Resilient Washington Subcabinet Report

Findings and Recommendations

August 2017

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Acknowledgments

This report was developed as a collaborative effort by the Resilient Washington Subcabinet Project Team from the Washington Military Department's Emergency Management Division on behalf of Governor Jay Inslee and the Resilient Washington Subcabinet. The conclusions reached reflect the result of a collaborative effort to consider all points of view by many contributors, and we appreciate the participation and support of the following contributors in producing this report:

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Executive Summary

Washington State has the second-highest earthquake risk in the United States. The 700-mile Cascadia Subduction Zone (CSZ) represents an extreme threat to the Pacific Northwest, capable of generating a magnitude 9.0 or higher earthquake and a tsunami. The most recent studies estimate 10,000 fatalities and direct economic losses of more than $80 billion combined for Washington and Oregon. In addition to the CSZ offshore, Washington's mainland is littered with active crustal faults which pose seismic hazards; the histories and hazards of many of these faults are still being uncovered. Developing a state that is prepared for these impending natural disasters will significantly mitigate the damage they can cause to its people, property, economy, and long-term survival.

On November 4th, 2016, Gov. Jay Inslee issued Directive 16-19, establishing a Resilient Washington Subcabinet. Through this subcabinet, the Washington Military Department's Emergency Management Division was directed to assess our strategy in creating a resilient Washington State with regard to the hazards posed by earthquakes and tsunamis. In addition, a general goal of the Directive was to increase individual, family and business preparedness.

Workgroups consisting of key stakeholders and subject matter experts were formed to identify gaps; develop and prioritize actions; estimate implementation costs; and draft a report with initial findings and recommendations. The report that follows is a summary of the findings by the workgroups, and the implementation plans they developed. These initial action plans provide a foundation for more thorough and detailed scoping, both in terms of activities and costs, and are meant to help guide the best path forward for initial actions.

Significant work has already occurred to increase Washington's resilience to withstand earthquakes and tsunamis, yet much work remains to further this effort. As you will see throughout this report, there are many high priority actions that can be accomplished within existing resources or an additional incremental investment, such as integrating the WAsafe Program within the ESF-3 structure to rapidly conduct building assessments post-earthquake; establishing a stakeholder business continuity workgroup; and completing the master bulk fuel contract to improve fuel distribution post-earthquake. Despite being comparatively low cost, these action items will still require labor, agency leadership direction to reprioritize staff time from existing efforts, and substantial coordination across many entities.

Many of the actions identified by the workgroups are very similar and fall under four categories – Assessment, Inventorying, Data Collection and Storage; Building Code Revision; Outreach and Training; and Multi-Agency collaboration. Due to their similarities (i.e., schools, cities, and historic buildings, for example, will all benefit from a combined effort to inventory and create a database of vulnerabilities), there is significant potential for leveraging resources and effort across organizations to lower costs for these actions.

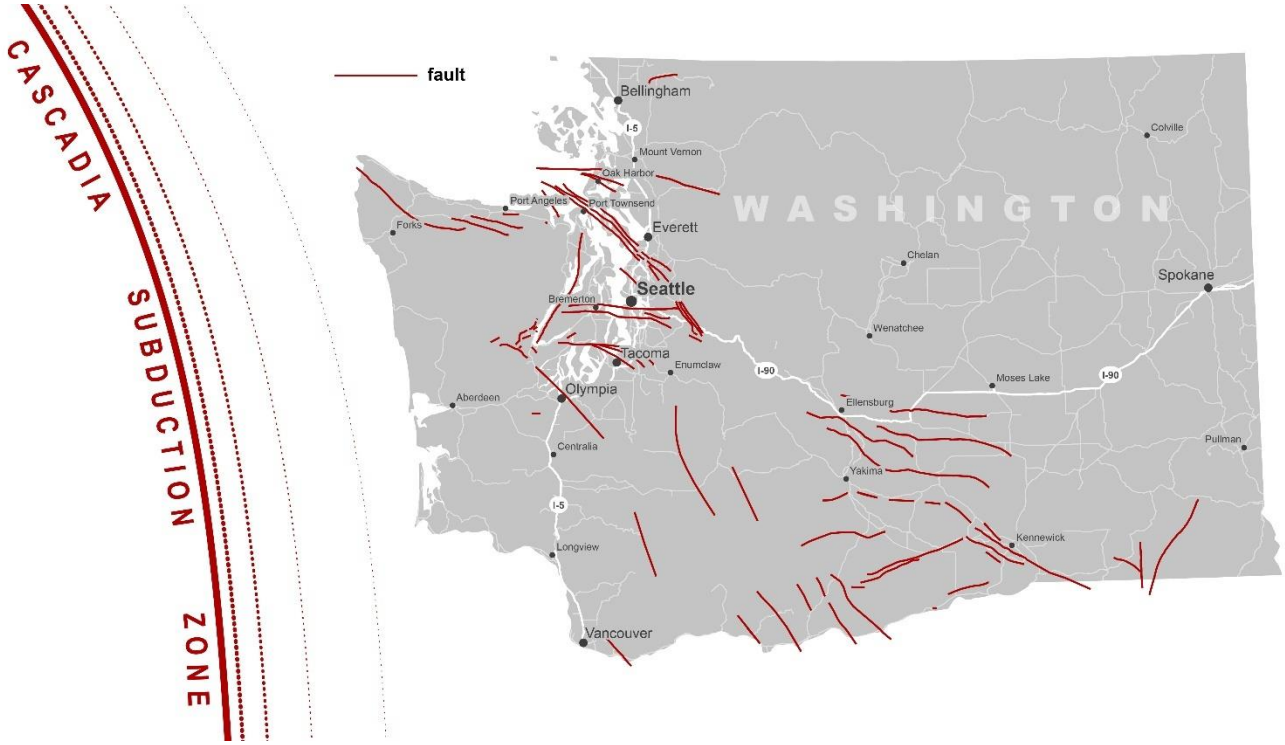
Several key actions will also require legislation and/or significant funding to accomplish, such as developing a state-level disaster recovery program; creating an earthquake insurance authority program; conducting seismic safety assessments on our school buildings; inventorying our earthquake-vulnerable

buildings; and supporting the building of tsunami vertical evacuation structures along the coast. While they do require capital investments, these actions are critical for making Washington resilient and offer some of the greatest opportunities to save lives and mitigate property damage – the highest priorities in any emergency.

Earthquake and tsunami resilience in Washington is a long-term goal. This document is meant to guide some of the first steps on that path, and outline future actions that need to be taken. To be successful in this long-term effort, Washington needs to establish a body, with corresponding authority and funding, to further the state's resilience goals by facilitating efforts across state agencies. This effort will require the continued support of the Governor, Resilient Washington Subcabinet, Legislature, and all entities involved in creating this report.

Introduction

Washington State has the second highest earthquake risk in the United States. The 700-mile Cascadia Subduction Zone (CSZ) represents an extreme threat to the Pacific Northwest, capable of generating a magnitude 9.0 or higher earthquake and tsunami. The most recent studies estimate 10,000 fatalities and direct economic losses of more than $80 billion combined for Washington and Oregon. In addition to the CSZ offshore, Washington's mainland is littered with active crustal faults which pose seismic hazards; the histories and risk from many of these faults are still being uncovered. Developing a state that is prepared for these impending natural disasters will significantly mitigate the damage they can cause to its people, property, economy and long-term survival.



In 2012, Washington State Emergency Management Council's Seismic Safety Committee – a subgroup composed of subject matter experts and policy makers in relevant fields to seismic hazard mitigation – published the Resilient Washington State Report, detailing 10 key recommendations for Washington State to mitigate, respond to, and recover from the effects of a devastating earthquake and tsunami. For the sake of the report, the Seismic Safety Committee adapted the following definition for resilience:

> *A resilient state is one that maintains services and livelihoods after an earthquake. In the event that services and livelihoods are disrupted, recovery occurs rapidly, with minimal social disruption, and results in a new and better condition.*

In June 2016, the *Cascadia Rising* exercise tested the state's capabilities of responding to a full rupture of the CSZ and resulting tsunami – the worst-case scenario geologic hazard event for Washington. Using the most up-to-date data on potential earthquake impacts and combining the efforts of local, state,

interstate, federal and international partners, the four days of exercise highlighted the significance of the degree of damage, challenges to response and life-safety issues. One direct result of the exercise was the realization that families in Washington should prepare themselves with two weeks of supplies, given it will take a long time for responders to reach isolated communities due to damaged infrastructure. The Cascadia Rising Exercise After-Action Report (AAR) highlighted the ability of many partners from a wide variety of backgrounds to work together in a situation with many unknowns; it also identified some critical weaknesses in the state's response and recovery capabilities.

On Nov. 4th, 2016, Gov. Jay Inslee issued Directive 16-19, establishing a Resilient Washington Subcabinet. Through this subcabinet, the Washington Military Department's Emergency Management Division was directed to assess Washington's strategy in creating a resilient state with regard to earthquakes and tsunamis. This was in consultation with the Washington Departments of Transportation, Commerce, Health, Enterprise Services, Social and Health Services, the Utilities and Transportation Commission, and other agencies, boards, commissions and councils as appropriate. This includes coordinating across multiple entities to identify gaps, developing and prioritizing actions, estimating implementation costs, and drafting this report, detailing initial findings and recommendations.

The Directive originally focused on recommendations 2, 3, 5, 6 and 7 in the Resilient Washington State Report, and 2 items (mass care and bulk fuels) that arose as lessons learned from the Cascadia Rising exercise. Recommendations 1 and 9 were added at the request of the governor, along with a third item from the Cascadia Rising after-action report (communications). Recommendation 8 was also added at the request of the Department of Natural Resources. Communications is intended to be a cross-cutting effort for state-wide resilience, however for this report it is included as its own section. For each of the 11 focus areas, a workgroup was formed and facilitated by project team members from the Washington Military Department's Emergency Management Division. The workgroups consisted of subject matter experts from state agencies, local jurisdictions, professional associations and other key stakeholders.

In addition, a general goal of the directive was to increase individual, family and business preparedness for an earthquake and/or tsunami in Washington. Washington's efforts to improve earthquake and tsunami resilience have been ongoing for years. The report that follows is a summary of the findings by the subcabinet and the implementation plans developed by the workgroups.

Methodology

For each focus area, a workgroup was formed and facilitated by project team members from the Washington Military Department's Emergency Management Division. The workgroups consisted of subject matter experts from state agencies, local jurisdictions, professional associations and other key stakeholders, and together they identified:

- Actions necessary for accomplishing the recommendations;
- Current actions being taken toward accomplishing the recommendations;
- Gaps and barriers hindering the accomplishment of identified actions;
- Anticipated costs and effort for completing necessary actions;
- Areas where additional collaboration is necessary and/or could help facilitate efforts;
- Which actions are highest priority (and categorized by short-term, medium-term and long-term); and
- Implementation plans for completing the prioritized actions.

Each workgroup met regularly between January and June of 2017. Their findings were reported out to the governor and subcabinet on January 17th and May 3rd of 2017. A third subcabinet meeting is scheduled for the end of September, 2017, to brief the governor and subcabinet on this report.

The workgroups were asked to rank each action in the following categories:

Priority: Prioritize the actions as high, medium or low, with regards to the goal of a resilient state.

Estimate Effort: This is the amount of effort/time/coordination/complexity/difficulty/FTE etc. that this action will take.

Estimate Cost: This is the cost to complete this action: low = $0 to $50,000, medium = $50,001 to $1,000,000, and high = greater than $1,000,000.

This report includes a summary of the findings from each workgroup, with a focus on the highest priority actions that can be achieved with the least amount of funding and effort. These include actions that scored an 8 or 9 (see below for more details on scoring), were legislative requests, were common among multiple workgroups and/or that specifically require large multi-agency efforts. Each workgroup summary section includes at least two implementation actions, even if they did not qualify as high prioritization (i.e., school seismic assessments and building tsunami vertical evacuation structures). For a full list of all actions identified by the workgroups, please see the appendices.

Prioritization for each action was based on the combined score of the following categories: priority, effort and cost. Example: for high prioritization, the action needs to be ranked in the highest scoring category in at least 2 of the categories for a score of 8 or 9, for medium prioritization the action needs to be ranked in medium in at least 2 categories for a score of 5, 6 or 7, etc.

	High	Medium	Low
Priority	3	2	1
Effort	1	2	3
Cost	1	2	3

Prioritization	
Highest	8-9 Points
Medium	5-7 Points
Lowest	3-4 Points

Assumptions

- Current and anticipated resources (appropriations and allotments) will be available.
- Resources will be able to be reassigned/reallocated from current projects in a way that will keep these projects within their time frames of short-, medium- and long-term.
- Expertise needed to carry out many actions described does not currently reside in position descriptions. Most of those individuals are tasked with other agency projects and other areas of focus.
- All costs provided are best estimates, some of which are indeterminate at this time. Calculating the actual costs (public and private) will require further analysis.
    - For instances where cost estimates were not provided, a range was estimated using the scales provided for the templates (i.e., an item with a “high” will cost “at least $1 million.”
- Estimated costs are considered total project costs (inclusive, one-time expenditures).
- Some of the short-term actions that scored higher in the report are setting the foundation for medium- and long-term actions.

Workgroup Sections

Each workgroup provides a summary containing the highest priority action items (see the appendices for a list of all identified actions). These include actions that scored an 8 or 9 (see the Methodology section for more details on scoring), were legislative requests, were common among multiple workgroups and/or that specifically require large multi-agency efforts. Each workgroup summary section includes at least two implementation actions, even if they did not qualify as high prioritization (i.e., school seismic assessments and building tsunami vertical evacuation structures). Some of these action items are steps toward longer-term items. In addition, many of the action items identified were the direct result of the interdisciplinary workgroup efforts to craft an implementation strategy in accordance with the governor's directive as opposed to a specific activity, action or current priority proposed by one or more state agencies.

RECOMMENDATION 1

Make schools resilient: structurally, socially, and educationally.

With the multitude of potential seismic sources around the state, a key element of resilience is making sure the buildings in which residents spend the most of their time are also resilient. For children, this location for most of the year is their schools. Many Washington school buildings are older and have not undergone a retrofit to ensure their structural integrity during and following an earthquake. Some Washington school buildings are even part of the National Register of Historic Places due to their age and cultural significance, and many more would make it onto this register if evaluated. These buildings have a cultural significance within our communities that must be considered in addition to the hazard they represent.

Understanding the scale of the seismic risk to school buildings is a critical first step, but the desired end-goal is to ensure that all schools in Washington are seismically safe. The educational function of schools also provides an ideal opportunity to provide the foundation for a culture of resilience; students can learn about Washington's seismic hazards and how to protect themselves from, and be prepared for disasters. They can then bring those lessons home to share with their families. This process helps initiate a cultural value shift toward preparedness, leading to a more resilient state.

Steps toward the goal of resilient schools require efforts by both hazard assessment professionals, engineers and policy makers. First, to understand the full magnitude of seismic risk, consistent building assessments need to be conducted for all schools in Washington. Once the scale of the risk is known, legislative efforts are critical to push funding of school building retrofits and replacements, and the development of a culture of resilience in Washington's schools. Recent legislation has declared that four

mandatory types of safety drills must be performed in Washington schools per year, with earthquake "Drop, Cover, and Hold On" life safety drills as one optional choice. With the high seismic risk in places where students and their families live, work, and vacation, amending the legislation to mandate this option would be ideal for life safety. Additional legislation must be enacted requiring schools to create and/or participate in the development of hazard mitigation plans (HMPs), and to develop continuity of operations plans (COOPs). Schools are an integral, historical, and cultural part of many communities, and functioning schools are critical to recovery following an earthquake.

Lead Entities

Washington State Department of Natural Resources (DNR)
Office of the Superintendent of Public Instruction (OSPI)
Military Department, Emergency Management Division (WA EMD)

Current Actions

- Washington DNR, structural engineers, WA EMD, and FEMA have performed school seismic safety assessment pilot studies at several school districts throughout the state.
- A Pre-disaster Mitigation (PDM) program has been developed within OSPI Information and Condition of Schools (ICOS) inventory system. The system uses statewide GIS hazard data (not site specific) to identify the overarching hazards for each school facility, with additional building information, and uses tables to display the levels of hazard and risk for each campus or building. The system includes not only information regarding earthquakes, but also the following natural hazards: volcano, landslide, flood, tsunami, and wildland urban interface fires.
    - Twenty-five school district Hazard Mitigation Plans (HMPs) have been completed or nearly completed, drawing on the campus-level and building-level building data collected in OSPI's ICOS database.
- Development of an Earthquake Performance Assessment Tool (EPAT) that can provide quantitative estimates of the level of damage expected for any public K-12 school building in Washington for a range of earthquake ground motions. This tool is simpler to use than HAZUS and includes consideration of the time-history of building codes in our state and refined fragility estimates for schools built at different times. To be fully functional, further study of site specific hazards needs to be done.
- Substitute House Bill 1279 – signed May 4th, 2017, which requires schools to conduct four types of drills per year, with earthquake "drop, cover and hold on" as an option.
    - The legislation requires monthly drills (nine or 10 per year), which includes summer months if summer sessions are offered at the school. Schools decide which ones they need to do more of.

- Schools must include three basic functional exercise drills annually, including lockdown, shelter-in-place and evacuation. Pedestrian evacuation is required for districts/schools in tsunami inundation zones and mapping must be included in at least one drill.

- House Bill 1003 (2016) calls for a model policy for natural disaster school infrastructure recovery. Although that model policy includes/refers to adoption of a required COOP, there is no requirement for districts to adopt the policy and develop the COOP.

Gaps and Barriers

- Support for the following necessary elements:
  - OSPI staff
  - Technical consultants for HMPs
  - Geologists/engineers/architects to enter the hazard and risk data into ICOS
  - Initial site-specific hazard investigations by geologists and engineers
  - Staffing for follow-up once initial investigations have been conducted
  - Staffing to assist schools with developing HMPs
- Current school assessment efforts do not include work with Washington's Department Archaeology and Historic Preservation (DAHP), and these must be considered.
- Training and implementation of databases, HMPs, COOPs

Implementation Plan

Short-Term (1-5 years)

Action Description: Complete consistent, cost-effective, comprehensive inventories and assessments of Washington school buildings to prioritize seismic risk reduction efforts. DNR estimates that this effort will cost at least $15 million. Additional time and effort will be needed to compile the data into the ICOS system as part of the district HMPs, which will cost at least $10,000 for each of the 270 school districts in Washington – at least another $2.7 million.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)	1		

SCORE: 5 – Medium

Action Description: Update language in RCW 28A.320.125 (6)(d) that requires school safety drills from "may" to "must" incorporate an earthquake drill annually, using the state-approved earthquake safety technique "drop, cover, and hold on." Previous legislation in 2016 allows a school district to voluntarily include this type of drill but falls short of requiring earthquake safety drills. This drill requirement may be satisfied by participating in the annual Great Washington ShakeOut Drill.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)			3
Cost (estimated)			3

SCORE: 9 – High

Action Description: Enact legislation that requires all school districts to develop HMPs either on their own, or by participating in a city or county mitigation planning process. Drafting this legislation initially and completing the 25 Pilot school HMPs will be low-cost, as a funding source is currently identified for that project. However, the cost for implementing HMPs for all schools would be significantly higher.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)			3
Cost (estimated)			3

SCORE: 9 – High

Action Description: Enact legislation that requires all school districts to develop and maintain comprehensive COOPs, including provisions for mutual aid (e.g., facility-sharing) between districts.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)		2	

SCORE: 7 – Med

RECOMMENDATION 2

Require that utility providers (domestic water supply, wastewater, electricity, natural gas, petroleum, and information and communication technology) identify the vulnerabilities in their systems and mitigate the deficiencies.

Recognizing that energy, water, communication, and transportation make up the "lifeline sectors" upon which all other critical infrastructure sectors rely, the survivability of publicly and privately-operated utilities is a crucial component of Washington's resilience. Utility restoration provides essential support to response operations and is a precondition for community recovery. A significant takeaway from the 2016 Cascadia Rising exercise was the extent to which utility infrastructure would be impacted by a catastrophic earthquake. Damage to these components would not only significantly hinder response efforts, but also put individuals, families, and businesses at risk following a disaster, due to a variety of hazardous conditions. The interdependence of critical pieces of infrastructure and facilities means that damage to any portion of the systems directly effects the whole.

The community of public and private entities that make up the energy, water, and telecommunications sectors is working to address vulnerability and mitigate deficiencies. In some cases, this is done by investor-owned utilities (IOUs) who have an interest in continuity of operations and are subject to regulatory requirements to provide safe and reliable service. In other cases, this infrastructure is operated by publicly-owned utilities (POUs) that place a high value on reliability and recovery, and provide these services to their own communities. Addressing the threat posed by catastrophic earthquakes remains challenging, and continued coordination spanning public and private sector owner/operators and all levels of government is needed to ensure a comprehensive and integrated approach.

Lead Entities

Washington Utilities and Transportation Commission (UTC)
Washington Department of Commerce, State Energy Office (COM)
Northwest Power and Conservation Council (NWPCC)
Washington Department of Health (DOH), Office of Drinking Water

Current Actions

- COM is engaged in funding and leveraging outside investment to modernize the electrical grid with resilience in the forefront of project development through Clean Energy Funds (CEF) 1 and 2. Projects have included development of integrated control systems that maximize the efficiency and situational awareness within the grid; energy storage; micro and campus grids; and islands of refuge.

- The Infrastructure Resilience Sub-Committee (IRSC) of the state's Emergency Management Council (EMC) is an active community that facilitates improved coordination, planning, and response among public and private sector lifeline operators.
- DOH's Office of Drinking Water (ODW) has substantial regulatory oversight of reliability and emergency operations. DOH is planning to update its 2010 Water Sector Specific Plan which provides a foundation for response to catastrophic events.
- The Water Supply Forum (www.watersupplyforum.org) is currently undertaking a regional project envisioned to help the water utilities of King, Pierce, and Snohomish counties take proactive steps to evaluate and enhance water supply system resilience. This group published a document titled Earthquake Vulnerability Assessment Technical Memorandum in April of 2016 that directly addresses earthquake resilience issues for the three-county workgroup.
- The State Building Codes Council (SBCC) examined requiring earthquake-activated shutoff valves on the customer side of natural gas meters approximately 10 years ago. The SBCC did not adopt the requirement. Since 2009, the US Pipeline and Hazardous Material Safety Administration has required excess-flow valves for new or replaced service lines. The latest rules also require curb valves for the same construction.
- The Washington Emergency Communication Coordination Work Group (WECCWG), a group focused on emergency communication planning and telecommunication infrastructure resilience, has met four times in 2017. In July 2017, the group laid the groundwork for comprehensive emergency communications response planning that will directly address the threats posed by a catastrophic earthquake. WECCWG URL: https://mil.wa.gov/emergency-management-division/washington-emergency-communications-coordination-working-group.
- Leveraging the expertise of the IRSC, the WA EMD's Infrastructure Program is working with the Washington State Fusion Center to establish a survey-to-database tool. This tool will allow emergency planners to prioritize utility restoration based on identified dependencies and interdependencies of critical infrastructure facilities. This tool would leverage federal infrastructure data present in the Infrastructure Protection (IP) Gateway to identify infrastructure locations to be analyzed with the tool.
- The Bonneville Power Administration (BPA) engaged the Electric Power Research Institute in 2014 to develop a spare transformer strategy. This project explored the development of substation spare equipment to expedite the restoration of the power grid following a major disruption. BPA has made strides in addressing the resilience of their transmission and substation infrastructure as documented in the BPA Transmission Management Strategy and the BPA AC Substation Asset Management Strategy.

Gaps and Barriers

- There are significant regulatory differences for utilities based on multiple factors:

- The UTC has authority over the three IOUs that provide electricity in the state. These IOUs provide service to approximately half the state. No state agency is charged with regulating the rates and services of Public Utility Districts (PUDs), municipal utilities and cooperatives.
- DOH has significant authority over the operations of all public water systems, while the UTC has rate setting authority of the private, investor-owned public water systems.
- The Department of Ecology (ECY) has regulatory authority over the environmental aspects of most publicly owned wastewater infrastructure.
- The Federal government has preemptive authority over interstate natural gas and petroleum lines. The state has no authority over interstate pipelines, i.e. cannot regulate pipelines to make mitigation investments.
- ECY and UTC have regulatory authority over intrastate hazardous liquid pipelines.
- The UTC regulates wireline telephone service; the Federal Communications Commission (FCC) regulates cellular and Voice Over Internet Protocol (VOIP).

- Data necessary to make informed planning and investment decisions toward resilience is incomplete at the state level. For instance, the UTC's pipeline GIS data contains only lines operating above 250 PSIG. This excludes nearly all distribution facilities.
- Restoration prioritization must be based upon the actual damages that occur, infrastructure and system interdependencies, and operational requirements. For example, in order to restore electricity to a specific location, repairs to the supporting grid must occur in a specific, sequential order.
- Tools to determine economic losses due to an earthquake exist, but are limited in scope. Results of these tools are also highly sensitive to their starting assumptions and user inputs.
- Challenges to public-private coordination:
  - The private sector may not wish to jeopardize confidential network information by sharing locations of infrastructure or other operational information with public agencies.
  - There are legal and statutory barriers to distributing state and federal funding and resources to the Investor Owned Utilities (IOUs) to facilitate restoration.

Implementation Plan

Estimated cost of the following action items is at least $2 million.

Short Term (1-5 years)

Action Description: Prepopulate a public information campaign (i.e., flyers showing options for making water safe to drink and how to dispose of human waste appropriately). Some of this information is already in existence but will need to be tailored for a catastrophic event and the technical and

organizational environments of utility providers. It will need to go beyond current personal preparedness public information campaigns. It must also be consistent and replicable by infrastructure owner/operators across the state.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Action Description: Multi-agency legal mapping of "lifeline sector" agencies (energy, transportation, communication, and water/wastewater) emergency powers vs. governor's emergency proclamation. Analysis of statutory authority would need to occur in consultation with the Attorney General's office. Once a full understanding is established of legal authorities as related to state agencies who play a role in the lifeline sectors during emergencies, policy recommendations may be made to clarify any gaps in legal authorities that need to be instituted in a governor's proclamation.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)			3

SCORE: 7 – Medium

Action Description: Jurisdictional/regulatory gap assessment, requiring multi-agency assessment. Specifically, there are multiple entities that require emergency backup generators dependent upon the facility in question (i.e., backup generation for hospitals is required by the Department of Health, backup generation for other critical facilities may be required for other critical facilities based upon county, state or federal requirements). This action will require the multi-agency coordination of one FTE, one executive from each state agency listed (Governor's Office, UTC, Commerce, DOH, WMD, OCIO, DES, SDOT) and an AAG; Federal assessment by DHS, BPA, WECC/NERC, FEMA, FHMSA, and FRA must also be completed.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)		2	

SCORE: 6 – Medium

Action Description: Detailed attention needs to be given to the Infrastructure Systems Target Capability Assessment in the State Preparedness Report (SPR). The current SPR lists response as a target capability, but this section is in need of an update based on new knowledge of the effects of a 9.0 CSZ event. Additionally, a new Target Capability Assessment is needed for recovery. This should include development of a strategy for coordinating "lifeline sector" (energy, transportation, communication, water/wastewater) recovery planning to maximize effectiveness.

Multi-agency coordination is necessary by one FTE, one executive from each state agency listed (Governor's Office, UTC, COM, DOH, WMD, OCIO, DES for fuel contracting, WSDOT) and an AAG; Coordination with federal agencies (DHS, BPA, WECC/NERC, FEMA, FHMSA, FRA) is also required.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)		2	

SCORE: 6 - Medium

RECOMMENDATION 3

Improve the resilience of buildings in areas of high seismic hazard to improve life safety and increase the number of people who will be able to shelter in place.

The 2001 Nisqually Earthquake provided a reminder that many buildings in Washington were constructed before the state's seismic hazards were well known or even discovered. Facades and parapets on many old buildings crumbled and fell into the streets. While fortunately, no one was killed, the earthquake caused injuries and significant property damage. Many of these structures are in need of seismic retrofitting to prevent injury or loss of life, in addition to remaining intact following an earthquake. Improving the seismic safety of buildings is critical to community, regional, and statewide resilience by saving lives and preventing injury, during both the main earthquake and aftershocks. Additionally, businesses located within seismically-safe structures will be able to resume operations much faster following a disaster, which is essential to rapid community and economic recovery.

Improving the resilience of buildings requires a multi-faceted approach. One of the fundamental challenges associated with improving the resilience of buildings is knowing where to prioritize current scarce resources and any potential future investments without a full understanding of the scope of the issue. Presently, existing building stocks that contain vulnerable or potentially-vulnerable structures located within local jurisdictions have not been assessed for seismic performance to know where retrofitting may be most beneficial, and to what degree. To accomplish this major task, there must be collaboration between research organizations, local businesses, legislators, historic preservation specialists, and building owners, as well as resources allocated to support such an endeavor.

In addition to looking at current building stock, this approach also examines opportunities to support development and implementation of updated building codes which improve seismic safety. During an earthquake response, buildings need to be assessed as quickly as possible so they can either be reoccupied or deemed unsafe, and repairs can begin where needed. Finally, homeowners, renters, and small-to-medium sized businesses must know and understand what their options are when it comes to earthquake insurance before and after an earthquake. This will assist them as they seek to recover both physically and financially in the earthquake and/or tsunami aftermath.

Lead Entities

Washington State Department of Commerce (COM)
Military Department, Emergency Management Division (WA EMD)
Office of the Superintendent of Public Instruction (OSPI)
Department of Archaeology and Historic Preservation (DAHP)
Office of the Insurance Commissioner (OIC)
Department of Natural Resources (DNR)

Federal Emergency Management Agency (FEMA)
American Society of Civil Engineers (ASCE)
Washington Association of Building Officials (WABO)
Structural Engineering Association of Washington (SEAW)
American Institute of Architects (AIA)
Washington State Building Code Council (WSBCC)
City of Seattle, Office of Emergency Management (OEM)

Current Actions

- WA EMD and the WABO addressed liability concerns regarding organizations that train volunteers for post-disaster damage assessments. SSB 5185 was signed by Gov. Inslee on April 17, 2017, which extended immunity from liability over damages by covered volunteer emergency workers to professional and trade organizations.
- OIC has identified that consumers may be unaware that their homeowner's or renter's insurance policy does not include coverage for earthquake losses. OIC is pursuing consumer education to increase the take-up rate for earthquake insurance. To help accomplish this, OIC has created a webpage which lists the top 40 companies authorized to sell earthquake insurance in Washington.
- COM has begun reviewing various databases for inventories of vulnerable structures, such as unreinforced masonry (URM) buildings.
- COM, WA EMD, and DSHS have collaborated with a wide variety of external stakeholders on the development of a draft housing Recovery Support Function (RSF) as part of the state's long-term recovery strategy. The housing RSF is the first to be developed and will serve as a template for future recovery planning efforts.
- The WAsafe Program, which is designed to support post-earthquake building assessments, was formalized. WAsafe is composed of members from WABO, AIA, SEAW and ASCE. WAsafe is currently enrolling and training qualified volunteers that can be rapidly dispatched to support local jurisdictions in performing post-disaster building safety assessments. The organizations that make up WAsafe are being integrated within Emergency Support Function (ESF) 3 – Public Works and Engineering.

Gaps and Barriers

- There is currently a lack of a Washington State-specific local planning framework/template for communities that describes how to incorporate resilience concepts, including tools demonstrating how a community can protect its cultural and historic resources in disaster preparedness, response and recovery.

- There is a not an existing inventory of earthquake-vulnerable structures, such as unreinforced masonry (URM), soft story, concrete tilt-up buildings, etc. that local jurisdictions can use to prioritize limited resources toward retrofitting, replacing, etc. Similarly, there is a lack of incentives and financing options available for public and private sector entities to retrofit buildings that are identified to be vulnerable.

- There are no models of local legislation within Washington that require mandatory or voluntary building retrofits, such as URM retrofitting ordinances common in many California cities. Additionally, a capital program that provides financial and technical assistance or incentives for seismic retrofitting of vulnerable buildings and structures, especially URMs, does not exist.
- Local government comprehensive plans are existing tools for incorporating community resilience concepts and/or locally identified mitigation strategies. Such plans and updates require resources and many smaller jurisdictions with a single planner or a contractual arrangement for planning services may have difficulties implementing such strategies without additional resources.
- Currently, when building permits are issued for repairs due to earthquake damage or geologic hazards, there are no requirements for attaching such records to a property deed. This makes it difficult for home/building owners to determine potential risks when purchasing property.
- There is a deficit of resources and/or coordinated effort within the public and private sectors to support workshops for building owners and real estate agents in order to explain the performance criteria in the building code (i.e., life safety vs immediate occupancy), as well as opportunities and options for retrofitting existing structures.

  The lack of a state-level disaster recovery fund and programs like those available in a federally declared disaster, which are designed to rapidly support a local jurisdiction's rehousing and recovery needs, remains an impediment to long-term recovery efforts. Especially in small-to-moderate disasters in which federal individual assistance programs are not available.

Implementation Plan

Estimated cost of the following action items is at least $2.7 million.

Short Term: (1-5 years)

Action Description: Define how resiliency relates to the Growth Management Act (GMA) and add a Community Resiliency Guidebook into the Growth Management Services Unit's annual work program. Additionally, identify new resources for a DAHP toolkit on cultural and historic resources that will be included as a component of the new guidebook. COM is currently in the process of aligning the agency's programs around new strategic priorities, including seeking ways to improve community resilience. As a component of this work, COM and DAHP will work with stakeholders to produce a guide that could best be implemented through local comprehensive plans, development regulations, and emergency plans.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)			3
Cost (estimated)			3

SCORE: 9 – High

Action Description: A volunteer training curriculum needs to be developed for the WAsafe program. A proposed training curriculum will be based on the California Office of Emergency Services Safety Assessment Program, but customized for use in Washington State by WAsafe volunteers. In addition, this training program will need to be verified and recognized by WA EMD and FEMA.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)			3
Cost (estimated)			3

SCORE: 9 – High

Action Description: Develop and formalize a vetting process for volunteer enrollment through the WAsafe program.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)			3
Cost (estimated)			3

SCORE: 9 – High

Action Description: Formally integrate the WAsafe program within the ESF-3 structure, which will allow program members to be part of operational response to a disaster. The effort necessary to achieve this action will require modification of internal WA EMD processes and practices as they relate to ESFs, the development of MOUs and moderate FTE resources, which will require some reprioritization within WA EMD and DES. Development of deployment procedures as well as an ongoing state/local training and outreach effort will also be required to fully implement and maintain this capability.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Action Description: As COM implements the Evergreen Sustainable Development Standard (ESDS) v3.0, additional training is necessary for COM staff involved in emergency plan review to ensure emergency plans that are submitted as part of the standard are realistic and functional. This will ensure that low-income housing projects subject to ESDS v3.0 have emergency plans relevant to their seismic hazards. This will require the development and delivery of a training curriculum to COM staff that review and approve emergency plans.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Action Description: Improve earthquake (EQ) insurance take-up rates by increasing the number of affordable options and through regular, on-going public education efforts targeted to raise consumer awareness of gaps in coverage between standard homeowner's insurance policies and additional EQ insurance policies. Increase public-private sector collaboration on EQ insurance outreach efforts through education campaigns, seminars and workshops, and drills like the "Great Washington ShakeOut." Such efforts and their potential costs could be leveraged/shared with other organizations working as members of the same campaigns, such as the state of California.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Action Description: Develop technical standards for the retrofit of URM buildings, including a basic retrofitting technique known as "bolts-plus," which is designed to attach the buildings' walls to its floors, and an "aspirational" (above code minimum) standard. The City of Seattle has been actively pursuing the development of a "bolts-plus" program, which may be used as a guideline and adapted for

other local jurisdictions. Developing an aspirational standard that requires additional work and expense may be considerably more challenging. These standards will have additional considerations based on the Secretary of the Interior's Standards of Rehabilitation when applied to historical buildings. Coordination of these efforts will require a partial FTE, but some technical expertise is anticipated to be provided by volunteer civil and structural engineers, architects, historic preservation specialists, and other design professionals as part of the standards development process.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Action Description: Establish a working group of key stakeholders to examine the development of voluntary or mandatory seismic evaluations or reporting completed as part of real estate transactions. This would help ensure disclosure of a property's seismic condition between buyers and sellers. Suggested workgroup members would consist of representatives from the real estate, insurance, finance, historic preservation specialists, engineering and building management industries and other relevant parties that need to be engaged. Reprioritization of staff time or recruitment of additional staff may be required to support the workgroup.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Action Description: Engage and conduct training for stakeholders that have been identified as part of the housing Recovery Support Function (RSF) plan and other key participants that support disaster housing**.** Depending upon the authorizing direction, development of training and operational procedures will have moderate FTE impacts, as this would require broad multi-agency coordination and potentially extensive stakeholder engagement. Reprioritization of staff time from COM as well as staff from collaborating agencies (WA EMD, DSHS) would be required.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Medium Term (5-10 years)

Action Description: Develop mandatory requirements for mitigation of geologic hazards in Washington through the use of land use and zoning. California's Alquist-Priolo Act may be used as an example of such legislation that has been used in the past. This would include recognition of a property's seismic vulnerability (including to liquefaction, ground failure, or shaking amplification), or its location within a potential tsunami inundation zone during real estate transactions. In Washington, this could extend to other potential hazards such as landslides and wildfires. The California legislation also includes minimum engineering standards and education requirements about a building's performance-based standards. Such recommendations could include options that could be adopted at the state level through modification of the RCW, or model code language that could be adopted by local jurisdictions via ordinance.

This legislation will also require a detailed, consistent geologic hazard assessment across the state, as is suggested in Recommendation 8.

(Medium-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)			3
Cost (estimated)			3

SCORE: 9 – High

Action Description: Develop a proposal for establishing a long-term disaster recovery fund, which can be used to support transitional housing and infrastructure for disaster survivors that have been displaced and lack rehousing options when a federal Individual Assistance declaration has not been provided. The level of effort and the cost for developing a decision package to establish a disaster recovery fund, which can support housing and infrastructure recovery, is estimated to be low.

(Medium-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)			3
Cost (estimated)			3

SCORE: 9 – High

Action Description: Develop an outreach program for local jurisdictions, property owners, private engineers and architects to inform them of the availability of the Building Occupancy Resumption Program (BORP) and Advisory Placard programs, which allow building owners to rapidly reopen following an earthquake. Such an effort will focus on establishing agreements with building officials,

qualified private building assessors and private property owners. This project is anticipated to be led by volunteers from WABO and WAsafe.

(Medium-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)			3
Cost (estimated)			3

SCORE: 9 – High

Action Description: Arrange for WAsafe credentialing and badging of California Office of Emergency Services Safety Assessment Program-trained volunteers to ensure their integration into response actions.

(Medium-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Action Description: Introduce financial incentives for earthquake insurance to mitigate against property losses and develop options for improved affordability, such as insurer's premium/mitigation discounts and disaster savings accounts. To improve affordability, insurance products with broader deductible options, such as 5-10-15-20-25% of insured home value, may be examined. Additionally, the establishment of an earthquake insurance authority in Washington, which could provide more options for affordable products, could be examined. Support state and federal legislation that promotes insurance product innovation (balanced with consumer protection), resiliency, preparedness and mitigation.

(Medium-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Action Description: Pass legislation to authorize the Washington State Building Code Council to develop a mandatory building retrofit code, which includes funding for code development, enforcement and financing options for building retrofits. This action will require time and funding to develop the

code in collaboration with a coalition of stakeholders, legislators, agencies and the Governor's Office to develop and introduce legislation. This group will then work with key sponsors and legislative leadership to schedule hearings and workshops to present findings, including need, assessment of risk and examples of successful programs. An estimated four FTE would be required to complete this task, provide technical support, legal analysis, construction cost studies, and testimony at public hearings.

(Medium-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)	1		

SCORE: 5 – Medium

Long-Term (10+ years)

Action Description: Undertake a comprehensive assessment and inventory of earthquake-vulnerable buildings, including historic buildings across Washington and make the data publicly available. This will provide critical data on areas with high seismic risk and buildings in need of retrofit for planning purposes. While the inventory/database will only need to be completed once (then maintained as new information arises), this project will require a high level of effort over a long term to complete, with at least four FTEs already known: one full-time project/program manager, one data steward/database administrator, and two project support staff. Additionally, a revolving loan fund to support retrofitting of priority public, private, and non-profit structures could be established.

In addition, a significant contract and associated budget to retain qualified professionals (engineers, architects, plan reviewers, historic preservation specialists, etc.) for completion of building assessments will be required. Given the potential legal considerations, legal assistance services would be required by the Attorney General's Office and/or outside legal counsel.

(Long-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)	1		

SCORE: 5 – Medium

RECOMMENDATION 5

Strengthen business continuity planning efforts by providing education, tools, and training.

In the aftermath of an emergency or disaster, reviving the local and/or regional economy is essential for the recovery of impacted communities and improving community resilience. Without gainful employment, residents leave, and often never return. Further, a healthy, vibrant community cannot exist when unemployment, as well as homelessness, housing shortages, and poor water quality persist and are exacerbated by a disaster. Business continuity planning helps companies reduce their vulnerabilities prior to an emergency or disaster; aiming for a quicker recovery following the emergency or disaster.

Although not as high-profile or high-earning as big business, small businesses propel economic growth in the United States and across Washington. The Council of Economic Advisors found that small businesses were responsible for creating more than 60% of new jobs in the United States over the past 15 years. However, while owners of small businesses invest a tremendous amount of their time, money, and resources into making their ventures successful, many owners fail to properly plan and prepare for disasters. A study by the Institute for Business and Home Safety estimated 25% of businesses do not reopen following a major disaster. Conversely, most large companies have the resources to conduct detailed business continuity planning, and some have even incorporated such measures into their routine business practices.

Lead Entities

Department of Commerce (COM), Community Outreach Program
Washington Military Department, Emergency Management Division, Private Sector Program (WA EMD)
Department Archelogy Historic Preservations (DAHP)
WA Main Street Program
Cascadia Region Earthquake Workgroup (CREW)

Current Actions

- COM started an agency-wide strategic planning effort that includes a focus on community resilience. Recognizing that economic and business resilience is a crucial part of community resilience, the agency is leveraging its community relationships to coordinate workshops across the state, which includes participation from technical experts:

- The Community Outreach Program is collaborating with WA EMD and other partners to pilot a Business Resiliency Workshop, bringing together members of local Chambers of Commerce, insurance industry representatives, local business owners, Washington Fire Action Council (WAFAC), and elected officials from around Eastern Washington.
- COM has met with rural communities (Okanagan, South Bend, Raymond, Long Beach, Sunnyside, Grandview, and the Shoalwater Bay Tribe) to discuss business and critical infrastructure resiliency efforts.
- COM conducted Home Improvement Zone (HIZ) training with seven counties. Training covered land management strategies for defensible space in wildfire affected communities.

- CREW worked with WA EMD to build a Disaster-Resistant Business Toolkit (www.DRBToolkit.org) in 2010. This toolkit is free to download for any Washington-based business. The Disaster Resistant Business Toolkit Workgroup (DRBTW) is currently supporting conversion of the DRBT from a desktop application to a web-based application. This provides for easier access to the tool on a variety of platforms, thereby promoting more widespread usage.
- WA EMD's Private Sector Program provides continuity planning resources and education for small to medium-sized businesses and performs outreach, coordination, and information sharing with large businesses.
    - The Private Sector Program's website provides the foundation for all outreach, education, and training related to business preparedness and response. The site includes links to online resources, steps to address business preparedness and recovery planning, links to partners, online training, news, and opportunities.
    - The Private Sector Program works with the Small Business Administration (SBA), Association of Washington Businesses (AWB), Washington Chamber of Commerce Executives (WCCE), CREW, and local Economic Development Councils (EDCs) to gain access to business audiences.
    - A Business Re-Entry (BRE) registration system is currently under development. The BRE system and pass supports accelerated re-entry for businesses to reach their customers and/or access their critical infrastructure immediately following a disaster.

Gaps and Barriers

- Many businesses remain unaware of both the hazards (or the full extent of said hazard) in their communities, as well as the variety of free continuity planning tools available to them.
- Even if aware of the available free tools, small-to-medium-sized businesses have limited capacity and resources to undertake business continuity planning efforts without significant technical assistance.

- There is no single regulator for large businesses that operate infrastructure critical to Washington's communities and economy; nor is there a clear standard for verifying or regulating the continuity plans of these businesses.
- A more extensive Limited English Proficiency (LEP) program is needed to connect with the diverse body of Washington businesses and the communities they serve.
    - COM and WA EMD continue to partner on this issue. However, the scale of the outreach and the scope of the material covered is limited by resource allocation and staffing.

Implementation Plan

Estimated cost of the following action items is around $100,000.

Short-Term (1-5 years)

Action Description: Establish a stakeholder business continuity workgroup of relevant entities, to include Washington emergency management agencies, Economic Development Councils, Washington Association of Business, Chambers of Commerce, and Councils of Governments.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)			3
Cost (estimated)			3

SCORE: 9 – High

Action Description: Upon establishment of a business continuity workgroup, complete an assessment of programs to determine how to best leverage existing training and outreach opportunities that may be available for small-to-medium sized businesses within Washington.

(Short-Term)	**High**	**Medium**	**Low**
Priority		2	
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 7 – Medium

RECOMMENDATION 6

Strengthen regional transportation networks.

For nearly 30 years, incremental steps have been taken to increase overall resilience and prevent structure collapse along Washington's most densely populated transportation corridor. This "Seismic Lifeline Route" includes the Interstate 5 (I-5) corridor from Paine Field (Everett) in the North, to Joint Base Lewis–McChord (Lakewood) in the South. This Central Puget Sound section of the Seismic Lifeline Route is planned to be completed within the next 10 years, but there is much more to be done. Statewide, an additional 592 bridges are identified as requiring seismic retrofitting. Furthermore, there are three potential Cascadia Subduction Zone (CSZ) hazard areas that are currently not addressed in transportation projects and require further research: liquefaction, slides/unstable slopes and tsunamis.

Lead Entities

Washington State Department of Transportation (WSDOT)

Current Actions

- WSDOT's Continuity of Operations Plan and Emergency Operations Plan both address seismic response and recovery. WSDOT has regional support to devolve during a seismic incident, with 10 available Emergency Operations Centers (EOCs) located statewide.
- Seismic Lifeline Route/Seismic Retrofit Program: Current lifeline corridor primarily uses I-5, I-405 and State Route (SR) 520. The priority travel for this route is from JBLM to Everett, with the focus being ground transportation routes between the following air fields: McChord Field, Paine Field, SeaTac and Grant County International Airport (Moses Lake).
- WSDOT has coordinated efforts with the following programs, agencies and jurisdictions:
    - Emergency Management Division – planning efforts:
        - Development of a Catastrophic Incident Plan
        - Statewide Catastrophic Incident Planning Team
        - Infrastructure Resilience Sub-Committee
    - Seismic Safety Committee – WSDOT is a participant of the multi-jurisdictional committee under the guidance of the Emergency Management Council.
    - The Region Resilience Assessment Program (RRAP) which includes Dept. of Homeland Security Region X Infrastructure Protection, WA EMD, FEMA Region X, US Coast

Guard District 13 and USDOT Region X, is assessing transportation infrastructure/route impacts from a CSZ.

- Local emergency planners – coordinating with King County, City of Seattle, Snohomish County, and Pierce County on seismic retrofit and identification of local lifeline corridors.

Gaps and Barriers

- Research for specific impacts from a CSZ event is limited and not incorporated into the seismic retrofit plan (1,000-year event – current standard) for bridges; to initiate this research, the first steps would be to develop a research plan and commit resources.
- WSDOT established the basic Puget Sound corridor lifeline while acknowledging that additional work to establish branch lifeline corridors off the main corridor is necessary. Statewide, an additional 592 bridges needing some seismic retrofitting have been identified. These bridges are outside of the current Seismic Lifeline Route.
- Planning and coordination is necessary to expand lifeline routes to additional corridors to address the massive impact of a CSZ event; additional coordination needed with local jurisdictions to gain understanding and agreement on how local roads could be impacted by an event and/or utilized for a comprehensive lifeline route.
- Recognize other jurisdictions' roadways will likely be utilized for response in a seismic event. Identification of specific roadways is difficult given the unknown nature (location, magnitude, duration) of an earthquake.
- Current construction and retrofitting is designed to prevent structure collapse; despite not collapsing, bridges may be too damaged for traffic for several weeks to months depending on the level of damage. When a significant seismic event occurs, assume that these structures will require emergency repairs to be used.
- Retrofit work and estimates do not include subsurface work to mitigate liquefaction, this work is accomplished on new construction. Liquefaction will affect roadway and bridge stability in identified zones.
- Research has not been completed to anticipate and identify the seismic vulnerability of unstable slopes. Although WSDOT does respond to and mitigate landslides that impact transportation routes on a routine basis as part of general operations, it is anticipated that the current amount of resources available to respond to slide hazards would be overwhelmed from a CSZ incident.
- Need to expand on identification of tsunami impacts to transportation facilities.

Implementation Plan

Estimated cost of the following action items is approximately $2 million.

Short-Term (1-5 years)

Action Description: Conduct research to thoroughly analyze the effects of a CSZ event on WSDOT structures (bridges, tunnels, etc.). A future challenge to seismic resilience is identifying the consequences of a CSZ earthquake. American Association of State Highway and Transportation Officials (AASHTO) standards currently address 1,000-year and 2,500-year seismic events, and it is still unknown if retrofitting to these standards would be enough to withstand the impacts of a full rupture of the CSZ. Research on the consequences of a CSZ event is required before the design and construction of structures. This can occur simultaneously, or after, the completion of the current Seismic Lifeline retrofit.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)		2	

SCORE: 7 – Medium

Long-Term (10+ years)

Action Description: Expansion of the Seismic Lifeline into a comprehensive North-to-South route from the Oregon State line to the Canadian border, and East to West from the coast to beyond the Cascades. Costs of this item are not currently able to be calculated, but are assumed to be extremely high, over a period of many years.

(Long-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)	1		

SCORE: 5 – Medium

RECOMMENDATION 7

Make hospitals resilient – structurally and functionally.

Hospitals are critical facilities for saving and sustaining lives. Due to high demand, and in keeping with good business practice, hospitals are typically at full capacity with patients at any given time of any given day. Making hospitals more resilient helps save patient lives by maintaining continuity of care in their hospital, instead of "decompressing" the degraded hospital wherein patients are moved (a highly stressful activity for both patients and personnel) to another, non-degraded healthcare facility (NOTE: patient movement is heavily dependent upon available vehicles and usable routes). Important planning factors to consider for hospital resilience are the ability to quickly assess the structure following a catastrophic earthquake and maintain critical supply chains required to keep a hospital in operation as a healthcare facility. Finally, making hospital facilities resilient means that they could potentially remain functional following a catastrophic earthquake thereby assisting in the response by being able to admit new patients and saving more lives.

Lead Entities

Department of Health (DOH)

Current Actions

- Washington adopts the latest version of the International Building Code (currently updated every three years) in Title 51 WAC. The DOH Construction Review Program in conjunction with local building departments enforces Title 51 WAC during the review of new construction healthcare facilities. Additionally, these standards are occasionally incorporated into existing hospital facilities when they receive significant renovation, thereby bringing portions of older buildings up to compliance with current standards; however, the owners of such buildings are not technically required to retrofit older healthcare facilities.
- Within the Office of the Assistant Secretary for Preparedness and Response (ASPR) funding opportunity announcement for budget year 2017–2022, there is a requirement to assess supply chain inventory. This mandate is in-depth, and requires Hospital Preparedness Program awardees to conduct a supply chain integrity assessment to evaluate equipment and supply needs for resources that will be in-demand during emergencies and develop strategies to address potential shortfalls.

- DOH is participating in efforts to complete the Washington State Restoration Framework with the U.S. Department of Health and Human Services (HHS) Recovery Support Function (RSF) as an RSF lead. This helps us align with the HHS recovery approach.

Gaps and Barriers

- Retroactive application of Seismic Building Codes:
    - Hospital facility construction standards are approved when built. Existing facilities are not required to implement seismic retrofits.
    - Many critical access hospitals cannot absorb the expense of seismic retrofits.
    - Private hospitals require incentives to retroactively apply seismic standards.
    - Local jurisdictions maintain all the authority for seismic building code enforcement.
- Supply Chains:
    - The just-in-time business model supply distribution companies use for operations means that in a disaster, most healthcare facilities would run short of medical materials almost immediately.
    - Although most hospitals have an emergency requisition capability, it would be depleted quickly. Washington is therefore reliant on the capabilities of the Strategic National Stockpile.
- Volunteers to support medical needs:
    - There is a critical gap in available medical volunteers across the state due to the geographic location of Medical Reserve Corps (MRCs).
    - The current Emergency Worker program (RCW 38.52.310) is designed to be used by state and local emergency managers and not by other state agencies in accordance with WAC 118.04. It does not fit the needs of health care response.
    - Independent of RCW 38.52.310, DOH needs separate specific authority, and within health statutes, to develop an Emergency Health Worker program to recruit, register, train and deploy MRCs after coordination with local jurisdictions as needed across the state. The geographic disparity among MRCs and the ability of MRC volunteers to decline to serve creates a critical gap in health care delivery and response during a catastrophic event, as identified during the 2016 Cascadia Rising Exercise.

Implementation Plan

Estimated cost of the following action items is around $100,000.

Short-Term (1-5 years)

Action Description: Collect, compile and assess data for existing hospitals related to long-term functionality after an event and supply chains. Includes internal data and cross-agency data sources in multiple content forms (plans, maps, files, etc.).

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Medium-Term (5-10 years)

Action Description: Enact changes to the state building codes for addressing performance gaps. New construction standards are sufficient and regularly updated with current technical data. Existing structures will have a greater challenge in meeting the new building codes. A technical advisory team would review requirements to correct gaps, draft code change proposals and attend hearings at the national level, while relying on private input for code changes.

(Medium-Term)	**High**	**Medium**	**Low**
Priority		2	
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 7 – Medium

RECOMMENDATION 8

Identify and map in greater detail sources of seismicity and geologically hazardous areas and develop plans for mitigation of identified hazards.

Understanding and cataloging the geology of the state helps to show where hazard potential exists and communicate the information to policy makers, emergency planners and the public. Understanding the subsurface geology improves knowledge of the overall impacts of these hazards, such as degree of earthquake-induced shaking amplification from local soils or basin configurations. The synthesis of this information helps inform the collaboration among scientists, engineers, planners and policy-makers as they work together to mitigate hazards. For example, this information may be used toward creating stricter local building codes. The M9 Project, which is an investigation of the potential effects of a Magnitude 9 earthquake on the CSZ, is an example of one of these collaborations, bringing these stakeholders from various fields together to understand not only what the latest research is, but what it means.

Learning more about the full impacts of Washington's seismic hazards is a continuous process which will require understanding the current unknowns. Further paleoseismic studies are critical to understanding the recurrence intervals of earthquakes along surface faults, such as the Seattle and Southern Whidbey Island faults. Computer simulations of shaking from a variety of sources help to constrain details about how Washington's building stock will be affected by different subsurface effects, and different durations of shaking. Continuing to improve seismic and geodetic monitoring will increase not only the understanding of Washington's geologic hazards, but improve the capabilities for Earthquake Early Warning system, providing additional automatic mitigation actions by technical users.

Lead Entities

Washington State Department of Natural Resources (DNR)
Department of Commerce (COM)
University of Washington (UW)
Pacific Northwest Seismic Network (PNSN)
U.S. Geological Survey (USGS)

Current Actions

- Collecting seismic shear wave data at schools and coordinating with structural engineering data.
- USGS creates national seismic hazard maps that characterize hazard for rock sites.

- M9 Project using computer simulations to refine details of expected ground shaking for magnitude 9.0 Cascadia earthquakes.
- Mapping and fault investigation is ongoing.
- Seismometers are recording earthquakes and collecting important fault data.
- Lidar is being collected to help understand active faulting.
- Statewide liquefaction maps have been made.

Gaps and Barriers

- Need more comprehensive paleoseismic studies to identify and characterize active crustal faults and to better determine the recurrence times of Cascadia Subduction Zone (CSZ) Magnitude 8+ earthquakes.
- Need to conduct more studies on active faulting.
- Need improved knowledge of the shallow (< 2 km deep) structure of the crust, especially in sedimentary basins (i.e., Seattle, Tacoma, Everett, Bellingham) to improve computer simulations of shaking for future large earthquakes.
- Need more computer simulations of ground shaking to better predict effects and impacts of strong ground motion.
- Urban seismic hazard maps should be produced for other higher-risk areas of Washington using computer simulations and detailed mapping of soils and sub-surface structure.
- Need to monitor slip and seismicity in the offshore portion of the CSZ, using seafloor GPS and seismometers, to better understand strain accumulation and more quickly determine magnitude of earthquake.
- DNR has limited staff for any of the action items listed in needs and expectations.
- Support is necessary for seafloor seismic and geodetic monitoring to better understand the CSZ.
- Need an update of the Seattle seismic hazard maps for a wide range of shaking frequencies based on 3D simulations using improved crustal model and source specification.
- More staff needed to collect data and enter subsurface information into databases.
- Need better models of the shallow crust, including depth to bedrock in the Seattle basin and other basins, and the shear-wave velocity to a depth of about 2 km.
- Most DNR work has been done under small competitive grants from FEMA and USGS the last few years. Grants are not always available and DNR is not always successful in attaining the grant.

Implementation Plan

Estimated cost of the following action items is at least $2 million.

Medium Term: (5-10 years)

Action Description: Prioritize areas for detailed liquefaction and other seismic hazard mapping and accelerate these efforts. Reference the updated liquefaction hazard maps in building codes and establish a consistent means of communicating maps and related information to local jurisdictions for use as best-available-science under the Growth Management Act (DNR and COM). This will require two FTEs at DNR and/or COM to work on this full-time, ongoing.

(Medium-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)	1		

SCORE: 5 – Medium

Action Description: Develop and maintain an online subsurface database for the state combining data from geotechnical work, geophysical surveys, and deep-well studies to provide easily-accessible resource assessments, hazard maps, and raw data. This data will be available when necessary for research in modeling of site-response and economic/building stock impacts (i.e., HAZUS runs). This will require several FTEs at PNSN to help populate these databases as information arrives from the various studies.

(Medium-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)		2	

SCORE: 7 – Medium

RECOMMENDATION 9

Improve life safety in communities at risk of local tsunamis.

Communities along Washington's coast, the Strait of Juan De Fuca, Puget Sound and Hood Canal are all at risk from locally-sourced tsunamis, which will provide little warning before the first wave arrives. In some of these areas, it will not be possible to evacuate to high ground in time due to earthquake damage to evacuation routes and bridges, or due to lack of accessible high ground. Reducing loss of life depends on improving the ability of residents, workers, and visitors to reach sufficiently-high ground. In some areas, this means creating new high ground where it was previously unavailable. Improved modeling of tsunami inundation zones and pedestrian evacuation continues to show how critical alternative tsunami evacuation methods are to life-safety.

The Ocosta School tsunami vertical evacuation structure is the first of its kind in North America. The 2011 Project Safe Haven Study established that for life safety along the coast in the event of a tsunami, at least 50 more of the structures are needed, with locations varying by population density. Since the Ocosta school was built, many coastal areas are working on modifying planned or routine construction into vertical evacuation structures. Each project is a multi-year effort involving the collaboration of multiple agencies in a process that includes feasibility, design, site-selection, geotechnical analysis, community involvement, acquisition of funding, and site-specific aspects. Additional life safety improvements will be obtained through educating community members on the use of these structures and on identifying appropriate evacuation routes to safety in each community.

Lead Entities

Military Department, Emergency Management Division (WA EMD)
Washington State Department of Natural Resources (WA DNR)
University of Washington (UW)
National Oceanic and Atmospheric Administration's Pacific Marine Environmental Laboratory (NOAA PMEL)

Current Actions

- Project Safe Haven Round 3, workshops to identify potential sites for Tsunami Vertical Evacuation Structures will occur in 2018.
- One structure completed at Ocosta Elementary School.
- One structure in design phase at Long Beach.

- Other vertical evacuation structures currently in planning/development stage:
    - Quinault Casino
    - Port of Grays Harbor: replacing the port EOC
    - Fire station at Ocean Park
- Plans in place to relocate Taholah and Makah Reservation infrastructure out of tsunami hazard zone.
- Pedestrian evacuation modeling being conducted to show where improvements are necessary.
- Tsunami inundation mapping being conducted to understand where there are tsunami hazard areas.

Gaps and Barriers

- Additional staff needed to conduct modeling, mapping and planning.
- New design guidelines are forthcoming that change building codes, specifically for structures in tsunami zones that require additional modeling (ASCE 7-16 chapter 6).
- Site-specific hazard assessments of all remaining candidate sites must be conducted, including detailed modeling of potential forces on proposed structures.
- Modeling, mapping, and planning efforts are currently dependent on grant funding.

Implementation Plan

Estimated cost of the following action items, excluding construction, are at least $2 million.

Short-Term: (1-5 years)

Action Description: Support existing efforts to build and/or adapt local structures into tsunami vertical evacuation structures with a focus on schools. This will require two FTEs for tsunami inundation modeling at selected locations for the project provided by DNR, UW, and PMEL. These initial projects will demonstrate the most cost-effective approaches and identify funding options that may be instituted on a regional or local basis. Based on the Long Beach berm vertical evacuation and Ocosta School pilot projects we estimate around $3-5 million for each project, depending on leverage.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)	1		

SCORE: 5 – Medium

Long-Term: (10+ years)

Action Description: Continue to support planning, development, and construction of tsunami vertical evacuation structures by local and tribal jurisdictions. Adequate funding must be secured to construct 50 vertical evacuation structures on the outer coast for the safety of the Washington populace. This would require new detailed modeling at each site at an effort level of three FTEs for two biennia (per site), plus engineering teams for each of the 50 structures. This long-term project will also involve:

- Advocating for and prioritizing integrating Safe Haven structures into school funding;
- Altering local zoning to encourage structures in tsunami hazard zones to be designed as safe havens;
- Mandating new hotel construction to incorporate safe havens;
- Supporting development of improved methods for detailed, site-specific modeling assessments of the tsunami hazard; and
- Determining funding sources for supporting local development of Safe Havens.

(Long-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)	1		

SCORE: 5 – Medium

DIRECTIVE 1

Plan for the distribution of bulk fuel through the use of master contracts in order to support relief efforts, restore essential services and re-establish commerce.

Given the prevalence of the internal combustion engine in everyday life, fuel distribution was chosen to be the first of the additional directives to supplement the initial 2012 Resilient Washington Report. Without fuel to power the vehicles and equipment required for a 21st century emergency response, alternatives become walking, bicycling, or using work animals where available. These alternatives significantly increase response times which is deleterious to life-saving efforts. Further, many communications facilities used by first responders and emergency managers rely on fuel-consuming backup generators and, even where generators are on-site, the average fuel storage covers only the first 72-hours of continuous use. Additionally, certain fuels provide for the rapid preparation of large quantities of food, disinfecting water, and sterilizing equipment. Without planning and coordination, the exhaustion of remaining fuel supplies could temporarily set society back to the 18th century following a catastrophic earthquake and tsunami.

Having a bulk fuel master contract allows the use of substitute commercial fuel distribution sources following a catastrophic incident. Such advance planning adjusts for the anticipated loss of routine sources from the state of Texas, which are received at a terminal in Tacoma. The current efforts and authorities within the scope of this area is for the public (i.e., government and non-profits performing essential government services) sector only. Bulk fuels distributed through master contracts reach the end-user after a local government Emergency Operations Center formally requests (to include pre-scripted/before incident requests) those resources from the State Emergency Operations Center.

Lead Entities

Department of Enterprise Services, Contracting & Purchasing Office (DES)
Department of Commerce, State Energy Office (COM)
Military Department, Emergency Management Division, State Logistics Program (WA EMD)

Current Actions

- Currently, COM has an established plan for the distribution and prioritization of energy products (the Washington State Energy Assurance and Emergency Preparedness Plan). This plan defines energy shortages, service interruptions, and an energy emergency in detail. The legislation that grants authority to the governor to establish controls, standards, and priorities for the production, allocation, and consumption of energy (to include fuel) is found in Chapter RCW 43.21G RCW.

- The governor declares an energy emergency through executive order. This makes available extraordinary powers that can be used to respond to an emergency and convenes the Joint Committee on Energy Supply and Energy Conservation to review and comment on the governor's proposed response plans.
- Measures available to the state under an energy supply alert are also substantial, as are options available to energy companies. It is generally expected that even severe supply shortages can be successfully addressed without resorting to the extraordinary powers available under a declared energy emergency.
- Mandatory directives that are authorized under a declared energy emergency are controversial measures that have their own costs while restricting citizens' choices. In addition, emergency response policies in the past at both the federal and state level explicitly embraced more severe regulatory actions. Reliance on markets is the preferred policy, and regulatory actions like state-wide fuel allocation programs are discouraged and contemplated only as extraordinary measures for extraordinary conditions.
- Upon the declaration of a condition of energy supply alert or energy emergency, the governor shall present to the committee her or his proposed plan(s) for programs, controls, standards, and priorities for the production, allocation, and consumption of energy during any current or anticipated condition of energy emergency, and any proposed plans for the suspension or modification of existing rules pertaining to energy. The governor shall review any recommendations of the committee concerning such plans and matters.

Gaps and Barriers

- Washington State maintains master contracts to distribute fuel at the *distributor level*. This means that if a disruption in service occurs, or the transportation network is compromised, fuel delivery does not have to be made by any of the five contracted distributers. Essentially, with the current contracts, a post-CSZ environment will have no fuel distribution and contracts cannot be utilized to leverage distribution.
- Lack of response authority for the state to provide direct assistance to the private sector refineries in Washington responsible for providing fuel to the public sector under emergency contract.
- Lack of response authority for the state to provide fuel to the general public.

Implementation Plan

Estimated cost of the following action item is less than $50,000.

Short-Term (1-5 years)

Action Description: Complete the master bulk fuel contract. DES is developing a master contract with Washington State refineries to provide fuel to the entire state of Washington. The new contract will enable the distribution of fuel post CSZ, and will have emergency response language within the contract. A refinery can choose from multiple modes (air, rail, road, water, etc.) to transport fuel. There will remain a substantial reliance on ESF #1 (Transportation) to clear routes for the distribution of fuels, however the refinery will be contractually obligated to move fuels into the state or along the coast. The anticipated timeframe for the completion of the new bulk fuel contract is September 2017.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)			3
Cost (estimated)			3

SCORE: 9 – High

DIRECTIVE 2

Develop a Mass Care Operational Coordination Plan Annex to address collaboration among response agencies and organizations, to be housed under Emergency Support Function 6.

The second additional directive supplementing the initial 2012 Resilient Washington Report focuses on mass care. Mass care is providing congregate shelter, sustenance (i.e., food and water), emergency supplies and family reunification to displaced persons. Without a coordinated and managed mass care response, an emergency or disaster becomes a humanitarian crisis. Mass care is distinctly separate from health care for acute injury or illness. During a "typical" emergency or disaster, staff from non-profit nongovernmental organizations (NGOs) provide mass care services directly to individuals on behalf of local governments, whereas state government has a coordinating role only. However, the large-scale and widespread nature of a catastrophic earthquake and tsunami requires greater state involvement to provide mass care to a significantly higher volume of individuals (projected to be more than one million persons).

A challenge with mass care planning for a catastrophic earthquake and tsunami is that the majority of pre-identified emergency shelters are schools, community centers, and places of worship, many of which are unreinforced masonry structures. Therefore, assuming that most pre-identified emergency shelters are rendered inoperable from the incident, 'non-traditional' sheltering facilities (such as field-expedient shelters in suitable open spaces) become immediately necessary. Further, if not thoroughly coordinated and planned-for in advance, using non-traditional facilities will involve emergency contracting with their owners (the preferred method over exercising eminent domain) as well as emergency contracting with companies that operate and/or deliver field-expedient emergency sheltering services. Providing security and law enforcement capabilities for large emergency shelters is another important planning factor.

Lead Entities

Department of Social and Health Services (DSHS)
American Red Cross (ARC)
The Salvation Army

Current Actions

- Initiated formal quarterly meetings of key ESF-6 partners.

- Improved geospatial capabilities to enable rapid identification of the residential location of clients and mapping in relationship to specific threats and hazards.
- Identified potential for using Contract #00707 (Emergency Standby Services/ESS) for establishing field-expedient shelters. Need to clarify capability/expectation of vendors (i.e., base camp for responders vs. emergency shelter for the general public).
- Pursuing opportunities for using The Salvation Army reservists for disaster case management expertise.

Gaps and Barriers

- No single or combined state agencies have been mission-assigned or allocated resources to provide the full array of mass care services and capabilities. State government has never adequately resourced this function.
- The current ESF-6 state capability is insufficient to address a catastrophic incident.
- State level ESF-6 relies almost entirely on non-governmental organizations (American Red Cross, The Salvation Army, Northwest Harvest, etc.) to self-organize, deploy, and address the response needs.
- The state lacks experienced catastrophic incident planning expertise. Mercy Corps, the International Red Cross, or other international humanitarian aid organizations with experience in providing both mass care support in significantly-degraded environments, and Civil/Military coordination may provide a source of catastrophic planning expertise the state could engage to assist with current planning efforts.
- Following a CSZ event, a humanitarian crisis may manifest within days. However, sufficient levels of resources may not reach survivors in coastal areas for weeks. Any delay of support increases the risk of mortality.
- State employees and NGOs are not trained and equipped to support catastrophic mass care response in forward and unsecured areas. Planning efforts must be coordinated with security from the military or law enforcement so mass care actions will not be impeded.
- Limited training and exercise opportunities exist that focus on mass care, especially with the detail necessary to resolve complex policy issues and provide specific (vs. general) knowledge to staff.

Implementation Plan

Estimated cost of the following action items is around $1 million.

Short-Term (1-5 years)

Action Description: Develop comprehensive agreements (Memoranda of Understanding) with each non-governmental organization that would be involved in a catastrophic response.

(Short-Term)	**High**	**Medium**	**Low**
Priority		2	
Effort (estimated)			3
Cost (estimated)			3

SCORE: 8 – High

Action Description: Develop a comprehensive training and exercise plan to prepare state agency employees to staff ESF-6 in the SEOC following a catastrophic incident.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)		2	

SCORE: 7 – Medium

DIRECTIVE 3

Build resilient communication systems and develop the relevant procedures to ensure reliable communications with clear protocol following a catastrophic seismic event.

Society is becoming increasingly reliant on real-time communication in our day-to-day lives. This reliance intensifies in times of crisis. Communication infrastructure provides vital capabilities for response and recovery activities. This infrastructure is important at all levels of society from connecting emergency operations centers and government officials, to personal correspondence between members of the community. It is imperative that Washington invests in the necessary technology to reduce or eliminate the disruption to communications that is expected following a catastrophic earthquake. It is equally important that common understandings and procedures are in place to ensure government and private sector organizations effectively utilize emergency communications to enhance and expedite their response.

Within the State Emergency Operations Center (EOC), Emergency Support Function 2 (ESF-2) responsibilities include extensive collaboration and outreach with public sector, private industry and tribal nation partners to ensure protection, restoration and sustainment of cyber systems and information technology resources for statewide emergency communications. The Washington State Military Department's Information Technology (IT) Division oversees the staffing and administrative management of ESF-2 within the incident management and response structures during emergencies to ensure functionality and/or restoration and repair of statewide telecommunication assets and infrastructure.

Lead Entities

Washington State Military Department (MIL)
Office of the Chief Information Officer/Washington Technology Solutions (OCIO/WaTech)
Utilities and Transportation Commission (UTC)

Current Efforts

Coordinating Communications Plans

- **Washington Comprehensive Emergency Management Plan (CEMP) – ESF-2 Annex**

  The ESF-2 Annex of the state's CEMP provides guidance and procedures for emergency communications between the SEOC and federal partners, Washington's 39 counties, 29 tribes, and other relevant political sub-divisions. This annex was last updated in 2008 and is due for revision in the next calendar year.

- **The Washington Emergency Communications and Coordination Working Group (WECCWG)**

The WECCWG gathers tri-annually to review past emergencies and exercises, prepare for future communication needs and standardize efforts in emergency communications. The WECCWG works in conjunction with the Infrastructure Resilience Sub-Committee (IRSC) and FEMA Regional Emergency Communication and Coordination Working Group (RECCWG). WECCWG meetings focus on a variety of topics relating to the resilience of communication systems. Additionally, the IT Division specifically hosted a meeting with many WECCWG participants to lay the groundwork for enhancing statewide emergency communications architecture and procedures on July 21, 2017.

- **Infrastructure Resilience Sub-Committee (IRSC)**

  The IRSC is a sub-committee of the state's Emergency Management Council (EMC). It is an active community that facilitates improved coordination, planning, and response among public and private sector lifeline operators, to include communication infrastructure owners and operators. A leading theme at IRSC meetings in 2017 is public-private information exchange.

Systems, platforms, and/or applications for emergency communications

- **OMNIXX.** WSP emergency communication relay. It allows users to send and receive text-based messages over dedicated law enforcement networks. These messages can be of an administrative nature or contain data elements for insertion into local, state, and federal databases.
- **AlertSense.** Text based emergency alert system. Multi-modal alert delivery across all communication channels is the key to quickly and effectively reaching each person who needs to be warned. Recipients can be selected geographically by drawing an impact area on a map, and by the expressed notification interests of targeted opt-in subscribers.
- **Lahar Sirens**. Volcanic mudslide emergency broadcast system. The Mount Rainier Volcano Lahar Warning System is a loose-knit, emergency notification and warning system developed by the United States Geological Survey in 1998, and now operated by the Pierce County Department of Emergency Management and several cities. Its purpose is to assist in the evacuation of the Puyallup River Valley in the event of a volcanic eruption of Mount Rainier.
- **FEMA Radio**. Radio system provided by FEMA. FEMA National Radio System (FNARS) is a FEMA high-frequency (HF) radio network to provide a minimum essential emergency communications capability among federal, state, local, and territorial governments in times of national, natural, and civil emergencies. Federal call signs for state emergency operations centers and FEMA facilities nationwide.
- **FEMA satellite phone**. Emergency Satellite phone provided by FEMA and housed in the SEOC. This allows direct access to FEMA during emergencies when terrestrial lines are down or congested.
- **Emergency Alert System (EAS)**. Methods and systems for mass distribution of alert messaging to the public. EAS is the primary means for providing the public with critical alert information

about an emergency or disaster. Under EAS requirements, radio, TV and cable TV stations must participate at the National level or specifically request a waiver from the Federal Communications Commission (FCC). Further, they are encouraged to voluntarily participate in state and local EAS plans.

- **All Hazards Alert broadcast (AHAB)**. It is a pole-mounted voice/tone siren system with an intense blue light that is deployed along WA coastline. It is used to warn citizens of Washington of impending tsunami events along coastal areas.
- **WMD Mobile Emergency Communications Vehicle (MECV).** The MECV is a suite capable of providing satellite and radio connectivity for voice, video and data transmission in remote locations statewide. Satellite trailer can provide 3GB uplink and downlink via sprint services and provides an estimated 100 users with connectivity. It has some limited print and data visualization displays in the cabin. Requires a minimum of two personnel to deploy during an activation.
- **Forward-Looking Infrared (FLIR).** Gyro-stabilized color camera with zoom lens and infrared optics. Real-time air-to-ground audio/video/data microwave downlinks from multiple platforms like WSP aircraft, etc. Provides long-range, day and night, search and surveillance capabilities.
- **High-Frequency (HF).** The operations secure high-frequency network is a secondary emergency back-up communications capability for intra and inter-state use. Operating on eight discrete frequencies, point-to-point long-range communications between the state EOC and fixed or mobile HF stations can be established as needed. Currently, in addition to the state EOC, fixed HF stations are located at each WSP district communications center.
- **State Agency Emergency Network (STAEN).** This system is utilized to contact the directors of our various departments at the state level via 800 MHz radio system.
- **Radio Amateur Civil Emergency Services (RACES).** A special part of the amateur operation sponsored by FEMA. RACES was primarily created to provide emergency communications for civil defense preparedness agencies and is governed in FCC Rules and Regulations, Part 97, Subpart E, Section 97.407. Today, as in the past, RACES is utilized during a variety of emergency/disaster situations where normal governmental communications systems have sustained damage or when additional communications are required. Situations that RACES can be used include: natural disasters, technological disasters, terrorist incidents, civil disorder, and nuclear/chemical incidents or attack.
- **Comprehensive Emergency Management Network (CEMNET).** Emergency Management Division operates a statewide very high frequency (VHF) low-band radio system, as the primary backup communication link between the SEOC, local EOCs and Tribal EOC's throughout the state.
- **On-Scene Command and Coordination Radio (OSCCR).** OSCCR serves as the "Primary Command Channel" for incidents involving two or more responding agencies. The primary

frequency is 156.135 MHz is maintained by Washington State Department of Transportation and Military Department's Emergency Management Division.

- **National Alert Warning System (NAWAS).** This is an automated telephone system used to convey warnings to the US-based federal, state, and local governments. It is operated and fully funded by FEMA. System consists of 2,200 phones on a party line. The original mission of NAWAS was to warn of an imminent enemy attack or missile launch upon the United States. NAWAS still supports this mission but the emphasis is on natural and technological disasters.
- **State/Federal Networks.** The Washington Military Department (MIL) operates on the State Government Network, Army National Guard Network and Air National Guard Network. ESF2's primary mission in support for these networks is to maintain access to networks and coordinate resources. Efforts include local carrier and service provider coordination. Overseeing outage restorations and COOP efforts.
- **Government Emergency Telecommunications (GETS).** GETS allows a card holder to access the phone system by entering a coded sequence during emergencies when the landline systems are overburdened.
- **Wireless Priority Service (WPS).** WPS works the same as GETS, but only on cellular networks.
- **Telecommunication Service Priority (TSP).** TSP tags data and telephone circuits on carrier's systems as essential emergency service which gives them the highest priority during outages to be repaired. All WMD and National Guard circuits are TSP registered.
- **Land Mobile Radios (LMR**). LMRs are provided on a limited basis to key leaders within MIL as a method of communication via radio with emergency responders statewide via WSP. ESF-2 responders also carry LMRs for better availability.
- **Avaya phone system.** Local phone system to Camp Murray runs on the state network. This system is crucial for connecting many of the alert systems housed in the SEOC and is the primary voice system for the SEOC.
- **Cisco phone system.** Local phone system to Camp Murray and 39 separate sites around Washington run on the federal network. It is a backup system for the SEOC and has three jump kits that can be set up in field locations during emergencies. The primary location is Camp Murray and COOP is in Spokane.
- **Satellite phones.** SEOC has 12 satellite phones issued to department and state agency leadership. This is voice communication only. The governor, Adjutant General, and Emergency Management Division Director have Satellite phones for use during a catastrophic emergency. This phone system is tied to 66 designated satellites with guaranteed service by the provider even in the most remote areas, so long as a signal can be obtained.

- **WSP Microwave.** Microwave relay system hosted by Washington State Patrol. The SEOC has two microwave connections to the WSP radio network. One points to a location in Parkland, WA, and the other to Capitol peak near Olympia.

Gaps and Barriers

- ESF-2 goals have focused on connecting the State EOC to state agencies/federal/local/tribal partners. It has not focused on connecting to other critical infrastructure sectors or facilities (i.e., it has not done outreach to energy facilitates or healthcare facilities, as an example).
- Although OSCCR is supported by the state government, use of the system requires ownership of radio hardware. Many entities at the local & tribal levels cannot afford to purchase the hardware necessary to utilize the network.
- OSCCR does not have complete coverage over the entire state – there are still coverage gaps in certain areas that need to be addressed with additional transmitter or repeater sites.
- OSCCR has not been adopted for use by all entities that it is designed to serve. Not all entities believe their response efforts warrant the use of OSCCR or they are unaware of OSCCR so they utilize alternative communication methods that may be less reliable and do not interoperate with other communications.

Implementation Plan

Estimated cost of the following action items is around $1 million.

Short Term (1-5 years)

Action Description: Leveraging the WECCWG and the IRSC meetings, planners from MIL's IT Division and Emergency Management Division need to create an emergency communication framework to incorporate infrastructure owner/operators from both the public and private sectors. The framework should initially focus on other lifeline sectors (energy, transportation, water/wastewater) as well as school districts and other important community support facilities.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)		2	
Cost (estimated)			3

SCORE: 8 – High

Action Description: OSCCR needs specific system upgrades and enhancements to ensure it is reliable following a large seismic event. Augmenting the OSCCR system with a satellite-based backhaul system will ensure the system is reliable even if its terrestrial transmitters are damaged or destroyed due to a catastrophic earthquake. In addition, 16 radios need replacement and numerous WAVE consoles need replacement/upgrades.

(Short-Term)	**High**	**Medium**	**Low**
Priority	3		
Effort (estimated)	1		
Cost (estimated)		2	

SCORE: 6 – Medium

Conclusion

Significant work has already occurred to increase Washington's resilience to withstand earthquakes and tsunamis, yet numerous opportunities remain to further this effort. There are many high-priority actions that can be accomplished at very little cost, though they will require labor, reprioritizing of staff time, and coordination across many entities. There are also key actions that will require significant funding to accomplish, such as conducting seismic safety assessments on our school buildings, inventorying our earthquake-vulnerable buildings, and supporting construction of tsunami vertical evacuation structures along the coast. Many of these actions will require significant effort, legislative support and funding, but they are critical for making Washington resilient. To be successful we need to establish a body, with corresponding authority and funds, to further the state's resilience goals by facilitating efforts across state agencies. This requires the continued support of the governor, Resilient Washington Subcabinet, Legislature, and entities involved in the development of this report.

POLICY/LEGISLATIVE CONSIDERATIONS

- Establish, with corresponding authority and funds, a body to further the state's resilience goals by facilitating efforts across state agencies.
- Continue the Resilient Washington Subcabinet. *(GOV & WA EMD, All)*
- Update RCW 28A.320.125 (6)(d) that requires for school safety drills from "may" to "must" incorporate an earthquake drill annually using the state-approved earthquake safety technique "drop, cover, and hold on." Previous legislation in 2016 allows a school district to voluntarily include this type of drill but falls short of requiring earthquake safety drills. *(OSPI, R1)*
- Require school districts to develop Hazard Mitigation Plans (HMP) either on their own, or by participating in a city or county mitigation planning process. *(OSPI, R1)*

- Require school districts to develop and maintain comprehensive continuity of operations plans (COOP) in coordination with cities and counties, including provision for mutual aid (e.g. facility-sharing) between districts. *(OSPI, R1)*
- Develop a state-level disaster recovery fund and programs to support local jurisdiction rehousing and recovery needs for small-to moderate disasters where federal individual assistance programs and funding are not available. *(WA EMD & COM, R3)*
- Mandate that seismic evaluations be completed as part of real estate transactions to ensure full disclosure of a property's condition between buyers and sellers to include attaching the record of repairs for damage due to geologic hazards to property deeds for full information in building permit processes. *(Real Estate Commission, DNR, R3)*
- Develop a mandatory building retrofit code that includes funding for code development, enforcement and financing options for building retrofits. *(DES, State Building Code Council, R3)*
- Develop an earthquake insurance authority program, along with financial incentives for improved affordability options**.** Consider a regionalized approach, working with other Pacific Coast states. *(OIC, R3)*

Near Term Implementation Cost

The estimated funding required to accomplish the highest-priority actions (high priority, low effort and low cost) listed in this report is at least $27.6 million. This is based upon best estimates and only includes one-time expenditures. Some of the costs, such as the construction cost from recommendations 6 or 9 are not included and are indeterminate at this time. Determining the actual and ongoing costs (public and private) will require further analysis. The remaining high-, medium-, and low- priority actions that require longer-term solutions could require significant capital investment.

COMMONALITIES

A number of actions identified by the workgroups are similar. They fall under four categories: Assessment, Inventorying, Data Collection and Storage; Building Code Revision; Outreach and Training; and Multi-Agency. There is a lot of potential for leveraging resources and effort to save on costs for these actions.

Assessment, Inventorying, Data Collection and Storage

Several workgroups identified the following actions as high priorities: inventorying vulnerable buildings (schools, hospitals and unreinforced-masonry buildings, historic buildings, etc.) and infrastructure; collecting relevant data; storing this data so it is easily accessible; and conducting risk assessments using the data. These are critical first steps for understanding the highest-risk structures and prioritizing

mitigation actions so that key facilities such as hospitals and schools are operational following an earthquake.

Building Code Revision

To improve the safety of our buildings we must also revise our building codes. A key example is the development of technical standards for the retrofit of URM buildings. The City of Seattle has been actively pursuing the development of a retrofit program, which may be used as a guideline and adapted for other local jurisdictions. Another recommendation is developing mandatory requirements for mitigating geologic hazards within local and/or state through land use planning and zoning, such as California's Alquist-Priolo Act. This requires:

- Detailed, consistent hazard assessment (liquefaction, ground failure, ground amplification etc.) statewide
- Minimum standards for engineering mitigation
- Performance based standards and education of which standard the building meets (life safety, non-collapse etc.)
- Requiring real estate transaction disclosures to include hazard maps from the Washington Geological Survey at a minimum

It is also important that geologic hazard maps (liquefaction, ground failure, ground amplification etc.) be updated and included in building codes or made mandatory in GMA.

Outreach and Training

The need for expanding outreach and training is vital for getting Washington State prepared. Some key areas include training stakeholders how to utilize the WAsafe program to rapidly conduct post-disaster building assessments; train COM staff on how to review emergency plans as the Evergreen Sustainable Development Standard (ESDS) v3.0 is implemented; train and deploy historic preservation specialists to be part of building assessment teams; improve earthquake insurance take-up rates by increasing public-private sector collaboration on earthquake insurance outreach efforts through education campaigns and drills like the "Great Washington ShakeOut;" develop an outreach program for local jurisdictions, property owners, engineers, and architects to inform them of the availability of the Building Occupancy Resumption Program (BORP) and Advisory Placard programs, which allow building owners to rapidly reopen following an earthquake; determine how to best leverage existing training and outreach opportunities that may be available for small-to-medium sized businesses within Washington; and develop a comprehensive training and exercise plan to prepare state agency employees to staff ESF-6 in the SEOC following a catastrophic incident.

Multi-Agency Collaboration

Most actions require multi-agency coordination and could be leveraged across entities. These actions were specifically identified by the workgroups: multi-agency legal mapping of "lifeline sectors" (energy, transportation, and communication & water/wastewater) in an emergency vs. governor's Emergency Proclamation; update the Infrastructure Systems Target Capability Assessment in the State Preparedness Report (SPR) based on new knowledge of the effects of a 9.0 CSZ event; develop a proposal for establishing a long-term disaster recovery fund, which can be used to support transitional housing and infrastructure for disaster survivors that have been displaced and lack rehousing options; undertake a comprehensive assessment and inventory of earthquake-vulnerable buildings across Washington, and make the data publicly available; and establish a stakeholder business continuity workgroup.

Appendices

Additional information on each topic can be found at the following link:
https://www.mil.wa.gov/emergency-management-division/resilient-washington-subcabinet