (a) pre-mature evacuation which is people who are evacuating voluntarily while they should be sheltering, (b) early evacuation of people with high vulnerabilities, (c) general evacuation, and (d) late evacuation of people who would be asked to leave last. We prepared one evacuation message and it is for early evacuation of people with high vulnerabilities as defined by the guidance.

NOTE: This message assumes that the Bay Area region adopts the protective action guidelines in: National Security Staff Interagency Policy Coordination Subcommittee for Preparedness & Response to Radiological and Nuclear Threats, 2nd Ed., June 2010 Planning Guidance for Response to a Nuclear Detonation. Washington, D.C. (Note: little if any federal guidance was provided for the content of this message.) The scenario is based upon the Department of Homeland Security's National Planning Scenario #1, Nuclear Detonation – 10-Kiloton Improvised Nuclear Device.

We will start to evacuate a small number of people who are especially vulnerable to radiation, in extreme risk, or in dire need of medical attention. Radiation levels have somewhat declined, but not enough to start a general evacuation. Radiation is still in the air. The "Mandatory Order to Shelter" from the chiefs of the Bay Area's fire and police departments, health departments, and city and county government officials remains in effect for everyone else.

EVACUATE NOW BUT ONLY IF YOU ARE
- In critical need of medical attention.
- Threatened with the collapse of the building you are in.
- In one of the following groups:
  - Children *[insert age here]* years of age or younger if accompanied by a parent or guardian.
  - *[Pregnant women early evacuation is not in federal guidance. Bay Area planners should decide if they want to include pregnant women in early evacuation.]*
  - If you are elderly, *[insert age here]* years of age or older.
- Or not in a good shelter such as a tall building, a basement, an underground garage, or a tunnel protected by materials like brick, concrete, and earth.

OTHERWISE STAY WHERE YOU ARE
- If you evacuate now, it would increase the time it takes to evacuate people with greater vulnerability and urgent medical needs.

EVERYONE EVACUATING SHOULD
- Protect your breathing while outside until you reach safety by covering your nose and mouth with a cloth or mask.
- Do not take off any clothing until you reach safety.
- Depending on where you are, here are the directions and routes you should take that go in directions away from the site of the explosion, are not blocked, and get you out of the radiation in the shortest amount of time.
  - People in *[insert a geographical description of a sub-section of the area under the plume in clear and simple language]* should evacuate by going *[insert the direction here)* using *[insert the road they should use here]*. You'll be out of the radiation when you reach *[insert a clear description of when safety is reached*]

    o *[Provide area and evacuation roads descriptions until the entire area is covered.]*

IF YOU EVACUATE IN A PRIVATE VEHICLE
- Keep the windows in your vehicle closed.
- Only use air circulation systems while in the re-circulate mode.
- If your vehicle is not equipped with re-circulating air, keep air conditioners and heaters off.
- Keep your radio on and tuned to *[insert station here.]*

IF YOU EVACUATE ON PUBLIC TRANSPORTATION
- Public transportation inside the area affected by radiation is *[insert a description of available public transportation inside the radiation zones which will be influenced by circumstance; say if it is not available; tell people where they can and cannot get on it if it is available]*.
- Once you reach safety, public transportation to take you to reception/decontamination centers is *[insert a description of available public transportation to take people to reception/decontamination centers here which will be influenced by circumstance; tell people if it is not available, and where they can and cannot get on it if it is available]*.

ONLY EVACUATE ON FOOT
- If it's the quickest or only transportation option available to you.

IF YOU NEED EVACUATION ASSISTANCE
- For example, because you can't walk, can't see, or are injured
- *(Bay Area planners should decide which of the following two options can be inserted here based on planning decisions and/or conditions of circumstance)*
  - *Option 1: We are not able to provide you with special evacuation assistance at this time. Ask others around you for help.*
  - *Option 2: [Describe what special evacuation assistance can be provided and clearly explain to people how they might go about obtaining it.]*

IF YOU EVACUATE OR ARE BEING EVACUATED FROM A FACILITY
- Such as a nursing home or hospital,
- Follow the instructions provided to you by facility personnel.

CHILDREN IN SCHOOLS AND DAY CARE CENTERS
- Under the age of *[insert the age here]* are now being evacuated.
- Do not go to schools or day care centers to get your children.
- The younger children being evacuated now won't be there when you arrive.
- Older children are still in lockdown and will not be allowed to leave.
- Some children are being evacuated from schools and day care centers. Here is a list of schools and day care centers that are evacuating and where the children will be taken, checked for contamination, decontaminated if needed, and taken care of until joined by a parent or guardian.

- o *[Insert a complete list of school and day care center names and a clear address and location of the reception/decontamination center to which children at that school or day care center will be taken.]*
- If you did not hear the name of your child's school, that's because that school is still in full lockdown and no one there is being evacuated.

EVERYONE EVACUATING
- Without medical injuries should go to one of the decontamination facilities that have been set up in safe areas.
- You need to be checked for contamination and decontaminated, if needed, by professionals.
- If your journey to a decontamination center is interrupted, we will tell you later things to do to partially decontaminate yourself until you can get to a decontamination center.
- These facilities can be found at the following locations.
  - o *[Insert a clear description of where decontamination facilities are located here.]*
- If you need immediate medical attention for non-radiation injuries, you should go to a hospital that can provide both medical and decontamination services. These are:
  - o *[Insert a list of such hospitals and their addresses here.]*

ONCE AGAIN, DO NOT EVACUATE
- If you are not among the very vulnerable or those in dire need of medical attention being evacuated at this time.
- It is safer for you to remain in a tall building, a basement, an underground garage, or in a tunnel made of materials like brick, concrete, and earth until radiation levels decline substantially.

IF YOU AREN'T IN *[insert an easily understood description of the geographical boundaries.]*
- There's no reason for you to do anything since harmful amounts of radiation will not reach you. We will let you know if conditions change.
- But please stay out of the area. Going there will expose you to radiation.
- Stay off the roads since unnecessary traffic will delay emergency response.

USE TELEPHONES ONLY IF YOU HAVE A MEDICAL EMERGENCY
- (*This assumes the Bay Area OA's have plans, equipment and capability to conduct rescue operations during such an incident.*)
- Call 911 *[insert the conditions under which people should call.]*.
- Otherwise, avoid using telephones, including cell phones, to prevent overloading the system and interfering with emergency use.

EVERYONE SHOULD
- Keep listening to this and other media for information and instructions about other actions we will ask you to take in about an hour *[insert the time it will happen here.]* Current radiation levels have only somewhat declined and remain dangerous. They will decline more in anywhere from a few hours to a few days.

Improvised Nuclear Device Decontamination Full Text Message

NOTE: Variations of this message are needed to customize the text to fit four different evacuating groups based on federal guidance. These groups are: (a) pre-mature evacuees who are people evacuating voluntarily while they should be sheltering, (b) early evacuees with high vulnerabilities, (c) general evacuees, and (d) late evacuees who are people asked to leave last. We prepared one decontamination message for early evacuees with high vulnerabilities.

NOTE: This message assumes that the Bay Area region adopts the protective action guidelines in: National Security Staff Interagency Policy Coordination Subcommittee for Preparedness & Response to Radiological and Nuclear Threats, 2nd Ed., June 2010 Planning Guidance for Response to a Nuclear Detonation. Washington, D.C. (Note: little if any federal guidance was provided for the content of this message.) The scenario is based upon the Department of Homeland Security's National Planning Scenario #1, Nuclear Detonation – 10-Kiloton Improvised Nuclear Device.

Everyone evacuating now should be decontaminated when they reach safety. The "Mandatory Order to Shelter" from the chiefs of the Bay Area's fire and police departments, health departments, and city and county government officials remains in effect for everyone else.

EVERYONE EVACUATING
- Should go to one of the decontamination facilities that have been set up in safe areas to be checked for contamination and decontaminated, if needed, by professionals.
- Decontamination facilities can be found at the following locations.
  - *[Insert a clear description of where decontamination facilities are located here.]*
- If you need immediate medical attention, you should go to a hospital that can provide both medical and decontamination services. These are:
  - *[Insert a list of such hospitals and their addresses here.]*
- If you do not need medical attention, and if your journey to a decontamination center is interrupted, go somewhere safe that has a shower.

DECONTAMINATE YOURSELF AS SOON AS YOU REACH THAT SAFE PLACE
- The radiation on you and your clothing is causing harm to you and to people and pets near you.
- Remove your shoes and clothing.
- Put your shoes and removed clothing in a bag. Place the bag far away from people and animals.
- Someone will come to collect your bag of contaminated clothing later.
- Shower at the earliest possible time from head to toe with warm water and mild soap. Cover open wounds to keep wash water out. Use a sponge, wash cloth or soft brush. Wash your head first. Bend your head forward to direct wash water away from your body. Keep wash water out of your eyes, nose, mouth and wounds. Don't damage your skin: keep water temperature on medium, rub gently, and use mild soap. Use shampoo but not hair conditioner because it will make radiation stick to your hair.
- Put on clean clothes.

- If a shower is not available, use a sink and wash as best you can. Pay particular attention to your hair and areas around your mouth, nostrils, and eyes. If no water is available, use moist wipes to clean your hands and face.

DECONTAMINATE YOUR PETS
- Dust off your pet outside while standing upwind to partially remove contamination.
- Wear a dust mask when brushing animals to avoid inhaling radioactive particles.
- Bathe pets thoroughly to remove additional contamination.
- Put your pet in a cage or on a leash if there is any risk of them becoming re-contaminated.

DECONTAMINATE YOUR VEHICLE
- Rinse or wash down your vehicle once out of the danger area.
- *(We recommend that more details about vehicle decontamination be provided here if Bay Area planners decide that the federal guidance statement here provided is insufficient.)*

THEN GO TO A DECONTAMINATION CENTER
- As soon as possible to be checked for any remaining contamination and further decontamination, if needed, by professionals.

USE TELEPHONES ONLY IF YOU HAVE A MEDICAL EMERGENCY
- (*This assumes the Bay Area OA's have plans, equipment and capability to conduct rescue operations during such an incident both in and around the impacted area*.)
- Call 911 *[insert the conditions under which people should call.]*
- Otherwise, avoid using telephones, including cell phones, to prevent overloading the system and interfering with emergency use.

EVERYONE SHOULD
- Keep listening to this and other media for information and instructions about other actions we will ask you to take in about an hour *[insert the time it will happen here.]* Current radiation levels remain extremely high. They will decline in anywhere from a few hours to a few days.

Improvised Nuclear Device Area Abandonment Full Text Message

NOTE: This message assumes that the Bay Area region adopts the protective action guidelines in: National Security Staff Interagency Policy Coordination Subcommittee for Preparedness & Response to Radiological and Nuclear Threats, 2ⁿᵈ Ed., June 2010 <u>Planning Guidance for Response to a Nuclear Detonation</u>. Washington, D.C. (Note: little if any federal guidance was provided for the content of this message.) The scenario is based upon the Department of Homeland Security's National Planning Scenario #1, Nuclear Detonation – 10-Kiloton Improvised Nuclear Device.

This is a "Do Not Enter Order" from the chiefs of the Bay Area's fire and police departments, health departments, and city and county government officials.

DO NOT ENTER
- The area affected by radiation from the nuclear explosion that occurred on *[insert date here]* in *[insert location here.]*
- The "Do Not Enter Zone" is defined by the following borders.
    - *[Insert clear and easily identified boarders here.]*
- Stay out of this area until further notice.
- The boundary of this zone is sealed off. The do not enter order is being enforced by *[insert the name of the law enforcement agencies on the zone perimeters.]*

HERE'S WHAT WE CAN TELL YOU NOW
- Some of our nation's best scientists are examining the radioactive contamination in the zone, and they will provide us with their results as they have them.
- Parts of the Do Not Enter Zone are more contaminated than others.
- Areas close to the Do Not Enter Zone are not contaminated and there is no need to avoid them.
- We will keep you informed with up-to-date information as soon as more is learned.

Initial Shelter Improvised Nuclear Device Message

*NOTE: This message is in the Common Alerting Protocol format. When encoded using the CAP 1.2 specification this message should be compliant with the IPAWS Profile version 1.0 (but see Note 1 below). Additional valid CAP 1.2 elements may also be included in the message, but additional **info** blocks should be included only to support multiple languages, not for alternate timeframes or target areas. **Info** blocks in languages other than English should include the corresponding CAP specified language code (e.g., "es-US" for Spanish) in the language element.*

ALERT		
identifier	*[unique message id – automatically assigned by authoring tool]*	
sender	*[unique sender id – pre-assigned to sending agency]*	
sent	*[time message sent – set automatically by authoring tool]*	
status	Actual	
Msg. Type	Alert	
scope	Public	
code	IPAWSv1.0	
		INFO
language	en-US	
category	CBRNE	
event	Nuclear explosion	
Response Type	Shelter	
urgency	Immediate	
severity	Extreme	
certainty	Observed	
Event Code	**Value Name**	SAME
	value	RHW
expires	*[sent time plus three hours]*	
Sender Name	*[Name of agency or entity responsible for this message]* - see NOTE 1	

headline	Nuclear explosion in *[insert location]* – Take shelter indoors!
description	A nuclear explosion occurred at *[insert time of event]* in *[insert jurisdiction where event occurred]*. Radiation is in the air, blowing in the direction of the wind, and is falling to the ground. Exposure to radiation can cause illness and even death.
instruction	You can increase your chance of surviving and avoiding injury by going inside the nearest tall building, basement, underground garage or tunnel IMMEDIATELY and staying there until you receive further official instructions. Shelters made of brick, concrete, and earth will give you the most protection. If you are in a different kind of building, stay there unless you can reach a better shelter in a few minutes.

	DO NOT EVACUATE. If you are driving, stop your car and take shelter. You will receive less radiation inside than outside no matter how fast you drive.	
	If you are not in the take-shelter area, STAY OUT.	
	Keep listening to this and other media for official news and instructions, as we will be asking you to take other actions later. Radiation levels are extremely dangerous right now, but they will decline in anywhere from a few hours to a few days.	
	This "Shelter Order" is based on expert advice from nuclear scientists and local, state, and federal emergency managers.	
	-see NOTE 2	
Parameter	**Value Name**	EAS-ORG
	Value	CIV
		AREA
Area Description	*[Text description of area for which this message is valid]* – see NOTE 3	
polygon	*[Optional CAP-formatted lat/lon polygon describing area for which this message is valid.]*	
circle	*[Optional CAP-formatted circle centered on explosion location, radius to include area for which this message is valid.]*	
geocode	**Value Name**	SAME
	value	*[6-digit FIPS code for county in which this message is vali*

NOTE 1 – FEMA guidance regarding the form of this element for IPAWS is unfinished at the time of this writing. Therefore this template should be reviewed from time to time for current compliance with the IPAWS as implemented.

NOTE 2 – This message does not contain all the known motivators to maximize the probability of timely and appropriate public response. Nor does it contain all the protective actions people should take at this point in time. These gaps should be filled with pre-event public education and the provision of rapid supplemental information after this message is disseminated.

NOTE 3 – This area should be defined in clear and simple language and should include the best available estimate of the fallout area for the initial period until more detailed information becomes available.

NOTE 4 - The message may include multiple geocode elements as required.

Evacuation for Mudflows after Wildfire Message

NOTE: This message is in the Common Alerting Protocol format. When encoded using the CAP 1.2 specification this message should be compliant with the IPAWS Profile version 1.0 (but see Note 1 below). Additional valid CAP 1.2 elements may also be included in the message, but additional info blocks should be included only to support multiple languages, not for alternate timeframes or target areas. Info blocks in languages other than English should include the corresponding CAP specified language code (e.g., "es-US" for Spanish) in the language element.

ALERT		
identifier	*[unique message id – automatically assigned by authoring tool]*	
sender	*[unique sender id – pre-assigned to sending agency]*	
sent	*[time message sent – set automatically by authoring tool]*	
status	Actual	
Msg. Type	Alert	
scope	Public	
code	IPAWSv1.0	
INFO		
language	en-US	
category	Geo	
event	Mudslides	
response type	Evacuate	
urgency	Immediate	
severity	Severe	
certainty	Likely	
Event Code	**Value Name**	SAME
	value	EVI
expires	*[as specified by detection agencies]*	
Sender Name	*[Name of agency or entity responsible for this message] - see NOTE 1*	

headline	Catastrophic Mudflows Imminent in *[location]* - Evacuate Now
description	Heavy rains over the last *[timeframe]* on burnt slopes in *[location]* have destabilized the ground above and beneath buildings and people. Rapidly moving mudslides and debris flows could occur now – large enough to bury homes, roads and people.
instruction	EVACUATE HILLSIDE AREAS under burnt slopes in the warning area NOW to increase your chance of surviving and avoiding injury. Do not delay your departure out of the area for long. Mudslides could occur now and without notice. The amount of rain that has already fallen in the area is enough to start

	catastrophic mudslides. Do not think you are safe if it is not raining where you are now.	
	If you are not in the warning area, STAY OUT.	
	Keep listening to this and other media for official news and information updates.	
	This "Evacuation Order" is from local emergency managers in consultation with weather experts and geologists.	
	-See Note 2	
Parameter	**Value Name**	EAS-ORG
	value	CIV
AREA		
Area Description	*[Text description of area for which this message is valid]* – see Note 3	
polygon	*[Optional CAP-formatted lat/lon polygon describing area for which this message is valid.]*	
circle	*[Optional CAP-formatted circle centered on explosion location, radius to include area for which this message is valid.]*	
geocode	**Value Name**	SAME
	value	*[6-digit FIPS code for county in which this message is valid*

NOTE 1 – FEMA guidance regarding the form of this element for IPAWS is unfinished at the time of this writing. Therefore this template should be reviewed from time to time for current compliance with the IPAWS as implemented.

NOTE 2 – This message does not contain all the known motivators to maximize the probability of timely and appropriate public response. This gap should be filled with pre-event public education and the provision of rapid supplemental information after this message is disseminated.

NOTE 3 – This area should be defined in clear and simple language. If possible use familiar landmarks to communicate unsafe and safe areas.

NOTE 4 - The message may include multiple geocode elements as required.

Evacuation for Near Source Tsunami Message

NOTE: This is in the Common Alerting Protocol format. When encoded using the CAP 1.2 specification this message should be compliant with the IPAWS Profile version 1.0 (but see Note 1 below). Additional valid CAP 1.2 elements may also be included in the message, but additional info blocks should be included only to support multiple languages, not for alternate timeframes or target areas. Info blocks in languages other than English should include the corresponding CAP specified language code (e.g., "es-US" for Spanish) in the language element.

ALERT		
identifier	*[unique message id – automatically assigned by authoring tool]*	
sender	*[unique sender id – pre-assigned to sending agency]*	
sent	*[time message sent – set automatically by authoring tool]*	
status	Actual	
Msg. Type	Alert	
scope	Public	
code	IPAWSv1.0	
INFO		
language	en-US	
category	Geo	
event	Tsunami	
response type	Evacuate	
urgency	Expected	
severity	Extreme	
certainty	Observed	
Event Code	**value Name**	SAME
	value	EVI
expires	*[sent time plus three hours]*	
Sender Name	*[Name of agency or entity responsible for this message]* - see NOTE 1	

headline	Tsunami Waves Imminent in Bay Area - go to high ground now & stay there

description	A large earthquake at *[time]* near *(insert location, e.g., off the coast of Oregon, Washington State, or the Pacific Northwest)* has generated a tsunami. The first wave will hit the Bay Area at *(insert time, e.g., which will be in under an hour after the quake)* and will not be the largest. Other waves will strike over many hours. The waves will move onshore very fast, and may reach heights of *(insert heights here, e.g., 20 to 50 feet)* above sea level or higher.	
instruction	GET TO HIGH GROUND NOW of at least *[insert height estimate here]* if you are on a beach or anywhere near a coastline.	
	EVACUATE OUT OF THE AREA if you can reach a safe area that a tsunami will not hit *[insert description of safe area/distance here]* by *[insert time tsunami will hit].*	
	Otherwise, EVACUATE TO AN UPPER FLOOR of a high rise building.	
	If you see the ocean water pull back and expose the sea floor, RUN to high ground as fast as you can since a tsunami will strike in few moments.	
	Once you are in a safe location or at a safe height, STAY THERE until advised it's safe to leave by officials since multiple waves are expected over many hours.	
	If you are not in a tsunami impact area, STAY OUT.	
	Keep listening to this and other media for official news and information updates.	
	This "RELOCATION ORDER" is from local emergency managers based on information from scientists at the Pacific Tsunami Warning Center.	
	-see NOTE 2	
Parameter	**Value Name**	EAS-ORG
	Value	CIV
AREA		
Area Description	*[Text description of area for which this message is valid]* – see Note 3	
polygon	*[Optional CAP-formatted lat/lon polygon describing area for which this message is valid.]*	
circle	*[Optional CAP-formatted circle centered on explosion location, radius to include area for which this message is valid.]*	
geocode	**Value Name**	SAME
	Value	*[6-digit FIPS code for county in which this message is valid*

NOTE 1 – FEMA guidance regarding the form of this element for IPAWS is unfinished at the time of this writing. Therefore this template should be reviewed from time to time for current compliance with the IPAWS as implemented.

NOTE 2 – This message does not contain all the known motivators to maximize the probability of timely and appropriate public response. This gap should be filled with pre-event public education and the provision of rapid supplemental information after this message is disseminated.

NOTE 3 – This area should be defined in clear and simple language. It would be different for each Bay Area county/OA. County-specific run up zones are available on-line with CalEMA and clear descriptions of these for each county should be prepared now and inserted into county-specific message templates as follows: If you are in *[insert county name here]* the tsunamis will likely strike the following areas *[insert a simple description of county-specific run up zones]*.

NOTE 4 - The message may include multiple geocode elements as required.

Explosion at a Dam (possible sabotage) Initial Message

NOTE: This message is in the Common Alerting Protocol format. When encoded using the CAP 1.2 specification this message should be compliant with the IPAWS Profile version 1.0 (but see Note 1 below). Additional valid CAP 1.2 elements may also be included in the message, but additional info blocks should be included only to support multiple languages, not for alternate timeframes or target areas. Info blocks in languages other than English should include the corresponding CAP specified language code (e.g., "es-US" for Spanish) in the language element.

ALERT		
identifier	*[unique message id – automatically assigned by authoring tool]*	
sender	*[unique sender id – pre-assigned to sending agency]*	
sent	*[time message sent – set automatically by authoring tool]*	
status	Actual	
Msg. Type	Alert	
scope	Public	
code	IPAWSv1.0	
INFO		
language	en-US	
category	CBRNE	
event	Explosion at Dam	
response type	Monitor	
urgency	Immediate	
severity	Likely	
certainty	Observed	
Event Code	**Value Name**	SAME
	value	CEM
expires	*[sent time plus three hours]*	
Sender Name	*[Name of agency or entity responsible for this message]* - see NOTE 1	

headline	Explosion at *[insert name]* Dam – People in possible flood area should listen for urgent information updates
Description	An unexpected explosion occurred at *[insert time]* at *[insert the name of the dam and where it is located]*. The explosion may have damaged the dam. The dam is being examined by engineers to determine if it is in danger of failing. If the dam fails, it could result in a catastrophic and fast moving flood.
Instruction	There is no need to evacuate at this time, but people immediately downstream from the dam should PREPARE TO EVACUATE if necessary by gathering items that you will want to take with you if it becomes necessary. These items include medicines, food and water, prescription information, baby and pet supplies, clothing, personal hygiene items, cash, identification and important papers, bedding, and other items such as a portable radio, and insurance papers.

	KEEP LISTENING to this and other media for urgent information updates. You will be given new information about the condition of the dam as it becomes available.	
	If an evacuation becomes necessary, you will be notified immediately and given important evacuation information about what to take with you and how to get to safe areas.	
	If you are not in the potential flood zone, STAY OUT.	
	This "Advisory" is from the dam operators and local emergency managers.	
	-see NOTE 2	
Parameter	**Value Name**	EAS-ORG
	Value	CIV
AREA		
Area Description	*[Text description of area for which this message is valid]* – see Note 3	
polygon	*[Optional CAP-formatted lat/lon polygon describing area for which this message is valid.]*	
circle	*[Optional CAP-formatted circle centered on explosion location, radius to include area for which this message is valid.]*	
geocode	**Value Name**	SAME
	Value	*[6-digit FIPS code for county in which this message is va*

NOTE 1 – FEMA guidance regarding the form of this element for IPAWS is unfinished at the time of this writing. Therefore this template should be reviewed from time to time for current compliance with the IPAWS as implemented.

NOTE 2 – This message does not contain all the known motivators to maximize the probability of timely and appropriate public response. Pre-event public education containing a public evacuation checklist would enhance public compliance were such an instruction issued during an actual event.

NOTE 3 – This area should be defined in clear and simple language based on existing maps of the area that could flood in the event of dam failure.

NOTE 4 - The message may include multiple geocode elements as required.

Anthrax Release Shelter Message

NOTE: This message is in the Common Alerting Protocol format. When encoded using the CAP 1.2 specification this message should be compliant with the IPAWS Profile version 1.0 (but see Note 1 below). Additional valid CAP 1.2 elements may also be included in the message, but additional info blocks should be included only to support multiple languages, not for alternate timeframes or target areas. Info blocks in languages other than English should include the corresponding CAP specified language code (e.g., "es-US" for Spanish) in the language element.

ALERT		
identifier	*[unique message id – automatically assigned by authoring tool]*	
sender	*[unique sender id – pre-assigned to sending agency]*	
sent	*[time message sent – set automatically by authoring tool]*	
status	Actual	
Msg. type	Alert	
scope	Public	
code	IPAWSv1.0	
INFO		
language	en-US	
category	CBRNE	
event	Anthrax – dispersal	
response type	Shelter	
urgency	Immediate	
severity	Extreme	
certainty	Observed	
Event Code	**value Name**	SAME
	value	SPW
expires	*[sent time plus three hours]*	
Sender Name	*[Name of agency or entity responsible for this message]* - see NOTE 1	

headline	Anthrax disease in the air in *[location]* – Take shelter indoors! – see NOTE 2

description	Anthrax is in the air in *[insert a simple description such as "downtown" followed by the name of the city].* Infection can occur if it is breathed in, contaminated food is eaten, or through an open cut or wound. People sick with anthrax have flu-like symptoms. You cannot catch anthrax from people who are sick. Anthrax can cause death if not treated.
instruction	IMMEDIATELY GO INSIDE THE BUILDING CLOSEST TO YOU if you are in the contaminated area. This includes people who are driving and pets. If you are in a building stay there. Turn off all heat, air conditioning, and ventilation systems to keep outside air from getting in. REMOVE YOUR OUTER CLOTHING AND SHOES and, if possible, place them in a sealed bag in a closet. Otherwise place them as far from people and pets as possible. If you are able, TAKE A SHOWER with soap and warm water. Do not vacuum or do other things that would stir up dust. If you are not in the contaminated area, STAY OUT. Keep listening to this and other media for official news and instructions, as we will be asking you to take other actions later. This "Shelter Order" is based on advice from county health officials and local emergency managers. -see NOTE 3

Parameter	**Value Name**	EAS-ORG
	Value	CIV

AREA		
Area Description	*[Text description of area for which this message is valid]* – see NOTE 4	
polygon	*[Optional CAP-formatted lat/lon polygon describing area for which this message is valid.]*	
circle	*[Optional CAP-formatted circle centered on explosion location, radius to include area for which this message is valid.]*	
geocode	**Value Name**	SAME
	Valve	*[6-digit FIPS code for county in which this message is va* -see NOTE 5

NOTE 1 – FEMA guidance regarding the form of this element for IPAWS is unfinished at the time of this writing. Therefore this template should be reviewed from time to time for current compliance with the IPAWS as implemented.

NOTE 2 – Sheltering in not always the appropriate anthrax protective action. In some cases evacuation is appropriate.

NOTE 3 – This message does not contain all the known motivators to maximize the probability of timely and appropriate public response. Nor does it contain all the protective actions people should take at this point in time. These gaps should be filled with pre-event public education and the provision of rapid supplemental information after this message is disseminated.

NOTE 4 – This area should be defined in clear and simple language (for example, from 1st to 4th Streets and between H and L Avenues in downtown followed by the name of the city) and should be based on the best available estimate of the contaminated area for the initial period until more detailed information becomes available.

NOTE 5 - The message may include multiple geocode elements as required.

Earthquake as Foreshock Warning Message

NOTE: This is in the Common Alerting Protocol format. It is not formatted for distribution over the IPAWS/EAS system. Additional valid CAP 1.2 elements may also be included in the message, but additional info blocks should be included only to support multiple languages, not for alternate timeframes or target areas. Info blocks in languages other than English should include the corresponding CAP specified language code (e.g., "es-US" for Spanish) in the language element.

ALERT	
identifier	*[unique message id – automatically assigned by authoring tool]*
sender	*[unique sender id – pre-assigned to sending agency]*
sent	*[time message sent – set automatically by authoring tool]*
status	Actual
msg. type	Alert
scope	Public
INFO	
language	en-US
category	Geo
event	Earthquake
response type	Prepare
urgency	Expected
severity	Extreme
certainty	Observed
expires	*[sent time plus three hours]*
Sender Name	*[Name of agency or entity responsible for this message]* - see NOTE 1

headline	Today's Earthquake Raises Odds of a Great Quake Happening Sometime in Next 72 Hours – get ready now
description	Today's *[insert magnitude]* magnitude earthquake has raised the probability of a Great Earthquake of *[insert estimated magnitude here]* in the Bay Area sometime within the next *[insert number of hours here]*. The odds of such a quake are typically 1 in *[insert estimated number reported buy UGSG here]*. Scientists have raised those odds to 1 in *(insert estimated number reported by the USGS here)* for the next *[insert number here]* days*.*
instruction	PREPARE FOR A LARGER EARTHQUAKE in the next *[insert estimated number here]* days. Even if doesn't occur, there will be aftershocks from today's quake and some of them will be large. There are many things that you should do to get ready for a larger quake and aftershocks from today's earthquake. Here are some of them. Identify objects that

	could injure you in your home and sources of gas and electrical fires and fix them. Gather emergency supplies and water. Check for weakened parts of your house or building from today's quake and avoid them. PROTECT YOURSELF during aftershocks and the bigger earthquake with DROP, COVER, AND HOLD ON. A larger quake would affect a larger area than today's quake and cause more extensive damage. Keep listening to this and other media for official news and information updates. This "Advisory" is from earthquake scientists and local emergency managers. -see NOTE 2	
AREA		
Area Description	*[The entire Bay Area and beyond]* – see Note 3	
polygon	*[Optional CAP-formatted lat/lon polygon describing area for which this message is valid.]*	
circle	*[Optional CAP-formatted circle centered on explosion location, radius to include area for which this message is valid.]*	

NOTE 1 – FEMA guidance regarding the form of this element for IPAWS is unfinished at the time of this writing. Therefore this template should be reviewed from time to time for current compliance with the IPAWS as implemented.

NOTE 2 – This message does not contain all the known motivators to maximize the probability of timely and appropriate public response. Nor does it contain all the protective actions people should take at this point in time. These gaps should be filled with continued pre-event public education and the provision of rapid supplemental information after this message is disseminated.

NOTE 3 – This area would include a much larger geographical area than was affected by the earthquake just experienced. It would include all of the OAs in the Bay Area.

NOTE 4 - The message may include multiple geocode elements as required.

Appendix G

Warning Practices

The following warning practices section provides background information on the complex process of issuing public warnings. These practices do not set out a prescriptive set of actions and do not impose any affirmative duty to take any particular action or inaction when it comes to issuing warnings to the public. These practices are not an operational guide. They are for situational awareness purposes only.

Where Warnings Come From

Requirements and messages for particular warnings come from two types of sources: external and internal.

External: These are agencies or entities outside the immediate community that have expert knowledge of some particular hazard and an established relationship of expectations with local agencies. Examples include the National Weather Service, the Alaska Tsunami Warning Center, the Northern California Regional Intelligence Center, petrochemical and other hazardous industrial operators and numerous others. External sources provide information about impending hazards and frequently also supply recommended warning messages. They generally have well-developed operating procedures for warning within their particular domain of expertise. They may have their own warning dissemination channels in addition to local or regional systems. However, they do not have authority over local alerting systems, nor are they responsible for local public safety beyond their notification responsibilities.

Internal: These are "insiders" within an agency, an Incident Command or an Emergency Operations Center. Frequently these are response personnel in the field from police, fire or public health agencies. Internal sources generally have direct responsibility for the public welfare well beyond the activity of warning. They may have detailed understanding of local conditions and first-hand knowledge of events and trends. However they are only rarely expert in public warning practice and may need immediate assistance in order to use available warning capabilities effectively. In addition to predictable hazards for which detailed pre-planning is possible, they also are responsible for dealing with unexpected and exceptional situations.

Many long-standing warning systems, particularly ones that rely on broadcast media, are designed primarily for the dissemination of warnings from external sources.   More recent warning systems (e.g., many telephone notification systems) tend to be oriented toward

distributing warnings from internal sources. Without an active effort to integrate both types of warning sources across all warning delivery systems, this can create inconsistencies in messaging that can undermine warning effectiveness.

A special case of an external warning source is an adjacent jurisdiction. Neither natural nor man-made hazards can be counted on to respect political or administrative boundaries. As a result an instantaneous capability for warning across multiple jurisdictions is often required. Development of such a capability is a key goal of the Strategic Plan.

Why Warnings Fail

Warning systems are complex systems that weave together different organizations and the people who work in them as well as use communication technologies. Combined, the organizations, people and technologies have the end goal of reaching and motivating an at risk public to take timely and effective protective actions. Research has documented that warning systems have a high probability of experiencing failures since they are inherently unreliable. This is because it is inherently difficult to effectively weave together the behavior of disparate organizations and agencies--and the people who work in them--across an often complex web of varied government levels.

To complicate matters further, warning systems tend to rely on people to effectively communicate with others across organization boundaries who may rarely communicate with each other. Many of the individual actors in the system may focus--as do most people--on their individual jobs alone, and more often than not no one is in charge of viewing and managing the multi-organizational, multi-agency, multi-government level warning system as a whole. The result is that effective communication links between organizations and people in the system breakdown or fail with the unfortunate result of increased loss and injury among the at-risk public.

The probability of warning system failures increase as the complexity of the system increases. A *warning system of systems* that weaves together multiple warning systems across multiple local jurisdictions for multiple hazards complicates things exponentially as does the probability of such a system experiencing a failure somewhere when used. Enhanced technology coupled with robust incident management systems such as the Standardized Emergency Management System and related and tested multi-jurisdictional operational plans, e.g. the Bay Area's Regional Emergency Coordination Plan may decrease the odds of failure, but the inherent complexity of such warning systems creates inherent risk of failure in a multi-jurisdictional emergency response.

The research record on communication from risk detectors—those who detect a hazard such as the National Weather Service, a police officer, an intelligence officer, a county health officer, etc. regardless of the involved hazard--to local players in the warning system catalogues a set of classical historical reasons for historical communication failures between these two types of actors. These follow.

- **Failures involving the communication link**:
  o Risk detectors do not know with whom to communicate at the local level and/or do not perceive that they have the authority to do so.
  o Fail safe, mutually exclusive, and redundant channels of communication between detectors and locals managers do not exist and the existing communication channel(s) fails.
  o Mutually agreed to and complete protocols are absent resulting in less than optimal communication.
  o Communication protocols exist but inadequate training for risk detectors results in sub-optimal communication.
  o The communication link is based on incompatible technology.
  o The communication link is one directional and flows from detectors to locals with effective way for locals to ask and get answers to questions.

- **Failures involving bypassing the established link**:
  o Risk detectors bypass local managers and directly communicate with the local public with conflicting public information.

- **Failures involving what is communicated and when**:
  o Risk detectors communicate to locals using words, jargon and/or in ways that locals find difficult to understand.
  o Risk detectors communicate less (or more) information than locals require in order to make informed decisions.
  o Detectors communicate too late providing local managers too little time to do their job.

A warning must first be issued in order to have an effect. Yet recent history is full of examples, from the Virginia Tech shootings to the Indian Ocean Tsunami, in which a potentially life-saving alert was possible and yet was not delivered to the people at risk.

Through experience a number of recurrent "failure patterns" have emerged that can render the most advanced and expensive warning technology useless. None of these involve personal failures by irresponsible or incompetent individuals. Instead, they represent systemic failures that make effective warning difficult or even impossible. They include:

"Tall" Chains of Execution: So many levels of approval and review are required that a warning is delayed until it is no longer useful.

Lack of Policy "Top Cover": Fearful of the ramifications for themselves, and lacking clear guidance on when a warning should be issued, responsible officials elect not to take the risk.

Undefined Authority: There being no clear assignment of responsibility for issuing warnings, the personnel with information about an immediate hazard take no action, assuming that somebody else will take care of the warning aspect.

Multiple and/or Changeable Activation Procedures: While striving to follow science-based policy by using multiple warning delivery systems, responsible officials are confronted with a time-consuming and complex array of redundant procedures for activating individual systems, or find that the tools they expected to use have changed due to vendor upgrades or new additions.

Lack of Expertise and Support: Although they would like to issue a warning, the responsible personnel lack confidence in their ability to use the available warning capabilities properly and have nowhere to turn for immediate assistance.
Confusion of Mechanics with Policy: Warning system procedures address the mechanical steps of issuing a warning but are unclear or silent on questions of when and how the warning system should be used.

"Uncertainty Anxiety": Concerned about appearing indecisive or uninformed, responsible officials delay issuing warning because there is some degree of uncertainty about the situation, or inflate the certainty of the hazard information in their messages.
Inflexible Procedures / Lack of Basic Principles: Warning system policy is expressed in terms of specific scenarios, which leaves the responsible officials without guidance when a different or unexpected situation arises.

Many of these barriers can be reduced or eliminated by, a) implementing integrated warning control systems, and b) adopting policies and a Standard of Practice to provide guidance and "top cover" for responsible officials. Mitigating these barriers and smoothing the paths to successful and effective warning is another key goal of the Strategic Plan.

Defining Warning Success

In any cooperative effort it is crucial to have a shared understanding of "what success looks like." Discussions of warning system strategy often get sidetracked because different participants have different objectives or are using different metrics to evaluate options and activities.

Public warning systems are often evaluated in one of three ways. The first perspective holds that the appropriate measure of success is an improved outcome for the community; this is a laudable ideal but can be difficult to evaluate objectively. A second view takes information transfer to the target audience as the standard of performance; this metric is relatively easy to measure but doesn't necessarily satisfy those who aspire to actually reduce losses.

A third, pragmatic approach treats public compliance with protective action recommendations as the practical goal of public warning. People evacuating when they're asked to evacuate, sheltering in place when that's the recommendation, or even just refraining from some activity for a time—these are observable behaviors that incident commanders and emergency managers hope to elicit in service of the larger goals of reducing harm and improving outcomes. Warnings that achieve this pragmatic objective can be described as "effective."

When to Warn

The presence of risk can be communicated to local emergency public information providers from a wide range of sources including federal scientific agencies (as in the case of many natural hazards), county health departments (in the case of some biological hazards), law enforcement and intelligence agencies, private businesses (for example, for fixed-site hazardous materials incidents), neighboring governments, and even from members of the public itself (suspicious activity reports).

Local public emergency communication plans should contain clear procedures for emergency local public information providers to follow about the trigger points *when warning information containing protective action recommendations* would be made public by emergency local public information providers. Trigger points for public protective action recommendations may be similar across some hazards, but different for others; and the public protective action trigger point may indicate a single action, for example, in the case of evacuation for a mudslide, or sequenced actions as in the case of radiation exposure

reduction after a nuclear detonation. For example, shelter in-place for the first hour, then shelter in a particular building type for the first day, and then evacuate.

Local emergency public communication personnel must have an operations plan that converts information from risk detectors to information that can be used by local emergency public communication personnel to warn the public regarding an array of hazards – terrorist incidents, natural disasters and human-caused accidents, etc. Local emergency public communication plan should contain clearly specified criteria about when public warnings recommending each different but possible public protective action for each hazard should be issued.

It is clearly beyond the knowledge set in the social sciences to determine what might be appropriate protective actions. These decisions should be made by technical experts, e.g., radiation health physicists in the case of hazards involving radiation. However, the social science research record is filled with cases in which public warnings containing protective action recommendations have been delayed because planned trigger points for public warning dissemination were absent from emergency public communication plans resulting in increased loss and injury.

Finally, when determining when to issue a warning, emergency public communication personnel must also consider those not at risk from the hazard. People not at risk also need information in emergencies. For example, "shadow evacuation" is a well-documented phenomenon that refers to safe people evacuating when there is no real reason for them to do so. This can be a problem when shadow evacuees slow evacuation time for people at risk and delay their reaching safety. This can only be addressed by emergency communications to people not at risk that explains why they are safe and no action on their part is needed.

How Warnings Get Delivered

Once the decision is made to issue a warning to the public, or to some segment of the public, and the warning message is composed, there are a variety of ways that alerts can be distributed to the public. Capabilities vary from place to place and new methods of warning delivery are constantly emerging. However, these can all be gathered into two general classes:

Primary Media: Sometimes called "official" warning delivery systems, these are means by which a single source can get a message to a relatively large number of recipients. Examples include the Emergency Alert System and NOAA Weather Radio, sirens and in-

building devices, and also most official applications of telephone notification and social media for warning. Although these mechanisms vary greatly, they all take a common message and deliver it to a number of recipients.

Secondary Media: Also known as "word of mouth" or "milling," this is the dissemination of warnings one-to-one among the public, frequently in person, by telephone or via "social media." This secondary sharing of warning messages is of crucial importance. Not only can it enhance the effectiveness of warnings delivered through primary media, it can be of great importance in extending the reach of warning messages to people who didn't get the "direct" warning, including non-English speakers and people isolated from conventional media by sensory disability.

One of the key goals of warning messages delivered over primary media is to simulate secondary distribution and to minimize the errors that often result from peoples' well-intentioned attempts to fill in the gaps in incomplete or ambiguous warning messages. Use of a research-based message format such as the Common Alerting Protocol can help ensure the completeness of warning messages.

The increasing variety of warning delivery options in recent years has had several beneficial effects on how warning systems are used:

There has been a broad trend away from building hazard-specific warning systems and toward all-hazard utilization. This has been driven largely by the need to pool resources in order to afford new warning system investments. However, it has led to greater consistency in how warnings of all types are presented to people in any given community.

Warning messages increasingly are written to fit a wide variety of warning delivery systems rather than being tailored to a particular warning technology or product. This is another regard in which the growing adoption of the Common Alerting Protocol for creating warnings has increased the interoperability of warning systems by providing a template for an "ideal" warning message that can be adapted in realtime to the particular character of each particular delivery medium.

Warning delivery systems are increasingly able to target warnings to relatively small geographic areas, sometimes as small as a city block. This has had the effect of making public warning systems, once reserved for the most dire and extreme threats, usable on a much more frequent basis for less severe localized hazards. This increased utilization not only has improved the return on investment on warning systems, but has also increased their reliability through frequent exercise. At the same time, it has mitigated the negative

operational and political side-effects of delivering warnings to people who are neither at risk nor in a position to help those who are.

The growing variety of primary warning media has created both an opportunity and a challenge for public safety agencies in the Bay Area. Quick, concurrent delivery of a consistent message through multiple primary media can enhance warning effectiveness, mitigate the risk of warning system failure, and help inform secondary dissemination. On the other hand, effective use of public warning systems is no longer a simple checklist-driven procedure. One of the key challenges to be addressed in the Strategic Plan is the development of a regional capability for effective management and use of public warning systems.

Appendix H
Record of Changes

The primary responsibility for recording changes to the *Strategy* rests with the regional EPI&W Program Manager or his/her designee. In all cases, regardless of the individual making a change, the EPI&W Program Manager shall maintain the master copy of the *Strategy*.

The following table tracks the significant changes made to the *Strategy*. Revisions that should be documented include the following:
- Completion of a project or addition of a new project
- Addition or re-prioritization of goals and objectives following a capabilities assessment or similar analysis
- Changes in regional organization
- Changes in purpose, vision or mission
- Other necessary changes

Date of Change	Brief Description of change	Individual making the change