The Impacts of the Cascadia Subduction Zone Earthquake on Eastern Oregon

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Oregon Military Department
Office Of Emergency Management
What does this mean to Eastern Oregon?

Physical impact on built environment?

Impact on the people of Eastern Oregon?

What will be the economic impact?
Impacts on Western Oregon

• Earthquake deaths ranging from 650 to 5,000, with another 600 to 5,000 deaths due to the tsunami.
• 24,000 buildings completely destroyed, and another 85,000 with extensive damage requiring months to years of repair.
• 27,600 displaced households.
• Approximately $32 billion in economic losses.
• Almost 10 million tons of debris (1 million dump truck loads).
Shaking Intensity in Eastern Oregon from CSZ
Shaking Intensity in Baker City
Compared to Japan 2011 EQ
ShakeMap for March 11, 2011 Tōhoku M9 earthquake

ShakeMap for SIMULATED M9 Cascadia earthquake
Conclusion: Light Physical effects

• Shaking Intensity
  • Light to moderate, with pockets of strong shaking
• Modified Mercalli Scale I to VI
  • Felt by all
  • Some damage to plaster, chimneys
  • Significant damage unlikely
But …

- Buildings in eastern Oregon will experience ground shaking levels similar to or greater than those that URM buildings experienced during two previous Oregon earthquakes: Scotts Mills and Klamath Falls.
- Because the Cascadia subduction zone earthquake will likely be of much longer duration than these two previous events, it has the potential to cause even more damage.
- For this reason, the expected recovery duration for vulnerable buildings in eastern Oregon was determined to be 30 days.
It doesn’t take a building collapsing to cause injury

Pendant light fixtures failed in this elementary school library during the 1983 M6.5 Coalinga, California earthquake. If the room had been occupied, this could have caused injuries. Bracing nonstructural elements in homes, schools, and offices can often be done easily and relatively inexpensively. (Source: NOAA/NGDC, Earthquake Engineering Research Institute)
Most impacts will be secondary

Transportation & Energy

Relief & Response

Economy
Energy Interruption

- Electricity
- Natural Gas
- Liquid Fuel
Transportation & Energy

State of Oregon’s bridges

Figure 3: Distribution of year of construction completion
A quake’s toll on Oregon bridges

Computer modeling shows a 9.0 earthquake off the Oregon coast – similar to what happened in January 1700 – would collapse six major highway bridges, extensively damage others and cost $1 billion for bridge repair and replacement.

- Slight
- Moderate
- Extensive
- Collapse

Source: Oregon Department of Transportation/Portland State University

STEVE COWDEN/ THE OREGONIAN
Repair crews can’t make repairs to power grid

Earthquake leads to loss of liquid fuel

Repair crews can’t re-fuel vehicles
# ENERGY SECTOR

## Target Timeframe For Recovery

### KEY TO THE TABLE

| Desired time to restore component to 80-90% operational - In 50 Years | Resilient 6 |
| Desired time to restore component to 50-60% operational - In 50 Years | Resilient 4 |
| Desired time to restore component to 20-30% operational - In 50 Years | Resilient 2 |
| Current state restoration to 90% operational | Today X |

## TARGET STATES OF RECOVERY

### ZONE: WILLAMETTE VALLEY

<table>
<thead>
<tr>
<th>Event Occurs</th>
<th>0-24 Hours</th>
<th>1 - 3 Days</th>
<th>3-7 Days</th>
<th>1 - 3 Weeks</th>
<th>3 Weeks - 1 Month</th>
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<th>3 Months - 6 Months</th>
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### ZONE: EASTERN OREGON

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Relief and Response

- Eastern Oregon will become the main area of support functions
- Supply side chain distribution (including fuel, food, and natural gas)
- Demand for logistics and staging areas
- Shelter, and relocation of individuals and animals from the impacted areas.
Response Plans

• Cascadia Catastrophic Plan
• Cascadia Playbook
## OEM’s Requirements for Playbook

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Details</th>
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<tbody>
<tr>
<td>Honoring existing Cascadia plans and efforts</td>
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<tr>
<td>Not recreating the wheel</td>
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<tr>
<td>Initial response - From ground shaking to first 14 days</td>
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<td>Framework can be used for any disaster event</td>
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<td>Clearly established decision-making bodies</td>
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<td>Focused on action items</td>
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<td>Organized by Essential Support Function -18 ESF structure</td>
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<td>Plays are comprised of tasks to achieve specific objectives</td>
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<tr>
<td>Punch list of items for each ESF</td>
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</table>
Deriving Content for the Playbook

Sourced from existing Cascadia plans for cross referencing and consistency

Oregon Cascadia Subduction Zone Plan

FEMA Region X CSZ Plan – Execution Matrix

Content for Ops and Activations from ORS 401.165
### Initial Response in the Event of Disasters

<table>
<thead>
<tr>
<th>PLAY 1</th>
<th>PLAY 2</th>
<th>PLAY 3</th>
<th>PLAY 4</th>
<th>PLAY 5</th>
<th>PLAY 6</th>
<th>PLAY 7</th>
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<td>Notification,</td>
<td>Life Safety</td>
<td>Damage Assessment</td>
<td>Mass Care and Sheltering</td>
<td>Logistics and Resources Management</td>
<td>Planning and Prioritizations</td>
<td>Emergency Repairs</td>
<td>Outside Assistance</td>
<td>Begin Recovery</td>
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<td>(0 – 72 hrs)</td>
<td>(1 – 72 hrs)</td>
<td>(6 hrs – 30+ days)</td>
<td>(12 hrs – 30+ days)</td>
<td>(18 hrs – 30+ days)</td>
<td>(20 hrs – 7 days)</td>
<td>(1 – 30+ days)</td>
<td>(8 – 180+ days)</td>
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</table>

- Notify Governor
- Emergency Communications
- Establish Lifeline Routes
- Establish Shelters
- Establish Contact with Affected Area
- Transport Displaced People
- Vulnerable Populations
- Medical Care at Shelters
- Assess Impacts / Damage
- Medical Care
- Identify Unmet Needs
- Mass Feeding
- Animal Care
- Initiate Resource Requests
- Locate / Receive Supplies
- Contingency Plans
- Points of Distribution
- DMORT Operations
- Prioritize Emergency Repairs
- Emergency Contracting
- Clear debris
- Repair Essential Systems
- JIC Operations
- Mobilize Heavy Equipment and Personnel
- Receive Federal Resources
- Expedite Out-Of-Area Utility Repair Crews
- Facilitate Contracted Services
- Volunteers and Donated Goods
- Identify Economic Recovery Priorities
- Community Planning Needs
- Begin Restoring Community Services
- Begin Restoring Critical Systems
• Massive staging areas are likely to be required in various areas of Central and Eastern Oregon with the primary location of relief supplies
  • Roberts Field Airport in Redmond, Oregon, Deschutes County.
• River traffic on the Columbia River will be an important response and recovery lifeline.
Note: Major flows include domestic and international freight moving by truck on highway segments with more than twenty five FAF trucks per day and between places typically more than fifty miles apart.

2,376 Route Miles
2 Major Carriers (UP & BNSF)
20 Short Lines
1,039 Oregon Lifeline Miles
Union Pacific = 810 Miles
BNSF = 229 Miles
• Mutual aid from Eastern Oregon local jurisdictions will be sought to the maximum degree possible.
• Many building inspectors, police, firefighters, medical personnel, engineers, and public works personnel may deploy to the impacted areas of Western Oregon.
Impact on Economy

- Probably the longest lasting impact for Eastern Oregon
Top Oregon Exports Markets, 2009

- **6%** Taiwan
- **9%** Japan
- **13%** Canada
- **13%** Malaysia
- **20%** China
- **39%** Other*

* Other category includes more than 230 countries, the largest markets including South Korea, China, The Netherlands and Germany.

Port of Portland, Marine Tonnage

- Recession
- Grain Tonnage
- Grain 4 Qtr MA
- All Other Tonnage
- All Other 4 Qtr MA

[Graph showing time series data from 1990Q1 to 2010Q1]
Exports

Imports
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