# NAWS China Lake Earthquake Response and Recovery

**Presented by:**

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SAME San Diego Post Luncheon
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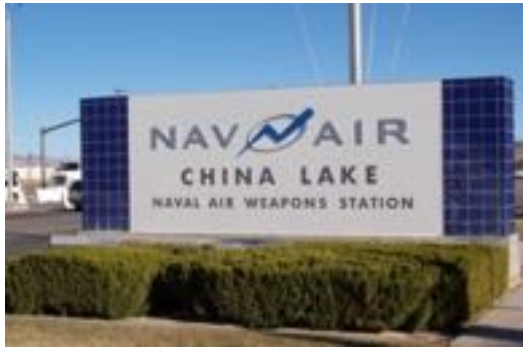
# Naval Air Weapons Station China Lake

# Overview

## *Naval Air Weapons Station China Lake*

- Western Mojave Desert region of California
- 150 miles north of Los Angeles
- Navy's largest single land holding
- Over 1.1 million acres—larger than the state of Rhode Island
- 85% of the Navy's land  for weapons and armaments research, development, acquisition, testing and evaluation
- 38% of the Navy's land holding worldwide


Sources:
https://www.cnic.navy.mil/regions/cnrsw/installations/naws_china_lake.html.
https://defensestudies.net/pages/naval-air-weapons-station-china-lake-small-business-contracting.
https://i.pinimg.com/originals/a0/0b/ef/a00befb394804b74433801ebe2d33908.jpg.

# Location - NAWS China Lake

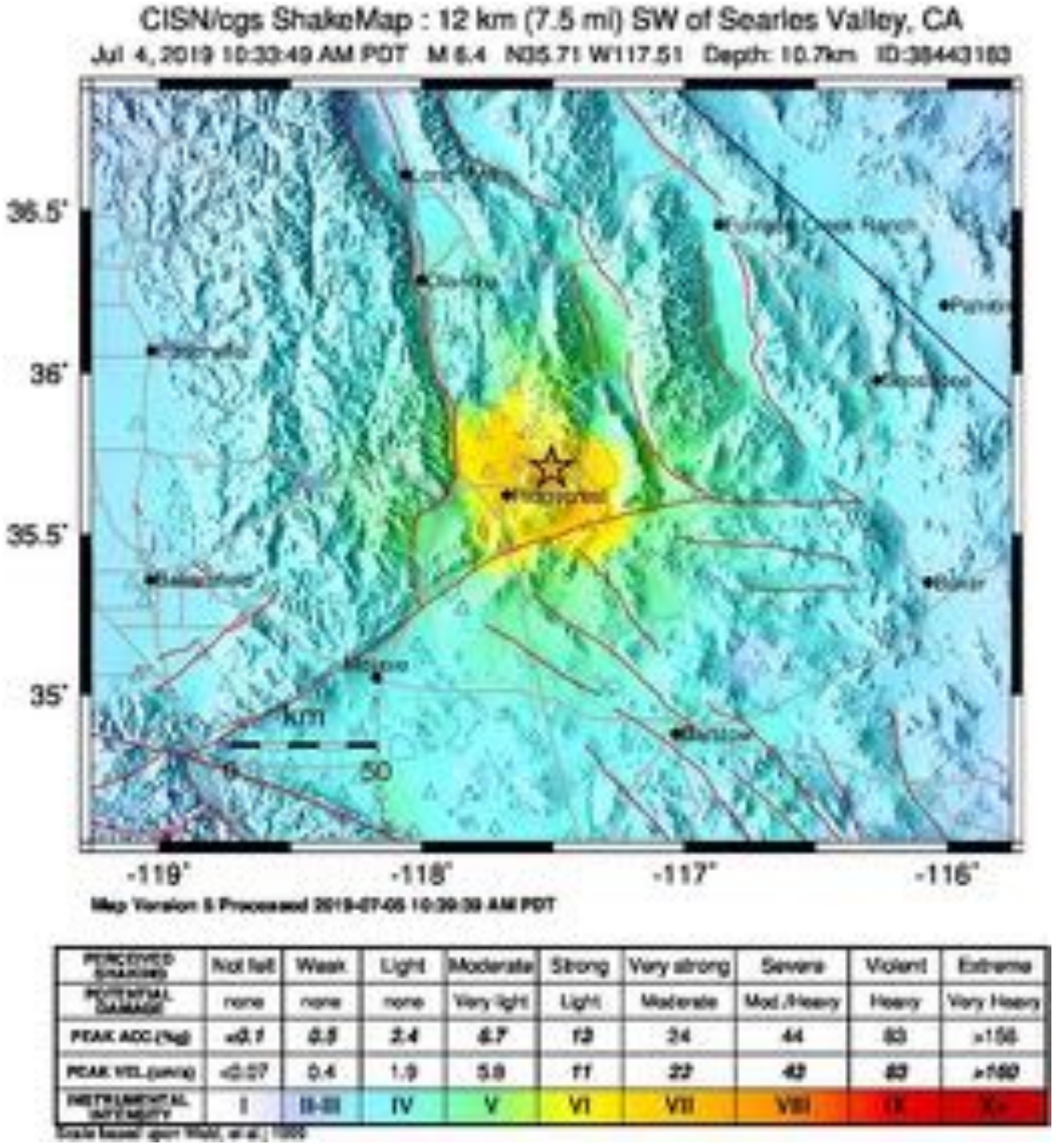


Source:
https://www.google.com/maps/place/Naval+Air+Weapons+Station+China+Lake/@35.6921236,-118.4388467,10z/data=!4m5!3m4!1s0x80c1124b2c5e64d5:0xba9250134ea239e8!8m2!3d35.6551706!4d-117.6574374

# July 4th and 5th, 2019 Searles Valley Earthquakes

# First Earthquake M6.4 ShakeMap

- M6.4 Earthquake
- 10:33A Local Time
- July 4th Holiday
- Epicenter 7.5 miles SW of Searles Valley
- 6.4 miles Deep

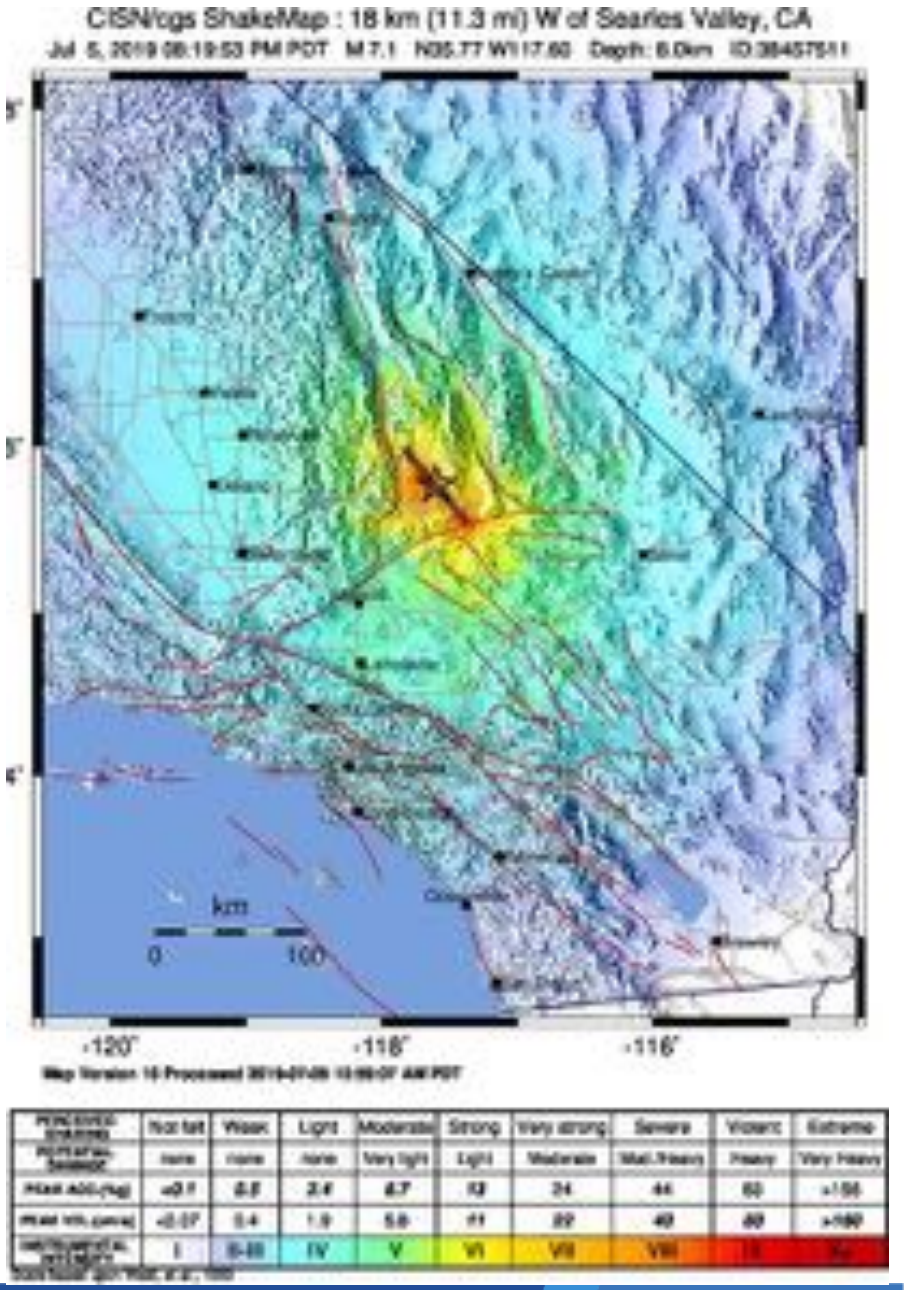



| PERCEIVED SHAKING | Not felt | Weak | Light | Moderate | Strong | Very strong | Severe | Violent | Extreme |
|---|---|---|---|---|---|---|---|---|---|
| POTENTIAL DAMAGE | none | none | none | Very light | Light | Moderate | Mod./Heavy | Heavy | Very Heavy |
| PEAK ACC.(%g) | <0.1 | 0.3 | 2.4 | 6.7 | 13 | 24 | 44 | 83 | >156 |
| PEAK VEL.(cm/s) | <0.07 | 0.4 | 1.9 | 5.9 | 11 | 22 | 43 | 83 | >160 |
| INSTRUMENTAL INTENSITY | I | II-III | IV | V | VI | VII | VIII | IX | X+ |

Source: https://strongmotioncenter.org/shake/38443183/intensity.html.

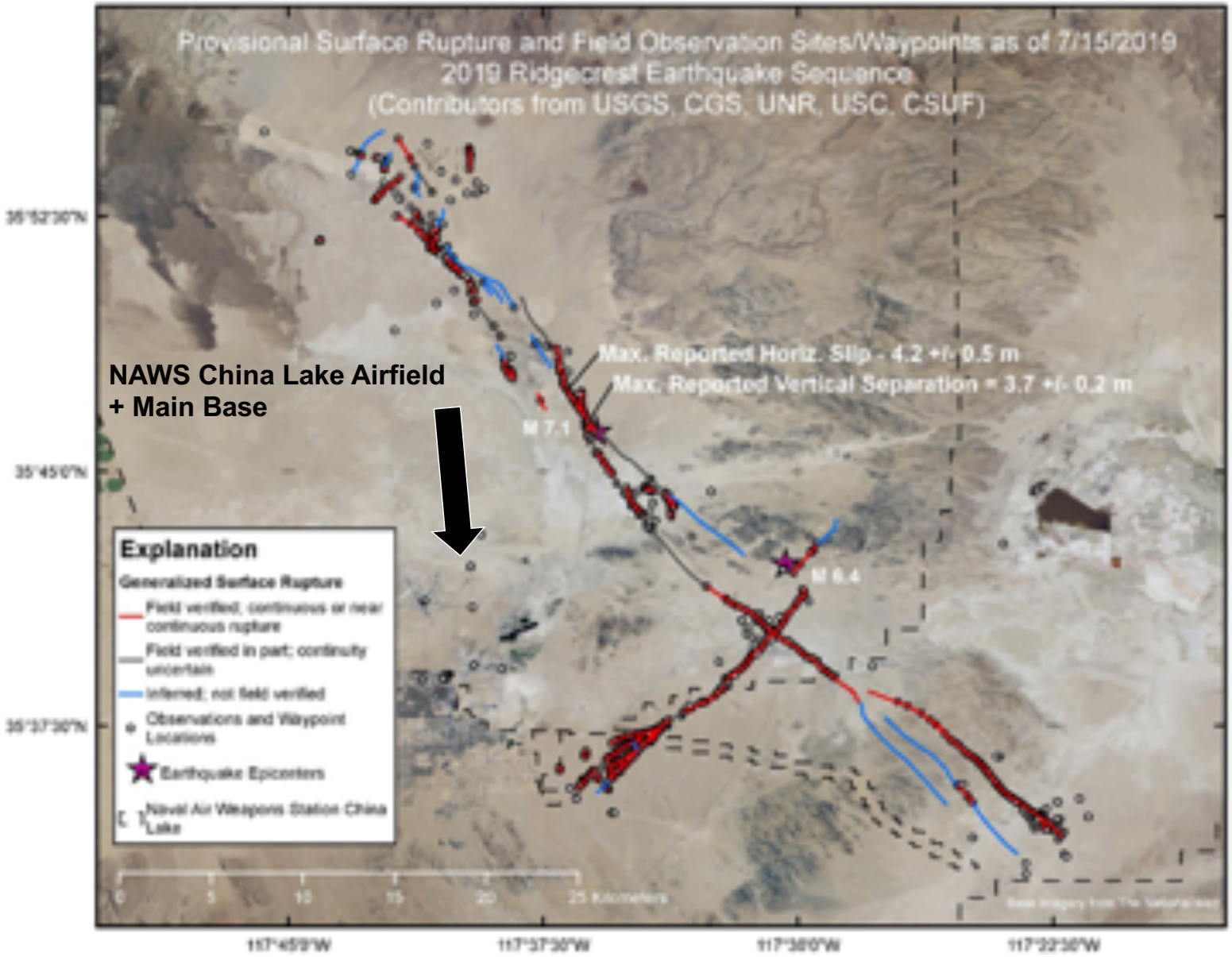
# Second Earthquake M7.1 ShakeMap

- M7.1 Earthquake
- 8:19P Local Time
- July 5th Holiday Weekend
- Epicenter 11.3 miles W of Searles Valley
- 5 miles Deep




Source: https://strongmotioncenter.org/shake/38457511/intensity.html.

# Surface Rupture Map

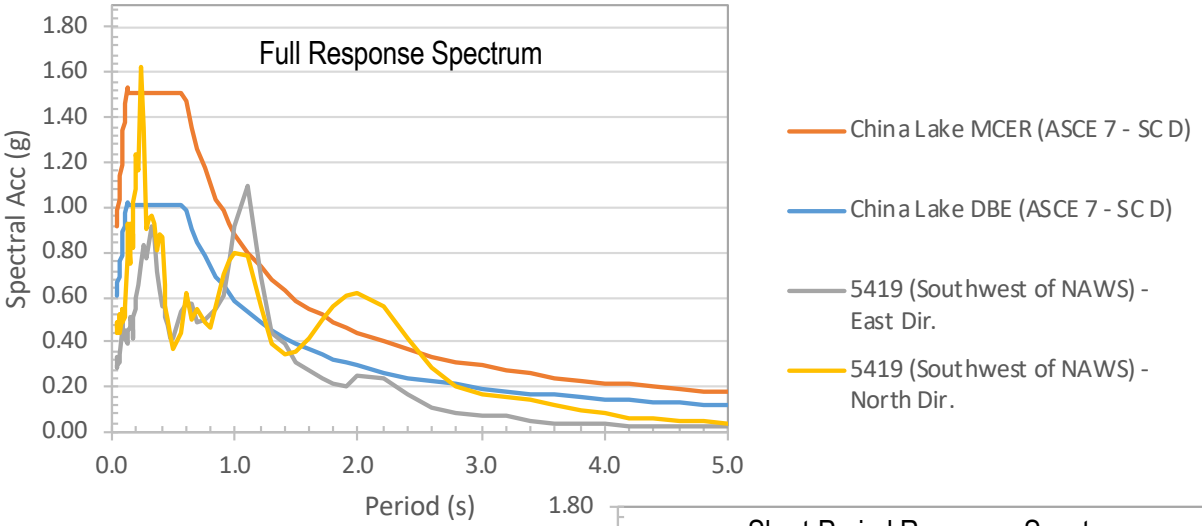


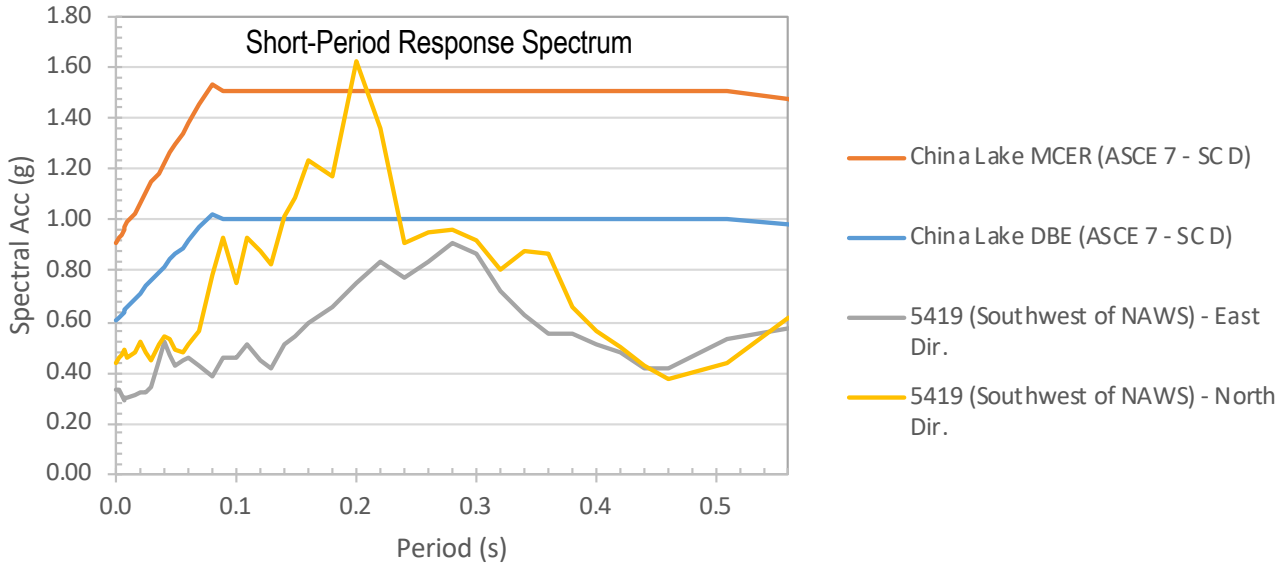

Source: https://www.usgs.gov/media/images/surface-ruptures-july-4-and-5-ridgecrest-ca-earthquakes

# Design Response Spectrum Comparison

*Recorded vs. Expected*

- July 4th, 2019 MW 6.4 Summary Graphs of Recorded Spectral Acceleration—Station 5419 PGA: 0.382g



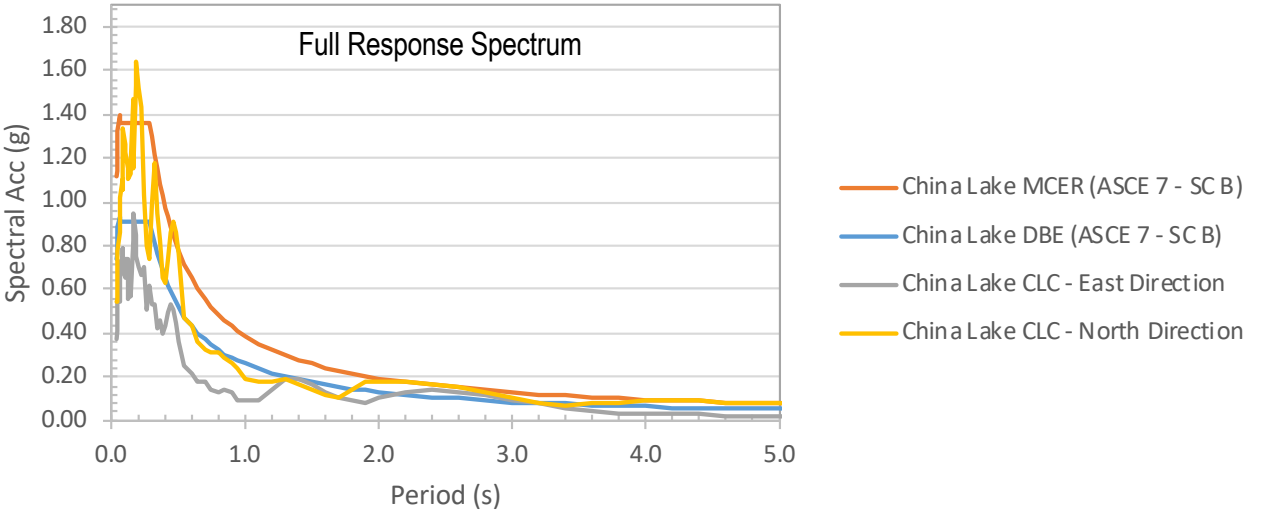



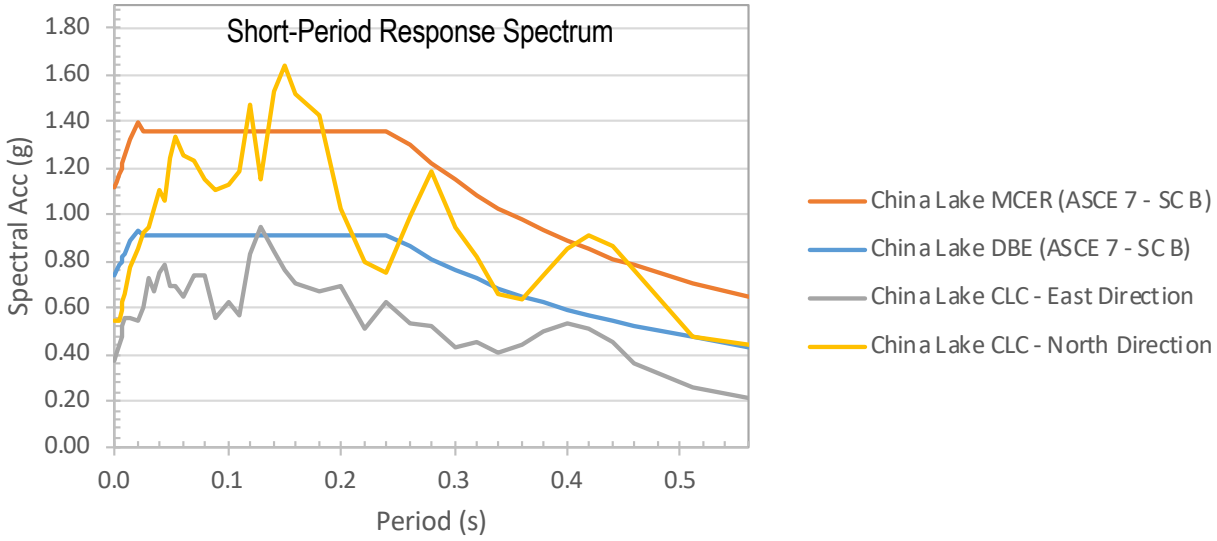

Source: Data: strongmotioncenter.org/cgi-bin/CESMD/iqr_dist_DM2.pl?ID=ci38443183.

# Design Response Spectrum Comparison

*Recorded vs. Expected*

- July 5th, 2019 MW 7.1Summary Graphs of Recorded Spectral Acceleration—Station CLC PGA: 0.484g




Source: Data: CESMD Internet Data Report, 22 July 2019, strongmotioncenter.org/cgi-bin/CESMD/iqr_dist_DM2.pl?ID=ci38457511.

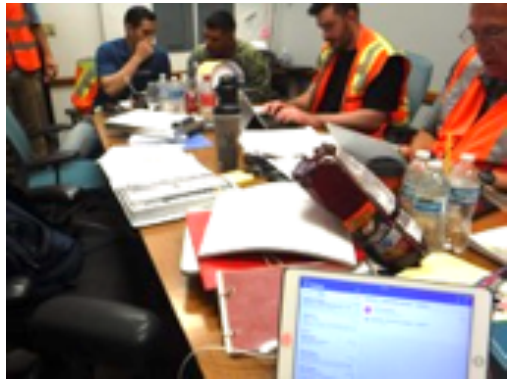
# Reid Middleton Mobilization

- Monitored Earthquakes via USGS
- Monitoring System at NMCSD Recorded Events
- On-Site Thursday, July 11, 2019, 1 Week after the Second Earthquake
- Response Phase:
  - Initial Deployment Teams ~ 24 to 28 People
  - ATC-20 Rapid and Detailed Assessments in Support of NAVFAC SW and NAWSCL Personnel
  - Initial Focus on Large and Critical Facilities
  - Emergency Shoring and Stabilization
- Recovery Phase:
  - Detailed Damage Assessments and Evaluations
  - DD1391 Development
  - Repair Procurement Development
  - Construction Phase Assistance



# Reid Middleton Mobilization (cont.)

- Some Staff Experienced in Earthquake Deployments
- Most Staff Trained in ATC-20/45
- Utilized Web-Based Real-Time Scheduling
- Staff from Multiple Offices and Partner Firms
- Multidisciplinary Team
- 5 Days on Site (3 Day Minimum)
- Double Shifts for Many
- Document Everything for Accurate Follow Up
- Information Flow:
  - Daily Reports
  - Briefings
  - Record Keeping



# NAWS China Lake Earthquake Impacts

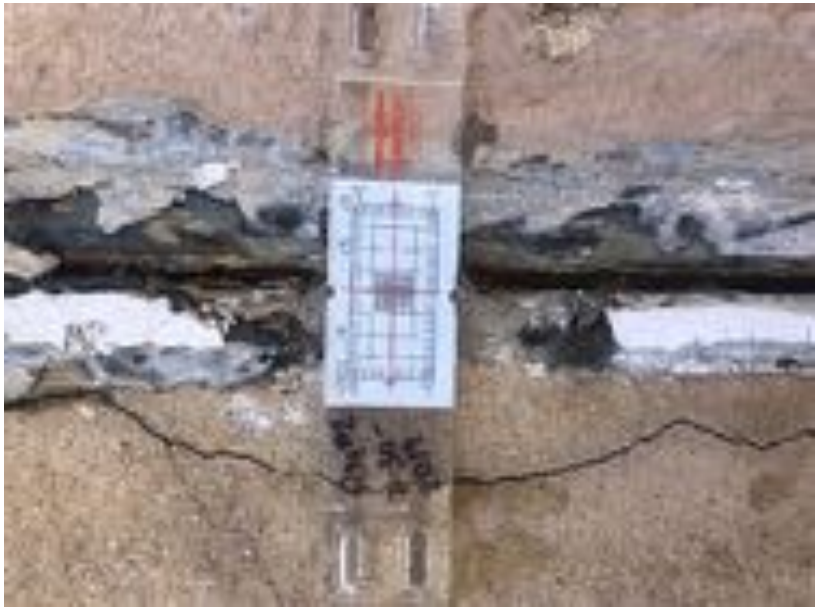
- Earthquake Damage of Varying Degrees to Building Structural and Nonstructual Systems
- Test Facilities Damaged to Varying Degrees
- Road and Utility Infrastructure Damages
- Some Flood Damage from Broken Water Lines
- Emergency Shoring and Contents Retrieval
- Base Access Only for Essential Personnel Initial Days
- Badging and Lodging Demands Increased Due to Additional Workforce

# Measuring Earthquake Damage

## *Leveling Survey of Concrete Slab*

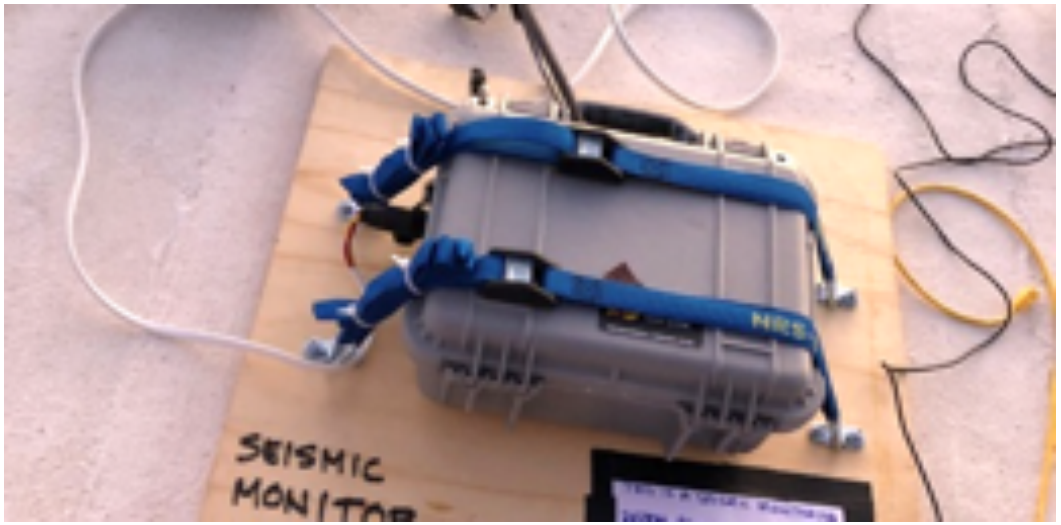
# Monitoring Aftershock Movement

## *Concrete and Masonry Crack Gauges*



# Measuring Aftershock Movement

## *Seismic and Vibration Monitoring Equipment*



# Measuring Aftershock Movement

## *Seismic and Vibration Monitoring Equipment*

# Earthquake Damage

## *Surface Faulting*

# Earthquake Damage

## *Roadways*

# Earthquake Damage

## *Concrete and Masonry Building*

# Earthquake Damage

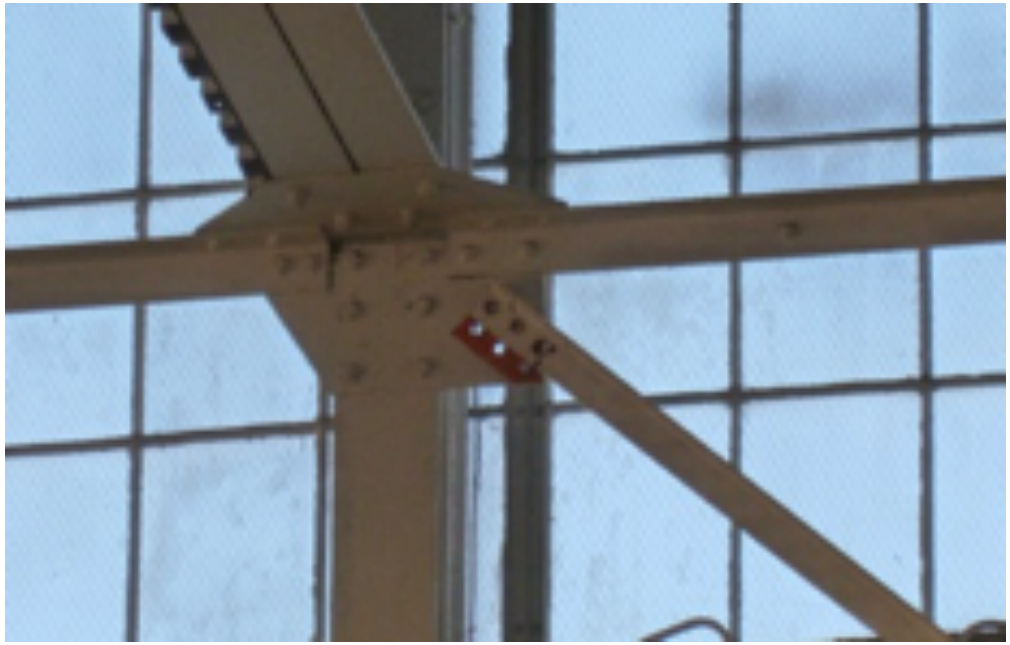
## *Concrete and Masonry Building*

# Earthquake Damage

## *Steel Braced Frame Hangar*

# Earthquake Damage

## *Steel Braced Frame Hangar*



# Earthquake Damage

## *Steel Braced Frame Hangar*

# Earthquake Damage

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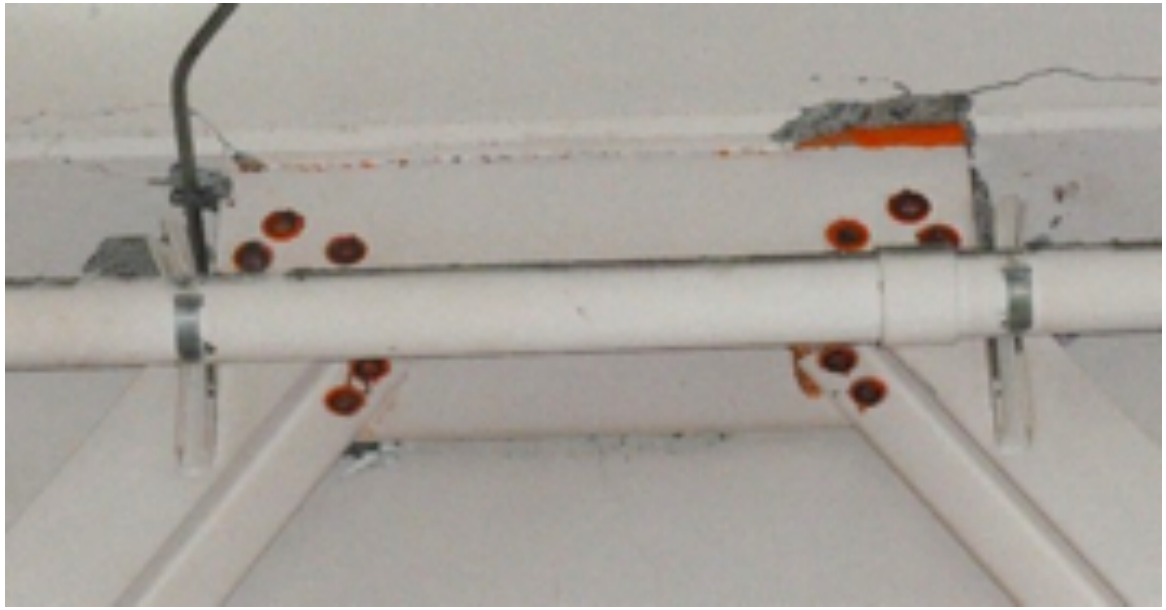
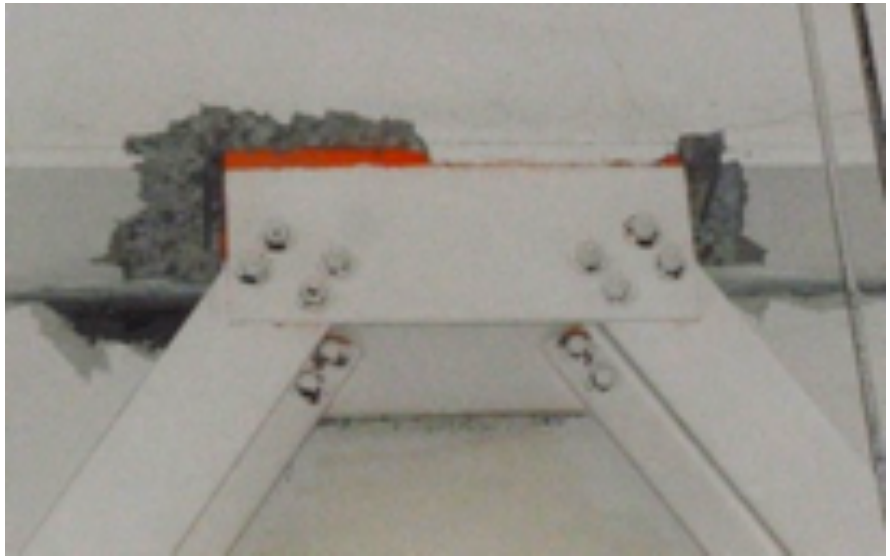
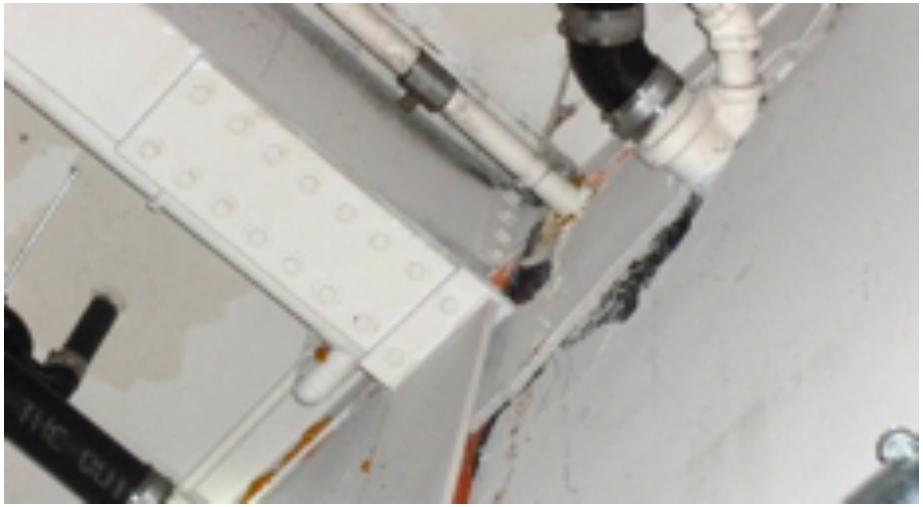
## *Steel Braced Frame Hangar*





# Earthquake Damage

## *Steel Braced Frame Hangar*



# Earthquake Damage

## *Steel Braced Frame Hangar*

# Earthquake Damage

## *Concrete Frame and Shear Wall Building*

# Earthquake Damage

## *Masonry Building*

# Earthquake Damage

## *Masonry Building*

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