CALIFORNIA EARTHQUAKE EARLY WARNING
ADVISORY BOARD
SEPTEMBER 27, 2018, MEETING

Cal OES
GOVERNOR'S OFFICE
OF EMERGENCY SERVICES

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MEETING PUBLIC NOTICE

California Earthquake Early Warning Advisory Board
Public Notice/Agenda
September 27, 2018
1:00 PM – 4:00PM

Meeting Site:
Governor's Office of Emergency Services
3650 Schriever Avenue
Mather, CA 95655
Multipurpose Rooms 1 and 2

Date of Notice: September 17, 2018

NOTICE IS HEREBY GIVEN that the California Earthquake Early Warning Advisory Board will meet at the Governor's Office of Emergency Services Multipurpose Rooms 1 and 2 as set forth below. The Bagley-Keene Open Meeting Act applies to meetings of the California Earthquake Early Warning Advisory Board, which are open to the public. Public participation, comments, and questions are welcome for each agenda item. Agenda items may be taken out of order. While the board intends to webcast this meeting, it may not be possible to webcast the entire open meeting due to limitations on resources.

Item	Agenda Topic
I	Welcome – Call to Order –Approval of Previous Minutes – Opening Remarks
II	General Program Update
III	Functional Area Updates
IV	Public Comment*
V	Adjourn

* Public comment will be taken before any official actions.

PUBLIC COMMENT: If the committee determines that there is not enough time to hear from all those wishing to present comments, the committee will select among those wishing to testify to ensure representation of a range of viewpoints and interests. Those providing public comment

may choose to supplement their testimony with written statements that will be made part of the official public meeting record.

SUGGESTIONS FOR SUBMISSION OF WRITTEN MATERIALS: It is requested that written materials be submitted to the California Earthquake Early Warning Advisory Board Executive Officer prior to the meeting. If this is not possible, it is requested that at least 30 copies be submitted to the California Earthquake Early Warning Advisory Board Executive Officer. This material will be distributed to the California Earthquake Early Warning Advisory Board members.

ACCESS TO THE HEARING: The meeting is accessible to those with access and functional needs. A person who needs an access and functional needs-related accommodation or modification in order to participate in the meeting may make a request by contacting Emily Holland at (916) 845-8828 or sending a written request to the Governor's Office of Emergency Services at 3650 Schriever Avenue, Mather, CA 95655. Providing your request at least five (5) business days before the meeting will help ensure availability of the requested accommodation.

For further information, please contact:

General Information:
Emily Holland, Outreach and Education, California Earthquake Early Warning Program at (916) 845-8828 or via email at Emily.Holland@caloes.ca.gov.

Media Information:
Brad Alexander, Public Information Officer, at (916) 845-8455 or via email at Brad.Alexander@caloes.ca.gov.

PREVIOUS MEETING MINUTES

California Earthquake Early Warning Advisory Board
Meeting Minutes

Governor's Office of Emergency Services
Multi-Purpose Room 1
Mather, CA
April 30, 2018

Members Present:

Mark Ghilarducci, Director of the California Governor's Office of Emergency Services
Alexis Podesta, Secretary of the California Business, Consumer Services and Housing Agency
Susan Fanelli, Chief Deputy Director at the Department of Public Health, designee of Diana S. Dooley, Secretary of the California Health and Human Services Agency
Marlon Flournoy, Deputy Secretary for Transportation Planning, designee of Brian Kelly, Secretary of the California State Transportation Agency
Barry Anderson, Vice President of Pacific Gas and Electric Company, Electric Distribution, Governor's appointee representing the utility industry
Lupita Sanchez Cornejo, Director of External Affairs, Greater Los Angeles Region AT&T, Speaker of the Assembly appointee representing the interests of private businesses
Robert Charbonneau, Director, Environmental & Emergency Services, designee of Janet Napolitano, President of the University of California

Others:

Ryan Arba, Seismic Hazards Branch Chief, Governor's Office of Emergency Services
Emily Holland, Acting Board Executive Officer, California Governor's Office of Emergency Services
Matt Newman, of Blue Sky Consulting
Katrina Connolly of Blue Sky Consulting

I. Welcome / Call to Order / Introductions

- Director Ghilarducci called the meeting to order.
- Emily Holland, Acting Board Executive Officer, conducted the roll call and the proposed agenda was adopted.
- Director Ghilarducci introduced the Advisory Board members and made opening remarks.
- Ms. Cornejo-Sanchez moved to approve the minutes and the motion was seconded by Mr. Anderson. The motion was unanimously approved.
- Director Ghilarducci asked Ryan Arba, Earthquake and Tsunami Programs Branch Chief to provide a general update on recent activities.
- Oregon and Washington are collaborating in developing specific tones and notifications for earthquake early warning.

- Mr. Arba discussed collaboration with other states, how the Alliance for Telecommunications Industry Solutions (ATIS) explored system requirements for earthquake early warning (EEW).
- Director Ghilarducci added that the recent fires in California have shifted attention to public alerting. Improvements being discussed include increasing redundancy for delivery methods and shifting public alerts from "opt in" to "opt out" which would ensure a larger audience. Director Ghilarducci added that Cal OES is working with other state agencies and resources to reduce costs through waiving land use fees.

II. Business Plan Presentation and Discussion

- Katrina Connolly of Blue Sky Consulting, provided an overview of the Business Plan and highlighted areas that need additional efforts like the telemetry plan to more effectively utilize state resources.
- Mr. Anderson asked if there has been a study to show if the state microwave can handle EEW. Mr. Arba responded by discussing Cal OES' pilot program that connects existing seismic sensors to the state microwave system. Director Ghilarducci added that this leverages the current system and covers the state equally. Ms. Sanchez Cornejo asked about build out challenges including California Environmental Quality Act (CEQA) permitting. Ms. Connolly and Director Ghilarducci responded outlining exemption process and possible reduced or waived fees for state lands.
- Secretary Podesta asked about the sources of additional funding needed to complete and maintain the system. Ms. Connolly said that she financing options would be outlined later in the presentation.
- Ms. Connelly continued that ongoing CEEWS costs are estimated at $16.4 million which funds modern real-time telemetry; last mile telemetry; equipment replacement costs; personnel to monitor data quality; education and outreach costs for a nationwide message including United States Geological Survey Joint Committee on Communication, Education and Outreach (JCCEO); technical user support; ongoing research and media campaigns so the message can saturate; and additional R&D funding to develop ideas for datacasting and receiving alerts.
- Matt Newman, of Blue Sky Consulting, outlined various financing options and explained each of them, but the business plan no longer suggests one single solution so there is flexibility for Cal OES to choose the best way forward.
- Secretary Podesta asked if Blue Sky Consulting calculated how much consumers can expect to pay. Mr. Newman responded that the charge would be less than 50 cents a year, a cost that would have very little impact for most people.
- Mr. Newman stated that the current cost estimate is approximately $16 million in one-time capital costs, and this assumes that the 15.75 from the General Fund proposed in the California Governor's 2018/2019 budget is approved. These costs are calculated to maintenance for 1,115 sensors, but as there are not that many sensors placed yet, it's possible to shift some maintenance money around to pay for one-time costs in the early phases.

- Mr. Flournoy asked if shifting funds would delay the buildout of the system. Mr. Newman said that it's a long process to build sites and maintenance funds will not be required right away. It is possible to shift funds and continue the system buildout.
- Mr. Anderson asked if Cal OES would be responsible for seismic station maintenance. Mr. Newman responded by saying the governance structure has not been finalized. The pattern so far is that the stations have been funded through federal and state funds, and there are contracts between Cal OES and the entity responsible for building and operating the station. Partners are responsible for maintenance. Mr. Arba added that there is an earthquake safety fund that can be used for contracts and interagency agreements with partners. Mr. Newman added that if the legislature appropriates 16 million a year from a new funding stream, accountability should be established and Cal OES should hold parties responsible and funds spent wisely. Director Ghilarducci added additional funding streams would necessitate an audit trail to ensure collection is carried out appropriately.
- Mr. Newman said that Cal OES and USGS' roles and responsibilities are as important as system funding. Both agencies have coordinated and an MOU is in progress. This MOU refines the telemetry plan and defines ownership of CEEWS. The business plan suggests the USGS manage the scientific details and Cal OES should lead outreach and education. Director Ghilarducci added that the MOU will be finished in the next couple of weeks. Mr. Anderson asked if the MOU is consistent with the division of labor, and Director Ghilarducci responded that it is. Mr. Newman added that some details do not fit in a neat package so Cal OES and USGS are working those out nuances. Mr. Newman added there is a role for third party vendors between the earthquake early warning signal and ways of receiving the signal. Ms. Connolly added that the USGS has supported private entities in developing EEW technology.
- Mr. Newman said that a limited public rollout should occur in 2018, but the span of the rollout still needs to be determined. There is a general consensus though that moving too quickly has risks, but there is a general consensus among the partners to roll out the system as soon as possible in an effort to protect Californians. Perhaps people with high risk with false alerts can opt out of EEW until the system is more reliable and those with low risk can move forward with the system and consider false alerts as drills.
- Secretary Podesta asked if technology companies are getting involved and if speed and reliability are considered different when it comes to EEW. Ryan Arba said that distributing messages is where speed is important. Ms. Connolly added that a denser seismic station network in California will deliver more reliable alerts. Director Ghilarducci added that pilot users understand the possibility of false alerts. These early adopters are crucial in helping Cal OES better define public rollout and the value EEW adds to various industries.
- Ms. Sanchez Cornejo commented that people who don't have EEW will ask when they can get it. Director Ghilarducci said that people are interested in EEW more

than ever, especially with the recent publicity about EEW and the Channel Islands. Rollout in high density areas will likely get EEW first.

- Secretary Podesta asked where the sensors are and what does buildout look like in the future. Mr. Given, USGS ShakeAlert Program Manager, explained optimal seismic sensory density, which ranges from 10km in urban populated areas to 20km in rural areas. The highest risk, more densely populated areas became priorities for seismic installations. The CEEWS is built on top of the California Integrated Seismic Network (CISN). Dr. Peggy Hellweg of UC Berkeley Seismic Lab, added that Los Angeles already had a dense seismic network. Existing CISN stations are also being upgraded to provide data needed for EEW.
- Mr. Newman spoke about the risk assessment plan and mitigation suggestions. He recommended the Advisory Board considers how these risks impact their various sectors. He also stated that Blue Sky Consulting considered the suggestion from the last Advisory Board meeting to quantify benefits of EEW. The Business Plan doesn't include a full Benefit Cost Analysis because it was outside the scope of the business plan, but all other factors point to the loss savings EEW could provide.
- Mr. Anderson commented that a benefit from EEW that we don't always think about is warning about aftershocks. First responders are already out in the field, and knowledge of oncoming shaking would help tremendously. Mr. Newman said that redundant telemetry networks will help if one network goes down so it would be possible to learn about aftershocks in advance.
- Mr. Newman summarized his recommendations: Cal OES must finalize the memorandum of understanding with the USGS and define detailed roles and responsibilities, a limited rollout in 2018 to the widest possible group, and the legislature should approve a funding source for ongoing costs.

III. Public Comment

- There were no public comments.
- Ms. Sanchez Cornejo and Mr. Anderson both complimented Blue Sky Consulting's efforts.
- Mr. Charbonneau said it would be ideal to leverage EEW statewide and asked about long-term feasibility. Mr. Arba responded that many vendors rely on Common Alerting Protocol (CAP) messages. Director Ghilarducci added that efforts are underway to standardize alerts and warnings. Standards will need to be developed, but Cal OES doesn't want to hamper innovation.
- Director Ghilarducci closed the meeting by saying this project has been in the conceptual stage for over 30 years, and we're working towards moving it into an operational stage. Financially earthquake early warnings cost of the system is very little compared to the cost of a disaster.

IV. Adjourn

- Ms. Cornejo-Sanchez moved to adjourn the meeting and the motion was seconded by Mr. Anderson. The motion was unanimously approved.

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California Earthquake Early Warning Advisory Board Meeting

September 27, 2018

Opening

- Call to Order
- Roll Call
- Approval of Previous Minutes
- Opening Remarks

Cal OES GOVERNOR'S OFFICE OF EMERGENCY SERVICES

USGS science for a changing world

General Program Update

Ryan Arba
Seismic Hazards Branch Chief
Cal OES

Doug Given
Earthquake Early Warning Coordinator
USGS

Unified Coordination Group

- Senior leadership at Cal OES and USGS
- Meet monthly
- Establish joint objectives
- Resolve issues
- Roles and responsibilities outlined in MOU (draft)

Future of Earthquake Early Warning in 2018

- Rollout
  - Public Mass Notification
  - WEA Test
  - Pilots Go Live
  - Technical Updates

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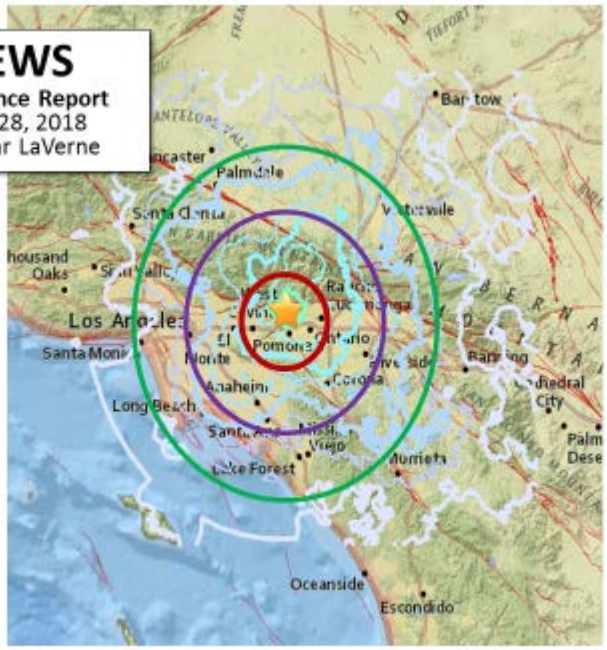
CEEWS

Performance Report
August 28, 2018
M4.4 near LaVerne



- No Warning Zone
- 5 seconds warning
- 10 seconds warning

- No warning for approx. 750,000 people.
- Up to 1.8 million people could have received up to 5 seconds of warning.
- Up to 8 million people could have received up to 10 seconds of warning.

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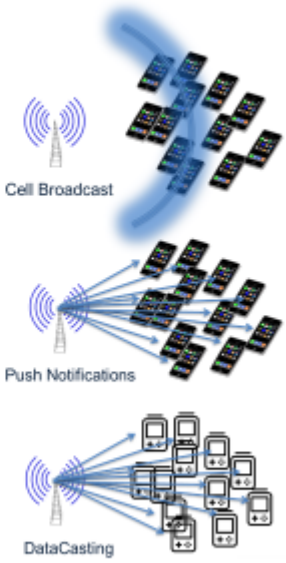
Public Mass Alerting Technology

- Cell broadcast IPAWS/WEA
  - Speed uncertain (Nov. test?)
  - No EEW-specific alert sound yet
- Cell apps, push notifications
  - Scalability, speed unknown (Tests by City of LA and others)
  - A Source must provide the service
- DataCasting – alert encoded in TV broadcast signal
  - Semi-specific geotargetting
  - Requires special receiver (not displayed on TV)



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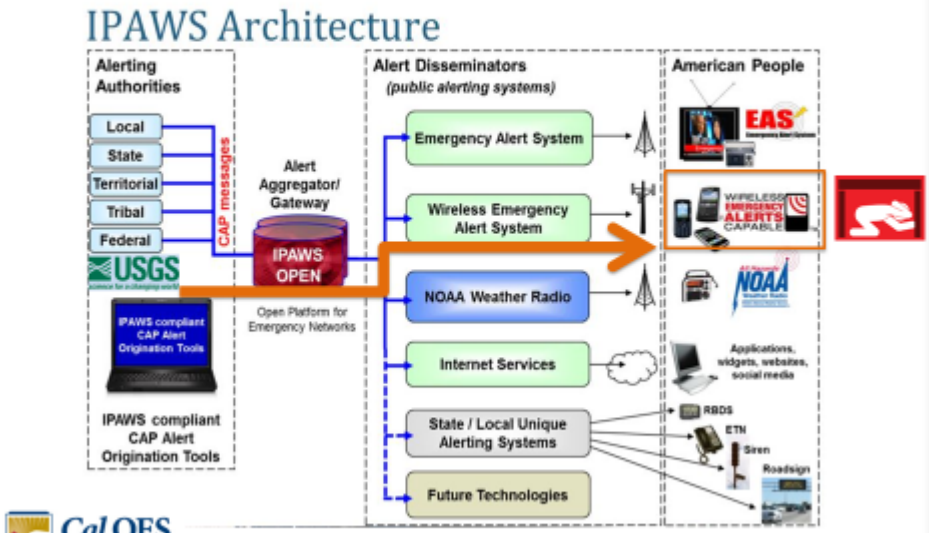
IPAWS: Integrated Public Alert & Warning System

WEA: Wireless Emergency Alerts (Amber, weather, etc.)



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California WEA Test Goals

- Assess the feasibility for using the IPAWS WEA alert system to warn the public of imminent shaking
- Will provide critical information to guide future development of earthquake early warning integration into IPAWS

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Discussion

- WEA Test
  - Should there be a single location or multiple throughout the state?
  - Where should the test be focused geographically? Should it be focused on commercial or residential neighborhoods?
  - How broad should the audience be?
  - How should we measure results?

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Pilot Projects

Jennifer Strauss, PhD
External Relations Officer, Berkeley Seismology Lab
Regional Coordinator for ShakeAlert, Northern California
Vice-Chair, ShakeAlert Joint Committee for Communication, Education, and Outreach

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Berkeley Seismology Lab

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Current Users and Development Levels

- Beta Users (exploring)
  - User agreement or
  - NDA
- Non-commercial Pilot
  - License
- Commercial Pilot
  - TAA + license to develop
- Operations
  - TAA + license to operate

5 Key Sectors

- Transportation
- Utilities
- Healthcare
- Education
- Emergency Management

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Utilities

Chevron
- alert personnel
- situational awareness

Pacific Gas & Electric
- alert personnel

Various
- develop hardware actuators

Transportation

Bay Area Rapid Transit (BART)
- slow and stop trains
- combine with onsite sensors

LA Metro
- alert bus and train personnel

Healthcare

LA County Medical Services
- alert personnel

Northridge Hospital
- alert personnel via radio and pager

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Education

Caltech
- alert personnel

International School of the Peninsula
- alert administration

LA Unified School District
- alert students in 3 schools, develop curriculum

Santa Monica Community College
- alert personnel

UC Berkeley Police
- alert police personnel, situational awareness for stadium

USC Public Safety
- alert personnel and medical center

Emergency Management

City of Los Angeles
- alert City Hall, cellular app

Jet Propulsion Lab
- alert personnel DSN, safety, radiation, lower antennas

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Other

Early Warning Labs
- develop hardware actuators

ESRI
- integrate with map and alert products

Everbridge
- integrate with Emer. Notification product

Global Security Systems
- Emergency notification and hardware development

KHSU Humboldt State Univ. Public Radio
- alerting over public radio stations

NBC/Universal
- alert personnel, radio, VoIP, open fire station doors

Regatta Condo
- alert residents, open doors

Regroup
- integrate with emergency notification product

Scada Solutions, Inc.
- develop hardware and interface for wind turbines

SkyAlert
- develop hardware actuators for clients

Aerwaze
- emergency notification in commercial Real Estate

ArxPax
- smart structure technology

MyShake
- emergency notification using smartphones

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Discussion

- Who can benefit?
- How can we scale up the recruitment process so there is more incentive to participate?
- What regulations need to be amended to allow the development of automated actions?

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Technical Upgrades

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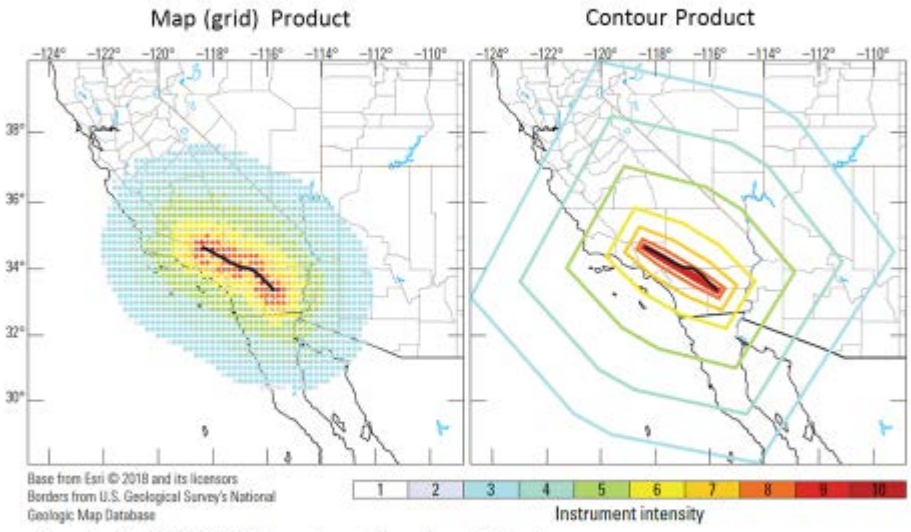
ShakeAlert Ground Motion Products



Examples for ShakeOut M7.8 scenario event in southern California.
Contour lines and grid map points are color coded by estimated instrumental Modified Mercalli Intensity (MMI).

Cal OES USGS

ShakeAlert Release Thresholds

For Institutional Users (Pilots)

Published if:

- Event is in alert area
- Magnitude M3.5+

1) Event Message

2) Contour Message

3) Map Message

Similar to JMA Alert Scheme:
- "Forecasts": to registered users, M3.5+
- "Warnings": to public if SI 5L+ to SI 4

For Public Alerts

Published if:

- Event is in alert area
- Region
  - Areas where state emergency managers are satisfied that public education is sufficient
- Magnitude 5.0+
- Area alerted where MMI 4+

CAP Message (public, WEA)

- CAP-specific content
  Alert area inside MMI contour (MMI value TBD)

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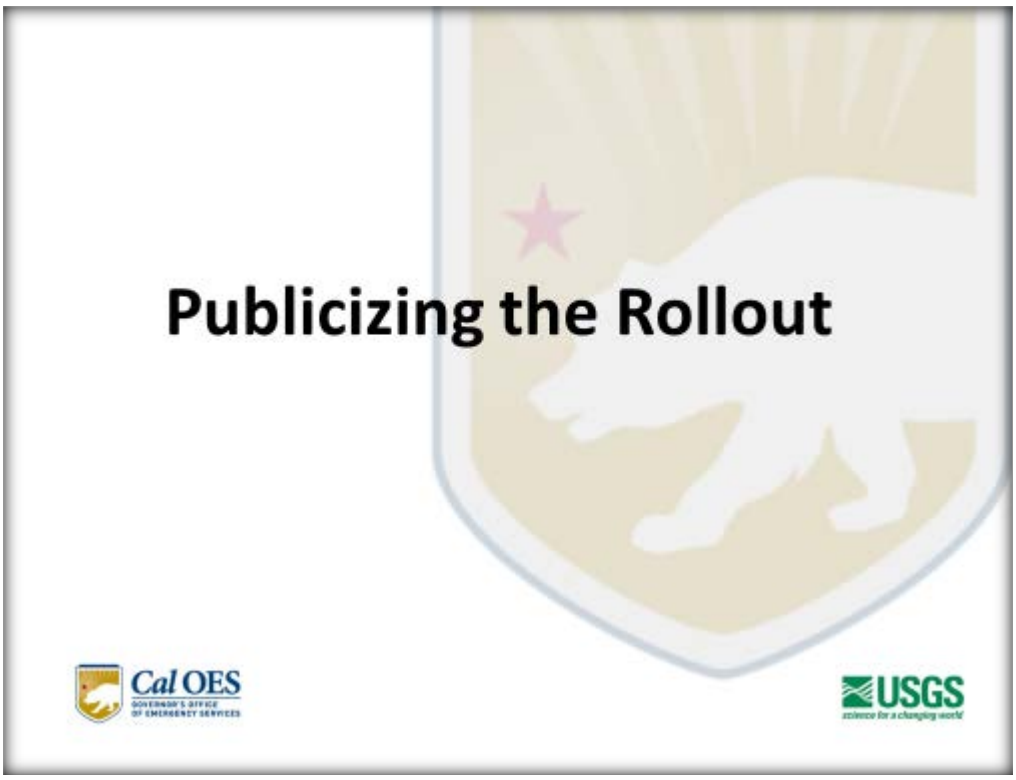

Publicizing the Rollout

- Statewide Counties Call
- Outreach Events
  - Media event at BART and Caltech
  - The Great ShakeOut at LA City Hall
- Media Campaign
- Information about what to expect posted on websites and distributed via social media

Phase 1 Timeline: public events

- Sept. 27 – CEEWS Board Meeting
- Sept. 29 – ShakeAlert Northern California Education Symposium, Exploratorium, San Francisco
- Oct. 2 – Congressional briefing on ShakeAlert
- Oct. 3 – National Wireless Emergency Alert (WEA) test [by DHS/FEMA]
- Oct. 8 – Northern California ShakeAlert event – at BART, lawmakers invited
- Oct. 14-20 – Earth Science Week with ShakeAlert tie-ins
- Oct. 17 – Caltech ShakeAlert Event – at Caltech, lawmakers invited
- Oct. 18 – ShakeOut (ShakeAlert tie-ins)
- Oct. 21 – 1868 Hayward quake anniversary, ShakeAlert tie-ins
- November TBD – WEA test in California [CalOES]
- Dec. 4 – ShakeAlert Southern California Education Symposium, Pasadena, CA

Discussion

- What other methods of outreach should be considered?
- Should the message be simpler or more detailed?&


Functional Area Update
Cal OES
USGS


Training and Education
Cal OES
USGS

Communication, Education, Training, and Outreach

- Public Education Partnership Spots
  - Radio
  - Television
- Social Science Research
  - Research for alert tones
- Community engagement
  - Sector Symposiums
- Developing Universal Protective Actions
- Creating Educational Resources for children

System Operations

CEEWS Sensor Build Out Totals

(July 2018)

Currently # of Stations Contributing: **590**

Completed/Undergoing Data Quality Controlled: **676**

Planned Installation with 2016-2017 Funding

CalOES Funded: **183**

USGS Funded: **34**

Remaining Stations Needed: **~278**

CalOES 2018 Funding: ~256

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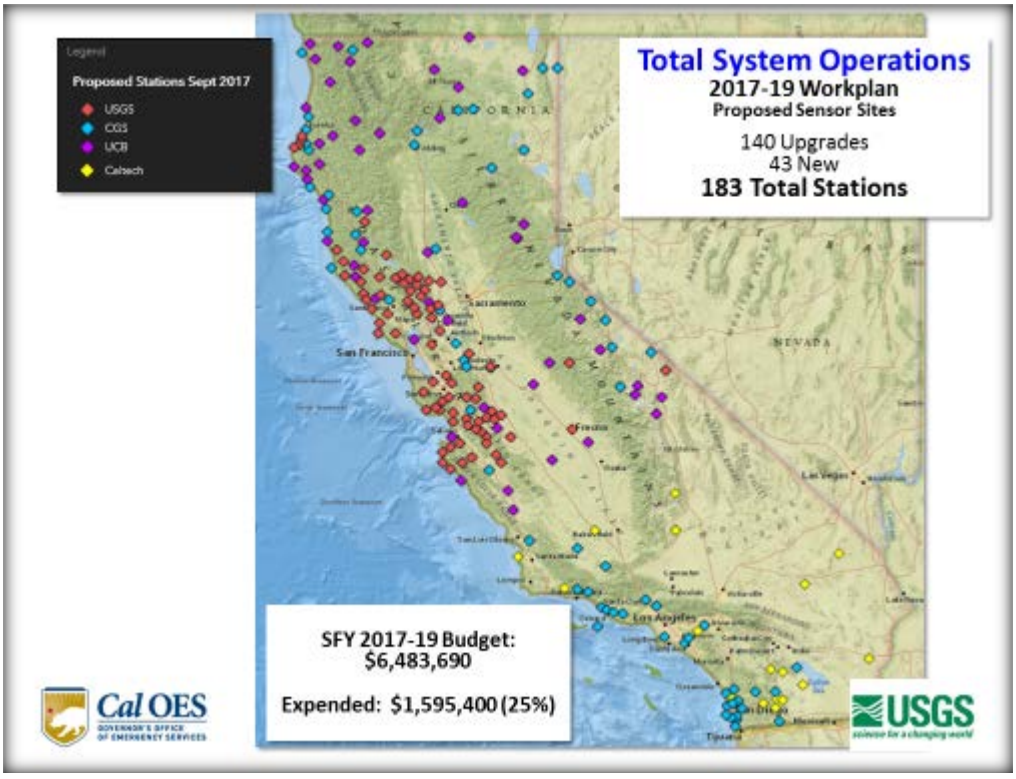


2016-2017 Funded Work Plan Overview

Completed: 60 Stations (33%)

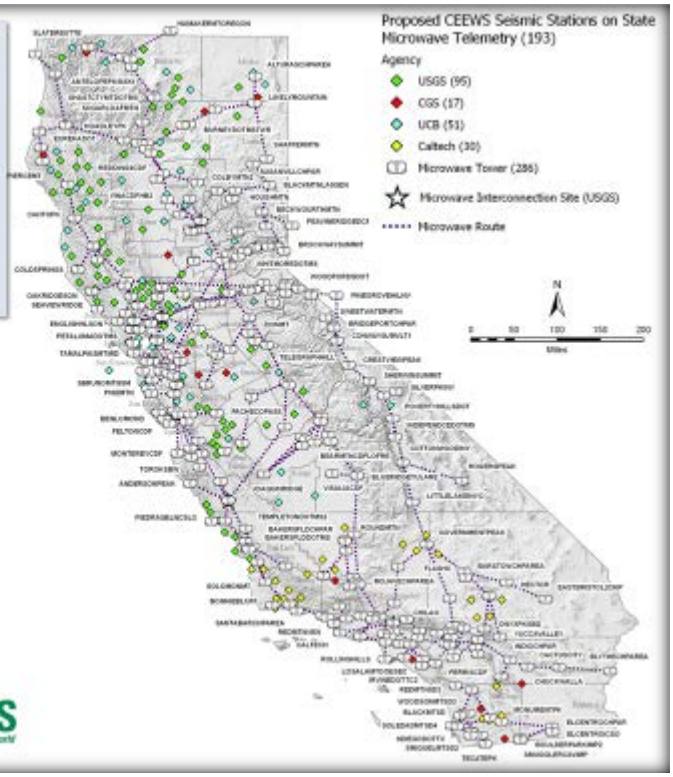
Red = Completed

	Year 1				Year 2				Total
	9/30/17	12/31/17	3/31/18	6/30/18	9/30/18	12/31/18	3/31/19	6/30/19	183/60
USGS	Plan/Logistics			15/2	15	20	20	Close-out	70/2
CGS	Plan	10/15	10/4	10/15	15/8	15	10	Close-out	70/42
UC Berkeley	Plan/Logistics			-	8/12	10	15	Close-out	33/12
Caltech	Plan/Logistics			3/3	3/4	4	-	Close-out	10/7

Microwave Telemetry Implementation Plan

Completed July 2018

Plan for 193 (25%) EEW Stations
Estimated at: $1.3 Million



Research and Development

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Datacasting Pilot Update

- Datacasting hardware installations complete:
  - Sacramento
  - San Francisco
  - Los Angeles
  - San Diego
  - Fresno
- Live demonstration completed in Sacramento on 9/18/18
- Next step to test ShakeAlert signal compatibility

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Finance and Investment

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New California Funding

- Cal OES received $15 million in 2018-19 General Fund to complete the seismic sensor buildout.
- USGS received $10 million in one-time funding for buildout the system and $12.9 million in ongoing programmatic funding.
- Funding to be used to complete system build out.
- A Request for Information (RFI) will be released to do market research on all available approaches to finish the network build out.

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Business Plan Update Requirements

- Due February 1, 2019
- Requirements:
  - The overall progress of the implementation of the system.
  - An update on funding acquired and expended.
  - An update on contracts and requests for proposals.
  - A summary of recommendations made by the board to the office.

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Next Steps

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Ongoing Considerations

- Sensor build out – site access, permitting, and regulatory flexibility
- Financing strategy
- Development and/or review early warning technology standards