



The Washington Guard Condensed CSZ Threat Brief

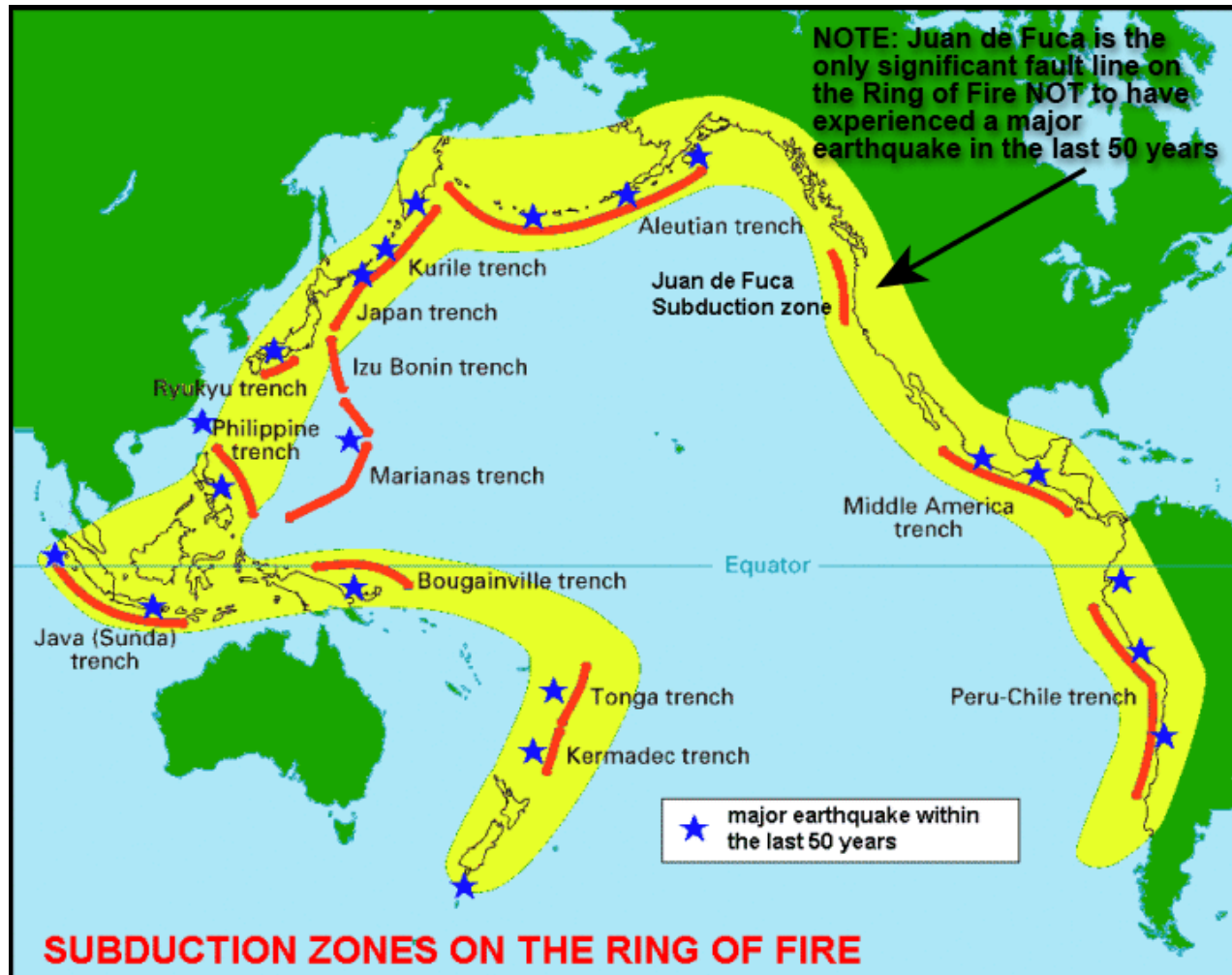
Brief to
Visiting Dignitaries

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Brief is current as of: 29APR2016

Ring of Fire



The Ring of Fire accounts for 90% of all earthquakes, and 81% of the world's largest earthquakes

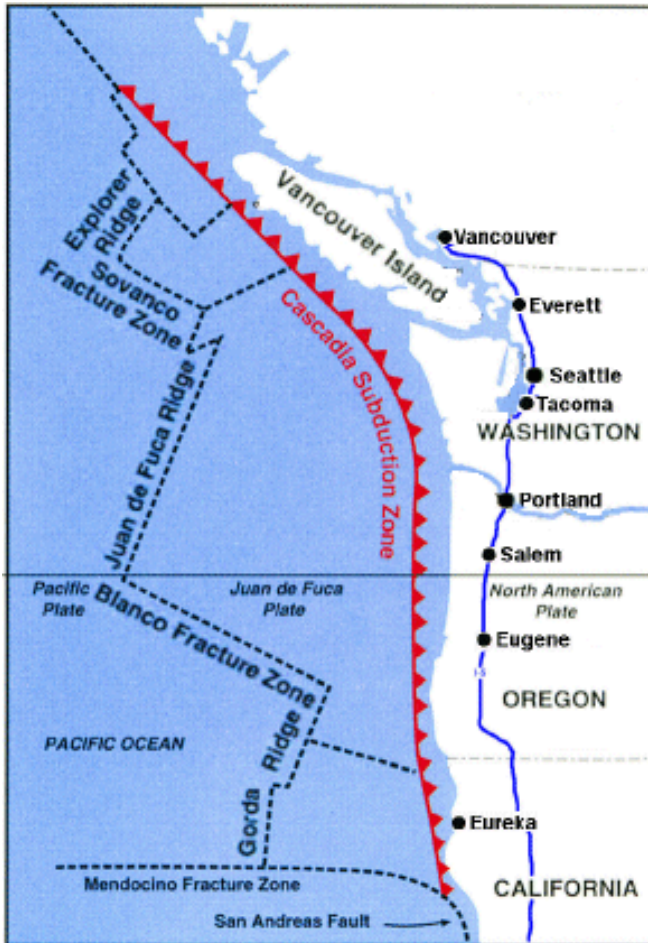
Subduction zones are shown in red

The CSZ fault line is part of the Ring of Fire

The CSZ is the only significant fault line on the Ring of Fire without a major quake in the last 50 years (see blue stars)



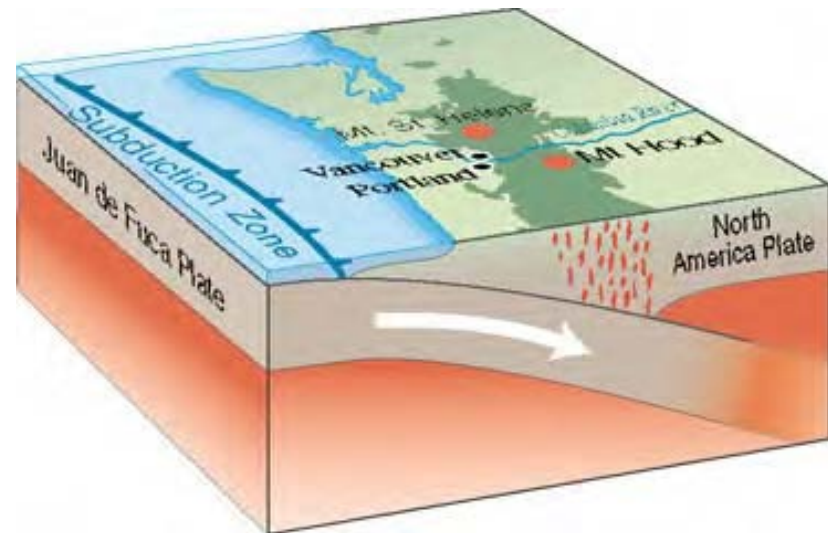
Cascadia Subduction Zone



The CSZ runs 800 miles from Southern British Columbia to Northern California, and lies 50 to 80 miles off the Pacific Coast

The heavy Juan de Fuca plate is sliding under the lighter North American plate

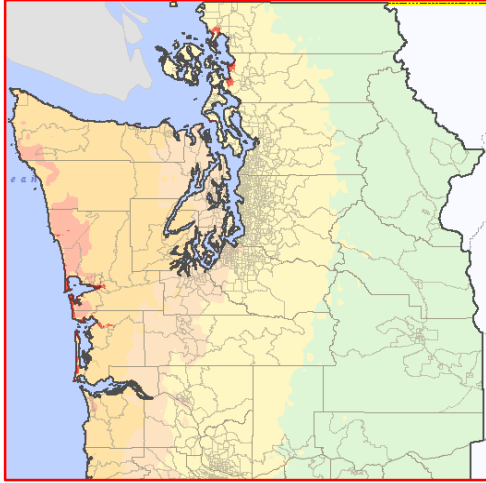
A magnitude 9.0 CSZ earthquake has occurred every 300 to 500 years (USGS – 400-600 years). The last CSZ earthquake occurred in the year 1700 (January 26).



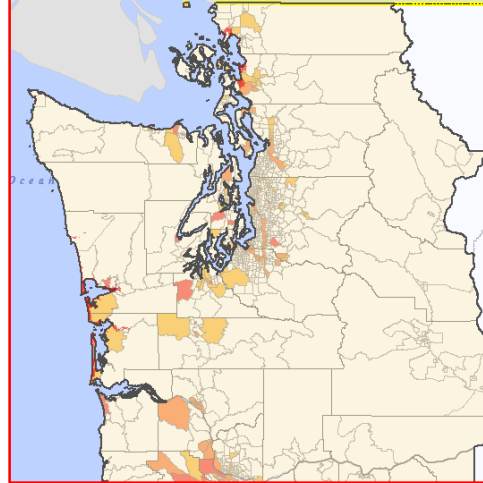


Ground Shaking Effects

Mercalli Index



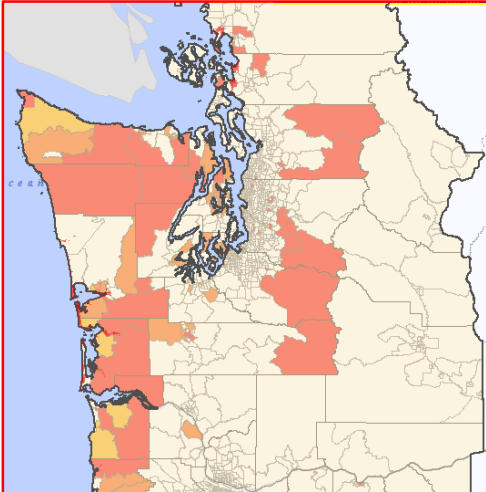
Liquefaction



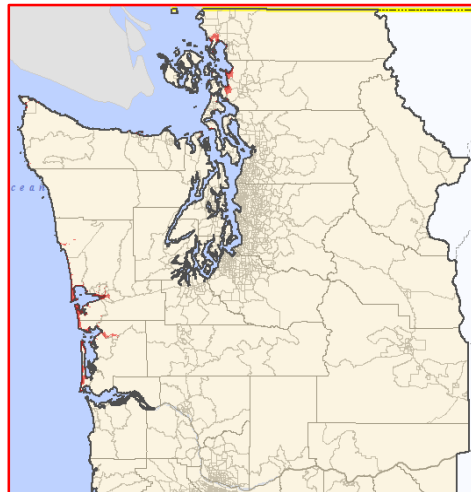
Mercalli Index: Ground shaking will depend on the actual fault rupture method and can not be accurately forecast. It is anticipated that the fault will rupture along its entire 700 mile length resulting in a magnitude 9.0 earthquake that will last 3-5 minutes. The intensity of the shaking will decrease 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.



1st Order Effects - Shaking



- Landslides, bridge damage, buildings unsafe



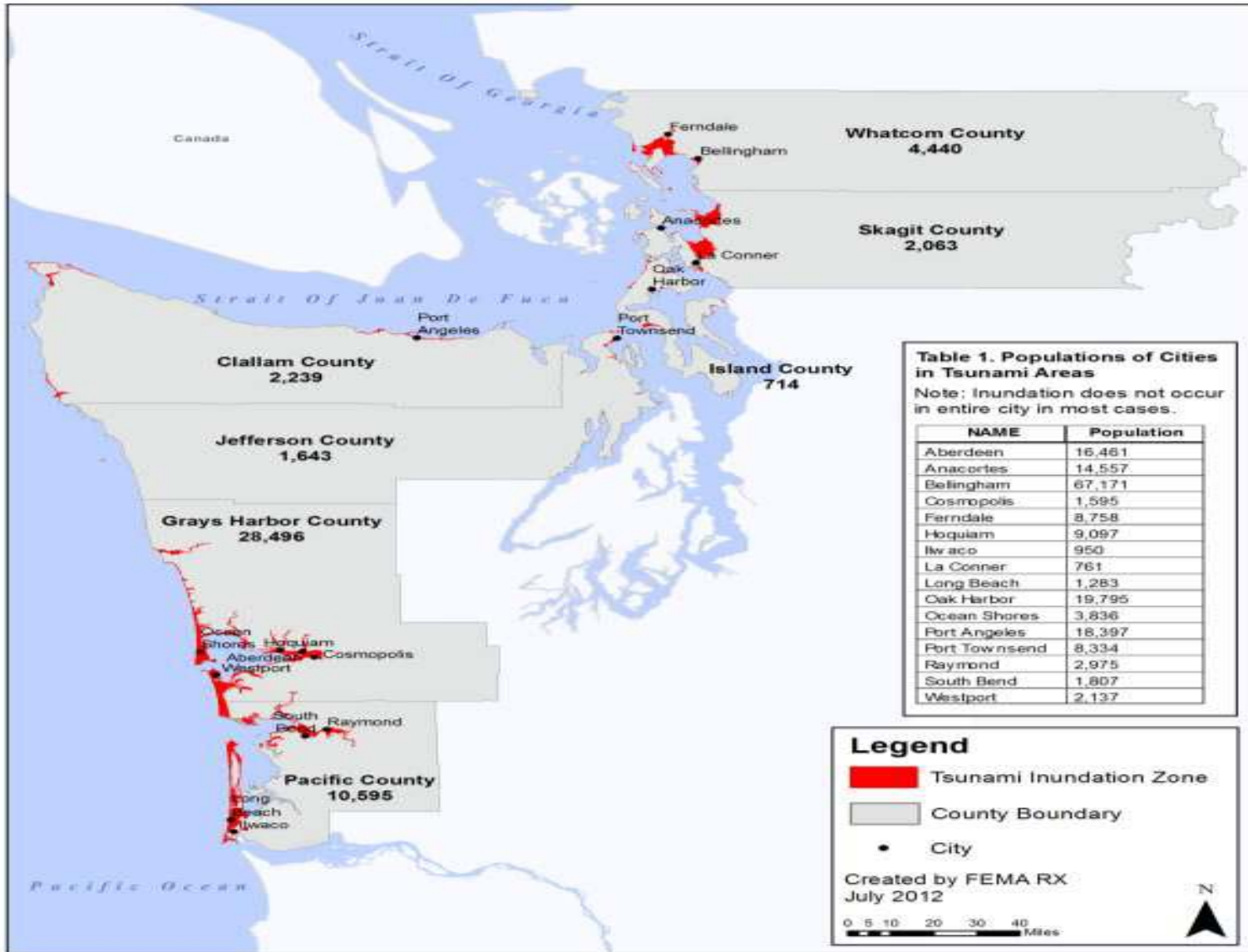
1st Order Effects - Liquefaction



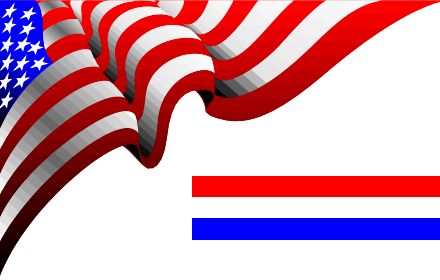
Structure collapse, damage to utilities, silting



Tsunami Inundation Areas



1st Order Effects - Tsunami



- High mortality rates, communities devastated



Legend

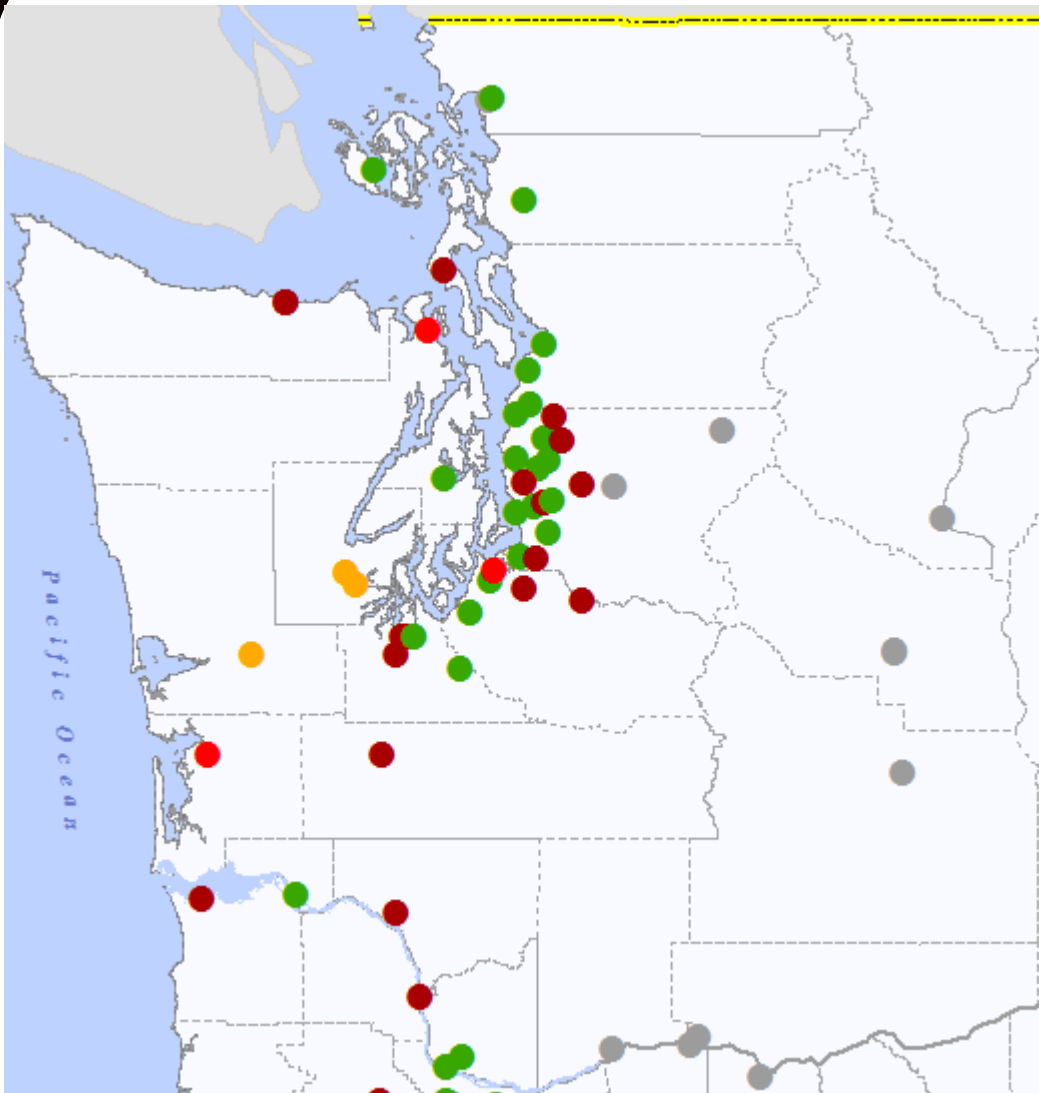
- Complete = Totally Destroyed.
- Severe = Severely Damaged – Not Useable
- Moderate = Moderately Damaged – 50% Capacity
- Slight = Slightly Damaged – Useable
- None = Not Damaged

The HITRAC study is designed and intended to be REPRESENTATIVE not PREDICTIVE.

Interpretation of HITRAC symbols associated with CSZ effects to Critical Infrastructure and Key Resources (CIKR), as interpreted by WA NG Joint Planning Team.



Emergency Ops Centers



These are general locations and forecast status of the known City, County and State EOCs.

There are 48 EOCs.

30% are completely destroyed, and 7% suffer severe damage and are unusable.

Result is 37% must devolve.

7% suffer moderate damage and may be partially usable, may devolve.

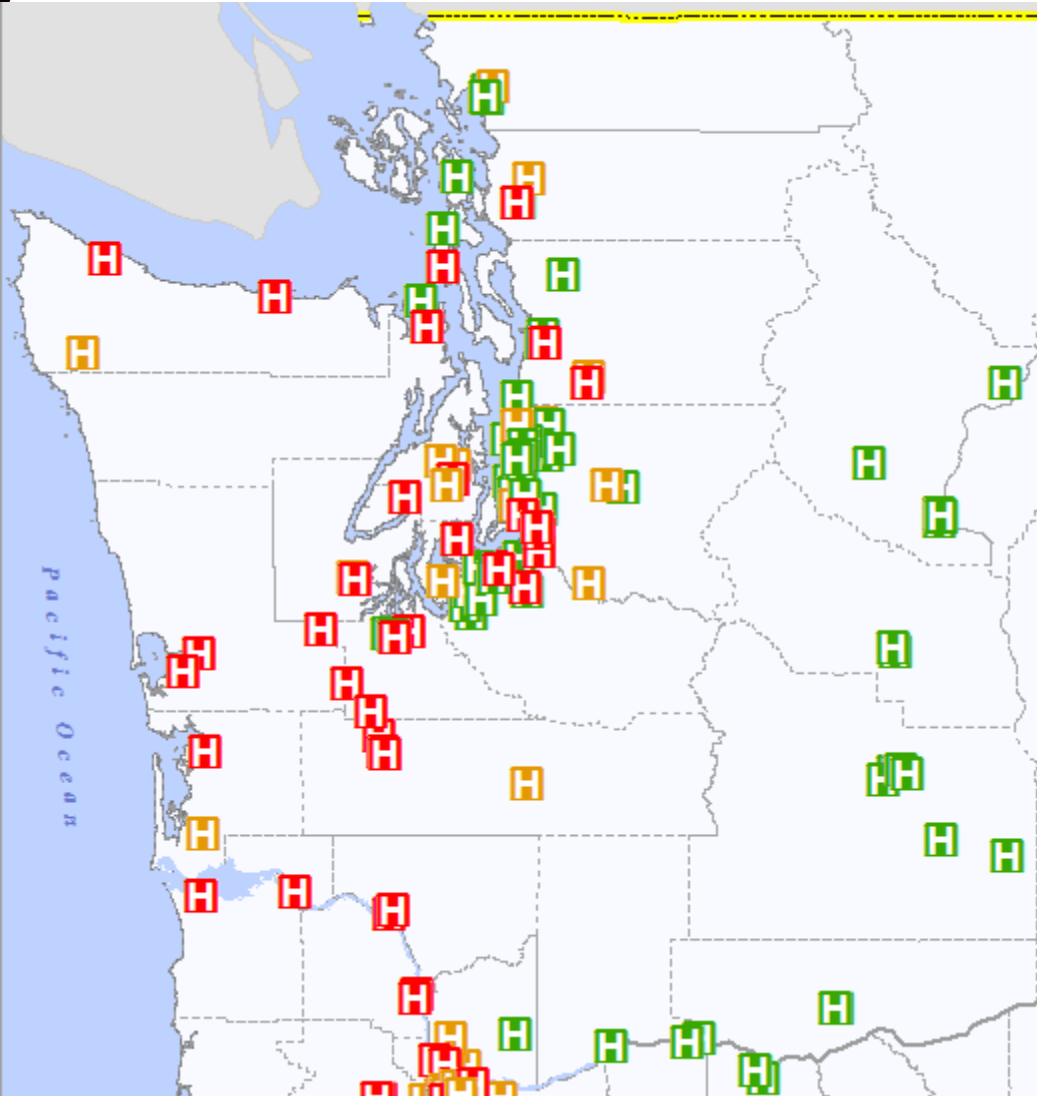
50% suffer slight damage, 6% suffer no damage.

56% are able to continue operations with minimal interruption.

State EOC sustains slight damage.



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.

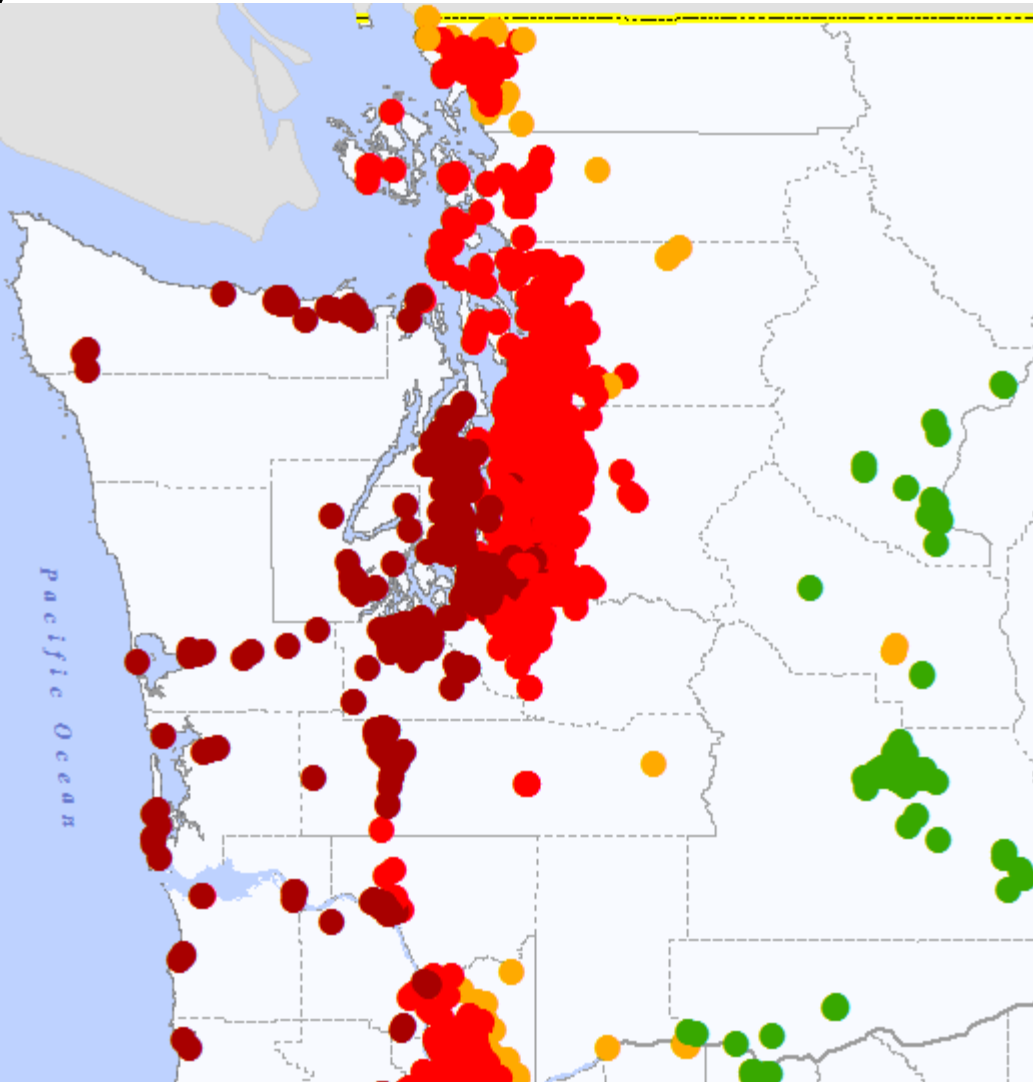
47% suffer slight damage and are able to continue to operate at capacity.

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.



Senior Living Facilities



There are approximately 2,156 senior living facilities in the affected area.

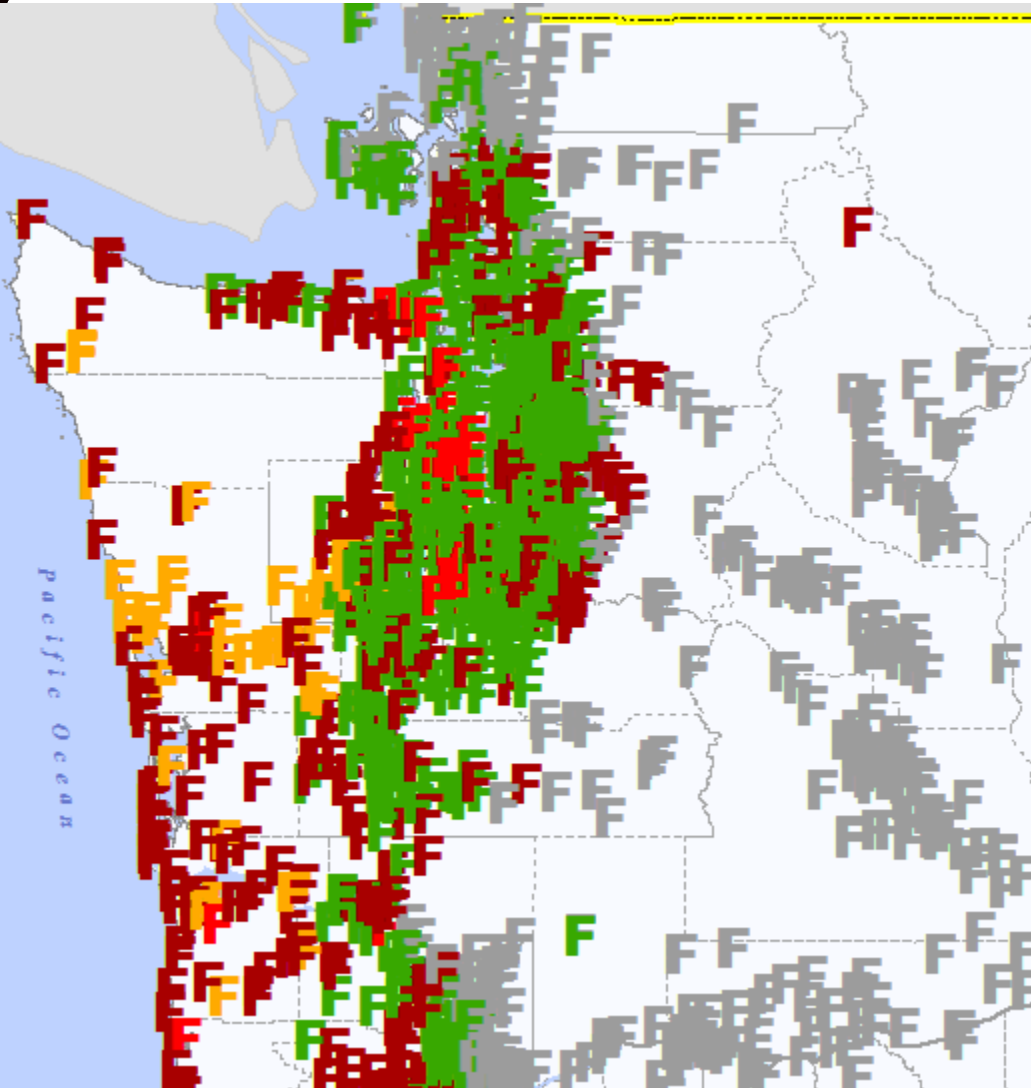
Significant numbers (approaching 100%) of facilities West of the I-5 corridor suffer extensive damage, and are likely unusable.

The vast majority of facilities along the I-5 corridor suffer complete to severe damage and are likely unusable, or are significantly degraded.

The facilities nearest the epicenter suffer most significant damage resulting in virtually no senior living facility capacity West of the I-5 corridor.



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.

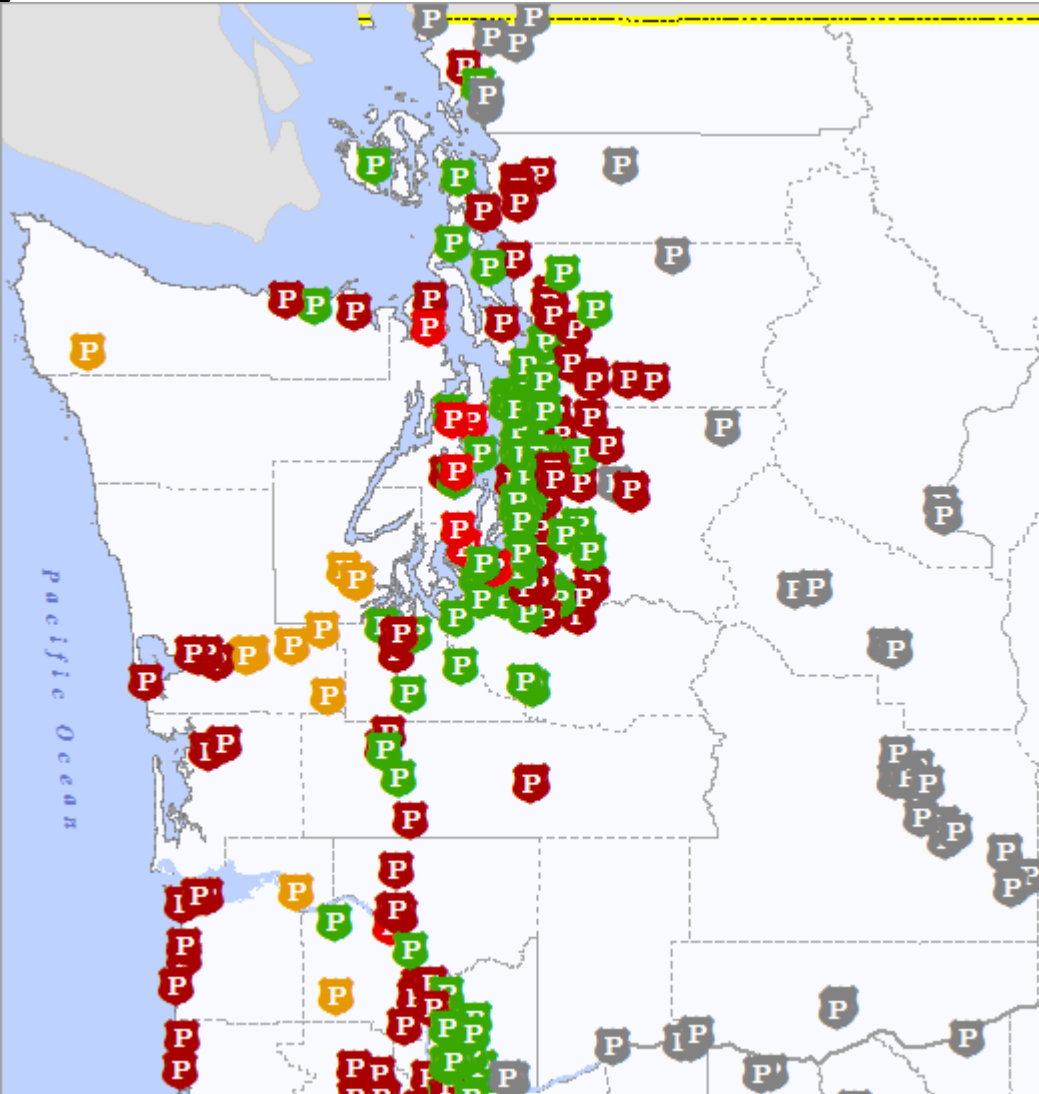
Total reduction is assumed to be 33% of Fire Response capability.

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.

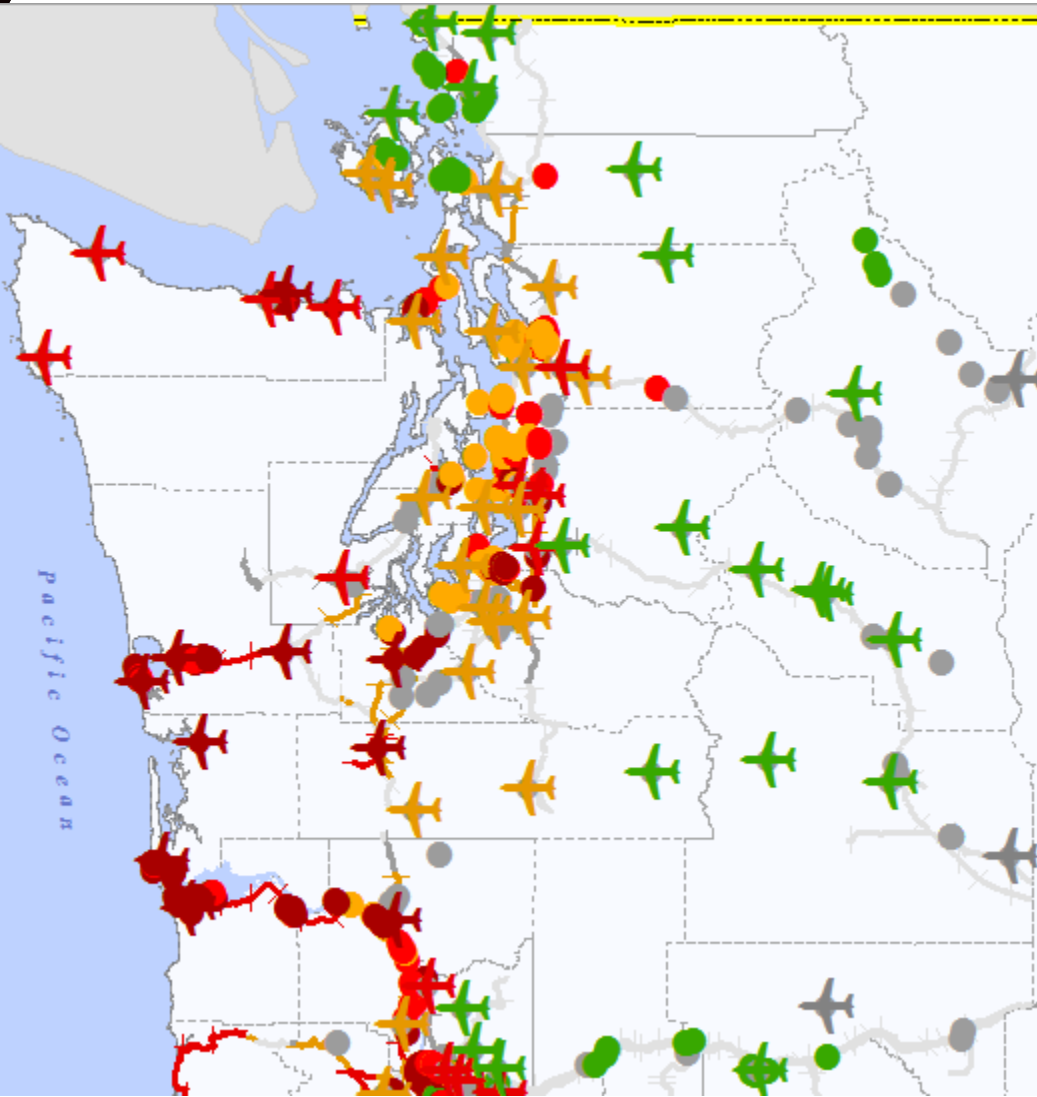
Total reduction is assumed to be 51% of Police Response capability.

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

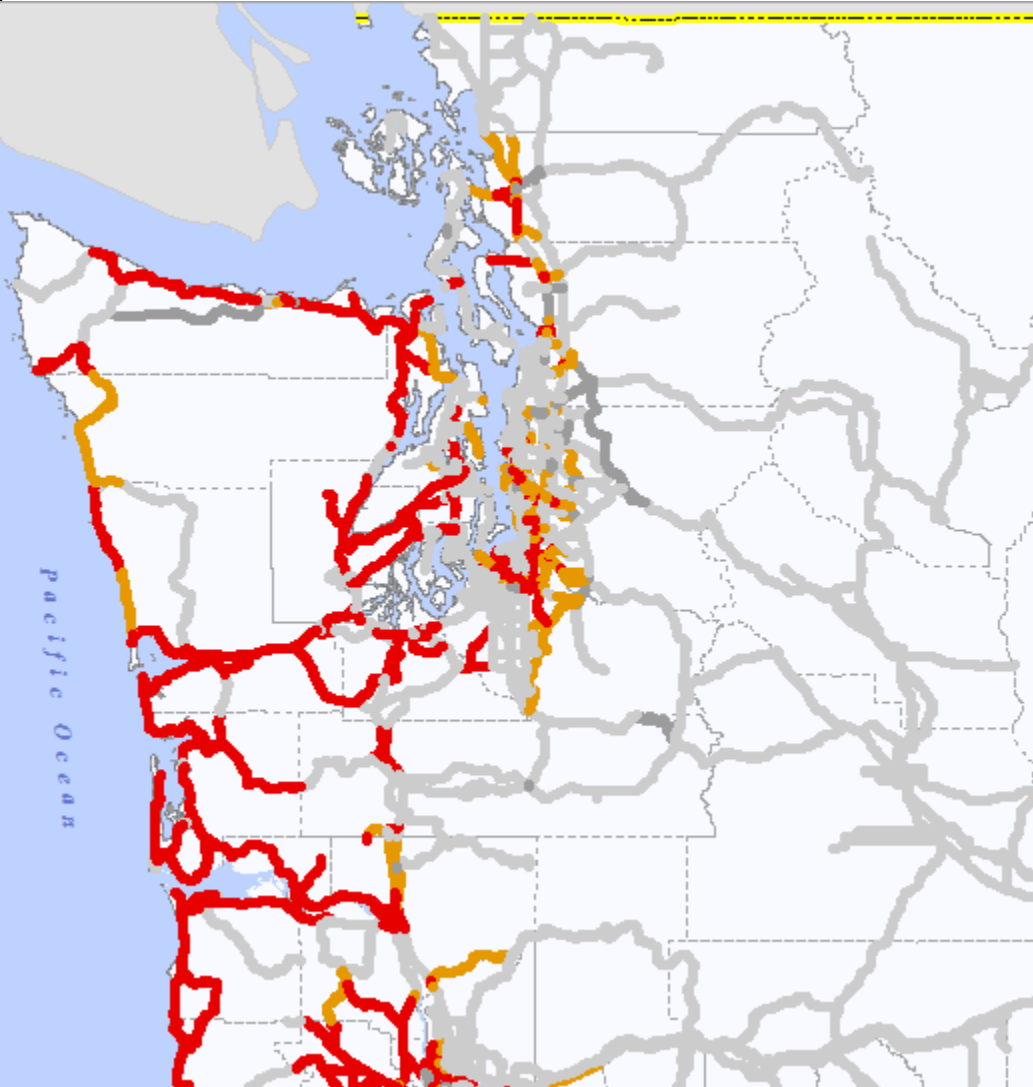
Most facilities along the I-5 corridor suffer severe to moderate damage

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.

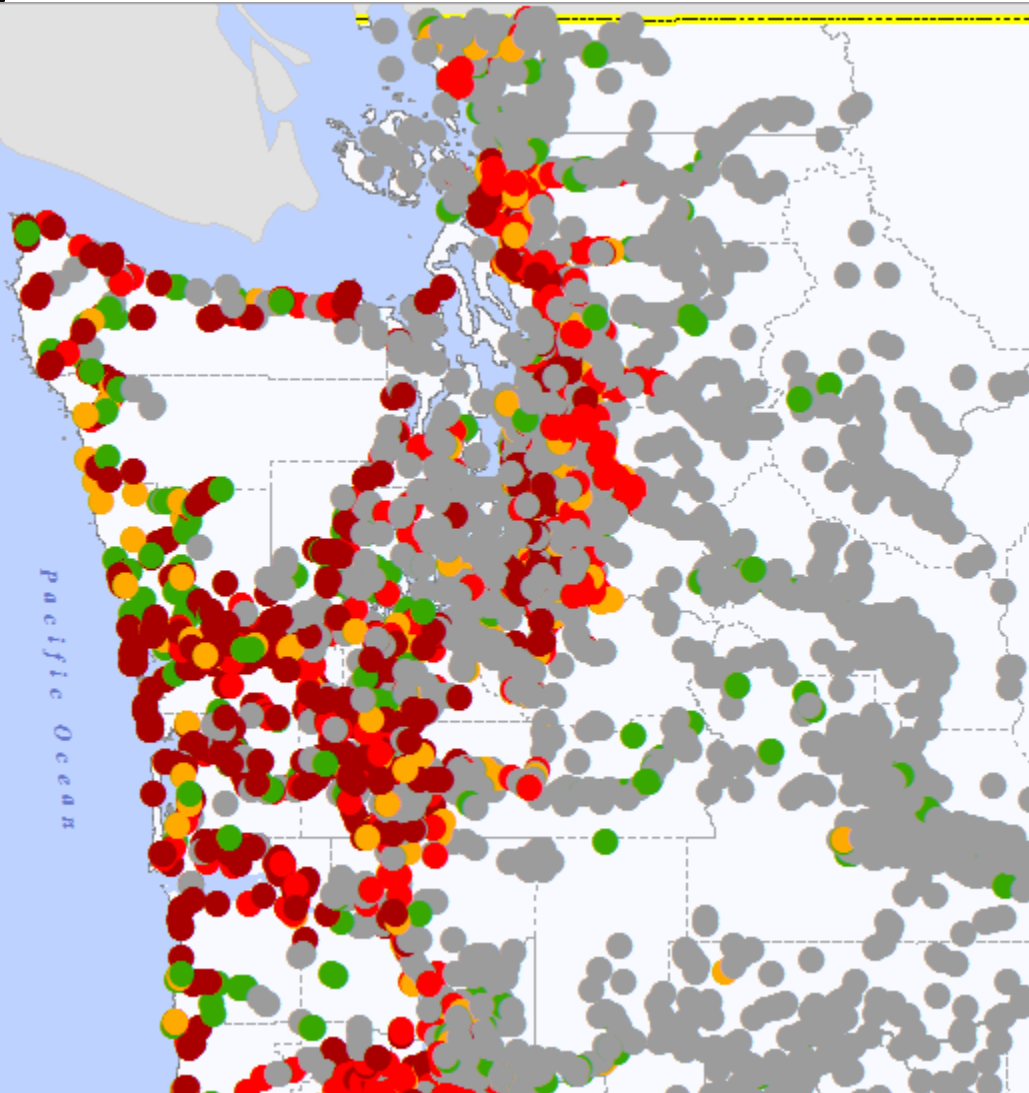
The highway system will suffer the most damage in the vicinity of the coast with both earthquake and tsunami damage. This will significantly impact any lifesaving or recovery operations, and will drive route clearance and roadway repair to a very high priority across the region.

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



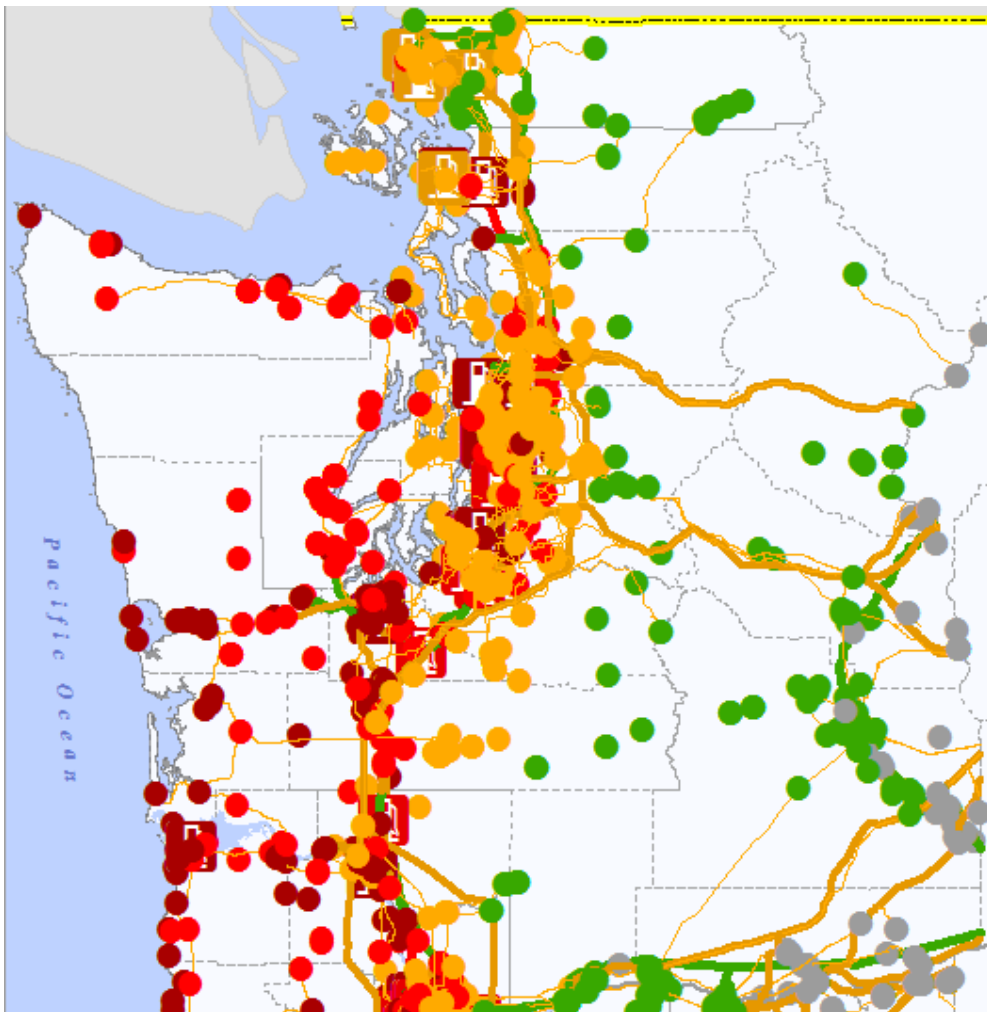
Virtually every highway crosses numerous bridges. Route identification that does not cross a bridge will not be possible when attempting to reach any isolated community. Bridges in the affected are predominantly old and were built prior to establishment of significant seismic building requirements.

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.



Utilities



- This slide provides an overview of the utilities networks across the affected area. In general the amount of damage decreases from West to East. Major networks will be out-of-service until significant repairs can be made.
- There are approximately 440 major electrical facilities and a vast network of electrical power lines, both above and underground throughout the region.
- There are 68 major Natural Gas facilities and 12 counties contain 22 major sections of NG pipe network.
- There are 54 petroleum processing facilities, and 9 counties contain 16 major sections of petroleum pipeline.
- There are 35 known Potable Water Facilities.

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	



Historical Comparisons

Date	Location	Significant Statistics	Aftershocks	Tsunami
1700	Cascadia	M8.7–9.2	Unknown	Height unknown Reached Japan
1960	Chile	M9.5 2,000 deaths 3,000 injured	5 of M7.0+	80 feet Affected Hawaii, Japan, Philippines, Australia, New Zealand and the United States
1964	Alaska	M9.2 12 deaths from quake Shaking for 4–6 minutes 119 deaths from tsunami	11 of M6.0+ in first day 9 of M6.0+ in 3 weeks 10,000+ in a year	30–50 feet Affected the U.S. West Coast
2004	Sumatra	M9.0 230,000 deaths in 14 countries Shaking for 4–10 minutes	1 of M7.1 within 3 hours 13 of M6.0+	98 feet
2010	Chile	M8.8 525 deaths Shaking for 3 minutes	Several M6.0–7.0 Lasted over a year	8.5 feet
2011	Japan	M9.0 16,000 deaths Shaking for 3–5 minutes	M7.9 & 7.7 same day Many M4.5–6.0+	130 feet Inundation 6 miles inland

Sources: CREW (2005), USGS Earthquake Hazards Program (2012), Asahi Shimbun (2011), oregonlive.com (2011)



Questions / Discussion



Thank you for your time!