Interagency Coordination Activities Report, July 2025 - June 2026:

CEI Hub Seismic Readiness Assessments & Mitigation Needs Identification

Prepared By:
Luke Hanst, Partnership Manager[1]
Yumei Wang, Senior Advisor on Infrastructure Resilience and Risk[1]
[1]Civil and Environmental Engineering, Portland State University

Prepared For:
The Fuel Tank Seismic Stability Program,
Oregon Department of Environmental Quality

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Executive Summary

Portland State University (PSU) was contracted by the Oregon Department of Environmental Quality's (DEQ) Fuel Tank Seismic Stability (FTSS) Program to identify, prioritize, and coordinate mitigation activities that could be undertaken by the public sector and other private entities which would support seismic resilience at the regulated fuel terminals in Oregon's Critical Energy Infrastructure (CEI) Hub. To achieve this goal, PSU convened a series of interagency coordination meetings between July 2025 and June 2026 and conducted supporting research to assess seismic readiness and identify mitigation needs at Oregon's CEI Hub based on the anticipated impacts from a Cascadia Subduction Zone (CSZ) earthquake.

This effort addressed four primary focus areas: (1) identify agencies and organizations and their roles and responsibilities relating to the CEI Hub, (2) identify critical infrastructure systems at the CEI Hub and assess their seismic readiness, (3) identify emergency response capabilities for fuel spills and petrochemical fires at the CEI Hub and assess their seismic readiness, and (4) identify and begin to prioritize mitigation activities that need to happen outside of parcels owned by the regulated fuel facilities (i.e., what we call "outside-the-fence") that are essential for timely and effective response and recovery operations. Across these focus areas, this work developed a common operating picture of how infrastructure and response systems are expected to perform under severe seismic conditions and identified key constraints that will shape both response and recovery. It is important that "outside-the-fence" mitigation, primarily by the public sector, begins immediately to meet the needs of the CEI Hub facilities as they are posed to make large investments in their facilities' seismic stability.

Focus Area 1, Roles and Responsibilities: Results indicate that while a large and capable network of agencies exists, coordination across infrastructure managers, response organizations, and regulatory bodies remains uneven. Emergency response organizations, particularly those involved in firefighting and oil spill response, are well coordinated through established incident command systems and regular exercises. However, coordination across infrastructure systems is more limited despite significant interdependencies, and external stakeholders may lack understanding in how response operations are conducted and what resource constraints exist for these response organizations. These challenges present barriers to implementing mitigation strategies that require cross-agency alignment.

Focus Area 2, Infrastructure Seismic Readiness: Infrastructure systems in and around the CEI Hub are expected to experience widespread and prolonged disruption following a CSZ earthquake. Transportation networks, municipal water systems, wastewater and stormwater systems, electric power infrastructure, and communications systems are all highly vulnerable to seismic impacts. Transportation and water systems emerge as the most critical constraints: damaged roadways and bridges will limit access to the CEI Hub, while loss of municipal water pressure for weeks to months will

significantly reduce firefighting capability. In addition, post-earthquake hazards posed by infrastructure failures present additional threats to life safety and are expected to impede response operations, such as downed power lines, wastewater system failures, and the potential for earthquake-induced hazardous materials releases in nearby industrial areas.

Focus Area 3, Emergency Response Seismic Readiness: Emergency response capabilities demonstrate a mixed level of seismic readiness. Spill response organizations and command and control systems are relatively resilient, benefiting from redundancy, distributed resources, and the ability to scale through regional and national networks. In contrast, post-earthquake firefighting capabilities are limited due to the number of anticipated post-earthquake incidents compared to the available personnel and equipment, and due to their reliance on transportation access, water supply, and local staffing. Across all response categories, utility outages and transportation closures are the primary limiting factors, meaning that response capabilities may be delayed, reduced, or reprioritized following a major earthquake. Situational awareness for response operations (e.g., oil spill locations and volumes or available transportation routes) is also expected to be challenged after an earthquake due to communication disruptions, constrained reconnaissance capacity, and overburdened bridge inspectors.

Focus Area 4, Mitigation Needs: A total of 10 “outside-the-fence” mitigation needs were identified with 43 associated mitigation strategies. These "outside-the-fence" mitigation needs include the need for: a resilient transportation network, resilient firefighting water supplies, additional and resilient firefighting capabilities, emergency power generation, increased situational awareness capabilities, additional debris management and road repair capabilities, post-earthquake fuel supplies, resilient health and medical capabilities, improved alert and warning capabilities, and the mitigation of post-earthquake hazards (e.g., downed power lines) that may impede response.

Table 1

Overview of Identified Mitigation Needs and Strategies.

Mitigation Need	Summary of Mitigation Strategies
Resilient Transportation Network	Establish resilient evacuation routes, improve local bridges and roadways, ensure a resilient route across the Willamette River (e.g., the Resilient Burnside Bridge Project), mitigate regional emergency transportation routes, and develop resilient runways (e.g., PDX south runway) to enable mustering response resources.
Resilient Firefighting Water Supply	Ensure access to firefighting water supplies beginning with high-volume deployable or permanent river pumps. Invest in resilient water reservoirs (i.e., tanks) with hazard resilient pipes and hydrants. Support system-wide improvements to municipal water

	supplies.
Resilient Firefighting Capabilities	Conduct regular tabletop exercises including both fire and spill response organizations that integrate seismic impact assumptions. Acquire additional equipment including monitor nozzles and hose connections for municipal reservoirs. Integrate ShakeAlert into PF&R systems. Increase firefighting capabilities citywide.
Resilient Emergency Power Generation	Install permanent emergency power generators at fuel facilities or acquire additional deployable emergency generators located in seismically resilient locations. Develop a resilient microgrid.
Resilient Situational Awareness	Install monitoring technologies to support incident command decision making including pre-earthquake LIDAR maps, air quality monitors, seismic instrumentation, and visual surveillance technologies. Acquire additional drones and drone operators to identify petrochemical spills and fires.
Resilient Disaster Debris Management	Enable post-earthquake debris management by establishing a PBOT maintenance yard on the west side of the Willamette River. Protect or relocate the existing PBOT maintenance yard on the east side of the river. Pre-establish debris management sites.
Resilient Fuel Supplies	Alleviate post-earthquake fuel shortages through rapid continuity of operations for bulk fuel facilities, the geographic diversification of fuel facilities in the Portland region, and by ensuring access to fuel in local gas stations.
Resilient Health and Medical Capabilities	Support decontamination capabilities and medical capabilities at the Legacy Good Samaritan hospital. Improve regional hospital resilience and medical transport capabilities. Ensure uninterrupted power and water supplies for hospitals and local decontamination operations.
Resilient Alert and Warning Capabilities	Improve mechanisms to warn community members of potentially dangerous conditions. Advance the implementation of ShakeAlert and the installation of emergency alert systems. Improve the resilience of cellular networks and satellite technologies.
Mitigate Post-earthquake Hazards	Mitigate stormwater and wastewater systems. Install fire protections to mitigate potential ignition sources including downed power lines. Conduct seismic mitigation of local facilities handling hazardous substances.

Mitigation strategies reflect a consistent focus on addressing system constraints, e.g., transportation access, that shape both response and recovery operations at the CEI Hub. Many strategies are interdependent and require coordinated implementation across agencies to be effective. While large-scale infrastructure investments may provide substantial long-term benefits, they are often costly and may take many years to implement. Smaller-scale strategies may offer more immediate improvements in response capability and represent practical near-term opportunities. Most mitigation needs fall outside the responsibility of individual fuel facilities and will require sustained coordination and investment across public and private sector partners.

Conclusion. Overall, this work highlights that seismic risk at the CEI Hub is governed not only by fuel facility vulnerabilities, but by the performance of infrastructure systems and the subsequent constraints placed on emergency response. These findings suggest that facility-level mitigation strategies should be designed to operate under conditions of extended infrastructure outage and limited external response. At the same time, many impactful mitigation opportunities fall outside the responsibility of individual fuel facilities (i.e., “outside-the-fence”) and will require sustained coordination and investment across public sector agencies. It is critical that the public sector begin working immediately to implement the identified mitigation strategies as most will take many years to complete. On the present timeline, fuel facilities will have addressed their seismic vulnerabilities but will still be threatened by deficient public infrastructure unless direct intervention begins now. The interagency coordination process implemented in this effort provides a foundation for continued collaboration and will be critical for advancing mitigation, refining assumptions, and improving seismic resilience at the CEI Hub.

Improving safety at the CEI Hub will require addressing deficiencies in infrastructure systems and emergency response capabilities through implementation of “outside-the-fence” mitigation strategies. Continued efforts are needed to identify vulnerabilities within public infrastructure and response systems and to advance mitigation actions that reduce key constraints on response and recovery operations. Ongoing coordination, prioritization of mitigation opportunities, and implementation of incremental actions where feasible will be essential to advancing resilience over time.

Introduction

Portland State University (PSU) was tasked with identifying, prioritizing, and coordinating mitigation activities that could be undertaken by the public sector and other private entities which would support seismic resilience at Oregon's Critical Energy Infrastructure (CEI) Hub. To achieve this goal, PSU convened a series of interagency coordination meetings which brought together organizations and public agencies who manage infrastructure, play a role in response and recovery, or uphold regulatory requirements relevant to CEI Hub facilities. These convenings and associated research developed a common operating picture for infrastructure and emergency response seismic readiness at the CEI Hub, where most facilities regulated by the Department of Environmental Quality's (DEQ) Fuel Tank Seismic Stability (FTSS) program are located. This process of understanding the anticipated post-earthquake conditions of infrastructure and response capabilities provided an opportunity to identify mitigation needs which fall outside of parcels owned by the regulated fuel facilities but would improve safety at fuel facilities (i.e., what we call "outside-the-fence" mitigation). In general, the focus was on potential impacts from a Cascadia Subduction Zone (CSZ) earthquake as it has a short recurrence interval which poses an extreme likelihood of an incident occurring in the near future. The risks of a local crustal fault earthquake were not excluded, and there is significant overlap for the identified impact assumptions between a CSZ earthquake and local crustal fault earthquakes.

This research was funded by the Oregon Department of Environmental Quality's (DEQ) Fuel Tank Seismic Stability (FTSS) program under the Master Services Agreement #043-23, Amendment #2, Work Order Authorization #007.

Background

Oregon law ORS 468B.513 through 468B.525 requires seismic vulnerability assessments (SVAs) and risk mitigation implementation plans (RMIPs) from bulk fuel facilities in three Oregon Counties. Under this law, facilities must consider a "magnitude 9.0 Cascadia Subduction Zone Earthquake, the potential consequences of that event and the resources needed to respond to that event." Further, RMIPs must minimize "uncontrolled releases of hazardous materials… due to an earthquake and its associated direct and indirect impacts, including fires and flooding," and this must include "provisions for training (and) response exercises…to verify the ability of the facility to sustain safe conditions and respond to uncontrolled releases… due to an earthquake." To implement this law, Oregon Administrative Rules Chapter 340 Division 300 (OAR 340.300) was adopted on September 14th, 2023, which formally guides the FTSS program. OAR 340.300 states that SVAs must include a "Safety Assessment" that describes the seismic vulnerability of fire control and suppression systems, spill containment systems, and emergency response capabilities. RMIPs must then address these vulnerabilities and

ensure the availability of emergency response resources including spill containment, shutdown procedures, firefighting equipment, and emergency power capabilities.

In their present conditions, regulated fuel facilities have varied safety management systems that rely on a combination of facility personnel, private response capabilities (e.g., Clean Rivers Collaborative), public response capabilities (e.g., Portland Fire and Rescue), and local infrastructure (e.g., municipal water) to respond to fuel spills and petrochemical fires. Therefore, the seismic readiness of emergency response organizations and local infrastructure must be understood both as it is today and as it is expected to change over the course of fuel facilities' seismic mitigation activities. Understanding seismic deficiencies will enable the FTSS Program to ensure regulated fuel facilities recognize the potential impacts of an earthquake on their safety and emergency response procedures and implement mitigation measures to protect public health and the environment.

Purpose

The interagency coordination meetings and associated research activities were divided into four focus areas. These four focus areas are: (1) identify agencies and organizations and their roles and responsibilities relating to the CEI Hub, (2) identify critical infrastructure systems at the CEI Hub and assess their seismic readiness, (3) identify emergency response capabilities for fuel spills and petrochemical fires at the CEI Hub and assess their seismic readiness, and (4) identify and began to prioritize "outside-the-fence" mitigation activities that are essential for timely and effective response and recovery operations. The objective, methods, and results of each focus area are described in detail in subsequent sections, and the developed spreadsheets and meeting notes are included as appendixes to this report which are summarized below. In addition to the specific objective of each focus area, these interagency coordination meetings advanced agency partnerships to support the implementation of mitigation strategies, provided a forum to communicate FTSS program updates, and supported the FTSS program in keeping up to date on external agency activities.

List of Appendixes:

1. Appendix 1: Roles and Responsibilities Inventory (pp. 40-57)
    a. Contains a list of agencies identified in Focus Area 1 with responsibilities described in the four categories of permitting & code authority, infrastructure management, emergency response, and recovery & environmental cleanup.
2. Appendix 2: Infrastructure Seismic Readiness Assessment (pp. 58-70)
    a. Lists critical infrastructure for the CEI Hub identified in Focus Area 2 and describes known seismic vulnerabilities and provides planning level mitigation costs where available.

3. Appendix 3: Emergency Response Seismic Readiness Assessment (pp. 71-90)
    a. Summarizes emergency response capabilities relating to petrochemical fires and spills at the CEI Hub identified in Focus Area 3 and describes their anticipated post-earthquake conditions or availability.
4. Appendix 4: Impact Assumptions for Post-Earthquake Response (pp. 91-92)
    a. Provides an overview of the anticipated barriers to response operations for petrochemical fires and spills at the CEI Hub following a CSZ earthquake in a memo format designed for response exercises.
5. Appendix 5: Mitigation Needs Identification (pp. 93-110)
    a. Captures "outside-the-fence" mitigation needs with associated impact assumptions. Attaches known mitigation strategies to these mitigation needs, describes strategy dependencies, and provides information on the strategy's potential difficulty, impact, and releant authorities.
6. Appendix 6: CEI Hub Interagency Coordination Meeting #1 (pp. 111-115)
    a. Post-meeting notes from the July 2025 interagency coordination meeting focused on roles and responsibilities.
7. Appendix 7: CEI Hub Interagency Coordination Meeting #2 (pp. 116-120)
    a. Post-meeting notes from the December 2025 interagency coordination meeting focused on infrastructure assets and their vulnerabilities.
8. Appendix 8: CEI Hub Interagency Coordination Meeting #3 (pp. 121-124)
    a. Post-meeting notes from the March 2026 interagency coordination meeting focused on emergency response capabilities.

Focus Area 1: Roles and Responsibilities

Objective:

Identify public sector agencies and other private or community-based organizations relevant to the CEI Hub and define their roles and responsibilities.

Methods:

Desk research identified the agencies and organizations with some role or responsibility in the CEI Hub. For each identified organization, responsibilities were described and categorized into four areas: permitting and code authority, infrastructure management, emergency response, and recovery and environmental cleanup. This step was informed by previous research and engagement with experts (e.g., DOGAMI, 2013; OSSPAC, 2013). This matrix of roles and responsibilities informed the list of invites for the subsequent interagency coordination meetings. During the July 2025 interagency meeting, this matrix was the subject of discussion and review where participants were asked to verify and revise summary information on their agency.

Interagency Meeting Summary:

The July 2025 meeting brought together 40 personnel from 22 agencies or departments including City, County, State, Federal, and other regional parties. The discussion focused on roles and responsibilities, ongoing work at the CEI Hub, and potential resilience opportunities. As part of this meeting, the Portland Bureau of Planning and Sustainability (BPS) provided an initial overview of their CEI Hub Zoning Code Policy Project. Notes from this meeting are available in Appendix 6.

Results:

The roles and responsibilities matrix is available in Appendix 1. In total, 63 agencies or organizational clusters (e.g., “local community groups”) were identified and catalogued. Of the identified agencies, 27 agencies play a role in permitting and code development, 23 agencies are involved in infrastructure management, 57 agencies play a role in emergency response, and 60 agencies are involved in recovery and cleanup operations. Large networks of subcontractors, especially in the realm of spill response, are not individually catalogued and instead are captured within the agency or organization that maintains said contracts. For example, the Clean Rivers Cooperative maintains significant subcontractors to provide personnel for spill response, such as Republic Services, but these contractors are not individually identified and catalogued.

Discussion:

Overall, this research suggests a large and capable network of agencies with roles and responsibilities in and around the CEI Hub, but with uneven levels of coordination across functional areas. Organizations involved in firefighting and oil spill response are particularly well connected to one another, largely due to the frequency of activations, drills, and exercises that reinforce established incident command structures. These relationships provide a strong foundation for coordinated response operations.

This level of coordination is not consistent across all participating agencies. Infrastructure managers and regulatory agencies are less integrated into these response networks, and coordination across infrastructure systems remains limited despite significant interdependencies. Many infrastructure assets in the CEI Hub are co-located and mutually dependent, yet are managed by different agencies with distinct priorities, funding mechanisms, and planning processes. This creates challenges for advancing mitigation strategies that require cross-agency alignment.

Several participants noted that emergency response operations can function as a “black box” to external stakeholders. While this reflects the complexity and specialized nature of response operations, it also limits the ability of infrastructure managers and planners to align mitigation investments with how response operations are carried out. This lack of shared understanding may reduce the effectiveness of both preparedness and mitigation planning efforts.

The number of agencies involved in recovery and environmental cleanup is also notable and suggests that post-earthquake coordination will be particularly complex. Without clearly defined coordination mechanisms or shared prioritization frameworks, recovery efforts may be slowed or fragmented, especially in the early phases following a major earthquake.

In terms of infrastructure managers, these findings suggest that coordination is a key constraint on the implementation of mitigation strategies. Advancing “outside-the-fence” mitigation efforts will require sustained coordination across infrastructure managers, response agencies, and regulatory bodies to prioritize mitigation strategies, plan implementation, and gather funding. The interagency coordination meetings themselves represent an important step in building this alignment and may serve as a model for continued collaboration.

Focus Area 2: Infrastructure Seismic Readiness

Objective:

Identify critical infrastructure assets (i.e., utility and transportation assets) that are important for facility operations as well as post-earthquake response and recovery operations. Then, assess the seismic resilience of this infrastructure.

Methods:

An initial list of infrastructure assets was derived from prior research along with visual inspection of satellite imagery of the CEI Hub area (DOGAMI, 2013; OSSPAC, 2013). The infrastructure asset collection process prioritized the 6-mile stretch of the CEI Hub with a varying buffer distance for certain critical infrastructure assets (e.g., the Columbia River maritime corridor). Notably, medical facilities were not included here and are instead catalogued as emergency response capabilities since the focus was on the medical facility’s decontamination and fire injury capabilities rather than total facility capabilities.

Following this initial asset identification, interviews were conducted with infrastructure management agencies including the Portland Water Bureau, Portland Bureau of Transportation, Portland Bureau of Environmental Services, and the Oregon Public Utilities Commission. Additionally, email outreach was conducted to the Oregon Department of Transportation for information on roadways, bridges, and rail assets. This outreach gathered details about the agencies’ infrastructure assets, the expected post-earthquake status of those assets, replacement or retrofit timelines, mitigation strategies, and planning-level mitigation cost estimates where available. Restoration of service timelines and known vulnerabilities were in some cases derived from the Oregon Resilience Plan (OSSPAC, 2013) and verified by interview participants. Additional sources and information on mitigation or retrofit timelines and available planning-level cost estimates are included in Appendix 2. In this section and throughout

the report, infrastructure failures are also referred to as utility outages and transportation closures.

Interagency Meeting Summary:

The December 2025 interagency meeting centered on an infrastructure seismic readiness roundtable which discussed the vulnerabilities, interdependencies, and potential avenues for mitigation of infrastructure assets. Following this roundtable the Oregon Department of Energy provided a summary of their work on energy security and fuel response, and the Portland Bureau of Planning and Sustainability provided an update on their CEI Hub Zoning Code Policy Project. Notes from this meeting are available in Appendix 7.

Results:

The table of identified infrastructure assets is available in Appendix 2. In total 33 infrastructure assets or clusters of assets were catalogued and fell into the following categories: transportation, water, wastewater and stormwater, electric power systems, and communication systems. The assets and their seismic robustness for each infrastructure category are summarized below.

Transportation Assets:

Transportation assets in the CEI Hub include the maritime corridors, bridges including overpasses, roadways including retaining walls, and rail infrastructure.

Maritime Corridors:

The maritime corridors include the Willamette River, along which the CEI Hub runs from mile marker four to mile marker nine. At mile marker zero the Willamette River joins the Columbia River which runs for one-hundred miles to the mouth of the Columbia River at the Pacific Ocean. These portions of the Willamette and Columbia rivers are dredged by the US Army Corps of Engineers to maintain a depth of approximately 40 feet to allow for the transportation of large shipping vessels including oil tankers that dock at CEI Hub facilities.

Following a CSZ earthquake both the Willamette and Columbia rivers will require significant restoration prior to their use for regular shipping operations, and local access for smaller emergency response vessels may be hazardous. In particular, earthquake shaking and liquefaction is expected to fill the dredged channel, making the corridors impassable for large vessels. Damage to the mouth of the Columbia River from a local tsunami will challenge river access, and bridge damage or collapses, pipeline failures, and electrical transmission line damage along the length of these corridors is expected to create significant debris barriers. Local access to the CEI Hub via the Willamette River will be difficult due to bridge damage or collapse, hazardous conditions including debris in the river, and damage to docks and boat launches.

Bridges and Roadways:

The roadway network in and around the CEI Hub depends on US Highway 30, which is maintained by the Oregon Department of Transportation (ODOT), and Northwest Front Avenue, which is maintained by the Portland Bureau of Transportation (PBOT). Along HWY 30, PBOT maintains a stretch of retaining walls responsible for slope stabilization of the West Hills at the base of Forest Park. These two arteries run parallel to the Willamette River on its west side and are connected by critical perpendicular arterial routes including NW Kittridge Avenue (opened in 1968) and NW 26th drive (unknown construction date) that are maintained by PBOT. Both of these arterial routes depend on bridge overpasses to cross railroad tracks. These roadways and arterial routes are listed as regional emergency transportation routes. The CEI Hub's closest available connections to the east side of the Willamette River are the Fremont Bridge (opened in 1973) and the St. Johns Bridge (opened in 1931) which are maintained by ODOT.

Of the identified transportation assets in the CEI Hub, none are expected to fare well following a CSZ earthquake or local crustal fault earthquake. Local roadways will experience significant deformation from ground failure and are likely to have partial or complete lane closures due to debris including landslides from the West Hills. The local overpasses were constructed decades ago to deficient seismic codes and are expected to be impassable following an earthquake. Finally, the closest Willamette River crossings are both classified by ODOT as seismically deficient and will need significant repairs or replacement prior to resumed operations. These deficiencies compound the extreme vulnerability of the PBOT maintenance yard, described in the emergency response section, which will undermine the ability to rapidly clear and repair transportation assets. Overall, the transportation network in and around the CEI Hub has significant seismic vulnerabilities and will be largely impassable, especially for emergency equipment such as firefighting apparatus, prior to significant road and bridge repairs and debris clearance activities.

Rail Infrastructure:

The local railway network servicing the CEI Hub facilities is composed of rail lines running parallel to the Willamette River, located between HWY 30 and NW Front Avenue. These lines are connected to the east side of the Willamette River via the BNSF Railway Bridge 5.1, which acts as a critical connection to east bound railway operations. The Willbridge Railyard is the primary yard serving CEI Hub facilities, and the Lake Railyard to the south supports broader rail operations.

Rail assets in this area are located on highly liquefiable soil and are considered seismically vulnerable, and repairs and debris clearance may be required to resume regular operations following a significant earthquake (DOGAMI, 2013). The BNSF Railway Bridge 5.1 (opened in 1908 with significant modification in 1989) has unreinforced masonry piers and is considered seismically deficient (DOGAMI, 2013).

Repair or replacement will likely be required prior to resuming operations. Railcar assets storing petrochemicals and other extremely hazardous substances are unlikely to overturn in an earthquake if stationary and are built to robust standards to withstand damage in the event that they do overturn. However, overturned railcars may require emergency response to reduce potential risks (e.g., damaged ventilation valves on railcars storing petrochemicals). In the event that a railcar is underneath a collapse hazard, such as a bridge or structure, the railcar may experience failure which could impede response operations or divert resources if hazardous materials are released.

Water Infrastructure Assets:

The municipal water system that serves fuel facilities and firefighting operations in the CEI Hub is maintained by the Portland Water Bureau (PWB). Portland's municipal water system is largely gravity fed and begins at a higher elevation on Portland's far east side where it is supplied from the Bull Run watershed with backup water supplied by wells in the Columbia South Shore Well Field. Large capacity, in-town reservoirs are maintained to address fluctuations in water demand (i.e., surge capacity) and to provide water for emergencies. Closest to the CEI Hub on the west side of the Willamette River are the Washington Park reservoir with a capacity of 13 million gallons in 3 buried reservoirs, the Mayfair water tank with 5.5-million-gallon capacity, and the North Linnton water tank with a 0.5-million-gallon capacity. A series of water mains connects the CEI Hub to these reservoirs and the source waters of the PWB system. These mains are large diameter, pressurized water pipelines that run under or adjacent to HWY 30 and NW Front Ave with service lines providing water to CEI Hub facilities.

Following either a CSZ earthquake or a local crustal fault earthquake, the PWB does not expect municipal water to be available in the CEI Hub for weeks or months. While some damage may impact the operations of the Bull Run Watershed or the Columbia South Well Field, the primary impedance to municipal water availability in the CEI Hub will be damage to the City's water mains. Extensive damage to east side water mains, river crossings, and west side water mains means that any pipe sections that remain functional will not remain pressurized. Of the water reservoir assets catalogued, only the Washington Park Reservoir was constructed to contemporary seismic codes and is expected to fare well during an earthquake. The Mayfair and North Linnton tanks were constructed in the 1960s and are considered seismically vulnerable. Water in the Washington Park reservoir may be available for firefighting operations but would require a significant number of fire engines used as relays to transport it, with pressure, to the CEI Hub.

Wastewater and Stormwater Assets:

The CEI Hub is served by a wastewater system and a stormwater system. The wastewater (i.e., sewage) system's gravity fed conveyance pipelines run underneath or

adjacent to HWY 30 and NW Front Ave, converging at the Guilds Lake Pump Station where sewage is pumped to the east side of the Willamette River and eventually treated at the City's wastewater treatment plant. The stormwater system is composed of multiple gravity-fed stormwater lines with pretreatment systems (e.g., trash racks) that transport stormwater to outfalls on the shore of the Willamette River.

Of the identified wastewater and stormwater assets, none are built to withstand the anticipated liquefaction and ground deformation expected in the CEI Hub, and restoration of services is estimated to take months to years following a CSZ earthquake. In addition to a lack of functioning wastewater and stormwater systems following an earthquake, these assets create potential post-earthquake hazards for response operations in the CEI Hub. In particular, large sewer conveyance lines may collapse causing damage to co-located roadways, damage to the sewage system and the Guilds Lake Pump Station may lead to sewage backups in the area, and failures in the stormwater system may cause localized flooding during rain events.

Electric Power Assets:

CEI Hub facilities are connected to the electrical grid via electric power lines, which are supported by local distribution substations. A new substation built to high earthquake standards which address liquefaction hazards has recently been constructed on the north end of the CEI Hub. The CEI Hub is also crossed by three high voltage transmission lines each with associated river crossings.

Most of these electric power assets are considered seismically vulnerable, and any local assets that remain functional will be without power until repairs to the broader electrical grid occur. Restoration of service timelines for the electrical grid will take weeks to months depending on the extent of damage. In addition, these electrical system assets present significant post-earthquake hazards to CEI Hub fuel facilities as downed power lines present serious ignition risks. Downed power lines also delay debris clearance and response activities as they must be manually assessed prior to responders entering an area.

Communication Assets:

The CEI Hub facilities' regular operations are dependent on the local cellular network for communications and on fiber optic corridors for network access. In addition, CEI Hub facilities that service marine vessels via docks are connected to the Maritime Fire and Safety Association's (MFSA) very high frequency (VHF) radio network, which utilizes four microwave service towers along the Willamette and Columbia River. This VHF network is available to all marine vessels in the Willamette and Columbia rivers, and the MFSA and Clean Rivers Cooperative (CRC) are implementing a JBL interoperability system to enable first responders to connect to this VHF network using their standard radio communication equipment.

Of these assets, the local cellular network and fiber optic corridors are expected to be damaged by earthquake impacts, reducing or eliminating their capacity. Any cellular capacity which does remain will be immediately overburdened with increased activity. First responders have priority access to any remaining cellular network capabilities, but in general they anticipate relying on radio and other backup communication systems following an earthquake. The MFSA's microwave service towers were built to remain in operation following an earthquake, but their date of construction prior to the 1994 Oregon building code improvements suggests they may have seismic vulnerabilities.

Discussion:

In general, infrastructure assets in and around the CEI Hub have a high degree of seismic vulnerability and are expected to experience widespread disruption following a CSZ earthquake or local crustal fault earthquake. These impacts are not isolated to individual systems, but instead represent a multi-system failure across transportation, water, wastewater, electric power, and communication infrastructure simultaneously. These damages are also not isolated to the CEI Hub as a CSZ earthquake will impact these infrastructure systems throughout Oregon and Washington. The combined effect of these disruptions creates significant barriers to emergency response, including immense resource allocation constraints statewide, as well as similar barriers to long-term recovery operations.

Transportation and water infrastructure emerge as the most critical constraints for response to potential petrochemical fires and oil spills at the CEI Hub. The expected impassability of roadways and bridges will limit access to the CEI Hub for emergency responders, equipment, and supplies. At the same time, the loss of municipal water pressure for weeks or months will significantly reduce the feasibility of conventional firefighting operations. These constraints exist regardless of the availability of personnel or equipment and therefore represent fundamental limitations on response capability.

In addition to limiting response, several infrastructure systems introduce post-earthquake hazards that may complicate operations. Downed power lines present ignition risks and delay debris clearance, wastewater system failures may lead to road collapse, localized flooding, or contamination, and debris within maritime corridors may limit access for response vessels. First responders are also concerned with the release of hazardous materials, such as toxic inhalation hazards, from nearby industrial areas which may threaten responders or divert available resources. These post-earthquake hazards increase the complexity of the operating environment in the immediate aftermath of an earthquake.

A key challenge identified in this assessment is the mismatch between the timelines required for effective emergency response and the expected timelines for infrastructure restoration. While response operations require access, water, and power

within hours to days, many infrastructure systems are expected to take weeks, months, or years to restore. This gap suggests that, given present day conditions, reliance on rapid infrastructure recovery is not a viable strategy for ensuring timely access to external response resources at fuel facilities.

Limited mitigation activities are currently underway in these infrastructure systems, particularly in the transportation network, where large capital investments are required and implementation timelines require years to plan and execute, which suggests mitigation activities should begin as soon as possible. Without intervention these infrastructure vulnerabilities will persist into the foreseeable future, which is why it is critical that public agencies and other relevant organizations begin planning and implementing mitigation as soon as possible.

These findings indicate that facility-level mitigation strategies must be designed to operate under conditions of extended “outside-the-fence” utility outages and transportation closures. In particular, assumptions about access, water availability, power supply, and communications should reflect the likelihood of prolonged disruption rather than short-term interruption.

Focus Area 3: Emergency Response Seismic Readiness

Objective:

Identify emergency response capabilities for petrochemical fires and spills at the CEI Hub. Then, assess the seismic resilience of these response capabilities.

Methods:

An initial list of response assets was derived from prior research (DOGAMI, 2013; OSSPAC, 2013). Unlike the infrastructure assessment which focused on a local geography, emergency response capabilities are distributed around the city, region, and country, which therefore depend on a tiered approach, that is a “cascade-in” approach, to bring additional resources to an incident.

Following initial asset identification, a series of interviews were conducted with response agencies and organizations including Portland Fire and Rescue, Clean Rivers Cooperative, Maritime Fire and Safety Association, and the Marine Spill Response Corporation. Additionally, email outreach was conducted to the Oregon National Guard, US Coast Guard, US Army Corps of Engineers, Multnomah County, the Oregon Department of Energy, the Oregon Health Authority, the Portland Bureau of Transportation, and the DEQ’s Oil Spill Contingency Planning Program. Outreach was planned to the US Federal Emergency Management Agency and the US Environmental Protection Agency to ascertain additional federal capabilities, but due to a federal funding hiatus this information was not collected. This outreach catalogued response capabilities, the expected post-earthquake status of those response capabilities, post-

earthquake hazards that may impede response, and critical infrastructure dependencies that could interfere with response.

Interagency Meeting Summary:

The March 2026 meeting centered on an emergency response seismic readiness roundtable, which discussed emergency response capabilities and their anticipated post-earthquake status. PSU then led a discussion on how seismic impact assumptions (Appendix 4) might be integrated into future scenarios for exercises and tabletops. Finally, the Regional Disaster Preparedness Organization overviewed the methods and outcomes from Phase 2 of the Regional Emergency Transportation Route work. Notes from this meeting are available in Appendix 8.

Results:

The table of catalogued emergency response capabilities is available in Appendix 3. In total 24 emergency response capabilities were identified across the following categories: firefighting, spill response, transportation response (i.e., road clearance and repairs), health and medical response, community alert and warning, emergency power, and command and control. The capabilities catalogued in this research are not comprehensive for the total world of post-earthquake emergency response resources, and an extensive network of contractors and equipment is available regionally and around the nation that are designed to “cascade-in” to address incidents that surpass local capabilities. Additionally, a number of emergency response capabilities which were catalogued in this research process are not reiterated here but can be found in Appendix 3.

Firefighting:

Portland Fire and Rescue (PF&R) is the lead agency for firefighting at the CEI Hub. PF&R maintains a mixture of apparatus across 31 fire stations including 31 fire engines, 10 fire trucks, 2 squad trucks, a command trailer, and 4 fireboats. Fire engines, monitor nozzles (i.e., high volume water cannons), and firetrucks with extendable ladders are especially important for an oil fire response. Most apparatus take four crew members, and apparatus are cross-staffed, meaning they require crew to be transferred off fire engines to operate ancillary apparatus, leaving the engine uncrewed and unusable during response.

When responding to petrochemical fires, firefighters rely on firefighting foam concentrate to create and maintain a layer of foam on the oil to starve the fire of oxygen. Foam concentrate is mixed with water at the point of dispersion via monitor nozzle or via fire engines and trucks. There are multiple types of firefighting foam with differing environmental and potential health effects, and in general the ratio of foam concentrate to water ranges between 1% and 5% foam to water. Prior to beginning an operation

using firefighting foam, firefighters muster the required quantity of concentrate which is based on the surface area to be covered along with the duration for which that foam must be maintained. These operations will not begin until sufficient foam is mustered, as insufficient firefighting foam will fail to extinguish the fire and therefore wastes the concentrate. For operational and financial reasons, foam concentrate is stored around the Portland region in a variety of locations with either official mutual aid agreements or handshake agreements in place to share these supplies during an incident.

Following a CSZ earthquake, models from a Portland Water Bureau report suggest as many as 60 different conflagrations will begin citywide. PF&R will prioritize the allocation of available response resources to these fires, as well as other incidents (e.g., potential high-rise collapses), based on the potential benefit to the greatest number of people and with low enough acceptable risk to first responders. Based on this framework, petrochemical spills and fires at the CEI Hub are unlikely to be the highest priority incident for response as the number of threatened employees and residents is likely to be lower compared to urban conflagrations or other incidents in the City paired with the high risk to first responders posed by volatilized petrochemicals and other hazardous substances, including extremely hazardous substances such as toxic inhalation hazards, that may be released from nearby industrial areas.

While PF&R and regional unified command will make decisions based on the potential risks and benefits to life safety, the city's firefighting capabilities will also be severely reduced following an earthquake by direct damage and infrastructure failures. In terms of direct seismic damage, PF&R fire stations have been reinforced to mitigate collapse hazards but may not be safe for immediate reoccupation, and damage to fire bay doors could trap fire engines inside for extended periods of time. Further, the PF&R warehouse has known seismic vulnerabilities and could collapse, potentially damaging equipment including firefighting foam concentrate. Response capabilities for a petrochemical fire at the CEI Hub will likely also be reduced due to expected damage to regional firefighting foam concentrate supplies as well as extensive damage to the regional transportation network, which will make mustering sufficient foam and equipment challenging or impossible in the immediate aftermath of an earthquake.

In terms of infrastructure failures, the two most critical dependencies are on the transportation network and municipal water supplies. Following a CSZ or local crustal fault earthquake, significant damage is expected to roadways and bridges which will inhibit the transportation of fire engines, and citywide municipal water outages will dramatically reduce water available for firefighting. Minimal alternative water supplies exist and are primarily composed of limited capacity portable pumps to rivers or surface water that require fire engines to pump and relay water which will reduce the number of engines available to fight fires. In addition, firefighters noted that prolonged response operations will be challenged by fuel shortages stemming from supply chain disruptions.

Spill Containment and Cleanup:

Overall, adequate spill response capabilities for the CEI Hub are in place to respond to even catastrophic fuel spills, however the ability for spill response to occur in a timely fashion following an earthquake is challenged by regional and local transportation system deficiencies. Spill response capabilities are maintained through the combined efforts of fuel facilities, a collection of privately owned nonprofit companies known as oil spill response organizations (OSROs), and contributions from public sector agencies. At the fuel facilities, a small supply of containment equipment, mostly booms, is maintained along with employees who are trained to initiate emergency response operations. When a facility has a spill or threat of an imminent spill, they contact their contracted OSRO(s) who aim to be on-site and mustering a response within one to three hours assuming “blue-sky” or non-disaster conditions. For the CEI Hub, the two most important OSROs are the Clean Rivers Cooperative (CRC) who maintain significant local and regional capabilities, and the Marine Spill Response Corporation (MSRC) who maintain significant regional and national capabilities. Both these OSROs have stockpiles of response equipment which are catalogued in their respective databases (see links in Appendix 3). Critical equipment includes booms, absorbents, dispersants, oil skimming vessels, pumps, and storage barges for effluent. These OSROs rely on contracted personnel to operate equipment, and these personnel are activated at regular intervals for training if no incidents occur.

While public agencies do not maintain large quantities of equipment or personnel for spill containment or cleanup, they do play a role in coordinating and overseeing the response. For oil spills, the public sector response framework is as follows: at the federal level, the USCG is the on-scene coordinator for spills to waterways, and the EPA is the federal on-scene coordinator for spills to land; at the state level, the Oregon DEQ is the state on-scene coordinator; and locally, either PF&R or Portland Bureau of Emergency Management personnel work alongside Multnomah County personnel as the local on-scene coordinators. These on-scene coordinators establish a unified command to determine incident objectives and ensure response operations are safe and effective. This incident command system determines the allocation of resources and strategy by which OSROs in the operations section contain and clean up an oil spill.

Spill response capabilities are expected to fare well during an earthquake in terms of direct seismic impacts. The highest value equipment (i.e., response vessels) are largely stored either on the river or on trailers in open-air environments, which are therefore less likely to be trapped or damaged by structural failures. Seiches pose a potential hazard to vessels on the water in the Willamette and Columbia rivers, and tsunami impacts threaten large coastal vessels. Protections are in place to mitigate these hazards including boat fenders and operational procedures (i.e., large coastal vessels plan to follow USCG guidance, such as casting off following an earthquake to

avoid tsunami damage). Furthermore, because of this spill response framework's reliance on resources that "cascade-in" from around the region and nation, there is significant redundancy in terms of equipment and personnel.

While direct damage may be lower, oil spill response operations will face barriers stemming from infrastructure outages and post-earthquake hazards. In terms of infrastructure outages, damage to the local and regional transportation networks including the maritime corridors and regional airports and runways will pose challenges for mustering and deploying response equipment. Regional transportation network outages may delay or challenge external resources from cascading in a timely fashion and may create logistical challenges for supporting personnel needs. Despite these barriers, the OSROs report a high level of adaptability and are confident in their ability to identify alternative avenues for implementing spill containment and cleanup operations.

In terms of post-earthquake hazards, these OSROs do not directly fight petrochemical fires, and they are not equipped to enter areas with toxic inhalation hazards. OSROs are trained to identify and avoid potentially hazardous situations which includes some air quality monitoring technologies that can identify dangerous conditions stemming from petrochemical volatilization. If hazardous conditions are present in the CEI Hub following an earthquake, oil spill response may be delayed to protect personnel. Alternatives still exist, such as deploying spill response operations downstream and outside of high-hazard areas.

Transportation Response:

Following an earthquake, significant debris management, bridge inspections, and roadway and bridge repairs will be required in the local transportation system to support response and recovery operations. Three public sector agencies were identified with response capabilities relevant to the transportation network in the CEI Hub: the Portland Bureau of Transportation (PBOT), the Multnomah County Transportation Division, and the Oregon Department of Transportation (ODOT).

In terms of debris management capabilities, PBOT maintains the largest fleet of response equipment (e.g., bulldozers and dump trucks) of the identified agencies and is establishing contractors to support disaster debris planning and management activities. Multnomah County and ODOT are able to provide additional support with incident response teams and some local equipment. These capabilities have known seismic vulnerabilities. In particular, PBOT's maintenance yards are located underneath I-405 bridge abutments on the east side of the river that are vulnerable to collapse and are expected to damage response equipment or make them inaccessible. All of these agencies' capabilities have to cross multiple local overpasses or bridges over the Willamette River to arrive at the CEI Hub, which will create significant delays for response operations reaching the area.

PBOT, Multnomah County, and ODOT are each responsible for implementing bridge inspections and closures for their respective infrastructure assets, and inspectors are on staff at each agency to conduct these inspections. Bridge inspectors are responsible for placarding bridges including overpasses based on visual damage assessments, with initial assessments utilizing “an abundance of caution” in the classification of a bridge as safe for use. Public sector first responders are trained not to cross any bridge that has not been classified as safe by their respective agency. Following an earthquake, these teams of inspectors will face significant challenges in assessing and placarding all the bridges in the City, and damage to the transportation network will delay the deployment of these inspectors around the City.

Finally, roadways and bridges that experience seismic impacts may require repairs or replacement prior to resuming operations, even for emergency purposes. All of the identified public agencies rely on external contractors to perform significant repairs or bridge construction operations. These post-earthquake contractors are not currently established, and public agencies plan to use emergency procurement protocol to onboard contractors for transportation restoration activities. Repair activities will be prioritized by regional incident command and is expected to focus on regional emergency transportation routes, especially those connected to health and medical facilities. HWY 30 and portions of Front Ave. are both classified as regional emergency transportation routes.

Health and Medical Response:

This investigation focused on the capabilities of local and regional healthcare facilities to provide aid to burn victims or decontamination for patients exposed to hazardous materials and on emergency medical services (EMS) patient transportation capabilities. The Legacy Good Samaritan Medical Center (Good Sam) is the closest hospital to the CEI Hub and does not require crossing the Willamette River. Good Sam maintains some decontamination capabilities on-site, including a plumbed decontamination shower as well as mobile decontamination equipment. For burn injuries, Good Sam is able to provide critical care to stabilize patients before transferring them to the Legacy Oregon Burn Center at the Emmanuel Medical Center for specialized care. Regional hospitals maintain similar on-site capabilities and coordinate emergency response operations and patient allocation through a 6-county health care coalition (HCC) and the Oregon Health Authority. EMS transportation of patients in Portland is the responsibility of American Medical Response Northwest (AMR) in partnership with Portland Fire and Rescue. AMR maintains significant ambulatory capabilities and PF&R are authorized to provide non-traditional transportation capabilities during a surge event.

Direct seismic damage and infrastructure outages threaten these health and medical response capabilities. Damage to hospitals and the water and electric power

infrastructure servicing those hospitals is expected to reduce the number of patients that can be treated. Damage to local and regional transportation routes will critically undermine patient transportation capabilities, as AMR ambulances and PF&R equipment are expected to be trapped or immobilized after an earthquake.

Community Alert and Warning:

For a CSZ earthquake, the USGS's ShakeAlert system is expected to provide somewhere between 15- and 60-seconds warning before the arrival of earthquake shaking. ShakeAlert can be integrated into automated systems to enact protective measures (e.g., sounding alarms, stopping trains, etc.). ShakeAlert has an opt-in notification system and is also integrated into Android and IOS operating systems to provide push notifications to cellular devices. ShakeAlert systems are designed to warn people before earthquake shaking arrives at their location and will presumably be functional for the initial earthquake. The subsequent functionality of ShakeAlert to identify aftershocks is less clear, and damage to cellular networks will interfere with the reach of these subsequent messages.

Multnomah County and the City of Portland co-manage PublicAlerts, an opt-in community emergency notification system that sends emergency notifications to residents via SMS, voice call, and email. Multnomah County and the City of Portland share authority to send Wireless Emergency Alerts (SMS texts to any device connected to a cellular network) and Emergency Alert System (TV and radio broadcast) notifications via FEMA's Integrated Public Alert and Warning System (IPAWS). As a last resort communication system, Multnomah County and the City of Portland can broadcast Emergency Alert System notifications via a Sage ENDEC device located at PBEM's Emergency Operations Center that relies on the PBS tower on Mt. Tabor being operational and on radio and TV stations being able to transmit the message. Widespread damage to the telecommunication systems including radio broadcasts is expected to disrupt these capabilities, resulting in reduced geographic coverage and time delays for message receival.

Emergency Power Generation:

Minimal public sector deployable emergency power generators were identified. In particular, the Oregon SPIRE program does maintain some deployable emergency generators, but the allocation of these few generators will be prioritized by regional and state unified command and depends on their availability (i.e., not in use by the local organization who owns the equipment). Additionally, the US Army Corps of Engineers does maintain some deployable emergency generators that may be available via FEMA Mission Assignment; however, these generators would be coming from outside the Portland region and may be delayed for weeks due to damage to regional transportation systems. Widespread earthquake impacts will divert available emergency generators to

higher priority facilities (e.g., medical facilities), and significant transportation outages will severely reduce access to the few available deployable generators.

Command and Control:

The total network of command and control capabilities relevant to emergency response at the CEI Hub following a CSZ earthquake is exceedingly complex with dozens of different public agencies and hundreds or thousands of subcontractors playing a role in response and recovery. As an example, the Oregon Cascadia Playbook (2018) provides a high-level overview of the different emergency support functions that the State of Oregon will work to implement in the immediate aftermath of a CSZ earthquake. From the local to the federal level, all first responders utilize the incident command system (ICS) framework to organize and scale response operations. Following a CSZ earthquake, multiple localized incidents will have a respective incident command system established, which will be further coordinated by regional, state, and federal command systems.

Certain buildings play a role in supporting incident command, such as the State of Oregon's government offices in Salem. The seismic resilience of these facilities varies widely. Many public sector buildings are classified as seismically vulnerable which may pose barriers to certain agencies fully participating in incident response (e.g., the DEQ headquarters in Portland). However, firefighters and OSROs rarely rely on buildings to stand up an incident command. Instead, these organizations rely either on mobile command trailers or open-air command posts for incident command to function. These organizations' command and control capabilities are therefore expected to be resilient following an earthquake.

Situational awareness is a critical aspect for an incident command system to function effectively while ensuring the safety of first responders. Facility specific monitoring systems are in place at fuel facilities in the CEI Hub and lines of communication are in place to communicate oil spills or threats of imminent spills to first responders. After the initial notification to contracted OSRO(s) and to relevant public sector agencies, first responders rely on a variety of methods to visually track oil spills or petrochemical fires. For example, drones are increasingly used to provide visual reconnaissance during an incident since they enable operators to maintain a safe distance while streaming live images to incident command. In general, significant gaps in situational awareness are expected in the CEI Hub following a CSZ earthquake. Initial incident reports may be confused and overwhelm available communication channels, and while visual reconnaissance capabilities are improving, they are still in the early stages of implementation and will have minimal availability in the immediate aftermath of a CSZ earthquake.

Discussion:

Emergency response capabilities relevant to the CEI Hub demonstrate a mixed level of seismic readiness, with some systems showing strong resilience and others facing significant constraints. Spill response organizations and command and control structures are well developed and benefit from redundancy, regular training, and the ability to scale through regional and national resource networks. In contrast, certain local response capabilities, most notably municipal firefighting, face more substantial limitations.

Across all response categories, anticipated utility outages and transportation closures stemming from earthquake impacts will likely have a significant effect on operational capability. Damage to transportation networks limits the ability to deploy personnel and equipment, loss of municipal water supply constrains firefighting operations, and electric power and communication outages complicate coordination and situational awareness. These dependencies mean that even well-equipped response organizations may be delayed in implementing effective operations under post-earthquake conditions.

Firefighting capabilities are particularly constrained due to their reliance on multiple infrastructure systems that are expected to fail simultaneously. The need for large volumes of water, transportation access for firefighting apparatus, and sufficient staffing creates a high threshold for effective operations. In addition, competing demands across the city following a CSZ earthquake are likely to limit the prioritization of response capabilities to petrochemical fires at the CEI Hub, especially given the relatively smaller population at risk compared to other incidents paired with the elevated risks to responders.

Spill response capabilities are comparatively more resilient, as they rely on distributed equipment, open-air storage, and a “cascade-in” resource model that draws on regional and national assets. However, these operations are still affected by access limitations and safety constraints, particularly in areas with fires or toxic inhalation hazards. While redundancy exists, the timing and effectiveness of these “cascade-in” resources remain uncertain in a large-scale disaster scenario. Until transportation system deficiencies are resolved through direct intervention, access limitations will continue to threaten post-earthquake spill response capabilities.

During an emergency, deployable and permanent emergency power generators are often used to support critical facilities while the electrical grid is offline. As part of ORS 468B.513 through 468B.525, regulated fuel facilities will need to consider and implement emergency power generation capabilities. Equipping fuel facilities with the systems to accept deployable emergency generators which are owned and maintained by the public sector is often mentioned as a potential avenue for fuel facilities to meet these safety requirements. This research does not support this as a viable strategy given the few number of present-day public sector deployable generators and the

extreme difficulties anticipated in quickly deploying these generators to support fuel facilities. Direct intervention could increase the viability of this strategy if additional deployable generators are acquired and stored in seismically resilient and accessible locations.

Situational awareness represents an additional area of concern. Communication disruptions and limited reconnaissance capacity in the immediate aftermath of an earthquake may delay accurate assessment of incidents, which in turn affects decision-making and resource allocation. While technologies such as drones are improving these capabilities, their availability is expected to be limited in the early stages following a major event.

These findings suggest that emergency response should be understood as constrained and delayed rather than consistently available. While response capabilities will play an important role in managing incidents, they are unlikely to provide timely or comprehensive coverage across all potential scenarios. Until mitigation of transportation assets occurs, fuel facilities should emphasize self-sufficiency and risk reduction in the absence of immediate external response.

Focus Area 4: Mitigation Needs Identification

Objective:

Identify "outside-the-fence" seismic mitigation needs in the CEI Hub and collect known mitigation strategies to improve infrastructure and emergency response capabilities.

Methods:

Mitigation needs identification began by synthesizing a list of known impact assumptions that will affect infrastructure and emergency response capabilities in the CEI Hub, which was reviewed by participants at the March 2026 Interagency Coordination meeting. These impact assumptions, available in Appendix 4, were used as a starting point to generate categories of "outside-the-fence" mitigation needs at the CEI Hub. “Outside-the-fence” refers, in this report, to mitigation opportunities which are not the responsibility of any one facility as they address infrastructure or response capabilities outside of a facility’s property boundaries (i.e., the “fence”).

Once these categories of mitigation needs were defined, any mitigation strategy that had been identified either via desk research or stakeholder engagement were connected to a mitigation need and associated impact assumption. For example, local bridge improvements were identified as a strategy to support a resilient transportation network. Once a strategy was identified, key dependencies were identified. For example, local bridge improvements are less effective without additional roadway improvements and robust debris clearance and roadway repair capabilities. Relevant

agencies for a given mitigation strategy were identified alongside potential secondary benefits.

As a final step, qualitative estimates for the difficulty of strategy implementation and potential impact (i.e., benefits to life safety and response operations) were posed by the authors. These difficulty and impact assumptions should be considered preliminary and require additional vetting by stakeholders. We strongly recommend continued outreach to engage public sector agencies, fuel facility owners and operators, and other experts to provide input. This outreach should result in adjustments to the estimated difficulty and impact of proposed mitigation strategies and will provide an opportunity to identify funding mechanisms and key partners.

Results:

The complete table of identified mitigation needs and potential strategies is available in Appendix 5, and a summary version of these results is in Table 2, below. A total of overarching 10 "outside-the-fence" mitigation needs were identified with 43 associated mitigation strategies. These "outside-the-fence" mitigation needs include the need for: a resilient transportation network, resilient firefighting water supplies, additional and resilient firefight capabilities, emergency power generation, increased situational awareness capabilities, additional debris management and road repair capabilities, post-earthquake fuel supplies, resilient health and medical capabilities, resilient alert and warning capabilities, and the mitigation of post-earthquake hazards that may impede response. Three examples of potential mitigation strategies are described after Table 2.

Table 2

Summary of Identified Mitigation Needs and Strategies.

Mitigation Need	Summary of Mitigation Strategies
Resilient Transportation Network	The most urgent transportation mitigation strategy involves the identification and reinforcement of evacuation routes for facility employees and local residents to support protective actions following an earthquake. Coordinated improvements to local bridges and roadways, bridges over the Willamette River (e.g., the Resilient Burnside Bridge Project), and improvements to regional emergency transportation routes are essential to support post-earthquake emergency response operations.

	Resilient airports in the region, in particular the PDX Resilient Runway Project, are critical to enable the deployment of regional and national emergency response capabilities to support operations at the CEI Hub.
Resilient Firefighting Water Supply	To ensure access to firefighting water supplies, a tiered mitigation approach is possible. In the near-term, high-volume deployable pumps are a feasible investment which could be utilized in other emergencies. Mid-range investments include reinforcing municipal water tanks (e.g., the Mayfair Tank) or facility-owned tanks for the storage of emergency water and installing hazard resilient pipes to ensure access to these tanks. In the long-term, system-wide improvements to the municipal water system and dedicated emergency hydrant systems would support firefighting at the CEI Hub with significant secondary benefits for other hazards and other post-earthquake incidents.
Resilient Firefighting Capabilities	Varied mitigation strategies are available to support firefighting capabilities at the CEI Hub. Straightforward mitigation strategies include: Regular tabletop exercises alongside spill response organizations which integrate seismic impact assumptions to prepare for response operations. Additional equipment acquisitions including monitor nozzles and hose connections for municipal reservoirs. And integrating ShakeAlert into PF&R systems to open fire bay doors when an earthquake is detected to ensure engines are available. There is also an overarching need to increase firefighting capabilities citywide to support response operations for the large volume of anticipated post-earthquake incidents.

Resilient Emergency Power Generation	Addressing emergency power generation capabilities is most directly accomplished through the installation of permanent emergency power generators at fuel facilities. Public agencies or fuel facilities could also acquire additional deployable emergency generators and place them in seismically resilient and accessible locations while facilities implement wiring systems to accept these generators. For a long-term solution, fuel facilities and public agencies could collaborate in the construction of a resilient microgrid which might be usable for other critical facilities and response operations.
Resilient Situational Awareness	The use of various instrumentation and monitoring technologies could support incident command decision making following an earthquake. Developing a LIDAR base map for pre-earthquake data would be fundamental to understanding post-earthquake damage including ground deformations. Permanent technologies include air quality monitors, seismic instrumentation, and visual surveillance technologies. Increased quantity of drones and drone operators could also support situational awareness for tracking petrochemical spills and fires.
Resilient Disaster Debris Management	To enable post-earthquake debris management, PBOT could establish a new maintenance yard for equipment on the west side of the Willamette River to alleviate the need for bridges across the river. This yard would have significant secondary benefits for west-side response operations. The existing PBOT maintenance yard on the east side of the river could either be relocated or protected through seismic mitigation to reduce the chance of bridge collapses damaging equipment and threatening personnel. Alongside the planned acquisition of contractors to address disaster debris management, pre-establishing debris management sites could hasten transportation response operations.
Resilient Fuel Supplies	Post-earthquake fuel shortages which threaten response operations could be alleviated through mitigation activities which enable the rapid continuity of operations for bulk fuel facilities, the geographic diversification of fuel facilities in the Portland region, and through the installation of emergency generators or equipment to enable access to fuel in local gas stations and other smaller fuel storage facilities.

Resilient Health and Medical Capabilities	Decontamination capabilities and medical capabilities for burn victims can be supported through structural improvements to the Legacy Good Samaritan hospital. Regional hospital improvements would be beneficial assuming the resilience of emergency transportation routes and medical transport capabilities. Uninterrupted power supplies and resilient water supplies to hospitals and local sites would enable facility operations and local decontamination operations.
Resilient Alert and Warning Capabilities	Improving mechanisms to warn community members of potentially dangerous conditions would protect life safety and support response operations. In particular, advancing the implementation of ShakeAlert and the installation of emergency alert systems (e.g., sirens and visual warning systems) would directly inform residents of dangerous conditions. Improving the resilience of cellular networks or advancing satellite technologies would enable continued communication with residents and within incident command following an earthquake.
Mitigate Post-earthquake Hazards	Varied mitigation strategies are needed to reduce the number and severity of post-earthquake hazards that may delay response operations. Mitigating stormwater and wastewater systems would protect co-located infrastructure assets and reduce the risk of flooding and sewage backups. Fires following earthquakes, including potential fires in Forest Park, and downed power lines, pose serious ignition risks at fuel facilities, risks which could be mitigated by installing fire protections (e.g., fire walls). Seismic mitigation of local industrial facilities including railyards that store hazardous substances such as toxic inhalation hazards would protect employees and residents while enabling response operations.

Mitigation Examples:

The mitigation strategies identified in this assessment vary considerably in scale, complexity, and implementation timeline. Some strategies could be implemented in the near term through operational changes or targeted investments, while others would require long-term infrastructure improvements involving multiple agencies and funding mechanisms. The examples below illustrate several potential pathways by which

mitigation needs could be addressed using a combination of shorter-term and longer-term approaches.

Example 1, Short-Term Community Protections:

Certain mitigation needs may be partially addressed through comparatively near-term operational improvements that strengthen both emergency response capabilities and community protective actions without requiring large infrastructure investments. For emergency responders and infrastructure managers, tabletop exercises and scenario-based discussions could improve understanding of anticipated post-earthquake conditions, refine assumptions regarding response operations, and identify gaps in coordination prior to an incident. These exercises may be particularly useful for helping to prioritize and plan mitigation investments.

For residents and employees in and around the CEI Hub, protective actions may be improved through a combination of evacuation planning and resilient alert and warning systems. Hardened evacuation routes could provide safer pathways away from hazardous areas, but additional planning is important as evacuations during certain incidents may place individuals at greater risk compared to sheltering in place if toxic inhalation hazards are present. Alert and warning systems, including emergency sirens and visual warning systems, may improve the ability to communicate protective action recommendations to community members. Together, these strategies may improve public safety and situational awareness while providing benefits for a broad range of incidents outside of earthquakes.

Example 2, Resilient Transportation Network:

Achieving a resilient transportation network would require a combination of major infrastructure investments and improvements to transportation response capabilities. At the regional scale, reinforcement of emergency transportation routes would improve the ability of personnel, equipment, and resources to enter and operate within the CEI Hub following an earthquake. Existing projects such as the Earthquake Ready Burnside Bridge project provide examples of infrastructure improvements intended to maintain critical river crossings following a major seismic event. Additional investments such as improved seismic resilience of regional airport infrastructure, including projects to mitigate the south runway at the Portland International Airport will improve the ability of regional and national resources to “cascade in” to the area. However, benefits from improved transportation routes may be undermined without addressing dependencies related to debris management and roadway restoration. Enhancing debris clearance and roadway repair capabilities, particularly through improvements to PBOT maintenance yards, may reduce these constraints and improve the functionality of the broader transportation system following an earthquake.

Example 3, Tiered Approach to Resilient Firefighting Water Supply:

Improving resilient access to firefighting water supplies could occur through a phased approach that begins with lower-cost and more rapidly deployable strategies

while larger infrastructure investments are pursued. Near-term efforts could include acquisition of large-volume deployable pump systems capable of drawing water directly from the Willamette River. Programs such as SPIRE provide a potential avenue for obtaining these capabilities, which could support not only earthquake response but also other emergency incidents requiring large water supplies. Intermediate strategies could include mitigating vulnerable water storage assets such as the Mayfair water tank and constructing dedicated hazard-resilient pipelines and hydrant systems within the CEI Hub. Longer-term approaches could involve investments in the resilience of Portland Water Bureau's backbone system, including hazard-resilient pipelines and improved system redundancy. While these larger investments may require substantial resources and long implementation timelines, they would also provide benefits extending well beyond the CEI Hub by improving water system resilience for broader community needs.

Mitigation Difficulty:

The mitigation strategies span a wide range of implementation difficulty based on our preliminary, qualitative assignments (See appendix 5). Many strategies fall within the "easy" to "medium" range and include deployable equipment, operational improvements, and smaller infrastructure development including emergency evacuation routes, ShakeAlert implementation, air monitoring systems, and communication upgrades. These strategies generally have fewer dependencies and may be more feasible to implement in the near-term.

In contrast, strategies categorized as "hard" or "very hard" are typically associated with infrastructure improvements that require significant capital investment, coordination across multiple agencies, and long implementation timelines. These include roadway and overpass improvements, resilient firefighting water systems, bridge retrofits, and regional emergency transportation route hardening. Several of the most impactful strategies, particularly those addressing regional transportation and water systems, fall into this category and face additional challenges related to funding, permitting, and prioritization within broader infrastructure programs.

Expected Impact:

Based on our preliminary estimates (See Appendix 5), a large share of the identified mitigation strategies are expected to have a high positive impact on life safety and the effectiveness of response and recovery operations. Strategies that improve transportation access, provide reliable firefighting water supply, and reduce post-earthquake hazards are notable in this regard. These strategies address core system constraints and often provide benefits that extend beyond the CEI Hub to support broader regional response and community safety. At the same time, several strategies, such as those related to situational awareness, health and medical response, and alert

and warning systems, require further assessment to determine their impact. In many cases, this reflects dependencies on other systems, such as transportation access or communication networks.

Interdependencies and System Constraints:

Many mitigation strategies are highly interdependent and are not effective as standalone actions. Transportation access is a recurring dependency across nearly all categories, affecting the ability to deploy firefighting equipment, deliver emergency power generators, conduct debris clearance, and transport personnel and patients. Water availability is a critical dependency for firefighting-related strategies and is closely tied to both infrastructure improvements and access constraints. Similarly, situational awareness and alert systems depend on functional communication pathways and established incident command structures to translate information into action. These dependencies indicate that coordinated implementation is necessary to realize the full benefit of many strategies.

Mutually Exclusive and Alternative Strategies:

Several mitigation needs include alternative strategies that address the same underlying risk through different approaches. This is most evident in categories such as firefighting water supply, where options range from large-scale infrastructure investments, such as resilient pipelines and dedicated hydrant systems, to more localized or deployable solutions, such as river pumps or on-site storage. Similar tradeoffs exist in transportation and emergency power strategies, where investments can be made at different scales and with varying levels of complexity. These alternatives reflect different assumptions about cost, implementation timeline, and governance, and suggest that multiple pathways exist to achieve similar resilience outcomes. In some cases, implementation of one strategy may reduce the need for another, while other mitigation needs may require a combination of strategies done in a stepwise approach.

Responsible Parties for Mitigation:

The implementation of mitigation strategies involves a wide range of public and private sector actors. Local agencies play central roles in transportation, water, and debris management strategies, while state and regional agencies are involved in larger infrastructure systems and coordination efforts. Most mitigation strategies require coordination across multiple agencies and organizations, and relatively few can be implemented by a single entity acting independently. This distributed responsibility reflects both the complexity of the systems involved and the shared benefits of many mitigation investments.

Experts noted that the majority of these mitigation strategies fall beyond the responsibility of fuel facilities in the CEI Hub, and that these facilities should not be solely or primarily responsible for covering mitigation costs. The rationale for this is threefold: the benefits of these strategies extend beyond fuel facilities to the broader community, the risks being addressed do not originate solely from fuel facility operations, and fuel facilities are already making significant investments to address site-specific risks through “inside-the-fence” mitigation activities. Add to this that certain “inside-the-fence” mitigation activities, especially ground improvements, may have protective benefits for infrastructure “outside-the-fence” by reducing ground deformation loads on nearby infrastructure such as pipelines and roadways. Overall, improving seismic resilience at the CEI Hub will depend on coordinated investments across interdependent systems, with a combination of near-term actions and long-term infrastructure improvements.

Funding Pathways and Secondary Benefits:

Identification of potential funding pathways for the identified mitigation strategies remains in the early stages and should receive continued investigation. Funding pathways include federal grant programs, state and local capital improvement programs (e.g., local improvement districts or bond measures), and public-private partnerships. Many of the strategies identified align with existing funding priorities related to infrastructure resilience, emergency preparedness, and environmental protection. In addition to reducing seismic risk, many mitigation strategies provide secondary benefits, including improved response capabilities for other hazards, enhanced business continuity, reduced risk from non-seismic events, and broader public safety and environmental benefits. These co-benefits may improve the feasibility of certain strategies to receive funding by aligning them with ongoing programs and opportunities.

Discussion:

The mitigation strategies identified in this assessment represent a wide range of potential approaches to improving seismic resilience in and around the CEI Hub. These strategies vary significantly in terms of cost, complexity, implementation timeline, and overall impact. In most cases, individual strategies are not standalone solutions but instead require multiple component actions and coordination across agencies to be effective.

Most strategies would require multiple component actions to complete, and their effectiveness is often limited by dependencies on other systems. For example, local roadway improvements could include improvements to portions or all of Highway 30, Front Ave, and connecting routes, but their effectiveness depends on bridge availability, debris clearance capabilities, and regional transportation system functionality. Similarly, strategies to improve firefighting water supply are dependent on both transportation

access and supporting equipment. These interdependencies suggest that individual mitigation strategies may provide limited benefit without coordinated implementation across systems.

There is a distinction between strategies that are feasible to implement in the near-term and those that require long-term investment. Smaller-scale or modular strategies, such as tabletop exercises and deployable equipment may provide incremental improvements in response capability and are more feasible to implement in the near-term. In contrast, strategies given the preliminary identification as “very hard” to implement (e.g., improvements to transportation networks or citywide water systems) require significant funding, coordination, and time to complete. While these strategies may provide substantial benefits, they require a much longer timeline and higher degrees of ongoing coordination.

In many cases, multiple strategies exist to address the same mitigation need. For example, access to resilient firefighting water supplies could be achieved through large-scale infrastructure investments or through more localized and deployable solutions. These alternatives reflect different assumptions about cost, timeline, and implementation complexity, and suggest that there is not a single pathway to achieving resilience for any given system.

In general, the mitigation strategies identified would require participation from a variety of public sector agencies and are most likely to be funded through federal grants, existing capital improvement funds, bond measures, and public-private partnership funding mechanisms such as local improvement districts. Most strategies involve distributed responsibility across multiple agencies and organizations, and implementation will depend on sustained coordination in addition to available funding.

Conclusion

This effort brought together a wide range of public and private sector stakeholders to develop a shared understanding of seismic readiness and mitigation needs at Oregon’s Critical Energy Infrastructure (CEI) Hub. Across four focus areas (i.e., roles and responsibilities, infrastructure seismic readiness, emergency response capabilities, and mitigation needs) this work established a common operating picture of how systems are expected to perform following a Cascadia Subduction Zone (CSZ) earthquake and identified key constraints that will shape response and recovery outcomes.

A central finding across all focus areas is that seismic risk at the CEI Hub is governed by facility-level conditions in tandem with the performance of interconnected infrastructure systems and the limitations these systems place on emergency response. Transportation access and firefighting water supplies emerged as the most significant infrastructure constraints. These systems are expected to experience widespread

disruption following a major earthquake, and their failure will limit the ability to deploy personnel, move equipment, and sustain operations. Perhaps most notably, the fuel facilities at the CEI Hub are integrated into nationwide spill response networks with capabilities sufficient for even the most catastrophic oil spills, but these capabilities will not be available in a timely fashion without significant investment in the local and regional transportation networks.

Emergency response capabilities demonstrate a mixed level of earthquake readiness. Spill response organizations and incident command structures are well developed and benefit from redundancy and scalable resource networks. However, many response capabilities, particularly firefighting, are highly dependent on infrastructure systems that are expected to fail. As a result, emergency response should be understood as constrained, delayed, and prioritized across competing incidents, rather than as consistently available.

The mitigation strategies identified in this report reflect these system constraints and provide a range of potential pathways to improve resilience. These strategies vary widely in cost, complexity, and implementation timeline, and in many cases are interdependent and require coordinated implementation across multiple agencies. A clear distinction exists between near-term strategies, such as deployable equipment and operational improvements, and long-term infrastructure investments, such as transportation and water system upgrades. Both will be necessary to improve overall resilience, but they operate on different timelines and within different funding and governance structures. It is critical that mitigation prioritization and planning begin now, utilizing incremental mitigation approaches whenever possible, so as to address these critical deficiencies to alleviate the threats they pose to fuel facilities.

Importantly, the majority of identified mitigation needs fall outside the responsibility of individual fuel facilities. While facilities are required to implement significant “inside-the-fence” mitigation measures under the FTSS program, their ability to achieve safe outcomes is constrained by external conditions that are not within their control. The benefits of many mitigation strategies extend beyond the CEI Hub to the broader community, and the risks they address are shared across multiple sectors. As a result, advancing these “outside-the-fence” mitigation strategies will require sustained coordination and investment across public agencies, private sector actors, and regional partners.

Our interagency coordination process represents an important step toward addressing these challenges. These convenings provided a forum for information sharing, alignment, and identification of cross-cutting issues, and they will be critical for refining assumptions, advancing mitigation strategies, and supporting implementation over time. Continued engagement will be necessary to validate findings, update information as conditions change, and build the partnerships required to improve seismic resilience at the CEI Hub.

Overall, improving resilience at the CEI Hub will depend on coordinated action across interdependent systems, with a combination of near-term investments and long-term infrastructure improvements. While significant challenges remain, the findings of this report provide a foundation for continued progress and a clearer understanding of the pathways available to reduce risk and support effective response and recovery at the CEI Hub following a major earthquake.

Next steps

Improving safety at the CEI Hub will require sustained efforts to address deficiencies in infrastructure systems and emergency response capabilities through implementation of “outside-the-fence” mitigation strategies. Public sector agencies and regional partners have an important role in identifying vulnerabilities within interconnected systems and advancing mitigation efforts that reduce barriers to response and recovery. Continued interagency coordination will be necessary to refine priorities, build alignment across organizations, and identify practical pathways for implementation. While many long-term infrastructure improvements will require significant investment and extended timelines, incremental actions should be pursued whenever possible to reduce risk and improve resilience as opportunities arise.

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Any findings, interpretations, or conclusions presented in this report are those of the authors and do not necessarily reflect the views or official positions of participating agencies or organizations.

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Appendix 1: Roles and Responsibilities Inventory

Agency	Permitting & Code Authority	Infrastructure Management	Emergency Response	Recovery & Environmental Cleanup	Jurisdiction Level
City of Portland					
Portland Bureau of Emergency Communications	N/A – Not a permitting or code-enforcing entity.	Manages and operates the regional 911 call center and related dispatch / communications systems.	Core responder; handles 911 call intake and dispatch for police, fire, medical, and HazMat incidents; critical role in alerting and coordination.	Not directly involved in cleanup but supports ongoing public safety dispatch operations and public notification systems during the recovery phase.	City
Portland Bureau of Emergency Management	N/A – Does not issue development or operational permits.	Operates the City's Emergency Coordination Center, Basic Earthquake Emergency Communication Nodes	Serves as the city's lead agency for emergency preparedness, coordination, and continuity; activates and manages the City Emergency Coordination Center (ECC); facilitates inter-agency coordination during large-scale events affecting the CEI Hub.	Coordinates damage assessments, disaster declarations, recovery planning, and intergovernmental recovery efforts (e.g., FEMA public assistance); supports equity and community resilience in recovery planning.	City
Portland Bureau of Environmental Services	Administers stormwater and sanitary sewer permits, erosion control permits, and environmental regulation.	BES has critical infrastructure in the CEI Hub area. Owns and operates stormwater and wastewater collection and treatment systems in the CEI Hub area.	Responds to sewer/stormwater overflows, pipeline breaks, and environmental discharges; coordinates with DEQ and PBEM.	Conducts infrastructure repairs, contamination assessments, and environmental remediation as needed for spills affecting city systems.	City

Portland Bureau of Permitting and Development	Issues building, mechanical, electrical, plumbing, and demolition permits; structural, seismic, and fire/life safety codes; administers plan review and inspections.	N/A – Does not own or operate public infrastructure.	Limited – post-event inspections for structural safety; supports damage assessment under Portland's emergency operations plan.	Yes – Inspects buildings post-disaster; determines habitability; manages reconstruction permits.	City
Portland Bureau of Planning and Sustainability	Develops Portland's zoning code and land use policy for the CEI Hub. BPS runs the Franchise and Utility Program, which regulates access to the public right-of-way through franchise agreements. BPS sets the Renewable Fuel Standard for fuel sold within city boundaries.	N/A – Does not own or operate infrastructure.	N/A – Not an operational or response agency. May support emergency planning.	N/A – No direct recovery or remediation role. May contribute to post-incident land use policy changes.	City
Portland Bureau of Technology Services	N/A – Does not issue external permits or enforce codes	Manages citywide technology infrastructure, including public safety communications, data centers, and citywide radio/fiber systems.	Supports public safety communications, emergency radio systems (800 MHz), and technology support for the City Emergency Coordination Center (ECC).	Restores and maintains IT services, communications infrastructure, and emergency technology systems post-disaster.	City
Portland Bureau of Transportation	Issues street use, utility, and right-of-way permits; enforces City Code; manages traffic signals, freight access,	Owns and maintains city streets, bridges (non-county), signals, signs, and traffic management	Manages road closures, detours, debris removal, and priority access for emergency vehicles; supports transportation	Leads or supports debris clearance, infrastructure damage assessment, and transportation system	City

	and curb use near CEI Hub.	systems within the CEI Hub	restoration under EOC operations.	recovery (signal repair, street restoration).	
Portland City Administrator's Office	N/A – Does not issue permits directly. May influence policy through oversight of bureaus.	Provides oversight of city assets through facilities management (e.g., city offices, ECC facility), but not infrastructure in the CEI Hub.	Provides executive coordination, policy direction, and resource prioritization during emergency response; ensures operational continuity across bureaus.	Coordinates administrative and financial functions, interbureau support, and recovery staffing or contracts needed for cleanup/recovery operations.	City
Portland Fire and Rescue	Enforces Portland Fire Code; reviews fire and life safety components of building plans; issues operational permits for flammable/hazardous materials.	Operates fire stations, emergency response equipment, and specialized units (e.g., HazMat teams).	First responder to fires, chemical releases, and rescue incidents; provides HazMat response within city limits.	Conducts decontamination and fire suppression; coordinates hand-off to DEQ or cleanup contractors for environmental recovery.	City
Portland Parks and Recreation	Issues permits for park use, events, and certain site access, but does not regulate industrial development.	Owns and maintains parks, trails, green spaces, and some natural areas, including along the Willamette River, including Forest Park adjacent to the CEI Hub.	May close facilities, assist with public information, or repurpose parks for emergency shelter or staging areas.	Responsible for clearing and restoring park infrastructure, if damaged, but not involved in CEI Hub facility recovery.	City
Portland Police Bureau	N/A - Does not issue permits	Operates police precincts and law enforcement facilities.	Provides public safety, evacuation enforcement, traffic control, and security coordination during	Assists with site security, traffic control, and reentry enforcement; not responsible for physical cleanup.	City

			emergencies near the CEI Hub.		
Portland Water Bureau	Reviews development plans for water service installation and fire flow; issues water service permits.	Owns and maintains city water supply and distribution infrastructure, including mains, hydrants, and pumps within and near the CEI Hub.	Provides emergency water service coordination, isolation of damaged lines, and support for firefighting; activates continuity plans for water delivery.	Assesses and repairs damaged water infrastructure; may deploy emergency water supply points or reroute water to critical facilities.	City
Multnomah County and Regional Public Agencies					
Multnomah County Emergency Management	N/A – Does not issue permits or regulate land use/building codes.	N/A – Does not own operational infrastructure.	Leads county-level coordination under the Emergency Operations Plan; supports Incident Command, resource coordination, and mutual aid for cities including Portland. MCEM is the County's Emergency Alerting Authority for IPAWS (Wireless Emergency Alerts and Emergency Alert System notification) and manages PublicAlerts, the County's opt-in community emergency notification system.	Facilitate damage assessments, public assistance processes, recovery planning, and community engagement for long-term recovery across unincorporated and incorporated areas.	County

Multnomah County Health Department	Enforces local environmental health codes; may regulate certain healthcare-related operations locally.	Operates county clinics and public health facilities, but does not own major hospitals.	Leads local public health emergency response, including shelter health, air quality alerts, mass prophylaxis, and community outreach during incidents.	Supports community health recovery, environmental exposure follow-up, and coordination with OHA, FEMA, and nonprofits for population health recovery.	County
Multnomah County Office of Sustainability	N/A – Develops policy and planning guidance, but does not issue permits or codes.	N/A – No ownership or operational role in infrastructure.	May support emergency communications or planning through climate resilience programs but not a direct responder.	Supports equity- and climate-informed recovery planning; may contribute to long-term resilience or adaptation strategies.	County
Multnomah County Sheriff's Office – River Patrol Unit	N/A – Does not issue permits.	N/A – Operates vessels and patrol assets, but no infrastructure ownership.	Provides marine law enforcement, search and rescue, and vessel traffic coordination on the Willamette River; supports incident containment and access control during waterborne emergencies or spills.	May assist with site security and monitoring, but not directly involved in cleanup operations.	County
Multnomah County Transportation Division	Issues transportation and utility permits for work in county roads and right-of-way outside the City of Portland; limited permitting in CEI Hub due to city jurisdiction.	Owns and maintains county roads and bridges, including several Willamette River bridges (Burnside, Morrison, Hawthorne, Broadway) used for access to and from the CEI Hub.	Responds to damage on county transportation assets; deploys barricades, signage, detours, and supports restoration of access during emergencies.	Leads bridge and road inspections, debris removal, and repairs for county-maintained assets; coordinates with FEMA and ODOT for disaster recovery efforts.	County

Metro	Manages the Urban Growth Boundary and regional land use planning policy; does not issue site-specific development permits, but influences zoning and regional policy.	Operates solid waste transfer stations, regional parks, and natural areas that may be impacted by CEI-related disruptions.	Coordinates regional data, planning resources, and continuity of regional services (e.g., waste systems); not a primary responder.	Assists with debris management planning, public information, and interjurisdictional coordination post-disaster.	Regional
Port of Portland	Issues site access, construction, and lease-based development permits for Port-owned property; coordinates with city and federal permitting bodies.	The Port of Portland does not own infrastructure in the CEI Hub. Some Port of Portland facilities are near the CEI hub, and the PDX Airport is the main recipient of aviation fuel from the CEI Hub.	Coordinates security, access, and facility operations during emergencies; may participate in Unified Command.	Conducts infrastructure repair and environmental remediation for Port-owned assets; oversees contractor recovery efforts.	Regional
Regional Disaster Preparedness Organization	N/A – Not a regulatory entity.	N/A – Does not own infrastructure.	Facilitates regional coordination and communication efforts.	Coordinates interagency recovery planning, mutual aid logistics, and regional resource prioritization for long-term restoration.	Regional
State of Oregon					
DEQ Air Quality Permits Program	Yes – Issues air contaminant discharge permits and Title V operating permits under the Clean Air Act; regulates industrial emissions at CEI Hub facilities.	N/A – Permits and monitors facilities but owns no infrastructure.	Limited – May provide technical air quality monitoring during or after events, especially fires or chemical releases	Yes – May require facilities to modify operations or apply for updated permits post-incident; ensures compliance with air regulations during recovery.	State

DEQ Cleanup Program	Oversees site remediation requirements and cleanup plans under state environmental statutes (ORS 465); reviews cleanup plans and approves institutional controls.	N/A – Regulates private facilities but does not own infrastructure.	May advise on environmental health risks but not a first responder; activates after acute hazard control is established.	Leads or oversees long-term remediation and site cleanup efforts; ensures compliance with cleanup standards and coordinates with EPA if on Superfund or joint sites.	State
DEQ Emergency Response / Contingency Planning	Reviews and approves oil spill contingency plans for facilities and vessels; enforces ORS 468B and OAR Chapter 340.	N/A – Regulates but does not own facilities or response assets.	Acts as the State On-Scene Coordinator (SOSC) during oil or hazardous material spills; participates in Unified Command with USCG and EPA.	Oversees environmental cleanup operations and ensures responsible party compliance with state and federal laws; may supervise Natural Resource Damage Assessment (NRDA) in coordination with federal agencies.	State
DEQ Fuel Tank Seismic Stability Program	Requires fuel terminal owners in the CEI Hub to assess seismic vulnerability and submit risk mitigation plans for approval.	N/A – Regulates private infrastructure but does not own or operate facilities.	Limited – Not an active responder during incidents, but seismic risk assessments may support pre-disaster planning.	Limited – May advise on post-earthquake environmental risks related to damaged fuel storage.	State
DEQ Water Quality Permits Program	Issues National Pollutant Discharge Elimination System and Water Pollution Control Facility permits; regulates stormwater and wastewater discharges.	N/A – Oversees compliance at private and municipal infrastructure but does not own or operate it.	Limited – Provides water quality assessments in response to spills or system failures.	Yes – Enforces water quality standards; may require emergency or revised discharge permits following incidents.	State

Department of Geology and Mineral Industries (DOGAMI)	Issues permits for surface mining and mineral resource development. Does not issue development or building permits but is responsible for creating many maps used by local municipalities for regulation.	Does not own physical infrastructure. DOGAMI helps with pre-disaster mitigation analysis of buildings and infrastructure and natural hazard mitigation plan updates.	Provides hazard mapping, landslide and earthquake risk data, and real-time geologic information during seismic or geohazard events. DOGAMI will collect data after events and distribute via a clearing house.	Supports post-disaster risk reassessment (e.g., aftershocks, landslides); contributes technical input to recovery planning.	State
Oregon Army National Guard	N/A – Not a regulatory agency.	N/A – Owns military facilities but not CEI-relevant infrastructure.	Provides logistical support, transport, communications, and security during major emergencies; activated by the Governor.	May support site security, debris movement, or specialized support; not a lead recovery agency.	State
Oregon Army National Guard - CBRN Enhanced Response Force Package	N/A	N/A	Provides specialized Chemical, Biological, Radiological, and Nuclear (CBRN) decontamination, search and extraction, and medical triage capabilities; deploys in large-scale hazmat or WMD scenarios.	Supports gross decontamination and hazard mitigation, but transitions site to civilian cleanup teams (e.g., DEQ, EPA) afterward.	State
Oregon Building Codes Division	Adopts and enforces statewide building, fire/life safety, mechanical, electrical, plumbing, and structural codes (including seismic	N/A – Regulates private and public construction but does not own infrastructure.	May support rapid building assessments and code flexibility guidance during a disaster; not a field response agency.	Guides reconstruction standards, code enforcement, and expedited permitting frameworks to support rebuilding.	State

	code provisions); local governments implement these codes under BCD oversight.				
Oregon Department of Energy	provides input on energy policy, seismic vulnerability, and fuel supply planning.	N/A – Regulates facilities but does not own energy infrastructure.	Supports ESF #12 (Energy); monitors statewide energy system status, provides fuel supply coordination, and advises on critical facility energy needs.	Coordinates fuel restoration, energy resilience planning, and public communication related to energy infrastructure recovery.	State
Oregon Department of Fish and Wildlife	Issues scientific take permits, consults on projects affecting state-listed species and habitats; may review land use changes or facility impacts under Goal 5 (natural resources) and other state regulations.	N/A – May manage hatcheries or wildlife areas but not industrial infrastructure.	Provides input on wildlife impacts and protection measures during response; coordinates with USFWS/NOAA.	Participate in natural resource damage assessments and guides state-level habitat restoration or fishery impact compensation.	State
Oregon Department of Transportation	Issues permits for access, utility placement, and oversize/overweight transport on state highways (e.g., US-30); regulates transportation infrastructure design standards. Oregon DOT participates in FRA's	Owns and maintains state roads including Highway 30, and bridges including the St Johns Bridge and the Fremont Bridge which all provide key access to the CEI Hub.	Deploys personnel for traffic management, detours, and debris clearance; supports access for emergency services.	Assesses and repairs state-owned roads/bridges; provides engineering and public works support; coordinates with FEMA on federal aid.	State

	State Rail Safety Participation Program that gives ODOT rail safety inspectors the ability to enforce federal railroad safety laws and hazmat regulations relating to railroad operations and rail shippers in Oregon.				
Oregon Governor's Office	N/A – No direct authority; influences through executive direction	N/A – Does not own/operate infrastructure	Yes – Declares emergencies, activates Guard, leads coordination	Yes – Directs strategy, requests federal aid, supports recovery efforts	State
Oregon Health Authority	Licenses healthcare facilities, EMS agencies, and drinking water systems; regulates environmental and occupational health under state law.	N/A – Does not own CEI-related infrastructure but oversees public health systems statewide.	Leads public health response at the state level (e.g., exposure monitoring, disease surveillance); activates Health and Medical Coordination Center (HMCC) and supports ESF #8 (Public Health and Medical Services).	Provides health advisories, contamination risk assessment, and recovery guidance; may coordinate post-event mental health or environmental health recovery programs	State
Oregon Office of Emergency Management	N/A – Does not issue permits or enforce building or environmental codes.	N/A – Does not own or operate infrastructure.	Serves as the lead state coordinating agency for disaster response and emergency management; activates the State Emergency Coordination Center (ECC); coordinates with counties, cities, tribes, and federal agencies	Leads the state-level disaster recovery framework, manages federal disaster declarations, and coordinates public assistance, individual assistance, and long-term recovery planning; liaises	State

			during multi-jurisdictional events.	with FEMA and other federal partners.	
Oregon Public Utility Commission	Regulates private utility providers (e.g., electric, natural gas, telecom) and their rates, safety standards, and service areas. Does not issue construction permits.	N/A – Does not own infrastructure but regulates those that do (e.g., PGE, NW Natural).	Coordinates with utilities on outage tracking, public safety shutoffs, and infrastructure restoration timelines.	Oversees utility restoration progress, policy compliance, and customer protection; may guide utility actions under state emergency declarations.	State
Oregon State Fire Marshal	Enforces Oregon Fire Code statewide; regulates bulk storage of flammable/combustible liquids; may review site plans for major facilities.	N/A – Does not own operational infrastructure.	Coordinates statewide HazMat response teams; may deploy Incident Management Teams (IMTs) for large-scale incidents; supports local fire agencies.	Coordinates emergency response phase; turns over site to DEQ or responsible party for environmental remediation.	State
Federal Government					
US Department of Transportation	While USDOT sets national transportation safety and operational regulations (e.g., FMCSA, FAA), it does not directly issue facility-level permits at the CEI Hub. Local/state agencies typically manage permitting.	N/A – Does not own infrastructure in the CEI Hub.	Coordinates through Emergency Support Function (ESF) #1 – Transportation under the National Response Framework. May provide logistics support, routing, and infrastructure damage assessment via regional FHWA offices or modal agencies.	May assist in restoring transportation systems and coordinating federal resources for re-establishing movement of goods/fuel. Direct cleanup oversight is outside USDOT's mission.	Federal

USDOT Pipeline and Hazardous Materials Safety Administration	Regulates the design, construction, operation, and maintenance of hazardous liquid pipelines and bulk hazardous materials transportation. Oversees operator compliance.	N/A – Regulates but does not own or operate pipeline infrastructure.	Investigates pipeline incidents; may deploy investigators to CEI Hub if a regulated pipeline is involved. Supports Unified Command with technical expertise.	Ensures operators conduct proper remediation and repair of pipelines after incidents; may issue corrective action orders or fines; coordinates with EPA and state DEQ for environmental impacts.	Federal
US Army Corps of Engineers	Issues Section 404 permits (Clean Water Act) for discharges of fill material into waters and wetlands, and Section 10 permits (Rivers and Harbors Act) for structures in navigable waters (e.g., docks, pilings in the Willamette River).	Maintains navigable waterways and related infrastructure (e.g., dredging channels). May oversee locks or levees if present nearby.	Assists with infrastructure assessments, emergency engineering, and coordination under Emergency Support Function (ESF) #3 – Public Works and Engineering.	Provides technical assistance and engineering expertise; may lead debris removal or restoration of navigation channels; supports FEMA with infrastructure recovery.	Federal
Federal Energy Regulatory Commission	Issues certificates for interstate natural gas pipelines and liquefied natural gas (LNG) facilities. Does not regulate most facilities in the CEI Hub, which are intrastate and not FERC-jurisdictional.	N/A – Regulates energy infrastructure operators but owns no infrastructure.	N/A – Not an emergency responder.	May assess and approve repairs to regulated facilities under its jurisdiction (e.g., LNG terminals, interstate pipelines), but is unlikely to be active at the CEI Hub unless specific facilities are under FERC control.	Federal
Federal Railroad Administration	Enforces federal safety standards for railroads, including track, equipment, and hazardous materials	N/A – Regulates infrastructure owned by private railroads (e.g., Union Pacific, BNSF)	Investigates rail incidents, especially involving hazardous materials; provides safety oversight; may	Coordinates with railroad companies to ensure safe and compliant cleanup; has authority to enforce	Federal

	transport (49 CFR); does not issue local land-use permits.	but does not own assets itself.	deploy incident response teams.	remediation but does not conduct it directly.	
Bonneville Power Administration	N/A – Regulates its own infrastructure under federal authority but does not issue permits externally.	Owns and operates high-voltage electric transmission lines and substations across Oregon, including through CEI-adjacent corridors.	Responds to damage affecting bulk power transmission; coordinates power restoration with utilities and emergency managers.	Conducts infrastructure repairs, grid stabilization, and long-term restoration planning.	Federal
Federal Emergency Management Agency - Region X	N/A – Does not issue operational or development permits; provides guidance and funding incentives for state and local code adoption through hazard mitigation programs.	N/A – Does not own or operate infrastructure in Oregon.	Deploys Incident Management Assistance Teams (IMATs) and coordinates federal resources under the National Response Framework; activates the Regional Response Coordination Center (RRCC) and Emergency Support Functions (ESFs) to support state and local response to disasters.	Administers Public Assistance (PA) and Individual Assistance (IA) programs under the Stafford Act; funds and oversees debris removal, infrastructure repair, and long-term recovery in partnership with ODEM and local governments.	Federal
US Coast Guard - Sector Columbia River	Regulates marine facilities, vessel safety, and spill contingency planning under the Clean Water Act and Oil Pollution Act (OPA 90); issues Facility	N/A – Regulates maritime facilities but does not own them.	Acts as Federal On-Scene Coordinator (FOSC) for oil spills in navigable waters; leads Unified Command for maritime or riverfront hazardous incidents.	Oversees responsible party actions, contracts cleanup if needed, and works with EPA and DEQ on recovery and NRDA processes.	Federal

	Response Plan approvals.		Responsible for maintaining the Northwest's Area Contingency Plan for oil spills in major port waterways.		
US Environmental Protection Agency	Issues or delegates Clean Air Act, Clean Water Act, and RCRA permits; co-leads environmental compliance with DEQ. Regulate facility oil spill prevention plans (SPCC Plans), Facility Response Plans, and cleanup and contingency planning under the Clean Water Act and Oil Pollution Act (OPA 90)	N/A – Does not own infrastructure; regulates private/public facilities.	EPA acts as FOSC and federal lead for inland spills threatening or discharging into Waters of the U.S. (WOTUS); deploys response teams, oversees contractor cleanups, and provides environmental monitoring.	EPA will oversee responsible party actions and can contract for clean up if necessary, but only for inland waterways. USCG is lead for coastal waterways, which include the Willamette River up to the falls in Oregon city. The USCG has a spill response lead for the Columbia River up to Bonneville Dam. Leads or supports hazardous materials remediation and oversees long-term recovery from environmental disasters. EPA has federal oversight of the Portland Harbor Superfund Site.	Federal
US Department of the Interior	Through sub-agencies like USFWS and BLM, DOI oversees natural resource regulations, endangered species reviews, and cultural resource compliance	May own land or facilities nearby (e.g., wildlife refuges), but generally not involved in CEI Hub infrastructure.	Provides natural resource expertise, tribal coordination, and cultural site protection during response actions.	Coordinates or participates in Natural Resource Damage Assessments (NRDA); may require restoration of affected ecosystems or habitats.	Federal

	(e.g., NEPA, NHPA Section 106), but does not issue infrastructure or industrial permits directly.				
US Fish and Wildlife Services	Issues permits under the Endangered Species Act, Migratory Bird Treaty Act, and Bald and Golden Eagle Protection Act; conducts consultations for habitat impacts.	May manage nearby wildlife refuges, but not CEI infrastructure.	Advises Unified Command on impacts to wildlife and habitat; may assist in wildlife protection during oil or chemical spills.	Participates in NRDA teams; may require restoration of affected habitats or populations.	Federal
National Oceanic and Atmospheric Administration	Through NOAA Fisheries, issues ESA Section 7 consultations and permits for actions affecting listed marine/estuarine species (e.g., salmon, sturgeon).	N/A – Does not own infrastructure near CEI Hub.	Provides Scientific Support Coordinators (SSCs) for oil spills; delivers trajectory modeling, weather forecasting, and resource impact projections.	Participates in NRDA, supports marine and aquatic resource recovery, and may guide habitat restoration planning.	Federal
US Geological Survey	N/A – Research and data agency only; does not regulate or permit activities.	Maintains earthquake monitoring, stream gauges, and geologic mapping infrastructure, including in CEI-adjacent areas.	Provides hazard data and real-time monitoring (e.g., ShakeMaps, river level alerts); informs situational awareness.	May contribute geologic or hydrologic analysis for recovery planning but not directly involved in cleanup operations.	Federal
Tribal Nations					
Regional Tribal Nations	N/A – May participate in federal or state consultation processes (e.g., NHPA, NEPA)	N/A – No direct infrastructure ownership in CEI Hub area	May participate in Unified Command or consult on resource protection	Participate in natural resource damage assessments and long-	Tribal

				term restoration of treaty resources and habitats	
Other Regional Stakeholders					
Northwest Natural Gas	N/A – Subject to state and federal regulations but does not issue permits to third parties.	Owns and operates natural gas pipelines, pressure regulators, and metering stations in and near the CEI Hub.	Responds to gas leaks, pipeline damage, and pressure issues; may isolate segments during major incidents.	Repairs infrastructure, restores service, and conducts post-incident safety checks after emergencies or seismic events.	Private
Portland General Electric	N/A – Operates under regulatory frameworks (PUC, FERC, etc.) but does not issue permits.	Owns and operates distribution substations, transmission lines, poles, and underground electric systems within the CEI Hub.	Responds to power outages, downed lines, equipment failures; prioritizes restoration to critical facilities.	Conducts damage assessments, equipment replacement, and phased power restoration during recovery.	Private
Portland & Western Railroad	N/A – Regulated by federal rail safety agencies; does not issue permits	Owns and operates rail lines and yards within the regional freight network including the line north of the BNSF drawbridge, including the spurs into CEI fuel terminals on that end.	Responds to rail incidents involving PNWR assets; coordinates with local responders	Responsible for cleanup and restoration following incidents involving its rail operations	Private
Union Pacific Railroad	N/A – Owns right-of-way and property; regulates internal operations but does not issue permits externally.	Union Pacific operates through the CEI Hub on trackage rights but does not perform any industry work.	Responds to derailments, hazmat spills, and blocked crossings; works with FRA and local responders.	Leads track and equipment repair, site remediation, and rail service restoration in coordination with emergency agencies.	Private

BNSF Railway	N/A – Controls its own ROW and facilities; does not issue external permits.	Owns and operates rail lines and infrastructure connected to the CEI Hub including the main line and yard that services the CEI fuel terminals to the south of the bridge.	Responds to incidents involving trains, hazardous materials, or infrastructure damage; coordinates with federal and local partners.	Responsible for site repair and hazmat mitigation involving BNSF assets. Works with contractors and environmental regulators.	Private
Private Telecommunications Providers	N/A – Operate under local franchise agreements or state/federal licenses; do not issue permits themselves.	Own and operate fiber optic lines, communication towers, switching stations, and customer equipment.	Respond to service outages and damaged lines; not emergency responders but provide support for 911 and public safety systems.	Repair and restore critical communications infrastructure; prioritize emergency and government services.	Private
Private Port Facility Owners	Subject to federal, state, and local permitting; no authority to issue permits	Owns and operates marine terminals, docks, access roads, and possibly fuel-handling infrastructure in the CEI Hub.	Must respond to incidents on-site; coordinate with USCG, DEQ, and local agencies	Responsible party for site cleanup, environmental compliance, and facility restoration	Private
Local Hospitals and EMT Services	N/A – Hospitals and EMS providers do not issue permits; they are licensed by state and federal health agencies.	Own and operate medical facilities, emergency departments, ambulance fleets, and related infrastructure.	Core role in mass casualty response, triage, treatment, and medical transport; may activate surge capacity and disaster medical protocols.	Provide ongoing care for impacted populations and may assist in public health recovery, but do not lead physical cleanup or environmental restoration.	Regional
Clean Rivers Cooperative	N/A – The Cooperative itself does not issue permits.	N/A – The Cooperative does not own infrastructure	Maintains a shared spill response capability and coordinates oil spill drills, training, and equipment readiness for its members;	Provides initial containment and cleanup capabilities through contracted OSROs (e.g., NRC, MSRC); supports post-incident	Private

			participates in Unified Command through member representation; serves as a Primary Response Contractor for fuel terminal spills.	environmental reporting and resource coordination for members.	
Maritime Fire and Safety Association	N/A – Not a regulatory or permitting entity	Owns and operates four very high frequency radio towers that provide radio coverage to all marine vessels in the Columbia and Willamette Rivers with dedicated channels for emergency response.	Provides maritime vessel firefighting response equipment to local jurisdictions and coordinates marine fire support and training with members	Supports cleanup logistics and resource coordination for shipboard fires	Private
Marine Spill Response Corporation	N/A – Not a regulatory or permitting entity	N/A – The MSRC does not own infrastructure	Maintains spill response capabilities for large oil spills.		Private
Fuel Facility Owners and Operators	N/A – Not a regulatory or permitting entity	Owns and operates bulk fuel facilities in the CEI Hub. Responsible for new construction and retrofits to bring facilities into compliance with the DEQ FTSS program.	Must respond to incidents on-site; coordinate with USCG, DEQ, and local agencies	Responsible party for site cleanup, environmental compliance, and facility restoration	Private

Appendix 2: Infrastructure Seismic Readiness Assessment

Infrastructure Asset	Description	Location	Type	Managing Org.	Post-Earthquake Status	Replacement Timeline	Retrofit Cost Range	Source(s)
Willamette River Maritime Corridor	Dredged to maintain depth of ~ 40 ft	Mile Markers 4-9	River	US Army Corps of Engineers / US Coast Guard	Damage at the coast will interfere with access via the Columbia River. Local bridge damage or collapses, pipeline failures, and electrical transmission line damage along the length of these corridors is expected to create significant debris barriers that will block maritime access. Liquefaction will fill the dredged channel.	N/A	N/A	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013)
Columbia River Maritime Corridor	Dredged to maintain depth of ~ 40 ft	Mile Markers 0-101	River	US Army Corps of Engineers / US Coast Guard	Damage at the coast will interfere with access via the Columbia River. Local bridge damage or collapses, pipeline failures, and electrical transmission line damage along the length of these corridors is expected to create significant debris barriers that will block maritime access. Liquefaction will fill the dredged channel.	N/A	N/A	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013)
NW Front Ave	Two lane road with some sidewalks	From Kittridge Ave to NW 112th	Roadway	Portland Bureau of Transportation	Extensive damage corresponds to liquefaction hazard, no seismically resilient roadways in CEI Hub at present.	No replacement planned without external funding.	Uncertain	City of Portland Bureau of Transportation seismic study (2020)

								PBOT Seismic Readiness Interview, Nov 20th, 2025
Retaining walls	Retaining walls across the road from NuStar and BP.	Primarily along HWY 30 from NW Bridge Ave to NW 107th Ave.	Retaining Wall	Portland Bureau of Transportation	Expect damage, retaining wall failures may result in lane closures on Hwy 30.	No replacement planned without external funding.	Uncertain	City of Portland Bureau of Transportation seismic study (2020) PBOT Seismic Readiness Interview, Nov 20th, 2025
NW Kittridge Avenue Overpass	Four lane overpass over BNSF Railyard	45.5564, -122.7322	Bridge	Portland Bureau of Transportation	Not seismically resilient, expect unsafe or impassable conditions following an earthquake.	No replacement planned without external funding.	Tens of millions	City of Portland Bureau of Transportation seismic study (2020) PBOT Seismic Readiness Interview, Nov 20th, 2025
NW 26th Avenue Overpass	Two lane overpass over P.T.R.R tracks	45.545964, -122.703508	Bridge	Portland Bureau of Transportation	Not seismically resilient, expect unsafe or impassable conditions following an earthquake.	No replacement planned without external funding.	High tens of millions	City of Portland Bureau of Transportation seismic study (2020) PBOT Seismic Readiness Interview, Nov

								20th, 2025
Highway 30 (NW St Helens Rd)	Four lane highway with sidewalks, includes some large stormwater culverts	Mile markers ~4-9	Roadway	Oregon Department of Transportation	Damage on ramps will be the main obstacle for accessing Hwy 30 after an earthquake. There are also sections with high potential for rockfall and significant risks for landslides and debris flow that would make Hwy 30 impassible in some sections.	No replacement planned without external funding.	Uncertain	Curran Mohney (ODOT Engineering Geology Program Leader) and colleagues written communication Nov 24, 2025
Fremont Bridge	Two decks each with four lanes, carrying the I-405 and Hwy 30 between downtown and North Portland	45.5377, -122.6837	Bridge	Oregon Department of Transportation	From a planning level vulnerability assessment, the bridge complex including Fremont Bridge and approach structures on either side of the Willamette River are defined as seismically vulnerable. Major repairs and/or partial bridge replacement may be necessary before traffic resumes over these structures.	No replacement planned without external funding.	Uncertain	Curran Mohney (ODOT Engineering Geology Program Leader) and colleagues written communication Nov 24, 2026
St. Johns Bridge	One deck of 4 lanes carrying Hwy 30 from the Linnton neighborhood to the Cathedral Park neighborhood.	8600 NW Bridge Ave, Portland, OR 97203	Bridge	Oregon Department of Transportation	From a planning level assessment, the St. John's Bridge is seismically vulnerable. Major repairs or total bridge replacement may be necessary before opening this bridge to traffic.	No replacement planned without external funding.	Uncertain	Curran Mohney (ODOT Engineering Geology Program Leader) and colleagues written communication Nov 24, 2027

Water Mains - Hwy 30	12", 16", and 24" water mains, connects to St Johns river crossing 30" pipe	Highway 30, begins in downtown and continues north to N Linnton Water Tank	Water	Portland Water Bureau	System will be inoperable due to local and system wide breaks - extended downtimes	~2040-2050	Tens of millions for localized pipe retrofits, but the retrofit is ineffective without full system operability	City of Portland Water Bureau, Water System Seismic Study (2017) PWB Seismic Readiness Interview with Dave Evonuk and David O'Longaigh, Nov 13, 2025
Water Mains - Front Ave	12", 16", and 24" water mains	NW Front Ave	Water	Portland Water Bureau	System will be inoperable due to local and system wide breaks - extended downtimes	~2040-2050	Tens of millions for localized pipe retrofits, but the retrofit is ineffective without full system operability	City of Portland Water Bureau, Water System Seismic Study (2017) PWB Seismic Readiness Interview with Dave Evonuk and David O'Longaigh, Nov 13, 2025
Washington Park Reservoir	13 million gallons in 3 buried reservoirs	240 SW Wright Ave, Portland, OR 97205	Water	Portland Water Bureau	Constructed in 2020, expected to be resilient	n/a	n/a	City of Portland Water Bureau, Water System Seismic Study (2017) PWB Seismic Readiness Interview with Dave Evonuk and

								David O'Longaigh, Nov 13, 2025
Mayfair Water Tank	5.5 million gallon at grade tank	NW Alexandra Ave, Portland, OR 97210	Water	Portland Water Bureau	1960s, poor overall condition, no specific seismic vulnerability	~2035-2040	Replacement cost included with local pipe replacement estimates from 2017 study	City of Portland Water Bureau, Water System Seismic Study (2017) PWB Seismic Readiness Interview with Dave Evonuk and David O'Longaigh, Nov 13, 2025
N. Linnton Water Tank	~.5 million gallon at grade tank	NW 2nd St, Portland, OR 97231	Water	Portland Water Bureau	1960s, seismic anchoring deficiencies	~2046-2050	Anchoring of tank estimated at hundreds of thousands	City of Portland Water Bureau, Water System Seismic Study (2017) PWB Seismic Readiness Interview with Dave Evonuk and David O'Longaigh, Nov 13, 2025

Sanitation Mains	30" and 60" sewer mains terminate at the Guilds Lake pump station.	60" Flowing north along Front Ave to Guilds Lake, and 30" flowing south along HWY 30 beginning in Linnton and terminating at the Guilds Lake pump station.	Wastewater	Portland Bureau of Environmental Services	Systemwide failures expected, but local segments may continue to function as islands. Emergency outfalls may continue to operate to the river.	Expect an additional 50-75 years of life with regular maintenance, no seismic retrofits planned ahead of schedule.	Seismic liners are more affordable (millions to low tens of millions) with hazard resilient pipe in the tens of millions.	City of Portland Bureau of Environmental Services Seismic Assessment BES Seismic Readiness Interview with Nishant Parulekar, Nov 20th, 2025
Stormwater Lines and Outfalls	Stormwater lines with pre-treatment and outfalls to the river, some parcel-specific stormwater outfalls.	Throughout CEI Hub	Stormwater	Portland Bureau of Environmental Services	Pipelines vulnerable to liquefaction, outfalls likely to be operable after an earthquake.	Expect an additional 50-75 years of life with regular maintenance, no seismic retrofits planned ahead of schedule.	Seismic liners are more affordable (millions to low tens of millions) with hazard resilient pipe in the tens of millions.	City of Portland Bureau of Environmental Services Seismic Assessment BES Seismic Readiness Interview with Nishant Parulekar, Nov 20th, 2025

Guilds Lake Wastewater Pump Station	Large pump station transferring wastewater across the BNSF railroad bridge to the treatment plant on the East side	7110 NW Front Ave, Portland, OR 97210	Wastewater	Portland Bureau of Environmental Services	Expect significant damage due to liquefaction, which may lead to large sewer backups at site.	~20-30 years of expected life	Uncertain	City of Portland Bureau of Environmental Services Seismic Assessment BES Seismic Readiness Interview with Nishant Parulekar, Nov 20th, 2025
Harborton Substation	High voltage transmission substation	45.6142, -122.7974	Electricity	Portland General Electric	New construction, expected to be seismically resilient	n/a	n/a	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013) OPUC seismic readiness interview with Heidi Caswell, Nov 14th, 2025
Substation	Distribution Substation	Adjacent to Siltronics, 45.5769, -122.7574	Electricity	Portland General Electric	Expect damage, systemwide outages expected for 1-3 months	ORP sets goal for 2060 to return to service within 3-12 weeks	Uncertain	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013) OPUC seismic readiness interview with Heidi Caswell, Nov 14th, 2025

Substation	Distribution Substation	NW 63rd Avenue, 45.5663, -122.7505	Electricity	Portland General Electric	Expect damage, systemwide outages expected for 1-3 months	ORP sets goal for 2060 to return to service within 3-12 weeks	Uncertain	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013) OPUC seismic readiness interview with Heidi Caswell, Nov 14th, 2025
High Voltage Transmission Lines	Includes large transmission towers on each side of the Willamette River	Northern most River Crossing Lines	Electricity	Portland General Electric	Expect damage, systemwide outages expected for 1-3 months	ORP sets goal for 2060 to return to service within 3-12 weeks	Uncertain	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013) OPUC seismic readiness interview with Heidi Caswell, Nov 14th, 2025
High Voltage Transmission Lines	Includes large transmission towers on each side of the Willamette River	Middle and South River Crossing Lines	Electricity	Bonneville Power Administration	Expect damage, systemwide outages expected for 1-3 months	ORP sets goal for 2060 to return to service within 3-12 weeks	Uncertain	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013) OPUC seismic readiness interview with Heidi Caswell, Nov 14th, 2025

High Voltage Transmission Lines	Includes large transmission towers on each side of the Willamette River	Parallel to Hwy 30	Electricity	Portland General Electric	Expect damage, systemwide outages expected for 1-3 months	ORP sets goal for 2060 to return to service within 3-12 weeks	Uncertain	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013) OPUC seismic readiness interview with Heidi Caswell, Nov 14th, 2025
Electrical Distribution Corridors	Power poles and local transmission lines throughout the CEI Hub	Throughout CEI Hub	Electricity	Portland General Electric	Expect damage, systemwide outages expected for 1-3 months	ORP sets goal for 2060 to return to service within 3-12 weeks	Uncertain	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013) OPUC seismic readiness interview with Heidi Caswell, Nov 14th, 2025
MFSA Marine Vessel VHF Radio System	MFSA co-owns a series of microwave radio towers along the Columbia River providing complete geographic coverage for maritime vessels to access stable very high	Four locations on the Columbia River	Communications	Maritime Fire and Safety Association	Each microwave tower is an independent facility built to risk category IV at the time of construction, each is equipped with emergency power. Overall this network has a high degree of redundancy between the microwave towers and backup radio systems.	Uncertain	Uncertain	MFSA Seismic Readiness Interview with Carl Obermeier, Jan 20th 2026

	frequency channels, including dedicated channels for emergency response. MFSA and CRC are rolling out JPL interoperability systems that will provide digital interoperability between radios and streamline connections across radio types in different geographies.							
Cell Stations & Towers	Privately owned utility assets with uncertain geographic locations	Throughout CEI Hub	Communications	Multiple Private Entities	Expect damage, systemwide outages expected for 1-3 months	ORP sets goal for 2060 to return to service within 0-2 weeks	Uncertain	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013) OPUC seismic readiness interview with Heidi Caswell, Nov 14th, 2025

Fiber Optic Corridors	Privately owned utility assets with uncertain geographic locations	Throughout CEI Hub	Communications	Multiple Private Entities	Expect damage, systemwide outages expected for 1-3 months	ORP sets goal for 2060 to return to service within 0-2 weeks	Uncertain	Oregon Natural Hazard Mitigation Plan (2025), Oregon Resilience Plan (2013) OPUC seismic readiness interview with Heidi Caswell, Nov 14th, 2025
BNSF Railway Bridge 5.1	An 1,800 foot, 2 track railway bridge with a vertical lift that spans the Willamette River.	45.575161, -122.749429	Rail Bridge	BNSF	Constructed in 1908 with modifications in 1989 this bridge was not constructed to contemporary seismic codes and utilizes unreinforced masonry piers and is expected to experience damage.	Uncertain	Uncertain	Matt McDowell, Oregon Department of Transportation, written communication March 4th and March 30th.
Northern rail lines	Rail lines north of BNSF Railway Bridge 5.1, including the spurs into CEI Hub fuel terminals on that end.	Throughout CEI Hub	Rail Lines	Portland & Wester	Rail lines on highly liquefiable soil are vulnerable, and repairs may be required to resume regular operations.	Uncertain	Uncertain	Matt McDowell, Oregon Department of Transportation, written communication March 4th and March 30th.
Central and southern rail lines	Main rail line that services CEI Hub facilities to the south of the BNSF rail bridge.	Throughout CEI Hub	Rail Lines	BNSF	Rail lines on highly liquefiable soil are vulnerable, and repairs may be required to resume regular operations.	Uncertain	Uncertain	Matt McDowell, Oregon Department of Transportation, written communication March 4th and

								March 30th.
Willbridge Railyard	Main railyard that services CEI Hub facilities.	5414 NW Doane Ave, Portland, OR 97210	Railyard	BNSF	Rail lines on highly liquefiable soil are vulnerable, and repairs may be required to resume regular operations. Quantities of petrochemicals and extremely hazardous substances are contained in railcars in this yard and could pose a post-earthquake hazard if they are damaged by earthquake impacts. These railcars are robust and unlikely to overturn during an earthquake but could be damaged.	Uncertain	Uncertain	Matt McDowell, Oregon Department of Transportation, written communication March 4th and March 30th. Association of American Railroads. Field Guide to Tank Cars (2022)
Lake Railyard	Railyard south of the CEI Hub.	3930 NW Yeon Ave, Portland, OR 97210	Railyard	BNSF, Union Pacific	Rail lines on highly liquefiable soil are vulnerable, and repairs may be required to resume regular operations. Quantities of petrochemicals and extremely hazardous substances are contained in railcars in this yard and could pose a post-earthquake hazard if they are damaged by earthquake impacts. These railcars are robust and unlikely to overturn during an earthquake but could be	Uncertain	Uncertain	Matt McDowell, Oregon Department of Transportation, written communication March 4th and March 30th. Association of American Railroads. Field Guide to Tank Cars (2022)

					damaged.			
Small culvert at Kinder Morgan terminal	Small stormwater culvert	N.W. BALBOA AVE. AT N.W. CULEBRA AVE.	Bridge	Portland Bureau of Transportation	Classified as vulnerable	No replacement planned without external funding.	Millions of dollars	City of Portland Bureau of Transportation seismic study (2020) PBOT Seismic Readiness Interview, Nov 20th, 2025

Appendix 3: Emergency Response Seismic Readiness Assessment:

	Description	Location	Type	Managing Org.	Post-Earthquake Status	Source(s)
Clean Rivers Cooperative Oil Spill Response Network	The CRC maintains the largest collection of spill response equipment on the Columbia River. CRC assets and their location can be viewed at: wrrl.us. Within the CEI Hub area, CRC maintains ~32,000 feet of containment boom, five oil skimming vessels, a wildlife response unit, and ~57,000 barrels per day (BPD) of oil recovery capacity. Response personnel for CRC are provided by contractors, with Republic Services contracted for response in the CEI Hub area. CRC estimates a total recovery rate of ~145,000 barrels per day and over 240,000 barrels of storage capacity for recovered oil with their equipment, and have in place contracts and partnerships to bring in additional resources for spills exceeding these capabilities.	5882 NW St Helens Rd, Portland, OR 97210	Spill Response	Clean Rivers Cooperative	CRC anticipates minimal direct damage to response equipment and has significant redundancy in response equipment across their network. Personnel safety risks and transportation system failures may delay access to certain areas and slow widespread resource deployment, but CRC is confident in their ability to enact spill response in any condition.	CRC Seismic Readiness Interview with Vanessa Green, Feb 4th, 2026

Marine Spill Response Corporation	MSRC maintains rapid spill response capabilities in the Willamette and Columbia rivers with a huge network of national resources (wrrl.us & MSRC equipment list) prepared to cascade in to address oil spills of any size. Equipment include spill containment and cleanup capabilities, airborne deployment of oil dispersants, environmental and habitat rehabilitation, and command and control support including situational awareness via drones and deployable communication infrastructure. MSRC in-house staff are trained to stand up response operations and oversee contract organizations for sometimes tens of thousands of contractors depending on the size of the spill.	Resources distributed across the west coast and nationwide	Spill Response	Marine Spill Response Corporation	MSRC anticipates minimal direct damage to response equipment and has significant redundancy in response equipment across their network. Personnel safety risks and transportation system failures may delay access to certain areas and slow widespread resource deployment, but MSRC is confident in their ability to enact spill response in any condition.	MSRC Seismic Readiness Interview with Chris Stadiem, April 1st, 2026

PF&R Firefighting Response Capabilities	PF&R maintains a mixture of apparatus including 31 fire stations, 31 fire engines, 10 fire trucks, 2 squad trucks, a command trailer, and 4 fireboats. Most apparatus take four crew, and apparatus are cross-staffed, meaning they require crew to be transferred off fire engines to operate ancillary apparatus, leaving the engine uncrewed and unusable during response. Fire engines, monitor nozzles (high volume water cannons), and firetrucks with extendable ladders are important equipment for an oil fire response. PF&R fireboats have some booms (500 ft on each boat, 1,000ft in warehouse) and absorbents for oil spills. The fireboats primary purpose is responding to shipboard fires, but fireboats can provide ship to shore water (high volume, low pressure requiring fire engines for relay), which is most useful for response operations within ~1,000 feet of the river. A single large tank fire would bring in 8-10 fire stations, ~1/3rd of PF&R's resources. Larger fires would activate mutual aid agreements and begin cascading regional and state resources for response. PF&R is able to request additional	PF&R relies on systemwide resources to respond to fires at the CEI Hub, local fire stations responding on their own would be unsafe and insufficient for oil tank fires.	First Response	Portland Fire and Rescue	Immediately post-earthquake PF&R resources are likely to be allocated to incidents with greater threats to life safety compared to potential oil fires at the CEI Hub. PF&R capabilities will take direct damage from earthquake impacts including damage to fire station bay doors that may impede fire engine deployment and extreme damage to the PF&R logistics center and the firefighting foam concentrate stored there. Transportation system failures will severely impede PF&R's access to the CEI Hub and their ability to muster resources for large coordinated response operations. Water system failures will present immediate barriers to firefighting operations citywide. Fuel system failures will quickly result in a fuel shortage for response equipment and hamper firefighting.	PF&R Seismic Readiness Interview with Steve Bregman, Tom Walsh, and Bryan Profit, February 5th, 2026 https://fire.fandom.com/wiki/Portland_Fire_and_Rescue_(Oregon)

	firefighting resources through the Oregon Fire Mutual Aid System (OFMAS) which is managed by the Oregon State Fire Marshal. OFMAS is primarily designed to support wildfire response operations and depends on the availability of resources and regional transportation routes to deploy assets.				Other extremely hazardous substances stored in the CEI Hub are likely to cause access hazards or may divert response resources for higher priority incidents.	

Regional Firefighting Foam Concentrate Supplies	PF&R maintains one dedicated foam apparatus that is cross-staffed. There are ~1,000-1,500 gallons of foam concentrate in the PF&R logistics warehouse and a few hundred more gallons in other PF&R locations. Beyond this capacity PF&R relies on mutual aid agreements and other regional resources totalling a few thousand more gallons of firefighting foam concentrate. Foam concentrate is used at a ratio of 1% foam to water, and all concentrate must be mustered in a single location prior to beginning oil fire firefighting operations.	Multiple locations in and around the CEI Hub and region.	Firefighting supplies	Multiple, including Portland Fire and Rescue	More assessment required. Some foam concentrate storage locations may remain accessible after an earthquake, others have known seismic vulnerabilities that may impede access or damage foam concentrate supplies. Multiple regional incidents likely to overburden regional foam supplies. Damage to transportation systems will make it challenging to muster the foam necessary for a large response.	PF&R Seismic Readiness Interview with Steve Bregman, Tom Walsh, and Bryan Profit, February 5th, 2026
State Hazmat Teams' Response Capabilities	State hazmat teams play a lead role in determining threats to the public and helping to control and mitigate hazmat spills while protecting the life safety of response personnel. These hazmat teams are specialized for hazmat rapid hazard assessments, hazmat incident command, and have PPE equipment to conduct direct response in some incidents. State hazmat teams depend on other emergency responders for a significant portion of response including alert and warning, evacuations, etc.	PF&R: Fire Station 7, 1500 S.E. 122nd Ave Team #9: Tualatin Valley Fire and Rescue Team #3: Gresham, Station 72	First Response	Multiple, including Portland Fire and Rescue	Same as PF&R firefighting response capabilities, see above.	PF&R Seismic Readiness Interview with Steve Bregman, Tom Walsh, and Bryan Profit, February 5th, 2026

CRC & MFSA Command and Control Facilities	CRC has four incident managers on staff ready to respond to an emergency. CRC's primary location in Portland can act as an Emergency Coordination Center, and CRC has one large mobile command trailer in Portland, and MFSA has a command trailer in Kelso, WA. These command trailers are equipped with mobile radio repeaters and temporary radio transmitters and receivers.	5882 NW St Helens Rd, Portland, OR 97210	Command and Control	Maritime Fire and Safety Association & Clean Rivers Cooperative	Uncertain seismic vulnerability for CRC main facility. Mobile command trailers are likely to be resilient to earthquake shaking if stored away from potential hazards.	CRC Seismic Readiness Interview with Vanessa Green, Feb 4th 2026 MFSA Seismic Readiness Interview with Carl Obermeier, Jan 20th 2026
Oregon DEQ Emergency Response Program	The DEQ is the state level agency with overall responsibility for cleaning up oil and hazardous material spills in Oregon, with DEQ personnel acting as the State On Scene Coordinator during spill response. The DEQ coordinates the emergency response alongside the USCG and EPA to ensure effective response and cleanup operations. DEQ provides oversight and regular drills for CEI Hub facilities' Oil Spill Contingency Plans. During an emergency, DEQ staff lead the Environmental Planning Unit which determines the sampling plan for	Personnel are distributed statewide using remote work capabilities.	Command and Control	Oregon Department of Environmental Quality	DEQ personnel are encouraged to be two-weeks ready but may be unable to participate in response due to personal needs. Extensive damage to the DEQ headquarters will present challenges for mustering response personnel ability to participate in incident command. Damage to transportation infrastructure will impede personnel deployment to	Scott Smith, Oregon DEQ, Verbal Communication, March 31st 2026

	environmental testing the responsible party must implement. DEQ staff can also contribute as public information officers, liaison officers, and safety officers. DEQ is responsible for public communication, not including public-safety information, using traditional media channels. Information includes information on the impacted areas, anticipated distribution of toxic materials, etc.				incidents. Widespread damage to communication infrastructure systems are likely to interfere with participation in incident command and with public communication capabilities.	
ODOE Fuel Action Plan	ODOE is the fuels lead for ESF-12 (Energy) in the State Emergency Operations Plan and will coordinate with private, nonprofit, state, federal, and tribal partners to identify and meet fuel-related needs when fuel supply disruptions occur.	Remote; ODOE office, 550 Capitol St. NE, Salem, OR 97301; or State Emergency Coordination Center, 3930 Fairview Industrial Drive SE, Salem, OR 97302	Command and Control	Oregon Department of Energy	Damage to power, transportation and fuel systems are anticipated to cause significant fuel shortages statewide. Incident responses at the CEI Hub may not receive priority fuel allocations compared to other incidents with greater threats to life safety. Damage to Oregon administrative and legislative buildings may delay the operations of the State's emergency support functions. Widespread power and	Traci Naile, Oregon Department of Energy, Written Communication, February 23rd 2026

					transportation infrastructure failures may interfere with ODOE personnel participating in emergency response and will pose challenges for fuel deployment. Communication and power system outages will pose challenges for ODOE's coordination with private entities and local jurisdictions to determine fuel allocation needs.	
PBOT Maintenance Yard	PBOT's debris clearance capabilities begin with initial damage assessments and electrical safety checks prior to the deployment of clearance equipment. PBOT maintains a fleet of debris clearance equipment including dump trucks, backhoes, excavators, loaders, cranes, and street sweepers. PBOT has newly established contractors for debris monitoring and debris management who will bring in regional and national resources to support debris clearance after a major incident. Large disaster debris sites are not pre-arranged and will be determined at the time of an incident. For major emergency bridge and roadway repairs, PBOT relies on	PBOT Stanton Yard and Albina Yard on North Kerby underneath Fremont bridge abutment	Transportation Response, Road Clearance, and Debris Management	Portland Bureau of Transportation	The Fremont Bridge abutment situated above the PBOT maintenance yards is a collapse hazard that threatens extensive damage to debris clearance equipment. Other transportation infrastructure failures and secondary seismic hazards pose potential barriers to accessing equipment following an earthquake and may delay the deployment of these capabilities. Remaining capability deployment will be prioritized by citywide incident command who will prioritize the maximum benefits to life	Corey Maciulewicz, Cameron Glasgow, PBOT, written communication Feb 3rd, 2026

	external contractors. For a seismic event these contracts are not pre-established and will rely on emergency procurement protocols.				safety, which may supersede incident response at the CEI Hub.	
ODOT Bridge Inspections	ODOT is responsible for rapid damage assessments to bridges crossing the Willamette near the CEI Hub, including the Fremont and St. John's bridges. ODOT Bridge Maintenance personnel begin with a Level I inspection, which is a rapid examination of whether the bridge is damaged, and whether it should be closed based on observable damage, applying a degree of caution. For bridges not closed by Level I inspection, ODOT Bridge Engineering Section staff (Certified Bridge Inspection Team Leaders and Licensed Civil/Structural Engineers) perform Level II inspection which investigates the bridge's capacity and recommends weight limits, lane restrictions, or closure if warranted. ODOT Bridge Engineering Section staff also perform Level III inspection which is more in-depth & analytical, and is required to remove restrictions or closures	A portion of ODOT Bridge Section staff is assigned in the Portland metro area, and significant backup is available from the Salem area.	Transportation Response, Road Clearance, and Debris Management	Oregon Department of Transportation	Bridge inspections will be a high priority. Delays to inspections may arise from transportation access issues and post-earthquake threats to life safety.	Ray Bottenberg, ODOT, written communication, March 23rd, 2026

	established in Level I or Level II.					
ODOT Maintenance Crews	ODOT maintains maintenance crews in the region including a small team in North Portland with a debris clearance capacity estimated between 50 to 200 cubic yards per shift. ODOT maintains other maintenance crews in Portland as well as a Region 2 crew that could be deployed to the CEI Hub depending on incident priorities	1100 N Columbia BlvdPortland, OR 97217	Transportation Response, Road Clearance, and Debris Management	Oregon Department of Transportation	Damage to bridges across the Willamette may delay the availability of response crews, and personnel will be deployed depending on local damage conditions and regional incident priorities.	Ray Bottenberg, ODOT, written communication, March 23rd, 2026
Multnomah County Transportation Division Maintenance Yard	Multnomah County maintains some transportation emergency response equipment in their maintenance yard in SE Portland that would be available to respond at the CEI Hub via mutual aid agreements.	1620 SE 190th Ave, Portland, OR 97233	Transportation Response, Road Clearance, and Debris Management	Multnomah County Transportation Division	Transportation system outages will delay the deployment of response equipment, and equipment may be allocated to higher priority incidents compared to the CEI Hub. Access issues may cause significant delays to damage assessments for major bridges.	Richard Higgins, MCEM, written communication, Feb 23rd, 2026

Legacy Good Samaritan Medical Center	Decontamination Capabilities: One plumbed decontamination shower in the Emergency Department. Mobile decontamination equipment available on site (tent, water heater, generator, suits, PAPRs, etc.). Fire Related Injury Response: Critical care services are provided on site. Transfer to Legacy Oregon Burn Center at Emanuel Medical Center for specialized burn care if infrastructure and transport resources are available.	1015 NW 22nd Ave, Portland, OR 97210	Healthcare	Legacy Health	Depending on the strength of the earthquake and availability of utilities, primarily water. On-site generator capability will provide power to all Life Safety infrastructure in excess of 96 hours before requiring refueling.	Robin Holm (OHA) with input from Legacy and Multnomah County EMS Administration, written communication February 19th, 2026
Healthcare facilities - general	Regional healthcare preparedness and response is coordinated through a 6-county health care coalition (HCC). Members consist of public and private sector healthcare facilities plus local, state, and federal partners that plan, train, and exercise together in support of regional healthcare delivery during emergencies. Regional healthcare response coordination is facilitated by HCC staff and supported by the Oregon Health Authority. All acute care hospitals have emergency operations plans outlining alternate care site locations, staffing procedures, backup communications systems, decontamination capabilities, and	Oregon Healthcare Preparedness Region 1 includes Multnomah, Clackamas, Washington, Clatsop, Columbia, and Tillamook Counties	Healthcare	Multiple by facility, health care coalition managed by the Oregon Health Authority	Bridge collapse, liquefaction, and water inundation will cause an islanding effect across the region. Fire, EMS, healthcare facilities and medical personnel in the immediate areas will need to work together to care for the injured and sick. The ability for healthcare facilities to remain operational is dependent on the availability of utilities, primarily clean water. Hospitals have generators with enough fuel for up to 96 hours. Evacuated hospitals will set up alternate care sites to care for	Robin Holm (OHA) with input from Legacy and Multnomah County EMS Administration, written communication February 19th, 2027

	critical supplies that can support ongoing operations. Clinics and other outpatient providers participate in HCC efforts and are working to prepare for earthquakes and other hazards.				patients. Hospitals, EMS, and other healthcare facilities only have a few days' worth of supplies on hand, limiting their ability to treat patients until roads can be opened and supplies can be acquired. Clinical staff will either operate at their clinic location or send staff to support hospitals. Medical Reserve Corps volunteers will deploy to support public health and healthcare operations.	
Emergency Medical Services (EMS) capabilities	The CEI Hub is located entirely within Multnomah County's single Ambulance Service Area. 911 Emergency Ambulances for the County's single Ambulance Service Area are currently provided through a franchise agreement assigning exclusive rights and responsibility to American Medical Response Northwest (AMR). This agreement goes through Sept 1, 2028. The Ambulance provider has the ability to request mutual aid resources to neighboring counties, and non-traditional surge capacity is authorized to be performed by Fire First Response Agencies based on agency policies, capacity, and capabilities. The Medical First Response agencies are also the	Resources are provided by the Ambulance franchisee, and the resources operate in a system status management process, which means they are spread across the County and not located at fixed locations. All 911 medical	Ambulance, Emergency Medical Transportation	Multnomah County Health Department, Emergency Medical Services Program, and American Medical Response Northwest	Transportation system failures are going to be the largest impediment to any response post-earthquake. Ambulances are distributed across the entire county not based at stations, they are likely to be trapped or stuck based on where they are at the time of the incident, transportation of sick or injured will face the same logistical challenge based on the severity of the earthquake, location of the vehicles, and the impact to the transportation infrastructure.	Robin Holm (OHA) with input from Legacy and Multnomah County EMS Administration, written communication February 19th, 2028

	only and primary fire responders. In addition, the Ambulance coverage west of the hub is provided by Scappoose Fire in Columbia County with access by Highway 30. The HUB is also located entirely in the City of Portland with Portland Fire providing all 911 medical first response to the location.	responses are dispatched by Portland's Bureau of Emergency Communications.				

Emergency Alert and Warning Systems	Multnomah County and the City of Portland co-manage PublicAlerts, an opt-in community emergency notification system that sends emergency notifications to residents via SMS, voice call, and email. Multnomah County and the City of Portland share authority to send Wireless Emergency Alerts (SMS texts to any device connected to a cellular network) and Emergency Alert System (TV and radio broadcast) notifications via FEMA's Integrated Public Alert and Warning System (IPAWS). PublicAlerts and IPAWS notifications have English template messages for sheltering in place and evacuation HAZMAT scenarios. These messages are translated into Arabic, Chinese, Japanese, Lao, Romanian, Russian, Somali, Spanish, Ukrainian, and Vietnamese for opt-in contacts who selected those language preferences during registration. For IPAWS notifications, the system currently only supports English and Spanish (without accents or special characters). As a last resort communication system, Multnomah County and the City of Portland can broadcast Emergency Alert System notifications via a Sage ENDEC device located at PBEM's	Distributed citywide and depends in-part on private utility systems.	Alert and Warning Systems	City of Portland (BOEC 911 Dispatch, PBEM, PPB, and PF&R) and Multnomah County	The alert and warning capabilities of both PublicAlerts and IPAWS will be hampered by earthquake impacts to communication infrastructure. Although PublicAlerts and IPAWS messages are treated with priority on cellular networks, if the networks are disrupted by damage from an earthquake, messages may be delayed or limited in their geographic distribution. Emergency Alert System messages rely on radio and broadcast television networks to operate. Significant outages are anticipated after a large earthquake that may interfere with the ability of these systems to reach a broad audience.	Richard Higgins, MCEM, written communication, Feb 23rd, 2026

	Emergency Operations Center that relies on the PBS tower on Mt. Tabor being operational and on radio and TV stations being able to transmit the message.					
ShakeAlert	ShakeAlert is an earthquake early warning system managed by the US Geological Survey. Individuals can opt-in to receive notification of the imminent arrival of earthquake shaking (~15-60 second warning), and Android and iOS phones have built-in early warning notification. ShakeAlert can be integrated into operational systems to automatically trigger safety procedures when an earthquake is detected.	Virtual software dependent on seismographs along the west coast.	Alert and Warning Systems	USGS	Designed to provide notification of impending earthquakes. Monitors assumed to be seismically resilient. Notifications for aftershocks may be impeded by damage to telecommunication systems.	https://ohaz.uoregon.edu/shakealert/

Basic Earthquake Emergency Communication Nodes (BEECNs)	BEECNs are temporary radio communications sites staffed by at least two volunteers after a major earthquake that takes down phone lines. BEECNs serve as important communication channels among responders, serving as a potential muster location, and public communication efforts including damage reporting and requesting emergency assistance when phones are down.	NW-1 BEECN: Linnton Community Center Parking Lot NW-3 BEECN: Chapman Elementary School Field	Alert and Warning Systems	Portland Bureau of Emergency Management	Designed and located to be functional after a major earthquake event.	https://www.portland.gov/pbem/about-beecn
US Army Corps of Engineers	USACE maintains dredging and debris clearance equipment locally to restore maritime channels after an earthquake. If local equipment is damaged or unavailable, nationwide resources will be brought in from unaffected districts. USACE can provide deployable emergency power generators under FEMA mission assignments. Generators are likely to come from outside of the Portland Region. USACE may have subject matter experts able to support incident response depending on expertise needs. USACE does not have firefighting or spill response capabilities for non-USACE facilities.	N/A, nationwide network of resources.	Mixed capabilities	US Army Corps of Engineers	Direct seismic damage to dredging vessels and other vessels to help with debris clearance and maritime channel surveying may undermine local capabilities to clear the maritime channel. Transportation system failures and tsunami damage at the mouth of the Columbia River may delay nationwide equipment from mustering for response. Deployable emergency power generators coming from outside the Portland region would be delayed due to infrastructure failures and would be prioritized for life-safety hazards that may supersede an incident at the	Mark McKay, USACE, written communication February 10th, 2026

					CEI Hub.	
Oregon Department of Emergency Management (OEM)	OEM personnel do not play a direct role in emergency response operations for an oil spill or petrochemical fire at the CEI Hub, instead OEM plays a support role working to fulfill resource requests from City and County officials to provide specialized personnel and equipment. OEM relies on multiple programs to make resources available for allocation to an incident. In Oregon, the SPIRE program is the state's primary grant program to assist localities in purchasing emergency response equipment, which are then listed in a database and can be made available to other localities for incident response if the equipment is not currently in use. SPIRE equipment includes a few dozen mobile emergency generators, fuel transportation equipment, drones with	N/A, statewide and nationwide networks of resources	Command and Control	Oregon Department of Emergency Management	After a Cascadia subduction zone earthquake multiple competing incidents will reduce resources available for response at the CEI Hub, and damage to the regional transportation networks will interfere with resource distribution for assets deploying to the CEI Hub.	Peter Lundgren and Althea Rizzo, verbal communication, April 24th, 2026

	thermal cameras, and other miscellaneous response equipment. If response equipment is not available via Oregon-owned assets, OEM can request resources from other states through the Emergency Management Assistance Compact (EMAC) program. EMAC is a nationwide mutual aid system through which Oregon can request any form of specialized response equipment and personnel who will deploy from their home state to assist in an incident.					
Oregon National Guard, CERFP response package	The Oregon CERFP is composed of 208 members of the Oregon National Guard equipped with Level C PPE. Those 208 members are broken down into the following sections; Command and Control (19), Search and Extraction (50), Decontamination (75), Medical (47), Fatality Search and Recovery Team (11), and Communications (6). Their health and medical capabilities focus on medical triage, patient stabilization, patient treatment, and patient tracking. Their goal is to stabilize casualties, coordinate transportation to definitive care, and prepare casualties for medical transportation. Oregon's CERFP maintains various pieces of monitoring equipment that assess all hazards on the CBRN	Mission equipment is staged in Portland at the Portland Air National Guard Base and at Camp Withycombe in Clackamas	Health and Medical	Oregon National Guard	The CERFP unit anticipates delayed response time for incidents in Portland following a Cascadia earthquake due to damage to the transportation network. In particular, airfields are used to muster equipment and personnel for response and are anticipated to sustain damage, which will delay Oregon's assets from mustering and will also delay alternative teams from adjacent states to deploy. Oregon's CERFP unit is deployed according to orders from the Governor and Department of War. This means that other potential	Captain Daniel Gates, Oregon National Guard, Written Communication, April 9th, 2026

	spectrum. Their Command and Control team uses those readings to establish our exclusion zones. The CERFP unit comes prepared to sustain operations for 72 hours, after which time they depend on the Oregon Department of War to provide sustaining logistical support.				hazardous materials incidents in the earthquake impact area may supersede the CEI Hub in priority.	
US Coast Guard (USCG)	The USCG acts as the federal on scene coordinator for oil spills to waterways. They will establish incident command alongside state and local on-scene coordinators. To support incident command, the USCG maintains a command center to field initial notification from the responsible party and to begin calling in response assets. The USCG maintains some mutual aid agreements to utilize other organizations' incident command posts either as backup locations or auxiliary locations to support incident command. Additionally, the Marine Transportation System Recovery Unit is a situational awareness unit that provides an ongoing picture of maritime operations and port operability within an incident area and can provide guidance to incident command on priority actions for response and recovery. In terms of direct response capabilities, following a major earthquake the USCG	Some resources are maintained in the Portland metro region. Significant capabilities along the Oregon Coast and nationwide.	Command and Control	US Coast Guard	Direct seismic damage may affect USCG facilities in the Portland metro region. Tsunami impacts on the Oregon Coast threaten USCG assets and will interfere with maritime access to the Columbia River. Regional transportation network outages are expected to delay additional response equipment from accessing the CEI Hub area in the immediate aftermath of a Cascadia earthquake.	Jim Merten, USCG, verbal communication, April 9th, 2026

	will begin cascading resources from around the nation to support response operations. This includes maritime salvage contractors who will begin clearing debris from the waterways in coordination with the USACE. The USGS also maintains a variety of spill response subcontractors as well as a CBRN strike team on the West Coast who are equipped with Level A PPE and air quality monitors designed to respond to releases of extremely hazardous substances.					
US Environmental Protection Agency	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete
Federal Emergency Management Agency	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete	Incomplete

Appendix 4: Impact Assumptions for Post-Earthquake Response

Purpose:

A safe and effective response to a post-earthquake fuel spill requires awareness of the post-earthquake context and practice implementing backup technologies and strategies. This document summarizes this post-earthquake context for a worst-case earthquake scenario, conceptualized here as a full rupture of the CSZ fault. These impact assumptions are based on estimated vulnerability of public infrastructure and emergency response capabilities and should not be assumed to be comprehensive of the situation following an earthquake.

This document does not provide guidance on the size of fuel spills that should be exercised. The standard three-year exercise cycles ranging from small, medium, to large spill scenarios remains reasonable. Following the implementation of seismic risk mitigation plans, fuel facilities in the CEI Hub will be expected to meet the maximum allowable uncontained spill (MAUS) of one barrel from their facilities. However, residual risks remain including the potential for secondary hazards that could lead to partial or total spills from one or more fuel tanks on a given facility, and which may cause additional damage to secondary containment systems. For example, if a full CSZ rupture occurs during a hundred-year flood event, liquefaction damage will increase substantially, ground improvements may fail, and seismically reinforced fuel systems may experience extensive damage.

The Cascadia Subduction Zone (CSZ) has an earthquake event roughly every 250 years, with the most recent event at a Magnitude 9 occurring in January of 1700. It is common for the CSZ to produce smaller earthquakes (partial ruptures) ranging from magnitudes 7.5 to 8.5. Compared to a full rupture, a partial CSZ rupture will cause less damage over a smaller geographic impact area. These partial ruptures as well as local crustal fault earthquakes (extreme localized impact) could be used to inform alternative planning scenarios. For example, a local crustal earthquake could be catastrophic for Portland and lead to fuel spills at the CEI Hub but is expected to leave regional response resources largely operational.

Impact Assumptions for a Worst-Case CSZ Earthquake

Expect a 15-30 second warning from ShakeAlert. How do you spend this time?

Utilities and Transportation Infrastructure:

- Widespread transportation infrastructure failures are expected to challenge external response resources from mustering in sufficient quantities.
    - Bridges are deemed unsafe prior to rapid damage assessment and multiple bridge failures are expected to create geographic islands.
- Municipal water supplies are not expected to be available for firefighting or decontamination operations at the CEI Hub immediately after an earthquake.
- Wastewater and stormwater systems are likely to be damaged and may pose additional hazards including sewage backups and pipe collapses.
- Widespread damage to the electrical sector is expected to make grid electricity unavailable for weeks or months.
- Communication infrastructure including community alert and warning systems likely to be down or overburdened following an earthquake.

Emergency Response:

- Local spill response resources are significant but may be delayed in accessing spills at the CEI Hub due to transportation outages and secondary hazards, and spill response capabilities may be overburdened without access to broader regional and national resources.
- Public sector firefighting capabilities will be delayed and will not be able to muster in sufficient quantities for immediate operations at the CEI Hub.
- Regional firefighting foam concentrate supplies are likely to be damaged, inaccessible, and insufficient for large response operations at the CEI Hub.
- Command and control capabilities in the region have significant redundancy and may be generally resilient to seismic events.
    - Fuel facilities and spill responders should expect to prioritize radio communications with public sector responders.
- Community air quality monitoring efforts will be delayed or unavailable at CEI Hub due to transportation access issues and may be prioritized for higher life-safety risk incidents compared to the CEI Hub.
- Alert and warning capabilities will be hampered by earthquake impacts to communication infrastructure and may have limited geographic range.
- There are minimal known sources for deployable emergency generators within the Portland area that will be available to fuel facilities after an earthquake.
- Secondary hazards including hazardous materials releases (e.g., toxic inhalation hazards) may threaten employees and response personnel, limiting access for response operations.
- Debris management and road clearance operations will prioritize regional emergency transportation routes but will take days to weeks for significant clearing operations depending on the location.
- Fuel supplies for emergency response will be insufficient following an earthquake and will challenge extended response and cleanup operations.
- Health and medical response capabilities including decontamination nearby the CEI Hub will be significantly overburdened following an earthquake.
    - The Legacy Good Samaritan Medical Center is the closest hospital but it may have reduced capacity from damage and infrastructure outages.
    - Medical services on the east side of the Willamette should be considered unavailable at the CEI Hub due to expected bridge failures.
    - Regular emergency medical transportation services will be unavailable following an earthquake due to transportation access issues.

Appendix 5: Mitigation Needs Identification

Mitigation Need:	Impact Assumption:	Potential Mitigation Strategies: Blue boxes are used to indicate options that may be mutually exclusive.	Mitigation Strategy Primary Dependencies	Difficulty: Based on planning level, cost estimates were available. Key: Easy, Med, Hard, Very Hard	Positive Impact Assumed potential benefits to life safety and support to response and recovery operations at the CEI Hub. Key: Low, Med, High, Not Assessed	Potential Parties for Mitigation	Emergency Support Function(s)	Secondary Benefits
Resilient Transportation Network	Liquefaction and ground failures likely to cause major deformations on Highway 30, Front Ave, and connecting roadways	Local Roadway Improvements	May be ineffective without local bridge improvements	Hard	High	ODOT, PBOT	ESF 1	Improved business continuity following an earthquake. Contributes to regional ETRs
Resilient Transportation Network	Liquefaction and ground failures likely to cause major deformations on Highway 30, Front Ave,	Hardened evacuation route for employees and residents	Resilient air monitoring, alert and warning systems, and reduced toxic inhalation hazard risks	Easy	High	ODOT, PBOT, MultCo	ESF 1	Community and employee protections for all hazards

	and connecting roadways		are essential to ensure evacuations don't place people in more danger than sheltering in place.					
Resilient Transportation Network	Co-seismic landslides of the Portland Hills adjacent to Highway 30 may lead to partial or total road closures.	Retaining wall improvements / Landslide Mitigation	Ineffective without additional local transportation system improvements	Med	Med	ODOT	ESF 1	Landslide protection during storms, floods, etc.
Resilient Transportation Network	PBOT owned Kittridge Ave overpass and NW 26th Ave overpass cross rail features. Both are expected to be damaged and impassable after an earthquake.	Local overpass improvements	Depends on resilient roadways or robust debris clearance and road repair capabilities to ensure availability following an earthquake.	Hard	High	PBOT	ESF 1	Contributes to regional ETRs
Resilient Transportation Network	The closest river crossings for fuel deliveries are expected to be	Willamette River Bridge improvements	Depends on resilient roadways or robust debris clearance and road repair	Very Hard	High	ODOT, MultCo	ESF 1	Significant potential benefits for citywide response operations,

	damaged and unusable.		capabilities to ensure availability following an earthquake.					community safety, and continuity of operations
Resilient Transportation Network	State and Regional Emergency Transportation Routes have known seismic vulnerabilities that will delay regional resources.	Regional Emergency Transportation Route hardening	Route hardening will not be cost effective in all locations and significant debris clearance and road repair capabilities will be required.	Very Hard	High	PBOT, ODOT, MultCo	ESF 1	Regional ETRs will be vital for cascading in regional and national resources for response and recovery
Resilient Transportation Network	Damage to airports in impacted areas will interfere with the deployment of emergency response assets including oil spill response capabilities.	Improve resilience of airports and runways such as the PDX Resilient Runway project.	Less effective without additional local transportation system improvements	Hard	High	ODOT, Port of Portland	ESF 1	Resilient runways and airports will provide immense benefits to emergency response and recovery following an earthquake.
Resilient Firefighting Water Supply	A significant earthquake is expected to cut-off the CEI Hub from	Replace municipal pipelines to water source(s). For	CEI Hub branch depends on river crossings and resilient	Very Hard	High	Portland Water Bureau	ESF 3, ESF 4	A resilient municipal water system of this scale has significant

	municipal water for weeks or months.	example, reinforce the Mayfair Tank and replace pipelines with hazard resilient pipe	pipe to water supply.					benefits to the public.
Resilient Firefighting Water Supply	A significant earthquake is expected to cut-off the CEI Hub from municipal water for weeks or months.	Deployable river pump systems (e.g., floating firefighting pumps)	Requires safe access to the river following an earthquake. Depends on resilient transportation access for firefighting equipment	Med	Med	Fuel Facilities, PF&R	ESF 3, ESF 4	Backup firefighting water for incident response at the CEI Hub for all other hazards
Resilient Firefighting Water Supply	A significant earthquake is expected to cut-off the CEI Hub from municipal water for weeks or months.	Seismically resilient water tanks	Depends on resilient transportation access for firefighting equipment	Med	Med	Fuel Facilities, PF&R	ESF 3, ESF 4	Backup firefighting water for incident response at the CEI Hub for all other hazards
Resilient Firefighting Water Supply	A significant earthquake is expected to cut off the CEI Hub from municipal water for	Resilient firefighting hydrant system with dedicated water supply (e.g., large	Depends on resilient transportation access for firefighting equipment	Hard	High	Portland Water Bureau	ESF 3, ESF 4	Backup firefighting water for incident response at the CEI Hub

	weeks or months.	permanent river pumps)						for all other hazards
Resilient Firefighting Capabilities	Damage to storage locations and transportation infrastructure will present extreme challenges to mustering sufficient firefighting foam concentrate for response.	Collective warehousing of firefighting foam in a seismically resilient location.	Depends on resilient transportation access for firefighting equipment and resilient access to water.	Med	Med	PF&R, Fuel Facilities, MFSA	ESF 4	Improved availability of firefighting foam for other HazMat spills and fires in the region.
Resilient Firefighting Capabilities	PF&R equipment may be trapped inside fire stations due to seismic impacts.	PF&R Shakealert implementation	None noted.	Easy	Med	PF&R	ESF 4	Significant benefits to PF&R's response times immediately following an earthquake
Resilient Firefighting Capabilities	Petrochemical fire response operations depend on specialized equipment, large volumes of water, and firefighting foam.	Pre-positioned Monitor Nozzles	Depends on resilient transportation access for firefighting equipment and resilient access to water and firefighting foam.	Med	Med	PF&R, Fuel Facilities	ESF 4	Improved petrochemical firefighting capabilities at the CEI Hub for all other hazards.

Resilient Firefighting Capabilities	Dozens of fires are expected to ignite citywide and will draw PF&R resources away from the CEI Hub to incidents with higher threats to life safety	Improved PF&R capabilities citywide including hose connection systems to Mt. Tabor	Depends on resilient transportation access for firefighting equipment and sustained access to fuel.	Med	High	PF&R	ESF 4	Significant benefits to PF&R's firefighting capabilities immediately following an earthquake have significant potential benefits to life safety and property and environmental protections.
Resilient Firefighting Capabilities	Utility outages and infrastructure closures will impact response operations in a variety of ways	Regular tabletop exercises including oil spill response organizations to adapt response to post-earthquake impact assumptions	None noted.	Easy	High	DEQ, USCG, PF&R, Oil Spill Response Organizations	ESF 4, ESF 10	Supports response operations for non-earthquake incidents.
Resilient Emergency Power Generation	Electric power system outages are expected after an earthquake with weeks of	Resilient microgrid	None noted.	Hard	High	Fuel Facilities	ESF 12	Supports fuel terminal operations during electrical outages

	estimated downtime.							
Resilient Emergency Power Generation	Electric power system outages are expected after an earthquake with weeks of estimated downtime.	Deployable emergency power generators (public)	Depends on resilient transportation access to generator storage locations. Depends on post-earthquake fuel availability.	Easy	High	OEM	ESF 12	Supports fuel terminal operations during electrical outages
Resilient Emergency Power Generation	Electric power system outages are expected after an earthquake with weeks of estimated downtime.	Deployable emergency power generators (private)	Depends on resilient transportation access to generator storage locations. Depends on post-earthquake fuel availability.	Easy	High	Fuel Facilities	ESF 12	Supports fuel terminal operations during electrical outages
Resilient Emergency Power Generation	Electric power system outages are expected after an earthquake with weeks of estimated downtime.	Permanent emergency power generators (private)	Depends on post-earthquake fuel availability.	Easy	High	Fuel Facilities	ESF 12	Supports fuel terminal operations during electrical outages

Resilient Situational Awareness	Loss of situational awareness is expected in the CEI Hub following an earthquake.	Air Quality Monitoring	Depends on established ICS with Alert and Warning capabilities to communicate to responders and the public.	Easy	Not Assessed	EPA, DEQ, Fuel Facilities	ESF 5, ESF 8, ESF 10, ESF 15	Improves the public sector's ability to identify and assess hazardous materials release incidents in the area for all hazards.
Resilient Situational Awareness	Loss of situational awareness is expected in the CEI Hub following an earthquake.	Seismic instrumentation	Depends on established ICS with Alert and Warning capabilities to communicate to responders and the public.	Med	Not Assessed	Fuel Facilities, DOGAMI, Academic Institutions	ESF 5, ESF 10, ESF 15	Supports engineers and researchers in conducting post-earthquake damage assessments
Resilient Situational Awareness	Loss of situational awareness is expected in the CEI Hub following an earthquake.	Pre-established surveillance equipment	Depends on established ICS with Alert and Warning capabilities to communicate to responders and the public.	Easy	Not Assessed	Fuel Facilities, PF&R	ESF 5, ESF 10, ESF 15	Improves the public sector's ability to identify and assess hazardous materials release incidents in the area for all hazards.
Resilient Situational Awareness	Loss of situational awareness is expected in the	Drone capability development	Depends on resilient transportation access.	Med	Not Assessed	PBOT, ODOT, PF&R, OEM	ESF 5, ESF 9, ESF 10	Improves the public sector's ability to identify and

	CEI Hub following an earthquake.		Depends on established ICS with Alert and Warning capabilities to communicate to responders and the public.					assess hazardous materials release incidents in the area for all hazards.
Resilient Disaster Debris Management	Structure collapses, landslides, and other debris are anticipated to block roadways. Local debris clearance and road repair equipment will be damaged or overburdened.	PBOT west side maintenance yard	Ineffective without additional local transportation system improvements	Hard	High	PBOT, ODOT	ESF 1, ESF 3, ESF 7	Potential to improve response times for PBOT to west-side incidents for all hazards. Significant improvement in response capabilities for all post-earthquake incidents.
Resilient Disaster Debris Management	Structure collapses, landslides, and other debris are anticipated to block roadways. Local debris clearance and road repair equipment will	PBOT resilient east side maintenance yard and resilient bridge(s)	Ineffective without additional local transportation system improvements	Very Hard	High	PBOT, ODOT	ESF 1, ESF 3, ESF 7	Significant improvement in response capabilities for all post-earthquake incidents.

	be damaged or overburdened.							
Resilient Disaster Debris Management	Structure collapses, landslides, and other debris are anticipated to block roadways. Local debris clearance and road repair equipment will be damaged or overburdened.	Preestablished debris disposal locations	Ineffective without additional local transportation system improvements. Ineffective without local debris clearance equipment.	Hard	Med	PBOT	ESF 1, ESF 3, ESF 7	Improved environmental outcomes for debris management.
Resilient Fuel Supplies	Fuel supplies for emergency response will be insufficient following an earthquake and will challenge extended response and cleanup operations.	Rapid continuity of operations from fuel facilities in partnership with emergency managers	Depends on local transportation network, emergency power, minimized post-earthquake hazards, successful emergency response operations, and an organized regional response and	Med	High	Fuel Facilities, ODOE	ESF 1, ESF 12, ESF 14, ESF 17	Significant potential benefit to statewide response and recovery operations.

			recovery system					
Resilient Fuel Supplies	Fuel supplies for emergency response will be insufficient following an earthquake and will challenge extended response and cleanup operations.	Fuel geographic diversification	Depends on local transportation network, emergency power, minimized post-earthquake hazards, successful emergency response operations, and an organized regional response and recovery system	Med	Not Assessed	ODOE	ESF 12	Supports response and recovery operations for all post-earthquake incidents
Resilient Fuel Supplies	Fuel supplies for emergency response will be insufficient following an earthquake and will challenge extended response and	Emergency power generation at fuel pumping locations	Depends on local transportation network, emergency power, minimized post-earthquake hazards, successful	Easy	Not Assessed	Local Gas Stations, PF&R, ODOE	ESF 12	Supports response and recovery operations for all post-earthquake incidents

	cleanup operations.		emergency response operations, and an organized regional response and recovery system					
Resilient Health and Medical Capabilities	Health and medical response capabilities including decontamination nearby the CEI Hub will be significantly overburdened following an earthquake.	Building improvements and resilient water supplies @ Good Sam	Ineffective for the CEI Hub facilities without resilient transportation routes and EMR capabilities.	Hard	Not Assessed	OHA, MultCo, Hospitals	ESF 3, ESF 6, ESF 8	Significant public health benefits following an earthquake and for all hazards.
Resilient Health and Medical Capabilities	Health and medical response capabilities including decontamination nearby the CEI Hub will be significantly overburdened following an earthquake.	Resilient Emergency Transportation Routes and structural improvements to regional hospitals	Ineffective for the CEI Hub facilities without resilient transportation routes and EMR capabilities.	Very Hard	Not Assessed	OHA, MultCo, Hospitals	ESF 1, ESF 6, ESF 8	Significant public health benefits following an earthquake and for all hazards.

Resilient Health and Medical Capabilities	Health and medical response capabilities including decontamination nearby the CEI Hub will be significantly overburdened following an earthquake.	Resilient water supplies for decontamination operations	Significant uncertainties in safe locations to muster nearby the CEI Hub	Med	Not Assessed	OHA, MultCo, Hospitals, Fuel Facilities	ESF 6, ESF 8, ESF 10	Significant public health benefits following an earthquake and for all hazards.
Resilient Alert and Warning Capabilities	Alert and warning capabilities will be hampered by earthquake impacts to communication infrastructure and may have limited geographic range.	Public ShakeAlert implementation	Pre-determined messaging requires determining public safety recommendations to evacuate or shelter in place.	Easy	Med	OEM, PBEM, MultCo	ESF 2, ESF 15	Residents and employees will be better able to implement protective actions for earthquake shaking.
Resilient Alert and Warning Capabilities	Alert and warning capabilities will be hampered by earthquake impacts to communication infrastructure and may have limited	Emergency sirens (public)	Pre-determined messaging requires determining public safety recommendations to evacuate or	Easy	Med	OEM, PBEM, MultCo	ESF 10, ESF 15	Improved ability to alert local residents of hazardous materials release incidents in the area for all hazards.

	geographic range.		shelter in place.					
Resilient Alert and Warning Capabilities	Alert and warning capabilities will be hampered by earthquake impacts to communication infrastructure and may have limited geographic range.	Emergency sirens (fuel facility)	Pre-determined messaging requires determining public safety recommendations to evacuate or shelter in place.	Easy	Med	Fuel Facilities	ESF 10, ESF 15	Improved ability to alert local residents of hazardous materials release incidents in the area for all hazards.
Resilient Alert and Warning Capabilities	Communication infrastructure likely to be down or overburdened following an earthquake.	Resilient cellular network capabilities	Resilient cellular networks may remain overburdened without significant system-wide capabilities	Med	Low	OPUC, Private Telecommunication Companies	ESF 2	Improved network resilience for all hazards.
Resilient Alert and Warning Capabilities	Communication infrastructure likely to be down or overburdened following an earthquake.	Satellite integration such as Starlink for incident command / alert and warning	None noted.	Easy	Not Assessed	Many	ESF 2	Additional communication redundancy for all hazards.

Mitigate Post-earthquake Hazards	Wastewater & Stormwater system failures including large diameter pipe collapse, sewage backups, and stormwater flooding	Replace municipal wastewater and stormwater pipelines with hazard resilient pipe	Wastewater and stormwater systems are co-located beneath critical transportation routes and improvements should be synchronized with roadway improvements to reduce costs.	Hard	Med	BES	ESF 3	Improved pipeline resilience for all hazards. Improved system operations in the target area.
Mitigate Post-earthquake Hazards	Local facilities, including rail, store extremely hazardous substances and may have seismic vulnerabilities that could release hazardous materials including toxic inhalation hazards.	Seismic mitigation of facilities handling extremely hazardous substances, especially toxic inhalation hazards	None noted.	Hard	Not Assessed	OSFM, OEM, DOGAMI, DEQ	ESF 10	Significant potential benefits to public health following earthquakes and improved facility resilience to all hazards.
Mitigate Post-earthquake Hazards	Local facilities, including rail, store	Resilience hubs or other safe locations	Significant uncertainties in safe locations	Hard	Not Assessed	OEM, PBEM, MultCo	ESF 6, ESF 8, ESF 15	Improved community

	extremely hazardous substances and may have seismic vulnerabilities that could release hazardous materials including toxic inhalation hazards.	to shelter-in-place	to muster nearby the CEI Hub					resilience for all hazards.
Mitigate Post-earthquake Hazards	Local facilities, including rail, store extremely hazardous substances and may have seismic vulnerabilities that could release hazardous materials including toxic inhalation hazards.	Train derailment protections (e.g., physical restrainers, ShakeAlert to halt moving trains)	None noted.	Easy	Not Assessed	Rail Companies, ODOT	ESF 1, ESF 3, ESF 10	Reduced likelihood for train derailment under normal operations and all hazards.
Mitigate Post-earthquake Hazards	Electrical power lines including high voltage river crossings are	Seismic mitigation of local power lines and high	None noted.	Med	High	OPUC, PGE, BPA	ESF 12	Reduced risk of system outages and electrical hazards during

	vulnerable to earthquakes and present significant ignition risk.	voltage river crossings						all hazards. Improved return to service times following an earthquake.
Mitigate Post-earthquake Hazards	Fire following earthquakes present external sources of fuel facility ignition risk. Fires at fuel facilities threaten residential areas and Forest Park.	Fuels management in Forest Park and other vulnerable green spaces	None noted.	Med	High	PF&R, PP&R, OSFM	ESF 4	Reduced risk of fires in public green spaces and adjacent communities.
Mitigate Post-earthquake Hazards	Fire following earthquakes present external sources of fuel facility ignition risk. Fires at fuel facilities threaten residential areas and Forest Park.	Fire walls and fire breaks between CEI Hub facilities and residential areas and Forest Park	None noted.	Hard	High	Fuel Facilities, PF&R, OSFM	ESF 4	Reduced risk of fire transmission during any incident at the CEI Hub.
Mitigate Post-earthquake Hazards	Oregon State agencies' participation in emergency	Seismic improvements to government buildings	Regional transportation capabilities and	Very Hard	Not Assessed	Many	N/A	Improved resilience of state emergency

	response may be challenged by direct damage to critical administrative and operations buildings.	including the capitol complex in Salem	communication capabilities are critical to State level participation in response and recovery					response for all hazards.

Appendix 6: CEI Hub Interagency Coordination Meeting #1 Notes

Introduction: Portland State University hosted the first Critical Energy Infrastructure (CEI) Hub Interagency Coordination Meeting on behalf of the Oregon DEQ's Fuel Tank Seismic Stability Program on July 9th, 2025. Attendance included roughly 40 personnel from 22 agencies or departments including City, County, State, Federal, and other regional parties.

Background: At the City of Portland's City Council Work Session on March 17th, 2025, council members called for improved safety at the CEI Hub and requested a better understanding of viable mitigation solutions. In addition, Portland's Bureau of Planning and Sustainability (BPS) is implementing a CEI Hub policy project to assess land use policy, revise the zone's comprehensive plan, and update zoning codes. And the Oregon DEQ Fuel Tank Seismic Stability (FTSS) program remains interested in advancing "outside the fence" mitigation, such as water or firefighting infrastructure, to support the success of fuel facility mitigation plans. To support these goals, Portland State University (PSU)—via an ongoing collaboration with the FTSS team—provides resources to convene interested parties on pertinent topics.

Meeting Summary: The Bureau of Planning and Sustainability team began with an overview of their CEI Hub zoning policy project including anticipated timelines, objectives, and key limitations. BPS expressed an intention to identify and avoid the creation of potential regulatory conflicts and barriers to successful risk reduction at the CEI Hub. Participant discussion helped to situate these zoning code operations within a broader regulatory framework by describing roles and responsibilities, existing regulations, and areas in need of special attention including oversight of transloading equipment and definitions of renewable fuels. Participants also discussed potential zoning code outcomes that may benefit ongoing risk mitigation, such as requirements on improved secondary containment and avoiding potentially hazardous new development.

The second half of the meeting focused on (1) roles and responsibilities, (2) gaps and opportunities, and (3) information on any ongoing CEI Hub related work. Participants were asked to discuss key aspects of their agencies roles and responsibilities and to provide comments on the Draft Agency Roles and Responsibilities Table.

In general, first response agencies indicated they have a robust response network with existing mutual aid agreements ready to respond in a seismic event, but these existing capabilities are limited by vulnerable critical infrastructure in and around the CEI Hub (e.g., bridge collapse hazards). In-depth tabletop exercises were proposed as one avenue to improve readiness to respond in a post-earthquake situation.

Infrastructure managers agreed with the assessment of vulnerable critical infrastructure in the area and reported these assets are due to be replaced at the end of their lifecycle, but there are no planned early seismic investments due to limited resources. Local improvement districts and system development charges were proposed as potential concepts to fund infrastructure improvements.

Federal agency partners described the framework of financial accountability for responsible parties after a spill and the types of federal funding available to support local agencies in response and cleanup operations (e.g., the Oil Spill Liability Trust Fund). The United

States Coast Guard's Region 10 Regional Response Team Area Contingency Planning Process was provided as an important point of collaboration and alignment.

Regulators familiar with the fuel facility owners and operators expressed an opportunity for forward-thinking conversations with facility owners to address shared priorities for mitigation and economic development. Potential challenges stemming from competition between facilities as well as anti-trust laws were noted.

Attendees:

- Althea Rizzo – Oregon Department of Emergency Management
- Andy Gulizia – Portland Planning & Development
- Beth Gilden – Portland State University
- Bill Burns – Oregon Department of Geology and Mineral Industries
- Bryon Alexander – U.S. Environmental Protection Agency
- Carol Chang – Regional Disaster Preparedness Organization
- Chad Hawkins – Oregon Department of the State Fire Marshal
- Chris Kuenzi – Oregon Department of Transportation
- Chris Voss – Multnomah County
- Dan Eisenbeis – Port of Portland
- Dave Mulligan – Pipeline and Hazardous Materials Safety Administration
- David Lacey – Oregon Department of Environmental Quality
- David O'Longaigh – Portland Water Bureau
- Don Pettit – Oregon Department of Environmental Quality
- Hannah Satein – Oregon Department of Energy
- Heidi Williams – Oregon Department of Environmental Quality
- Ian Johnson – Oregon Department of Environmental Quality
- James Merten – U.S. Coast Guard
- Julia Michel – City of Portland Bureau of Planning and Sustainability
- Kathy Hyzy – Governor Kotek's Office
- Kiel Jenkins – City of Portland Bureau of Planning and Sustainability
- Killian Stoltenburg – Oregon Department of Environmental Quality
- Lalo Guerrero – Oregon Department of Geology and Mineral Industries
- Luke Hanst (Host) – Portland State University
- Mark McKay – U.S. Army Corps of Engineers, Portland District
- Max Woods – Oregon Department of Energy
- Mike Kortenhoff – Oregon Department of Environmental Quality
- Mustafa Al Khafaji – Federal Emergency Management Agency, Region 10
- Nishant Parulekar – City of Portland Bureau of Environmental Services
- Randy Nattis – U.S. Environmental Protection Agency
- Richard Franklin – U.S. Environmental Protection Agency, Region 10
- Richard Rogers – Oregon Building Codes Division
- Russ Brooks – City of Portland Bureau of Transportation
- Svetlana Lazarev – Oregon Department of Environmental Quality
- Terra Metta – Oregon Department of Environmental Quality
- Tom Armstrong – City of Portland Bureau of Planning and Sustainability

- Traci Naile – Oregon Department of Energy
- Wes Risher – Oregon Department of Environmental Quality
- John Wasiutynski – Multnomah County
- Richard Rogers – Oregon Building Codes Division

Meeting Notes:

Part 1: Agency Partners Introductions and Overview

- Luke Hanst gives overview of coordination goals, focused on CEI Hub issues
- The Department of Environmental Quality (DEQ) staff give an overview of the DEQ Fuel Tank Seismic Stability Program, and the importance of aligning work with other involved agencies.
- The City of Portland Bureau of Planning and Sustainability (BPS) staff provide an overview of their CEI Hub Policy Project Work to date, timeline, and alignment of their project work with DEQ programs.
    - BPS staff outline scope of project, how project work can tie into larger local, state, and federal efforts.
- The Department of Geology and Mineral Industries (DOGAMI) staff discuss issues with lateral spreading site to site. Concerns that site-specific mitigation doesn't always account for failing of adjacent sites.
    - Highlights ideal situation where companies work together to coordinate mitigation strategies across the CEI Hub.
- Discussion of potential zoning code requirements
    - Full containment was discussed: Current standard is containment solely for single largest tank.
        - Potential to require full containment for any improvement.
        - Facilities are starting to move in the direction of increased secondary containment due to DEQ regulation.
- Point of attention: how are seismic regulations applied to transloading facilities?
    - Ensuring that offloading racks, dock connections, etc. are included in required upgrades.
- Discussion of how a Local Improvement District could help finance safety upgrades and infrastructure, enabling better emergency response.
- How to balance zoning code and building code regulations:
    - Call for clarification on what falls under state building code vs. city building code.
- How to balance renewable fuels and climate benefits with safety provisions
- The Pipeline and Hazardous Materials Safety Administration (PHMSA) staff give overview of responsibilities regarding pipeline regulation, including standards developed by the American Petroleum Institute.
    - PHMSA participates in regulation but does not have permitting authority for tanks.
        - PHMSA regulates pipeline connections from Portland to Eugene, CEI Hub to airport.

    - PHMSA does review facility response plans, which need to demonstrate that facilities have resources available to clean up the spills.
        - Many plans rely on mutual aid from other companies within the facilities.
- Environmental Protection Agency (EPA) staff give overview of regulatory responsibilities
    - Has regulatory authority over most of the tanks in the CEI Hub.
    - Coast Guard regulates overwater transfers and dock piping
    - EPA requires a response plan for the overall terminal, including an evaluation of the resources at risk (adjacent neighborhoods, schools, parks, rivers, etc).
- Port of Portland staff request consideration of renewable fuels as new development is being regulated.
- Can the zoning code updates be used to incentivize or accelerate the implementation of risk mitigation implementation plans?
- DEQ staff give overview of seismic stability program
    - States that there is a $23K annual compliance fee required until all mitigation measures are implemented which acts as an incentive.
    - Mitigation plans are phased on 1-, 3-, 5-, and 10-year timelines.
    - CEI Hub facilities are still mostly in the assessment stage.
- Financial Responsibility
    - Oil Spill Liability Trust fund, primarily for impacted waterways when a responsible party cannot afford to fund cleanup. EPA and Coast Guard can access this fund for emergency response.
    - Most of the funds are used for loss of income or damage because of oil spills.
    - Companies must prove they are not at fault to get out of paying costs.
    - Pollution Removal Funding Authorization (PRFA) can be provided to local and state agencies who provide support to the federal on scene response.
- Non-Conforming Use
    - If regulations change and make facilities non-conforming uses, the facilities still have certain rights to continue as a non-conforming use.
- Oregon State Fire Marshal (OSFM) staff give overview of responsibilities related to the CEI Hub
    - States that Portland fire is largely responsible for specific pre-planning work, state will work with local jurisdictions if requested.
    - Fire code regulates elements like fire suppression features, tank design for fire protection, reviewed by the state.

Part 2: Roles and Responsibilities / Open Discussion

- Luke Hanst provides overview table with each agency involved and responsibilities
- Discussion of the changing marine fuel landscape
    - New regulations by the International Maritime Organization to promote renewable fuels for a net-zero shipping industry by 2050.
    - Starting to see more methanol and ammonia-based fuels to reduce GHG emissions from shipping.
    - Need to adjust definitions to include new renewable fuel technologies.

- The Oregon Department of Fish & Wildlife (ODFW) has the responsibility and statutory authority to complete the national natural resource assessment.
    - If there was to be a spill and natural resources were damaged, the assessment would be completed under ODFW, not DEQ.
- Federal Emergency Management Agency (FEMA) Region 10 staff states that they will share information on CEI Hub for future CEI Hub planning.
    - EPA and US Coast Guard are updating area committee plans which focus on preparedness and response activities to significant oil and hazardous substance incidents in the Pacific Northwest.
- DEQ staff discuss the need to coordinate future CEI Hub work with federal Superfund cleanup work that will require reconstruction and new development along the shore.
- Bureau of Environmental Services (BES) staff state that while there is critical infrastructure in the CEI geography, currently no planned infrastructure investments
- Portland Water Bureau gives an overview of concerns about vulnerability of critical infrastructure to liquefaction, but currently there are no planned seismic infrastructure investments.
- Oregon Department of Energy (ODOE) staff provide overview of ongoing work
    - Update of Oregon Energy Security Plan for 2025, in depth update in 2026
    - Conducting an analysis of legislation and potential impacts on planned work.
- Oregon Department of Transportation (ODOT) staff provide overview of related work
    - The primary role is acting in conjunction with the Federal Railroad Administration.
    - Oversees rail transportation, rail safety requirements.
    - Current regulations do not touch on seismic vulnerability assets such as bridges.
- State Building Code Division clarifies regulatory authority with regards to facilities
    - Clarifies that the building code does not cover freestanding tanks, only those connected to a regulated structure.
    - State mentions that Portland is responsible for adopting standards for freestanding tanks.
    - The statute gives authority to the local government regarding seismic rehabilitation of existing tanks.
- Governor’s office staff provide outlook on their involvement
    - Discussions are ongoing about looking forward, including ways to work with some of the facilities.
    - Engage on solutions from a non-regulatory perspective.
- There is a need for more focused discussions in smaller groups in addition to broader group conversations.
    - Suggestion to organize smaller group discussions by authorities over Regulatory vs. Emergency Response.
    - Need to map out various timelines across multiple organizations relating to ongoing schedules (e.g., infrastructure lifecycles, planning cycles, legislative sessions, etc.)

Appendix 7: CEI Hub Interagency Coordination Meeting #2 Notes

Introduction: Portland State University hosted the second Critical Energy Infrastructure (CEI) Hub Interagency Coordination Meeting on behalf of the Oregon DEQ's Fuel Tank Seismic Stability (FTSS) team on December 11th, 2025. Attendance included roughly 45 personnel from 26 agencies or departments including City, County, State, Federal, and other regional parties.

Background: PSU is organizing and facilitating interagency coordination meetings that bring together public agencies who manage infrastructure, play a role in response and recovery, or regulate the fuel facilities. Through pre-meeting outreach and research, facilitated conversations, and post-meeting material development, these convenings will result in a documented common operating picture for seismic response and infrastructure readiness at regulated fuel facilities. These convenings also provide an opportunity for the advancement of public sector resilience initiatives that will improve safety at fuel facilities and may result in potential cost savings for fuel facilities.

Meeting Summary: This interagency coordination had three parts.

1. The bulk of the meeting included an infrastructure roundtable hosted by Portland State University preceded by a presentation summarizing the results of their infrastructure readiness interviews for the CEI Hub. The results of these interviews are available in this CEI Hub Infrastructure Readiness spreadsheet, and the roundtable discussion points are summarized below.

2. The Oregon Department of Energy provided a summary of their work and connections to the CEI Hub, emphasizing their role in emergency response for fuel related emergencies as described in the Oregon Fuel Action Plan. ODOE also described their statewide energy security efforts, noting the CEI Hub is a top concern. The Oregon Energy Security Plan evaluates threats and hazards and outlines mitigation strategies, including ongoing efforts to understand interdependencies within energy systems—such as improving coordination between natural gas and electric sectors to ensure resilient fuel supply for power generation—while identifying supply and distribution vulnerabilities and strengthening organizational resilience. A recommendation of the plan is expanding the geographic diversification of fuel storage statewide to improve resilience to natural hazards, including ensuring aviation fuel availability in eastern Oregon for wildfire response through fuel depots of varying capacities. Legislation introduced in 2025 sought to advance this diversification. Looking ahead, ODOE has plans for multiple fuel response exercises in 2026 to strengthen ESF operations and planning, with results intended to inform the 2027 update to the Oregon Fuel Action Plan.

3. The Portland Bureau of Planning and Sustainability provided updates on their CEI Hub Zoning Code Policy Project. Interested parties are encouraged to view the proposed updates on the BPS project website. For the sake of accuracy the BPS proposals are not summarized here.

Attendees:

- Althea RIZZO – Oregon Department of Emergency Management
- Amanda Wozab – Oregon Department of Environmental Quality
- Amit Kumar – City of Portland Building Codes Division
- Bryan Profit – Portland Fire & Rescue
- Cameron Glasgow – Portland Bureau of Transportation
- Carol Chang – Regional Disaster Preparedness Organization
- Courtney Duke – Portland Bureau of Transportation
- Curran Mohney – Oregon Department of Transportation
- Dan Eisenbeis – Port of Portland
- Danelle Peterson – Port of Portland
- Dave Evonuk – Portland Water Bureau
- Don Pettit – Oregon Department of Environmental Quality
- Hannah Rabinowitz Pratt – Federal Emergency Management Agency
- Heide Caswell – Oregon Public Utility Commission
- Heidi Williams – Oregon Department of Environmental Quality
- Ian Johnson – Oregon Department of Environmental Quality
- Joan Frederiksen – Portland Bureau of Planning and Sustainability
- Jody Orrison – Portland Bureau of Permitting and Development
- John Wasiutynski - Multnomah County Office of Sustainability
- John Weber – Federal Emergency Management Agency
- Julia Michel – Portland Bureau of Planning and Sustainability
- Katie Root – Portland Bureau of Transportation
- Kiel Jenkins – Portland Bureau of Planning and Sustainability
- Killian Stoltenburg – Oregon Department of Environmental Quality
- Luke Hanst – Portland State University
- Mark McKay – United States Army Corps of Engineers
- Matt McDowell – Oregon Department of Transportation
- Max Woods – Oregon Department of Energy
- Nishant Parulekar – Portland Bureau of Environmental Services
- Randy Nattis – United States Environmental Protection Agency
- Reed Burgette – Oregon Department of Geology and Mineral Industries
- Sean Condon – Oregon State Fire Marshal
- Shannon Buono – Portland Bureau of Planning and Sustainability
- Susan Ortiz – Oregon Department of Transportation
- Svetlana Lazarev – Oregon Department of Environmental Quality
- Todd Burke – Phillips 66
- Tom Armstrong – Portland Bureau of Planning and Sustainability
- Tom Grummon – Oregon Department of Transportation
- Tom Sicilia – Oregon Department of Energy
- Traci Naile – Oregon Department of Energy
- Vanessa Green – Clean Rivers Collaborative
- Yumei Wang – Portland State University

Infrastructure Roundtable Discussion Notes:

- DEQ opened with an overview of the Fuel Tank Seismic Stability (FTSS) Program, including its development and ongoing implementation.
- All regulated facilities met the statutory deadline for initial Seismic Vulnerability Assessments (SVAs) at which time the FTSS team initiated a collaborative, iterative process with fuel facilities to develop final SVAs.
- All facilities have approved timelines for subsequent SVAs, with most submissions expected between July–December 2026.
- DEQ FTSS FAQ Sheet https://www.oregon.gov/deq/ss/Pages/FAQ-public.aspx
- PSU presented:
    - Meeting agenda
    - Legal background for FTSS and related coordination efforts
    - Objectives of interagency coordination meetings
    - Overview of utilities and transportation (U&T) infrastructure asset vulnerabilities (see spreadsheet)
- Participants discussed infrastructure vulnerabilities and other potential hazards:
    - Repairs to the St. Johns Bridge would require additional surface-street improvements to maintain access to emergency response resources; St. Johns functions as an island.
    - Geographic “islanding” documentation may provide relevant planning context.
    - Hazardous materials storage sites, fuel and hazmat rail terminals, and railcars represent additional risk concentrations.
- First responders were asked to describe hazmat spill operations as they relate to public infrastructure:
    - Portland Fire & Rescue (PF&R) attempts to prevent hazmat spills from entering stormwater systems during “blue sky” responses by plugging drains, relying on other bureaus for sewer and stormwater system modifications.
        - This approach is viable for small spills but not feasible for large-scale releases.
    - Existing emergency response plans address standard spills, not catastrophic earthquake-related releases.
        - New post-earthquake spill response plans are needed
    - Clean Rivers Cooperative response capacity:
        - Maximum capability approximately 2 million gallons
        - Releases exceeding this volume would overwhelm available resources
    - Fire suppression needs are closely tied to water availability and firefighting foam.
        - A foam layer must be maintained over released fuel to prevent combustion.
        - Large spills—especially into the river—require significantly more foam than fires contained within secondary containment.
        - Foam-to-water ratio: 6% foam
    - Current foam capacity:

        - Maritime Fire and Safety Association tracks PFAS and alternative foam inventories across participating agencies. Maritime Fire and Safety Association has purchased 16 totes (4,240 gals) of firefighting foam for member agencies. Four totes (1,060 gals) reside with PF&R (Carl Obermeier, written communication Dec 30, 2025).
            - The remaining totes are distributed at Vancouver, Kalama, Clatskanie, and Astoria but are available to Portland (and all other member agencies) via a mutual aid agreement. Although Portland Airport Fire & Rescue is a member agency, their foam is purchased by the port and is not MFSA provided (Carl Obermeier, written communication Dec 30, 2025).
        - Railroads: foam trailers positioned statewide (~500–1,000 gallons each)
        - Airport: ~3,000 gallons
        - Clean Rivers Cooperative: no firefighting foam
        - Some CEI Hub facilities possess firefighting foam, but inventories are not well catalogued.
- PSU led discussion of four investment areas, including:
    - Transportation routes
        - Multnomah County noted potential cost-effectiveness of prioritizing westbound routes for evacuation and emergency response equipment; recommended further investigation.
        - Concerns raised about escalating bridge retrofit costs, informed by lessons from the Burnside Bridge project, suggesting alternative evacuation routes may be more viable.
        - PBOT highlighted a critical single point of failure: without west-side bridge access, emergency response equipment may be unavailable to support transportation response operations.
        - Proposal to explore establishing a PBOT satellite maintenance facility on the west side, potentially in coordination with ODOT and county partners.
    - Water system investments, participant contributions included:
        - Need additional investigations of river-based pumping systems viability and necessary capabilities.
        - Willamette Water Supply System noted as an example of resilient municipal water
        - Benefits of a unified system with a resilient hydrant network
            - International example: Japan fire infrastructure
        - Discussion of potential fireboat capabilities
    - Emergency Power
        - Emergency power is required under FTSS-related statutory requirements.
        - Facilities will need to implement some form of backup or emergency power systems.
    - Emergency Communication
        - PF&R currently relies on cellular communications for spill notifications from fuel facilities.

        - No known satellite phones in fuel facilities' inventories.
        - On-site radio systems exist but are not interoperable with PF&R radios.
        - Discussion of satellite phone options, including an OHA example of satellite phone deployment.
        - Mention of BEECN (Basic Earthquake Emergency Communication Node) sites.
- Discussion of potential funding mechanisms, including:
    - Exploring local improvement districts to finance public infrastructure investments
    - Voter-approved bonds
- Next steps:
    - Planning for the next interagency coordination meeting.
    - Proposed focus: earthquake emergency response readiness interviews with relevant agencies and stakeholders.

Appendix 8: CEI Hub Interagency Coordination Meeting #3 Notes

Introduction: Portland State University hosted the third Critical Energy Infrastructure (CEI) Hub Interagency Coordination Meeting on behalf of the Oregon DEQ's Fuel Tank Seismic Stability (FTSS) team on March 4th, 2026. Attendance included roughly 40 personnel from 22 agencies or departments including City, County, State, Federal, and other regional parties.

Background: PSU is facilitating interagency coordination meetings that bring together public agencies who manage infrastructure, play a role in response and recovery, or regulate the fuel facilities. Through pre-meeting outreach and research, facilitated conversations, and post-meeting material development, these convenings will result in a documented common operating picture for seismic response and infrastructure readiness at regulated fuel facilities. These convenings also provide an opportunity for the advancement of public sector resilience initiatives that will improve safety at fuel facilities and may result in cost savings for fuel facilities.

Meeting Summary: This interagency coordination meeting had three parts.

1. PSU led an emergency response seismic readiness roundtable, which summarized and discussed the results of the pre-meeting emergency response readiness interviews which are available in CEI Hub Emergency Response Seismic Readiness spreadsheet. The roundtable discussion notes are summarized in the appendix to this document.
2. PSU led a discussion on how seismic impact assumptions might be integrated into future scenarios for exercises and tabletops.
3. Carol Chang from the Regional Disaster Preparedness Organization provided an overview of the methods and outcomes from Phase 2 of the Regional Emergency Transportation Route work.

Attendees:

- Althea Rizzo — Oregon Department of Emergency Management
- Bryan Profit — Portland Fire and Rescue
- Carol Chang — Regional Disaster Preparedness Organization
- Curran Mohney — Oregon Department of Transportation
- Dan Eisenbeis — Port of Portland
- Danelle Peterson — Port of Portland
- Dave Evonuk — Portland Water Bureau
- DeWayne Hatcher — Oregon Health Authority
- Geoffrey Bowyer — Oregon Department of Transportation
- Heidi Williams — Oregon Department of Environmental Quality
- Heide Caswell — Oregon Public Utility Commission
- Ian Johnson — Oregon Department of Environmental Quality
- Jim Merten — United States Coast Guard
- Joan Frederiksen — City of Portland Bureau of Planning and Sustainability
- Jody Orrison — City of Portland Permitting and Development
- Julia Michel — City of Portland Bureau of Planning and Sustainability
- Katie Root — City of Portland Bureau of Transportation

- Ken Esplin — Washington Department of Ecology
- Kiel Jenkins — City of Portland Bureau of Planning and Sustainability
- Killian Stoltenburg — Oregon Department of Environmental Quality
- Lalo Guerrero — Oregon Department of Geology and Mineral Industries
- Luke Hanst — Portland State University
- Mark McKay — United States Army Corps of Engineers
- Matt Burke — Multnomah County Emergency Management
- Matt McDowell — Oregon Department of Transportation
- Ray Bottenberg — Oregon Department of Transportation
- Rachit Nerwal — Portland Bureau of Emergency Management
- Reed Burgette — Oregon Department of Geology and Mineral Industries
- Robin Holm — Oregon Health Authority
- Russ Brooks — City of Portland Bureau of Transportation
- Steve Bregman — Portland Fire and Rescue
- Susan Ortiz — Oregon Department of Transportation
- Svetlana Lazarev — Oregon Department of Environmental Quality
- Todd Burke — Phillips 66
- Tom Grummon — Oregon Department of Transportation
- Tom Sicilia — Oregon Department of Energy
- Tom Walsh — Portland Fire and Rescue
- Traci Naile — Oregon Department of Energy
- Vanessa Green — Clean Rivers Cooperative
- Yumei Wang — Portland State University

Discussion Notes:

- Spill Containment and Cleanup capabilities discussion notes:
    - USCG:
        - USCG's network of Oil Spill Response Organizations will be part of the national response network. Clean Rivers Cooperative (CRC) is local and would be the first call.
        - USCG relies on the Oil Spill Liability Trust Fund to ensure money will be available to pay for oil spill response before a responsible party has been determined.
        - The Captain of the Port acts as the Federal On-Scene Coordinator and will stand up incident command for the oil spill response
    - Washington Department of Ecology:
        - Ecology maintains some spill response equipment in Vancouver but primarily defer to spill response contractors in the region.
    - PBEM asked how CRC liaisons with local emergency management during a response.
        - CRC personnel fall within the operations section, usually under the operations section chief. Large oil spill responses are federalized quickly with CRC reporting to the relevant chain of command.

        - PF&R indicated that either PF&R or PBEM staff act as the local-on-scene coordinator participating in incident command.
- Firefighting and HazMat Response notes:
    - PF&R reiterated that unified regional command and control will take over and will prioritize the allocation of PF&R capabilities according to the greatest risks to life safety. Technical reports estimate 60 fire ignitions following a CSZ event which will be triaged to deploy PF&R resources. Uncontrolled fires will be evaluated based on capabilities and exposures with large urban fires potentially threatening more people compared to CEI Hub or potential fire at Forest Park.
        - Oregon Fire Mutual Aid System through OSFM provides access to regional resources (which may be impacted or delayed by an earthquake).
        - OSFM or OEM can provide an Emergency Management Assistance Compact which allows sharing resources across state lines. Federal resources will also be en route.
    - USCG indicated that vessel fires or other onboard incidents may complicate response given limited resources.
        - Quick release mechanisms to cut vessels loose during an earthquake was mentioned as a potential mitigation option. The USCG indicated this is complex as free floating vessels can pose their own hazards and may be more challenging to assist with fires or other onboard incidents.
- Command and Control notes:
    - USCG added the USCG command center to the list of assets.
    - PF&R maintains a cross-staffed command vehicle
    - CRC has an office trailer to provide additional space adjacent to their command trailer.
    - Washington State has significant command and control capabilities and ability to participate in unified command, especially once fuel has entered the Columbia it becomes a joint response operation.
- Transportation system response notes
    - ODOT indicates they have Incident Response crews that would respond to an event impacting Hwy 30. Any road closures would be manned temporarily until maintenance crews can respond for long-term emergency detour routing. Additionally, ODOT would work in the ICS structure as a support function for transportation related decision-making.
    - USCG notes the Marine Transportation System Special Response Unit- Provide an ongoing picture of maritime operations and port infrastructure status to inform incident command.
    - DOGAMI notes co-seismic landslides pose additional risks for transportation.
- Community Alert and Warning
    - Participants suggest adding ShakeAlert as a key asset.
- Emergency Power
    - PF&R notes there is access to emergency generators via OEM's Spire Program at the State level.

- Other response capabilities notes:
    - USCG indicates they have deployable teams of technical experts able to work alongside response operations in complex events.
    - ODOT provided information on new federal restrictions for drones that can be used during response operations which has reduced ODOT's available drones for emergency response (article).
        - Ecology indicates Washington has drone capabilities as well, unclear how they have been affected by new federal regulations.
- Participants discussed the Earthquake impact assumptions that PSU developed (Appendix 4) to inform potential scenarios for tabletops and deployment exercises.
    - DEQ, Ecology, EPA, and USCG set the parameters for Oil Spill Response Organization exercises; earthquakes are usually considered out of scope.
    - USCG uses the Homeland Security Exercise and Evaluation Program (HSEEP) to determine exercise and deployment schedules and content. Full scale deployment exercises practice geographic response plans according to the Area Contingency Response Plan.
    - During drill planning regulators set "injects" or disruptive scenarios that responders must address in real time