



# *Catastrophic Disaster Planning*

*for*

## *Washington Senate Ways and Means Committee*

**12 January 2017**



## FEMA Effort & Modeling

- FEMA commissioned a multi year \*HITRAC & scientific study and produced the Region X Response Plan (Published December 2013)
- Modeling Factors
  - February 6, 9:41am PST, weekday
  - Complete rupture of the CSZ fault line
  - Epicenter 60 miles off Oregon coast, 120 miles West of Eugene
  - M9.0 earthquake, with ground shaking up to 5 minutes
  - Tsunami wave heights 20 to 80 feet
  - Aftershocks of M7.0 or greater
  - Additional tsunamis caused by aftershocks

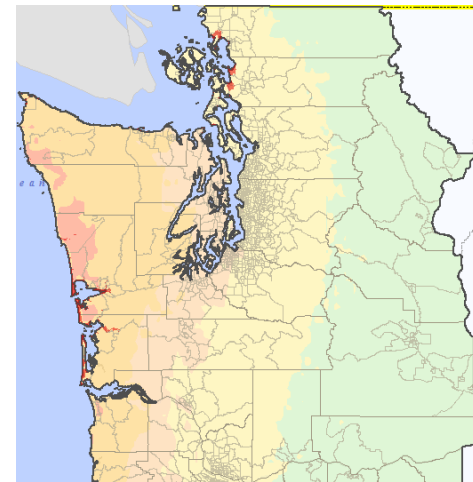
Note: Damage caused by aftershocks, follow on tsunamis, and secondary effects is not included in damage estimates. Model ran a data set that was the best available in Oct 2012

\***HITRAC** – Homeland Infrastructure Threat and Risk Analysis Center, the Department of Homeland Security (DHS) Infrastructure-intelligence fusion center.

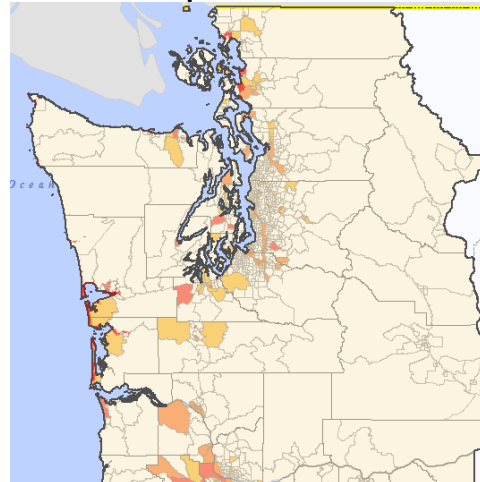


## Ground Shaking Effects

### Mercalli Index



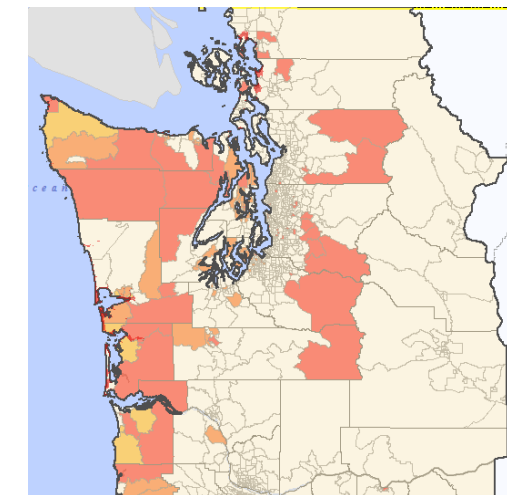
### Liquefaction



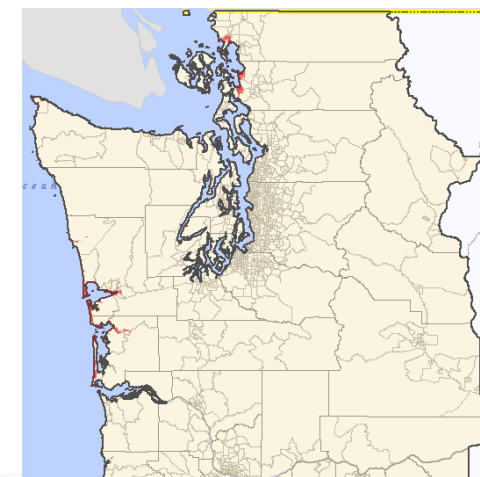
**Mercalli Index:** Ground shaking will depend on the actual fault rupture method and can not be accurately forecast. It is anticipated that the fault will rupture along its entire 700 mile length resulting in a magnitude 9.0 earthquake that will last 3-5 minutes. The intensity of the shaking will decrease with distance from the fault. Even so, Seattle is expected to experience a 7.0 magnitude or higher earthquake with 5 minutes of shaking.

**Liquefaction:** The cause of some of the most dramatic damage resulting from an earthquake, liquefaction areas can be accurately forecast based on soil types and water content. Some of the most susceptible areas are areas that have a high commercial potentiality, i.e. ports, bridges, commercial areas.

### Landslides



### Tsunami



**Landslides:** Landslides will occur up to hundreds of miles from the fault due to the intensity of the shaking. Landslide potential significantly increases with water content. If the CSZ rupture occurs during the rainy season, landslides will be most prolific.

**Tsunami Inundation:** Tsunami's are historically the biggest killer associated with earthquakes. The residents most affected are along Pacific Coastal areas. The numbers in jeopardy will increase sharply in summer months. Current estimates place as many as 50,000 residents in the hazard zone in February.



## 1<sup>st</sup> Order Effects - Shaking



- Landslides, bridge damage, buildings unsafe





## 1<sup>st</sup> Order Effects - Liquefaction



Structure collapse, damage to utilities, silting





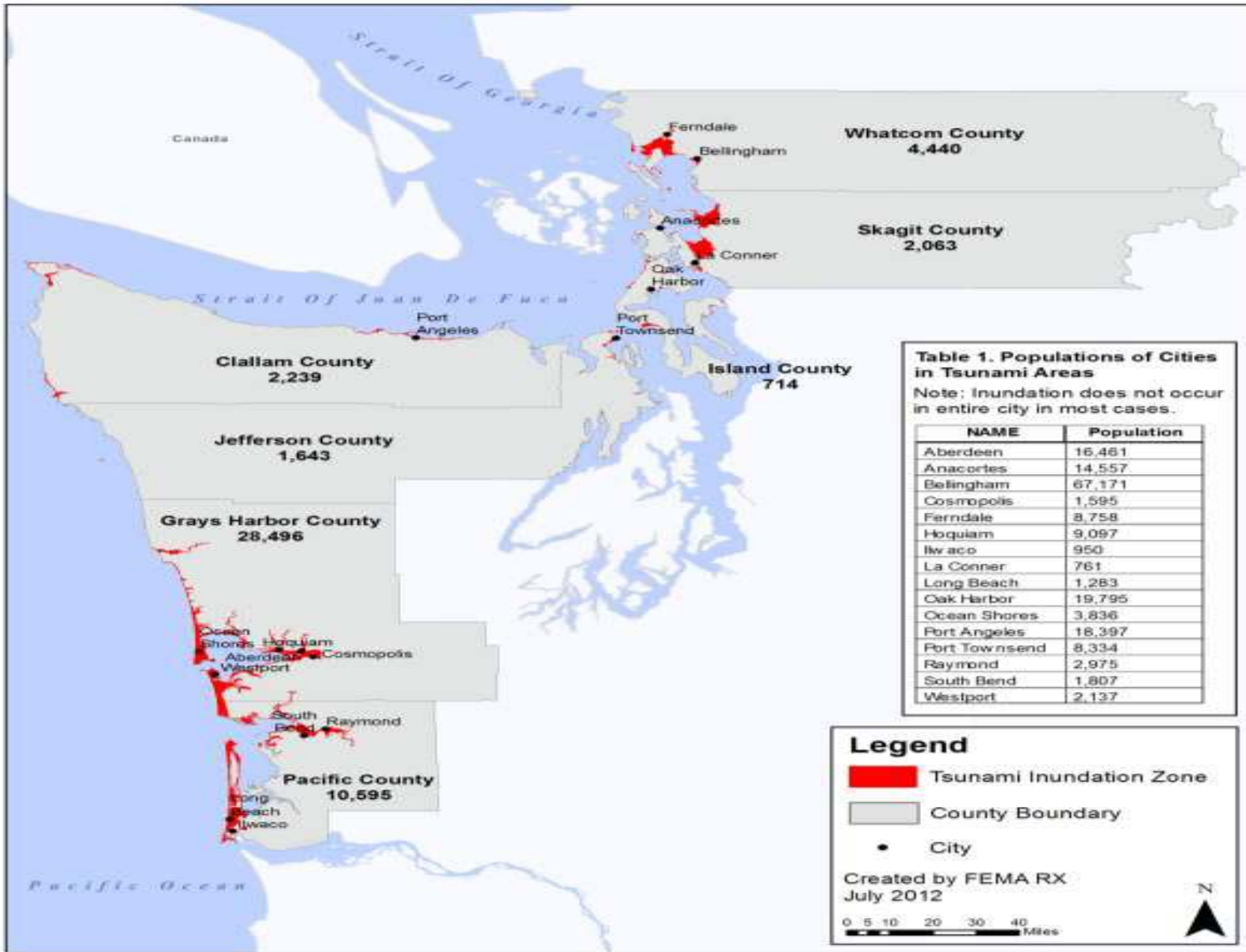
## 1<sup>st</sup> Order Effects - Tsunami



- High mortality rates, communities devastated

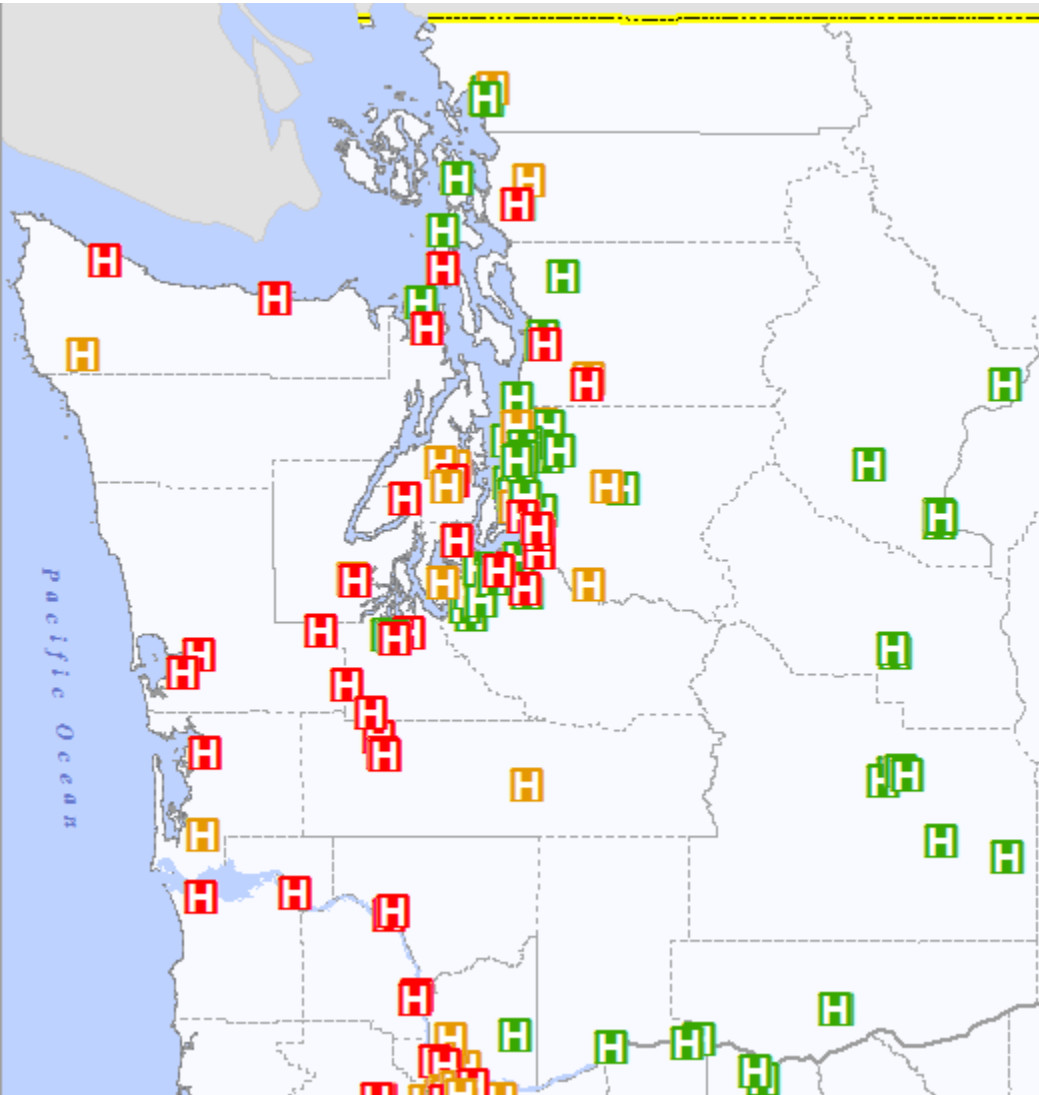


# WASHINGTON MILITARY DEPARTMENT





## Hospitals



These are general locations and forecast status of the known Hospitals.

There are 112 Hospitals in the affected area.

36% suffer severe damage, are unusable, and will likely be completely offline.

17% suffer moderate damage and are only assumed capable of 50% normal capacity.

Total reduction is assumed to be 45% of total hospital capacity.

47% suffer slight damage and are able to continue to operate at capacity.

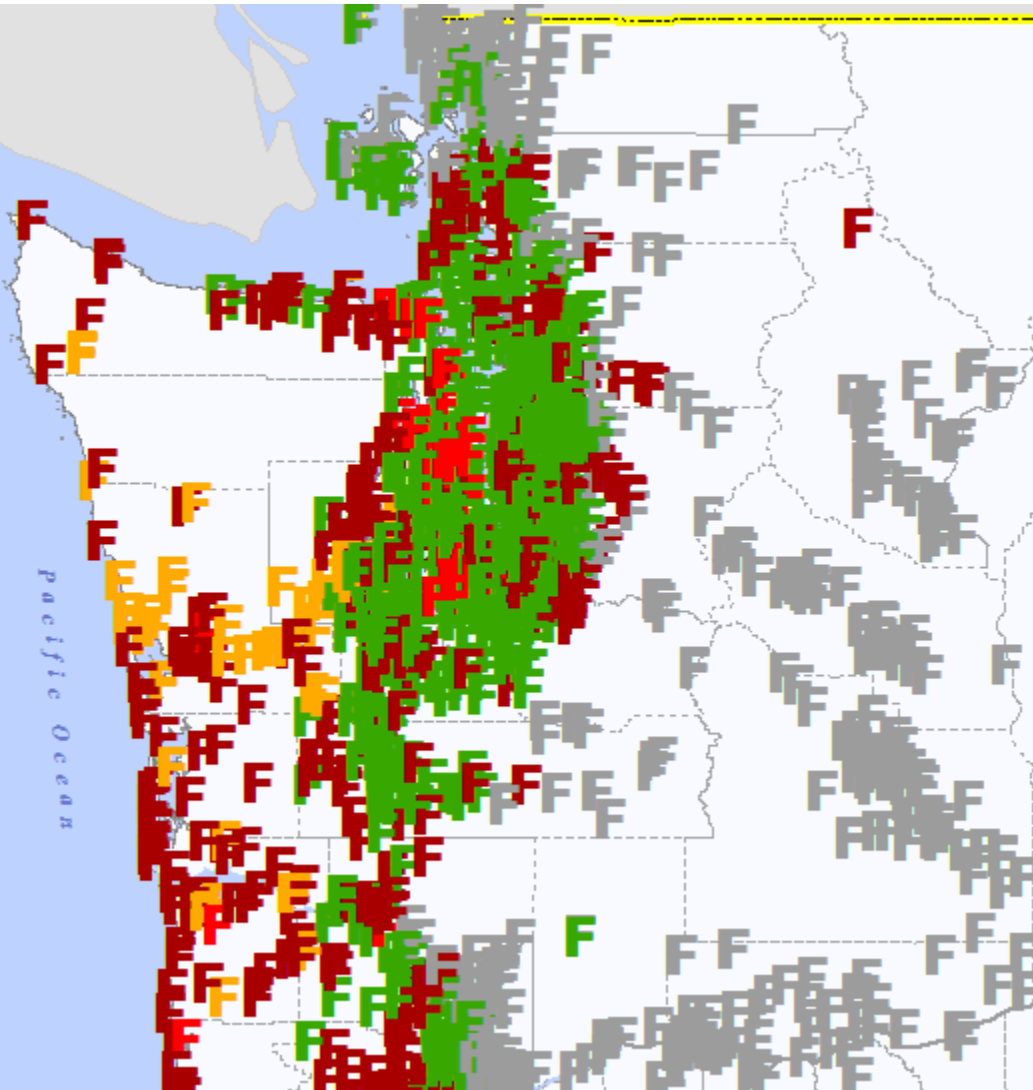
The facilities nearer to the epicenter suffer most significant damage resulting in virtually no Hospital capacity west of the I5 corridor.

These numbers discuss **STRUCTURAL** capacity, not patient capacity, which is further reduced due to lack of electricity, potable water, sanitation, etc.





## Fire Stations



These are general locations and forecast status of the known Fire Stations.

There are 971 Fire Stations in the affected area.

30% suffer severe damage, are unusable, and are planned to be completely offline.

6% suffer moderate damage and are only assumed capable of 50% normal capacity.

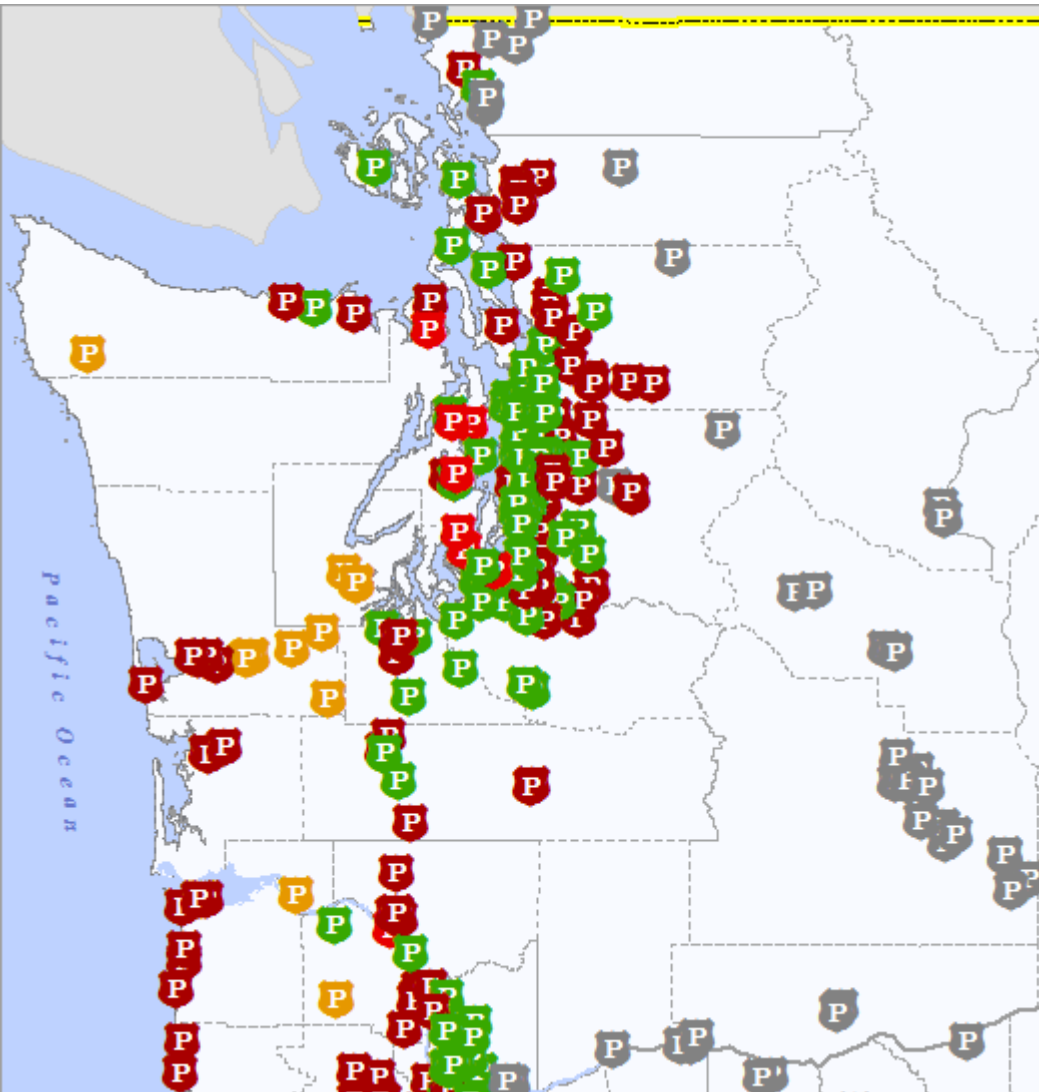
**Total reduction is assumed to be 33% of Fire Response capability.**

64% suffer slight or no damage and are able to continue to operate at capacity.

The facilities nearer to the epicenter suffer most significant damage resulting in **significantly reduced capability west of Shelton.**



## Police Stations



These are general locations and forecast status of the known Police Stations.

There are 178 Police Stations in the affected area.

41% are completely destroyed, 7% suffer severe damage, are unusable, and are planned to be completely offline.

5% suffer moderate damage and are only assumed capable of 50% normal capacity.

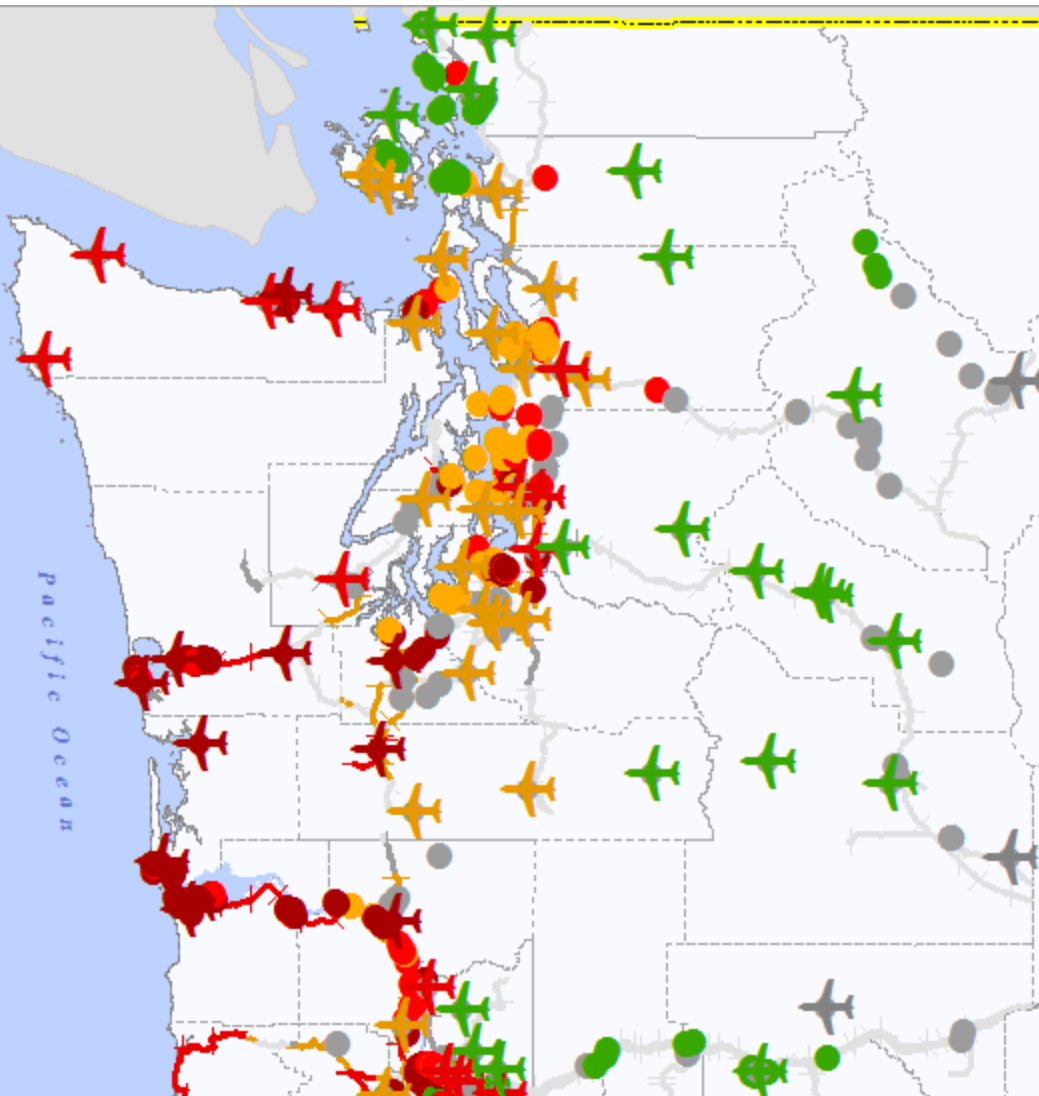
**Total reduction is assumed to be 51% of Police Response capability.**

48% suffer slight or no damage and are able to continue to operate at capacity.

The facilities nearer to the epicenter suffer most significant damage resulting in **significant degradation of Law Enforcement capability west of Shelton.**



## Transportation - Sea, Air, Rail



Most facilities west of the I-5 corridor suffer complete to severe damage

Most facilities along the I-5 corridor suffer severe to moderate damage

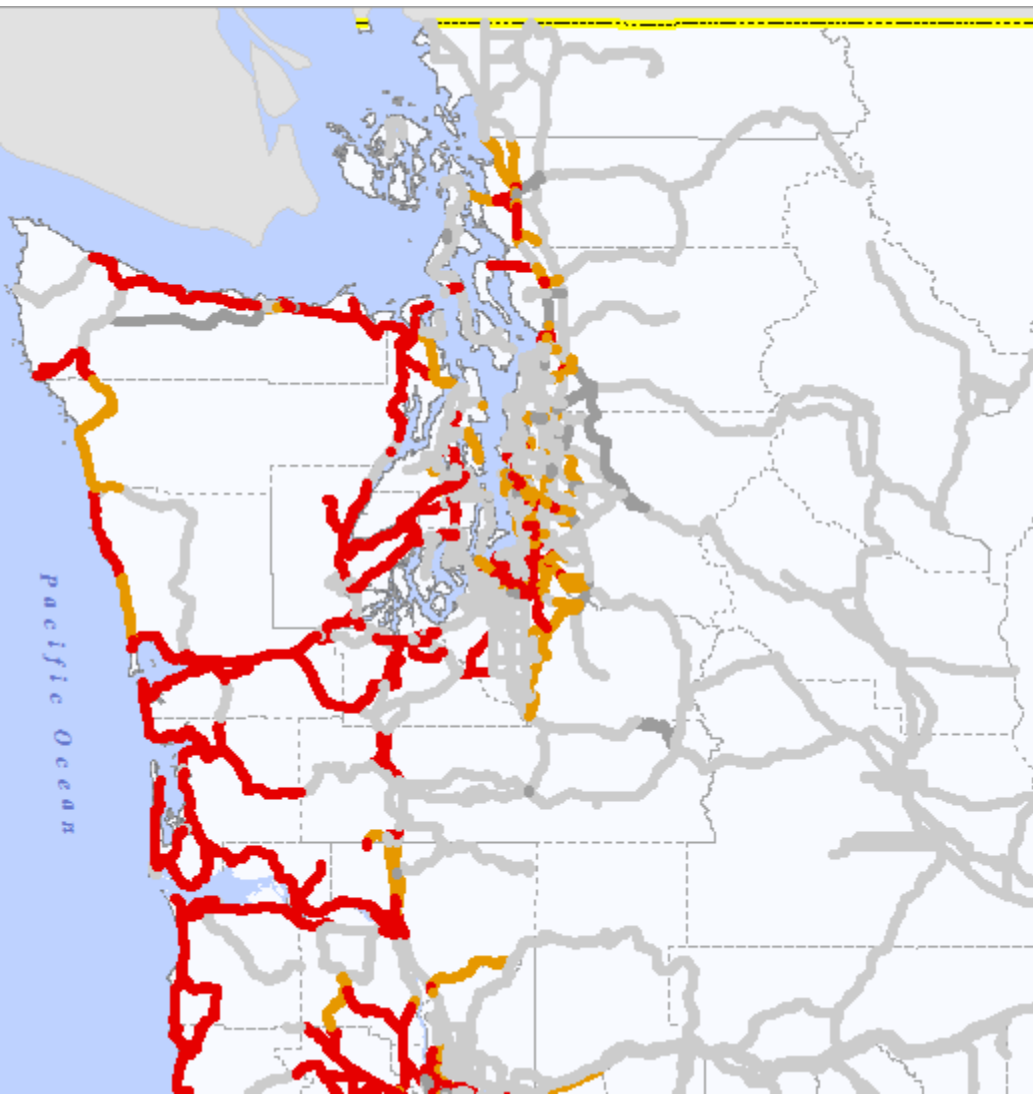
Most facilities east of the I-5 corridor suffer slight to no damage

Many of these facilities are located in liquefaction zones





## Transportation- Highways



There is a vast network of County, State, and Federally maintained highways in the affected area. Ground transportation is the primary method of movement for most commodities.

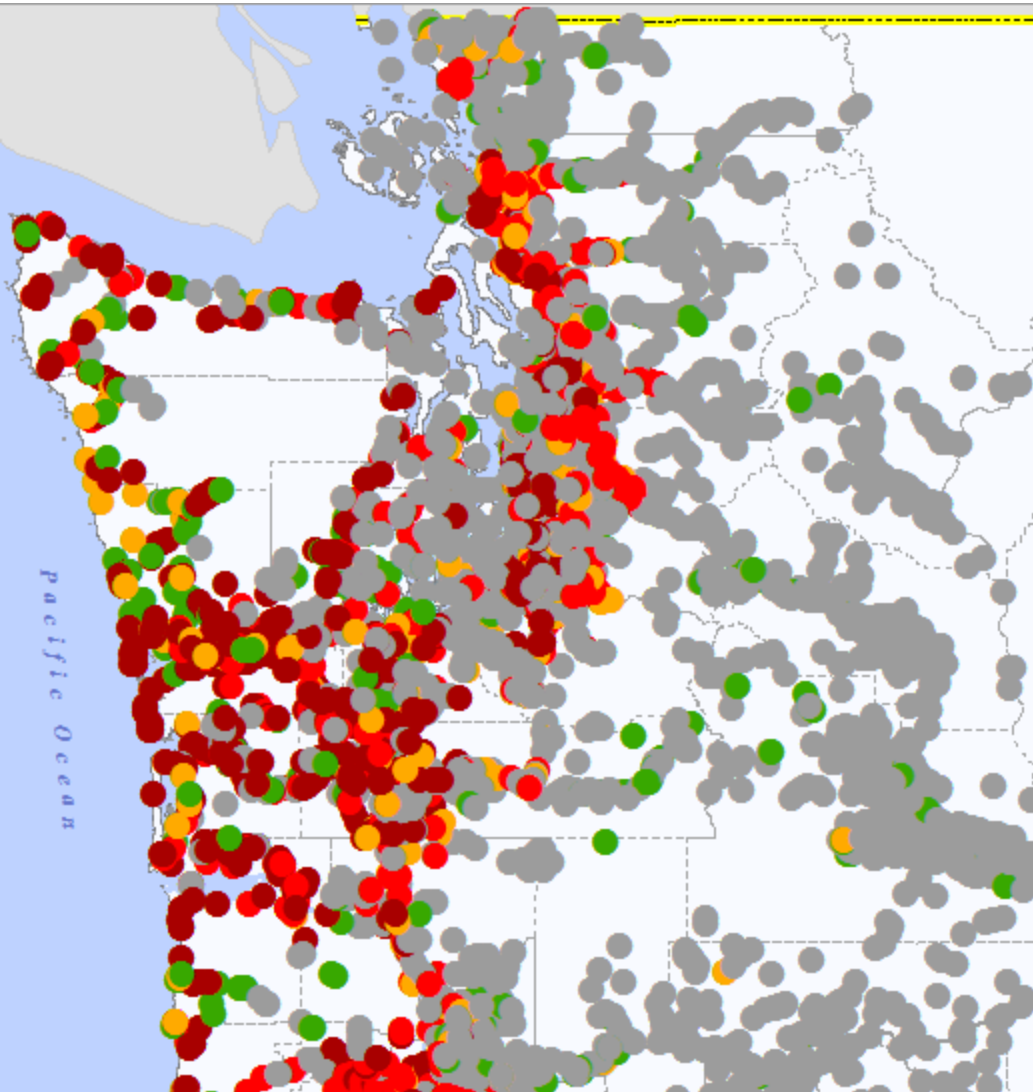
The highway system will suffer the most damage in the vicinity of the coast with both earthquake and tsunami damage. This will significantly impact any lifesaving or recovery operations, and will drive route clearance and roadway repair to a very high priority across the region.

In the I-5 corridor roads in areas of high liquefaction susceptibility are likely to prove impassable.

In the initial stages of the CSZ response the only method of reaching coastal communities will be by air. There are no surviving ground routes to the coastal region.



## Transportation- Hwy Bridges



Virtually every highway crosses numerous bridges. Route identification that does not cross a bridge will not be possible when attempting to reach any isolated community. Bridges in the affected are predominantly old and were built prior to establishment of significant seismic building requirements.

The assessment of bridges as early in the IAA process as possible will be key to the development of routes into isolated communities. Identifying bridges that need the least repairs will speed up recovery operations.

The lack of suitable bridges will be a factor in the determination of the recovery efforts and timelines.



## Planning Factors (FEMA)

	Washington Total	Notes
Land Area (Sq. Miles)	71,303	
Miles of Pacific Coastline	157	Does not include Strait of Juan de Fuca or shores of Puget Sound.
Population	6,894,121	
Population exposed to tsunami	50,190	
Residential buildings damaged (Slight to complete damage)	507,701	
Short term human sheltering requirements	410,127	
Short term pet sheltering requirements	254,357	
Mass feeding and hydration requirements (People)	1,274,327	
Mass feeding and hydration requirements (Pets)	777,340	
Deaths	8,440	Projection accounts for initial earthquake and tsunami, does not account for exposure, disease, dehydration, starvation, or follow on tsunami's and aftershocks.
Injuries	12,114	
Hospital patient evacuation requirements	15,501	Evacuation requirements based on projected numbers of facilities determined to be unusable. Does not account for evacuation to create room for newly injured.
Nursing home patient evacuation requirements	65,249	
Building debris (Cubic Yards)	13,174,243	





## Concluding Remarks Questions / Discussion



Thank you for your time!



Mr. Robert Ezelle, Director, Emergency Management Division

- (253) 512-7001

- [Robert.ezelle@mil.wa.gov](mailto:Robert.ezelle@mil.wa.gov)

LTC Clayton Braun, Deputy Joint Operations Officer

- (253) 512-8366

- [Clayton.e.braun.mil@mail.mil](mailto:Clayton.e.braun.mil@mail.mil)