



*Pacific NorthWest
Economic Region*



Infrastructure Interdependencies Tabletop Exercise

BLUE CASCADES III: Managing Extreme Disasters

FINAL EXERCISE REPORT

**Held March 1-2, 2006 in
Bellevue, Washington**

CONTENTS

INFRASTRUCTURE INTERDEPENDENCIES TABLETOP EXERCISE	2.4.1-1
BLUE CASCADES III: MANAGING EXTREME DISASTERS	2.4.1-1
FINAL EXERCISE REPORT	2.4.1-1
1 BACKGROUND	1
2 OVERVIEW	2
2.1 PURPOSE.....	2
2.2 FOCUS AND SCOPE	3
2.3 OBJECTIVES	3
2.4 EXERCISE DEVELOPMENT.....	4
2.4.1 Key Decisions	4
2.5 FORMAT, PROCESS, AND SCENARIO OVERVIEW	5
3 EXERCISE RESULTS	8
3.1 EVALUATION CRITERIA.....	9
3.2 FINDINGS AND RECOMMENDATIONS.....	10
3.2.1 Understanding of Interdependencies in an Extreme Disaster	10
3.2.2 Resilient, Reliable, Interoperable, Compatible Communications and Information Systems	14
3.2.3 Risk Assessment and Mitigation	17
3.2.4 Cooperation and Coordination	18
3.2.5 Information Sharing and Alert and Warning.....	20
3.2.6 Roles and Responsibilities/Incident Management (Physical and Cyber).....	21
3.2.7 Response Challenges.....	22
3.2.8 Recovery and Restoration	26
3.2.9 Business Continuity and Continuity of Operations	29
3.2.10 Logistics and Supply Chain Management	30
3.2.11 Public Information/Risk Communications.....	31
3.2.12 Exercises, Training and Education.....	32
4 EXERCISE UTILITY	33
5 PATH FORWARD	34

Executive Summary

BLUE CASCADES III: Managing Extreme Disasters, held March 1-2, 2006 in Bellevue, Washington, was the most innovative and far-reaching critical infrastructure interdependencies tabletop exercises conducted to date by organizations with roles and major interests in improving disaster resilience in the Puget Sound Region and the Pacific Northwest. More than 330 representatives from 150 organizations participated in this intensive two-day event, which built upon Blue Cascades I, held in Portland, Oregon in June 2002, and Blue Cascades II, held in Seattle in September 2004.

Representatives of member organizations of the Puget Sound Partnership for Regional Infrastructure Security chose and developed the scenario—a 9.0 magnitude earthquake along the Cascadia Subduction Zone. By focusing on the Pacific Northwest’s equivalent to Hurricane Katrina, the goal was to explore, identify, and assess what needed to be done to make the region resilient—able to withstand damage and disruption and reconstitute as rapidly as possible if affected. The exercise was hosted by the Pacific NorthWest Economic Region (PNWER), a consortium of five states (Washington, Oregon, Alaska, Idaho, and Montana) and three Canadian jurisdictions (British Columbia, Alberta, and The Yukon Territory). Funding was provided by the U.S. Department of Homeland Security National Cyber Security Division and US-CERT and regional private sector organizations.

BLUE CASCADES III covered response, recovery and longer-term restoration, as well as what preventative and mitigation measures already existed to address a large-scale regional disaster. In the scenario, the quake and resulting tsunami along the coast disrupted and damaged critical infrastructures and caused a prolonged electric power outage that lasted for weeks to months in parts of Washington, Oregon, and California. Among those infrastructures affected were electric power substations, and transmission and distribution lines; bridges, interstate highways, and railways; microwave, electrical and water towers; tunnels and underground cables; water, sewer and industrial waste; and natural gas and fuel pipelines. Exercise participants grappled with how to respond in a situation of widespread infrastructure failures and transportation gridlock as thousand of vehicles were abandoned along the roads and bridges with I-5 and other interstates turned into parking lots. Ferries ceased operation and Sea-Tac and smaller airports were closed until inspected for damage. Throughout the region, responders, utility maintenance, healthcare and other essential personnel were impeded by police roadblocks and traffic congestion. Emergency managers searched for viable shelters for people unable to go back into or reach their homes. Industry and businesses shut down. As the effects of power failures began to be felt across the area, there was disruption of wastewater lift stations causing sewage backup on streets. Banks were shut and ATMs did not function. Growing concern about civil disorder and looting became a major issue for law enforcement and emergency responders. Some hospitals experienced lack of supplies,

inability to get staff in to work, and were overwhelmed with walk-ins, while in schools children and distraught parents that managed to reach them were isolated with either no or limited food and supplies, and looming sanitation and potable water problems.

Radio stations fielded calls from people reporting fires, gas leaks, and injuries while hospitals called stations making on-air radio pleas for specific supplies. For many utilities and organizations, sensitive electronic and computer equipment had been damaged and services were dropped off-line or significantly degraded, including the City of Seattle. Severely impeded communications made coordination and obtaining essential resources and supplies difficult to impossible. As restoration efforts began, U.S. and Canadian government at all levels faced continued infrastructure disruptions and the needs to assist people who were homeless or still in shelters. Major metropolitan areas of Vancouver, BC, Seattle/Tacoma, and Portland remained without electrical service because of damage to critical components, such as transformers and circuit breakers, and spare equipment shortages. Debris removal and disposal was a huge long-term challenge. Communities in lower priority areas found they needed to be self-sustaining for weeks. Major environmental clean-up efforts were expected to delay construction and repairs as tourism continued to fall off amid fears of displaced individuals not returning.

Exercise Results. The exercise resulted in more than 100 findings and a large number of recommendations identified by the participants. The Final Report reflects their collective comments, including detailed observations of more than 60 evaluators.

Selected Findings

Understanding Interdependencies in an Extreme Disaster

- Most participants had no real idea of the physical effects on their facilities, operational and business systems of a large magnitude earthquake. Earthquake experts based on existing research could not provide a good picture of the extent of damage.
- Many people appeared not to understand how cascading and simultaneous infrastructure failures and physical destruction of critical assets could paralyze parts of the region for weeks or months.
- Many participants failed to appreciate the monumental task of rescuing thousands of individuals injured or trapped in buildings, the need to shelter or resettle tens of thousands of others, and attending to the dead.
- There was concern that Emergency Operations Centers (EOCs) and organizational command posts could be located within areas impacted by the quake. A number of organizations had no well-defined EOC or lacked any backup EOC.
- Cross-national border interdependencies were not explored, although, such interdependencies are extensive. They include electrical power, natural gas and other petroleum products, dams and reservoirs; also transportation; telecommunications; food and agriculture; and banking and finance.

Resilient, Reliable, Interoperable, Communications and Information Systems

- Many participants had difficulty coming to grips with the fact that damage and disruption of telecommunications and critical information assets left much of the region without telecommunications, emergency communications and business systems.
- There was need for “situational awareness”—knowledge of what was happening throughout the region as the disaster unfolded to enable optimal decision-making.
- It was unclear what state and federal agencies had to offer regarding assistance to respond to loss or damage to operational or business systems.
- It was recognized that the media during a major disaster functions as a critical communications infrastructure and should be treated as such.

Risk Assessment and Mitigation

- While many participants said their respective organizations had conducted physical and cyber vulnerability assessments, most had not addressed an earthquake scenario.
- Although there have been some general studies of earthquake impacts (e.g., a study of major bridges and the CREW Report), no regional risk assessment has been conducted on impacts and particularly those caused by interdependencies.
- It was not clear what services banks could provide in a large-scale disaster that had prolonged power and communications outages. Participants believed all electronic banking, transfers, and accounting would be impacted, including use of bank cards and ATM’s.

Cooperation and Coordination

- The exercise revealed that regional key stakeholders have a high level of public-private cooperation already developed over the past four years, establishing a Partnership, holding a major infrastructure interdependencies exercise, and meeting regularly.
- The exercise at the same time revealed that much work remains to be done in coordinating local and state government disaster preparedness plans and contingency plans of private sector organizations for a major disaster.
- Private sector and other non-government organizations emphasized the need for their inclusion in regional preparedness planning with states, provinces, and municipalities.
- Many participants called for more mutual assistance agreements among states, provinces, cities and counties, and with and among private sector organizations, particularly with organizations outside the potential earthquake impact region.

- Key stakeholder EOCs and command centers need to be virtually linked and drills conducted to test cooperative plans and procedures and work out decision-making processes and roles and mission issues.
- How to include regional and national defense assets in regional preparedness planning for major disasters received limited focus in the exercise other than recognition of the need to somehow integrate the military into regional preparedness planning.

Information Sharing and Alert and Warning

- Cross-sector information sharing is still in its infancy but acknowledged as vital to disaster preparedness and management.
- Participants questioned whether the many thousands of individuals along the coast from British Columbia to San Francisco would have ample warning time of the tsunami to reach higher ground, or even receive a warning given the widespread regional power outage and telecommunications failures generated by the earthquake.

Roles and Responsibilities/Incident Management (Physical and Cyber)

- Participants were not confident that there would be, as one expressed it, a “smooth line of authority” among government agencies at different levels and across jurisdictions.
- Many participants either were not familiar with the National Response Plan or they did not believe that it would function or be executed as written.
- Local jurisdictions, utilities, businesses and other organizations have their own disaster response or business contingency plans and responsibilities to employees, customers, and in the case of corporations, their shareholders. Some participants raised the importance of ensuring plans are flexible guidelines and do not impede response and recovery with bureaucratic or legal obstacles.
- It was not clear how the state, localities and federal government would interface in an extreme disaster where lines of authority were blurred, and officials in charge were unavailable or unreachable to make decisions on deploying/managing personnel and other resources.

Response Challenges

- Citizens in the affected states would be on their own for days at a minimum, given the level of disruptions and outages and the fact that there would be competing need for federal resources throughout all disaster-affected states and provinces
- There was no evidence of a regional evacuation plan that could move large numbers of individuals from homes and businesses in a chaotic situation of transportation gridlock, no power and limited communications.
- There were certain “special populations,” including tribal nations and individuals in nursing homes and assisted care facilities, and prisons who would not or could not evacuate unless provided realistic procedures and education on what to do.

- Sheltering large numbers of individuals was a major problem. Schools would have only a day's worth of food and many potential shelters could lack heat and potable water, or would soon exhaust available resources and face sanitary problems.
- Dealing with large numbers of abandoned vehicles was seen to be an unanticipated significant problem, along with debris removal to enable emergency response.
- The large number of casualties exceeded the surge capacity of hospitals that were not damaged or suspected of having structural damage and forced to evacuate.
- Utilities and other essential service providers would be greatly hampered in resuming or maintaining operations because of inability to bring staff in or to keep personnel from leaving to be with their families. In other instances, organizations would need to shelter individuals who could not return home.
- Participants spent a considerable portion of the exercise on “people issues” on the basis that personnel are integral to the ability of an infrastructure or organization to function.
- Several participants pointed out that response plans must be kept simple and flexible, and that “complex plans will not work.”
- Participants generally agreed that the local media do have an essential role in response activities—providing crucial information to citizens on response procedures, hazards, and conditions in the region.
- Many participants emphasized the need for a certification process to enable emergency medical, utility maintenance and other stakeholder essential personnel to have access to buildings and get past roadblocks.
- It could take at least two-to-three days for the National Guard to fully mobilize for the disaster, considering that mobilization would be delayed because of the regional paralysis. Also, widespread impacts of the quake would necessitate that Guard forces would be spread thin and sent to high-priority areas.

Recovery and Restoration

- Many participants did not recognize the extent of recovery and restoration challenges, or how long it would take to remove debris and to restore and rebuild structures and critical assets such as electric power transmission and distribution systems.
- While there are mutual assistance agreements in place among utilities, local governments and states, there would be no guarantee that these would be honored given the wide-spread impact of the disaster. Organizations would need to be as self-reliant as possible.

- Availability of transportation infrastructure is necessary for restoration of critical infrastructure operations and other essential services. Impediments to road and rail travel could be compensated by use of marine transportation and/or medium and heavy lift helicopter, if such assets are available.
- Organizations had no way to gain information on what resources were available, nor was there a management system to prioritize, allocate and ensure transport of resources to areas of most need.
- It was unclear how to manage the influx of volunteer aid and which organization would be in charge of determining which entities or jurisdictions needed these resources.
- A major challenge identified was the shortage of personnel needed for restoration activities, particularly construction workers and structural engineers to certify buildings, bridges, and tunnels as safe.
- Relighting pilot lights after a widespread and prolonged natural gas, propane (LPG), and power disruption was a major problem from a safety standpoint and particularly because of the large numbers of trained technicians and the time required. Likewise water utilities could cause significant damage to buildings should they restore water service prior to checking the integrity of the plumbing systems installed in those buildings.
- It would take a minimum of two weeks to put together storage and distribution of fuel. For oil refineries that had not sustained significant damage, it would take two-to-seven days to resume operations if electric power was also restored.
- Security of infrastructures during the restoration process was a concern; there would be a need to protect critical assets and resources, including fuel and power generators.

Business Continuity and Continuity of Operations

- Most businesses and organizations with the exception of larger companies have neither the time nor the personnel to focus on disaster response planning.
- Businesses, such as retail, manufacturing, and distribution and service organizations are rarely directly involved in local or regional preparedness planning.
- Certain businesses, such as information technology firms, indicated they were in the planning stages of remote siting of critical data and providing backup systems, while others either were not taking steps to protect their data or failing to realize that their remote or redundant locations could fail because of interdependencies.
- Long-term restoration would be dependent on residents remaining in or returning to the region, and government assistance would be needed to “jumpstart” with financial assistance and other incentives particularly small businesses in the disaster area.

Logistics and Supply Chain Management

- The exercise showed, as one participant put it, that the region is “woefully unprepared to implement a logistic system/resupply following a large-scale disaster.
- Populations of major cities depend on grocery stores, pharmacists, and other essential service providers that customarily have no more than a few days supply of product.
- In a prolonged disruption, maintaining integrity of the food supply, which is dependent on power, clean water, waste treatment, refrigeration, and transportation, is essential.

Public Information/Risk Communications

- The general public needs to be aware that they should be prepared for being on their own in a disaster for 72 hours or longer. (Many participants cited at least seven days.)
- The public needs education on what a major earthquake or other cascading disaster would cause in terms of disruptions to basic services and awareness of health and safety concerns, and what government can or cannot do.

Exercises, Training and Education

- Political and industry leaders need to be made aware of regional disaster resilience needs and to participate in discussions and exercises.
- The media need to have access to training courses to understand the challenges of regional disasters, what to expect from government, utilities and other key stakeholders, as well as have knowledge of local, state and federal disaster plans.

Selected Recommendations

1. Seek federal support for detailed research along the lines of the Project Impact Partnership sponsored by FEMA in the late 1990s to assess the effects of a major subduction zone earthquake on interdependent infrastructures and identify cost-effective mitigation measures to assure critical infrastructure resilience.
2. Encourage the further development of analytic tools to assess the health and human safety and economic impacts of a major subduction zone earthquake. Explore what assessment tools might be available that address interdependencies with particular focus on those that utilize Geographic Information Systems (GIS) that could be used for preparedness/response.
3. Revise and improve existing federal, state/provincial, and local plans to address infrastructure interdependencies.
4. Encourage critical infrastructure owners and essential service providers to, where possible, establish alternative sources for essential products and services.

5. Develop and conduct additional workshops and exercises, both sector-specific and regional, including field exercises, involving public-private organizations to examine interdependencies at deeper levels, assess assumptions, and identify gaps and solutions.
6. Examine evacuation, sheltering or shelter-in-place plans to make them realistic, taking regional interdependencies into account.
7. Develop a public-private sector plan for a Resilient Regional Telecommunications/Critical IT Infrastructure System that assures interoperability and compatibility among stakeholder communications and information systems and incorporate into state plans.
8. Investigate greater use of high speed Internet voice and data, customer contact, hotline numbers, satellite phones, text messaging for disaster response.
9. Link regional Emergency Operations Centers and command centers, including utility EOC's and local radio stations through a regional communications network based on resilient, interoperable systems such as radio, satellite phone and IT capabilities.
10. Develop a telecommunications/critical IT infrastructure response/restoration resource management system that links free expertise and donated equipment with organizations in need.
11. Develop requirements for, and implement a regional risk-assessment methodology focused on interdependencies and associated physical and cyber vulnerabilities and all-hazards threats, and which takes into account economic impacts.
12. More concerted effort needs to be undertaken by federal, state, and local governments to improve cooperation and coordination from the grass roots to the national level.
13. Where possible, public and private sector response and business contingency plans should be shared, coordinated, upgraded, and tested with regional exercises.
14. An up-to-date list of key stakeholder points-of-contact responsible for disaster preparedness and management should be maintained at state/provincial and local EOCs and be made accessible to all key stakeholders. There should be a list of federal, state, and local agency names to assist in providing points-of-contact for government resources.
15. Create an Information Sharing Working Group within the Puget Sound Partnership to work on approaches and mechanisms to improve information sharing.
16. Create a Working Group within the Puget Sound partnership to begin to delineate roles and missions, leveraging existing federal, state, and local response plans and knowledge of response, response and restoration needs from lessons learned.

17. Once regional incident management procedures are established, conduct education of not just key stakeholders but the general public and hold regional and targeted exercises to work through chain of command issues.
18. Develop a simple credentialing process (should involve the states/provinces and federal agencies with county and municipal officials, private sector and other key stakeholder organizations).
19. State/provincial and local governments should work with private sector and other organizations to develop a process and capabilities to insure situational analysis to increase the success of response efforts.
20. Regional key stakeholders should include the local media in exercises and work with them to define their role and how to utilize their resources for disaster response.
21. There should be further study on how the ports and marine/naval services could be used to assist in response efforts.
22. Staging areas and transportation routes to get to the disaster area should be identified and assessed for potential interdependencies-related vulnerabilities.
23. Community Emergency Response Teams (CERT) should be factored into local emergency planning so they can provide needed depth to first responder activities.
24. Getting schools back into operation as quickly as possible should be made a high recovery priority in local disaster plans. Also, certain schools should be designated in advance as potential shelters and provided with stockpiled supplies.
25. Local law enforcement, the Federal Bureau of Investigation, and the National Guard need to work in concert with key stakeholders to develop a contingency plan to deal with civil unrest.
26. Procedures should be developed to encourage and assist small businesses as part of restoration plans.
27. Establish criteria and a plan for conducting system and structural certification inspections as part of disaster preparedness.
28. Develop a debris management plan.
29. The Puget Sound Partnership or the broader Pacific Northwest Partnership should hold a workshop that focuses on what civilian and defense federal authorities can “bring to the table” in terms of services and resources for recovery and restoration, as well as address issues associated with access to these services and resources.

30. Organizations should put in place procedures to ensure that they have identified all essential personnel that would be required to provide support in a major disaster.
31. Organizations should investigate designating an area or facility outside the region from which to conduct business in a major disaster.
32. All utilities should investigate digitizing and backing up important system information outside the geographic area to a site or sites that would not be impacted by earthquake or other disasters striking their facilities.
33. Organizations should work with their suppliers to identify and assess supply chain vulnerabilities and interdependencies and disruption impacts, then develop a management strategy to assure availability of and access to critical equipment, materials, components and products, including from off-shore sources.
34. Publicize the need for at least a seven-day “Ready-Kit” of food, water, medicine and a family emergency plan, gas and cash.
35. Provide targeted information to special needs groups (people needing medications, on respirators or handicapped, or financially disadvantaged without access to transportation).
36. Provide education, training and exercise opportunities in disaster preparedness and management to government and non-government senior managers, political leaders, the media, and general public. Include these groups in regional and sector-specific exercises.

Next Steps. Exercise participants and other interested stakeholders agreed to meet on April 27, 2006 to prioritize the exercise recommendations and develop an Action Plan of short, medium and longer-term projects and activities that would be incorporated with Action Plans from the two previous Blue Cascades exercises and local and state plans. This meeting would lead to the creation of working groups to develop project requirements, including determining lead organizations and funding needs.

Infrastructure Interdependencies Tabletop Exercise BLUE CASCADES III : Managing Extreme Disasters

Final Report

1 Background

BLUE CASCADES III: Managing Extreme Disasters, held March 1-2, 2006 in Bellevue, Washington, was the most ambitious, innovative, and far-reaching regional interdependencies tabletop exercise conducted to date by government, private sector, and other organizations with roles and major interests in improving regional resilience for all-hazards disasters in the Pacific Northwest. More than 330 representatives from 150 organizations participated in an intensive two-day event, producing hundreds of pages of written observations on lessons-learned and recommendations for remedial activities.

BLUE CASCADES III built directly upon the first two exercises, Blue Cascades I, held in Portland, Oregon in June 2002, and Blue Cascades II, held in Seattle in September 2004. The first exercise, conducted under the umbrella of the newly created Pacific Northwest Partnership for Regional Infrastructure Security, focused on raising awareness of interdependencies and associated vulnerabilities associated with largely physical attacks and disruptions, while the second exercise centered on cyber threats, disruptions, and impacts. Both of these previous exercises resulted in Action Plans developed by the participants comprised of short and longer-term activities and projects to address high-priority preparedness gaps identified in the respective exercise reports.

Progress Made. Regional stakeholders have made some significant but limited progress thus far towards implementing elements of both Action Plans. Among, completed activities include the creation of the NorthWest Warning Alert and Response Network (NWWARN), the Puget Sound Partnership for Regional Infrastructure Security, and the Puget Sound Alliance for Cyber Security (PSACS), better coordination of stakeholder response plans, additional workshops and exercises, and the beginning of a Critical Infrastructure Decision Support Pilot Project with the U.S. Department of Homeland Security Science and Technology Directorate. Because of funding and staff constraints, and in some cases the lack of technical expertise, many of the projects in these Action Plans remain to be implemented, in particular the longer-term projects that require federal assistance and guidance.

It should be noted in assessing the results of BLUE CASCADES III in the Final Report that follows, that a few of the shortfalls identified in this exercise were not unexpectedly highlighted in the first two regional exercises. The Puget Sound Partnership member organizations, which selected the exercise focus and developed the scenario, made the decision to focus on a catastrophic disaster—in this case, a 9.0 magnitude earthquake along the Cascadia Subduction Zone—in September 2005 after Hurricane Katrina struck the U.S. Gulf Coast. By focusing the scenario on the Pacific Northwest’s equivalent extreme disaster, the desire was to explore, identify, and assess what needed to be done to

make the region as resilient as possible to a major earthquake. A particular interest of the Partnership members was to examine restoration needs and challenges after a major regional disaster in a situation where there was extensive damage and long-term disruptions of critical infrastructures and other essential services, including a prolonged (weeks to months) power outage. To make the exercise as useful as possible, the exercise was planned to cover all phases of the disaster—response, recovery and longer-term restoration. To be as comprehensive as possible, the scope of the exercise was extended to cover what preventative and mitigation measures already were in place in the region and their effectiveness to address a major earthquake scenario.

The Partnership members were assisted greatly by having access to nationally-known earthquake experts, the Cascades Region Earthquake Working Group (CREW); the Pacific Northwest Seismograph Network; ESRI experts in the development and use of Geographic Information Systems (GIS); and The University of Washington. CREW had completed a significant report focusing on the impacts of a major subduction zone earthquake on the Pacific Northwest, which was available to use as a general foundation for the scenario. The Partnership members also benefited from having the experience of developing the previous Blue Cascades exercises and particularly the trusted relationships that had evolved in collaborating regularly on regional infrastructure security and disaster preparedness issues.

As in the previous exercises, BLUE CASCADES III was hosted by the Pacific NorthWest Economic Region (PNWER), a state-chartered consortium of five states (Washington, Oregon, Alaska, Idaho, and Montana) and three Canadian jurisdictions (British Columbia, Alberta, and The Yukon Territory). Funding was provided by the U.S. DHS National Cyber Security Division/US-CERT, with private sector donations, including a venue in the Hyatt Hotel in Bellevue provided by Microsoft. (*See Appendix B for private sector supporters.*)

2 Overview

BLUE CASCADES III, like its predecessors, was not designed to be an exercise in the traditional sense, i.e., focusing on testing existing national, state, or local plans and processes. Nor was it meant to follow the model that has evolved from government drills that relegates private sector organizations to a lesser role, or does not include them and relies on simulations. This regional interdependencies exercise model relies heavily on public and private partnership and participation.

2.1 Purpose

The overall goal was to raise awareness and gain knowledge of gaps in preparedness planning and management in large-scale regional disasters. This was accomplished by exploring response, recovery, and particularly restoration activities in a prolonged, cascading, cross-border series of disruptions exacerbated by broad regional physical and cyber infrastructure interdependencies with major complicating factors and long-term

impacts that well exceeded the contingency planning and backup capabilities of most critical infrastructures and essential service providers.

2.2 Focus and Scope

As noted, the focus of the two-day exercise was a 9.0 magnitude subduction zone earthquake affecting much of the Pacific Northwest coast from Vancouver, B.C., to San Francisco, as outlined in a hypothetical scenario developed by CREW in its subduction zone earthquake 2005 Report. The first half-day focused on existing protection and mitigation measures, with the afternoon focusing on response challenges. The second day focused on recovery and longer-term restoration.

As in previous Blue Cascades exercises, a Scenario Design Team of key stakeholder representatives developed the scenario. In this case, however, the number of organizations making up the Team was much larger—more than 40 organizations with major roles or interest in regional disaster resilience. The large number of Team members was a testament to the increasing awareness of infrastructure interdependencies and the great interest of all stakeholder groups in improving regional disaster resilience. Included were utilities and other essential service providers; local, state, and federal government agencies, businesses, non-profits, academic and community institutions. *(See Appendix A for Scenario Design Team members.)*

There were several newcomer organizations to the group. These included area schools, represented by the Washington Association of School Principals, and the U.S. Postal Service. The exercise provided School representatives the opportunity to hold their own exercise within the BLUE CASCADES III exercise, and the U.S. Postal Service was able to schedule a meeting of its Western Region emergency preparedness personnel to coincide with the exercise and use it for training purposes.

2.3 Objectives

There were a number of specific exercise objectives, reflecting the diverse composition of the Puget Sound Partnership member organizations. BLUE CASCADES III was intended to:

- Illuminate reconstitution and business continuity challenges and needs associated with long-term disruptions of critical infrastructures;
- Increase understanding of interdependency issues related to recovering from long duration outages;
- Underscore and validate the mutual value of public and private sector and cross-function and multidiscipline cooperation to deal with large-scale, prolonged disasters of all types;

- Highlight the extent of cooperation, including understanding of roles, responsibilities, and authorities—local, county, state, federal (civilian and defense)—of jurisdictions and of private sector organizations during long-term regional disruptions;
- Further explore cross-border physical and cyber U.S. and Canadian interdependencies;
- Increase the level of collaboration among regional cyber security responders and experts, as well as cooperation along cyber and physical security and emergency management personnel;
- Explore and assess what approaches and plans are necessary for regional resource management;
- Recognize and examine jurisdiction boundaries and problems that arise from these artificial barriers;
- Explore the development of plans for determining restoration priorities;
- Examine and begin to better understand how to deal with the welfare of citizens;
- Highlight existing laws and gaps that may impede restoration or recovery efforts.

2.4 Exercise Development

The Scenario was developed over five-months of bi-weekly conference calls and four planning meetings. Members submitted “injects” (hypothetical events) that reflected primary areas of concern to their organization for inclusion and accompanying discussion questions. Engineers and seismologists from CREW were available to explain and interpret information from the CREW Report.

2.4.1 Key Decisions

Multifaceted, Complex Script. The Scenario Design Team was aware that this process would result in a great deal of diverse information incorporated into the script with many “things happening” at the same time, but after discussion decided to err on the side of inclusion as opposed to focusing on a few related events. The rationale was that an extreme disaster was typified by chaos and confusion with many events simultaneously occurring, including widespread infrastructure disruptions complicated by interdependencies that would challenge individual organizational and cooperative decision-making. To try to keep the scenario manageable and able to be competed in a two-day exercise, the Team selected certain questions as particularly significant for highlighting during the event.

Specific Site References. The Team also decided *not* to include specific references to most buildings, bridges, highways, or critical infrastructure components in the scenario that could reveal vulnerabilities. A main impetus was that the decision to provide the

entire exercise script electronically in a detailed “Read Ahead Package” to participants in advance to assist them and their organizations to prepare for the exercise. A final “scrub” was made of the scenario and most site-references were deleted. Upon registration for the exercise, participating organizations were asked to sign a Non Disclosure Agreement in order to attend. A version of the scenario with the issues questions deleted was provided to the media in advance of the exercise as part of the media backgrounder materials.

Local Broadcaster Inclusion in the Exercise. Some of the Scenario Design Team members felt strongly that media, and particularly local broadcasters, should be included in the exercise as participants. Discussions focused on the distinction between the management/operations functions of broadcast stations and their news gathering functions, if they had them. In previous Blue Cascades exercises, local reporters were allowed to stay through the opening keynote addresses of senior officials from supporting organizations and then conduct interviews of these officials and others willing to provide information on behalf of their organizations in a press conference in a separate area from the exercise. Local reporters, however, were not allowed to remain as participants. The reason for this was to provide stakeholders confidentiality when discussing infrastructure vulnerabilities and proprietary information, and also to enable participants the freedom to express their views in a trusted forum.

The rationale of those who supported inclusion of local broadcasters was that Hurricane Katrina reinforced the fact that local radio and television stations have significant roles in major disasters. First, local broadcast facilities are critical infrastructure. Broadcasters serve as essential service providers of communications that enable situational awareness and dissemination of crucial information to the general public on evacuation and other emergency procedures, duration of outages, contamination issues, and where to seek necessary resources such as food, water, fuel, and medicines. Second, local broadcasters also at times function as first responders to assist citizens in conjunction with response assets. Third, local broadcasters serve to educate the general public in pre-disaster preparedness planning. A distinction was made between national and local broadcasters as well because local broadcasters and their families are ultimately impacted in the same way others in the region are impacted, and therefore, have a different interest and understanding of a situation than national correspondents.

The Scenario Design Team heard from a panel of local broadcast infrastructure managers during the final preparations for the exercise, and agreed that a panel presentation along similar lines should be included at the end of Phase I and that these individuals could represent the local broadcast outlets in the exercise. The majority of the Team was not ready to allow broader media participation in the exercise, such as reporters, although it was recognized that this was an issue that required further consideration.

2.5 Format, Process, and Scenario Overview

The exercise was divided into four phases: I. Protection and Mitigation, II. Response, III. Recovery, and IV. Restoration. An “earthquake experts panel” and an ESRI technical GIS support team were available during the entire proceedings. The exercise was

untraditional in many ways, not least in that it used a large number of facilitators who were members of the Scenario Design Team to present their respective injects and pose questions to participants for their response.

Phase I: Protection/Mitigation. The first half of day 1 entailed a unique “Workshop within an exercise” format as a means to focus participants on the extent and effectiveness of existing plans, procedures, and other preparedness and mitigation capabilities to address major earthquakes. Participants were told that it was January 18, 2007, and they were meeting as the Puget Sound Partnership with their counterparts in neighboring states and Canadian provinces in Seattle to explore the impacts of large magnitude earthquakes and what regional stakeholders needed to collectively and individually do to make interdependent physical and cyber infrastructures *resilient* (able to withstand damage and rapidly resume operations). Workshop participants were told that a major subduction zone earthquake has struck the region in the past on average every 500 years (between 200 and 1,000 years apart) and that such an event could occur at any time. They were also told that subduction zone earthquakes have far more geographically widespread effects than other types of quakes, including long waves of ground motion that can cause landslides, soil liquefaction, tsunamis, fires, hazardous material spills, and building damage. Especially vulnerable are tall and long structures, such as multi-story buildings, unreinforced masonry and tilt-up buildings; bridges, railroad tracks, tunnels, and pipelines; also aging and degraded infrastructures.

Participants were then divided into breakout groups by infrastructure and provided a series of questions designed to enable them to share information on existing measures to protect against or mitigate damage to their infrastructure’s cyber and physical systems and facilities. After a short period of sharing results of the first breakout session, a second session took place, only this time participants were divided into breakout sessions of representatives from different infrastructures and organizations. In this instance they were asked to look at “interdependencies that exist outside the fence”, and to also look at the protection and mitigation challenges that would result from a major subduction zone earthquake. During the following plenary session and lunch, participants shared the results of the discussions from the two breakout sessions. The working luncheon focused on the media’s role in response activities.

Phase II: Response (Days 1 and 2). Exercise participants were seated in their respective infrastructures for Phase I on the basis that they would be working largely within their organizational missions for disaster response. As noted, they had received a copy of the scenario in the Read Ahead Package provided to them in advance of the exercise.

The hypothetical scenario provided to participants began at 1:45 on a cold, blustery late winter day after a period of a great deal of rain in the coastal Pacific Northwest, which has made the soil in areas prone to liquefaction and landslides in the region more unstable. The opening scene initially was at the Space Needle in Seattle where business leaders and municipal and county officials were coincidentally meeting to discuss regional disaster planning. The four minutes of rolling from the quake centered off-shore was felt by hundreds of thousands of individuals from Vancouver, B.C., south to Eureka,

California. All critical infrastructures and essential service providers were disrupted, in some cases such as electric power, for weeks to months in Washington, Oregon, and California. In certain areas power substations and transmission/distribution lines, bridges, interstate highways, railings, microwave, electrical and water towers, tunnels and underground cables; water, sewer and industrial waste; and gas and fuel pipelines were affected. Thousand of vehicles were abandoned along the roads and bridges with I-5 and other interstates turned into parking lots. Ferries ceased operation and Sea-Tac and other local airports were closed until inspected for damage. Throughout the region, responders, utility maintenance, healthcare, and other essential personnel that were not assisting their families or trying to get their stranded children from school were impeded by police roadblocks and traffic gridlock. Emergency managers searched for viable shelters for people unable to go back into or reach their homes. Industry and general commercial businesses in the area shut down. By mid afternoon the effects of power failures began to be felt across the area, and the resulting disruption of wastewater lift stations caused sewage backup onto streets. Banks shut down and ATMs did not function. Growing concern about civil disorder and looting became a major issue for law enforcement and emergency responders.

At 4:00 p.m., President Bush declared a National Disaster for the states in the earthquake impacted region and the National Response Plan officially went into effect. In Canada, the federal government provided support in response at provincial requests. By the end of Day 1, some hospitals experienced the lack of supplies, inability to get staff in to work, and were overwhelmed with walk-ins, while in schools children and distraught parents that managed to reach them were isolated with either no or limited food and supplies, and looming sanitation and potable water problems.

During Day 2, affected services remained largely out with emergency power and communications capabilities increasingly lost due to lack of batteries and depletion of fuel for generators. People with battery powered radios or backup power generators turned to the broadcast media for information or called stations because they could not get through on 911. Radio station hosts fielded calls from people reporting fires, gas leaks, and injuries while hospitals called radio stations making on-air radio pleas for specific supplies. For many utilities and organizations, sensitive electronic and computer equipment had been damaged and services were dropped off-line or significantly degraded, including the City of Seattle, which had been impacted by a failed backup power generator for its data center. At the same time, the local media continued to perform the vital function of responder/communicator for the general public. People not able to access the 911 system or their local utilities had been calling the local stations with phone calls asking for information.

Phase III: Recovery (Day 3). In most regions, severely impeded communications made coordination and obtaining essential resources and supplies difficult to impossible as the critical infrastructure disruptions continued. U.S and Canadian officials held conference calls and meetings to coordinate recovery activities against a backdrop of mutual terrorism concerns and security safeguards. Because of the cascading impacts to cross-border interdependent infrastructures, major long-term economic impacts were expected with loss of jobs and dollars. A bright spot was the U.S. Postal Service. Despite major

damage to key facilitates, its function was crucial to provide a government presence and serve small companies and people who depend on receiving social security checks and welfare and payroll checks, and who needed them for survival. Both the Postal Service and local and national businesses sought ways to offer personnel, products, materials, and expertise to assist in the response.

Phase IV: Restoration (Days 7 through 31). Government at all levels continued planning for longer-term restoration activities while major ongoing response efforts were directed at people who were homeless or still in shelters. There had been non-stop press coverage of the earthquake and two Congressional investigations. While some service had been restored, large segments of the population located in major metropolitan areas of Vancouver, BC, Seattle/Tacoma, and Portland were still without electrical service because of damage to critical components (e.g., transformers and circuit breakers). Some restoration delays were caused in part by spare equipment shortages (i.e., critical facility components), as well as the shortage of special handling equipment and damage to overpasses, roads, bridges, and rail lines. Compounding restoration efforts were the thousands of people requiring temporary shelter.

Debris removal and disposal had been a huge challenge and was expected to last for months. Communications remained limited and in many areas inoperable. Damage assessments were still underway in many locations for bridges and rail lines. Communities in lower priority areas found they needed to be self-sustaining for weeks. Many businesses and government agencies could not operate their offices, nor were they able to reconstitute themselves in temporary offices in eastern Washington and elsewhere. Rail lines, trucking, and air traffic were overburdened by extra demands for products needed to rebuild. Alaska, dependent on west coast ports for essential products and supplies, rapidly faced critical shortages of all supply categories. With ports damaged by the earthquake and ensuing tsunami, Alaska was faced with relying on land, or very limited air movement for the shipment of critical supplies.

At the end of the scenario, government officials assumed a continuance of restoration activities for at least another five months. Major environmental clean-up efforts were expected to delay construction and repairs. There was concern about the drop in tourism and that displaced people would not return to the Puget Sound area.

3 Exercise Results

A process was established to capture the results of the exercise that involved recruiting independent evaluators and evaluators from each of the Scenario Design Team member organizations. Each of the several dozen evaluators was asked to review the recently released *Guide to Develop Regional Disaster Resilience*, produced by a Task Force of The Infrastructure Security Partnership, a national public-private collaboration of the engineering community and representatives of key stakeholders from across the country. Evaluators were provided with a template with questions tailored to each exercise phase that reflected the 12 preparedness “needs categories” in the *Guide*. This template was also intended to form the basis of the BLUE CASCADES III Final Report.

In addition to the formal team of evaluators, participants were provided large note cards to jot down comments, ideas, and recommendations as the exercise progressed for inclusion in the exercise report. Participants also were also asked to fill out a detailed attendee evaluation form to provide their views on the “take-aways” or “Aha's!” from the exercise, its utility, as well as how to make it better, and their recommended courses of action to meet perceived preparedness gaps.

3.1 Evaluation Criteria

Criteria used for exercise evaluation to identify the findings and recommendations for Phases I-IV follow:

- Participants’ level of understanding of impacts to critical infrastructures, including regional interdependencies that could be factors in a major disaster and cross-border U.S. and Canadian interdependencies;
- Extent to which participating organizations have undergone cyber and physical vulnerability assessments and are using a risk-based approach to continuity planning and preparedness improvements to address these vulnerabilities;
- Extent/effectiveness of participating organizations capabilities to meet response, recovery, and restoration needs;
- Extent of preparedness to manage an extreme disaster that has prolonged outages of essential services;
- Ability of organizations to comprehend how to work around and compensate for loss of key assets;
- Extent of understanding of roles, responsibilities, and authorities—local, county, state, federal (civilian and defense)—of jurisdictions and private sector organizations during response and after a significant disaster;
- Level and mutual value of public and private sector, cross-function and multidiscipline cooperation, including information sharing to deal with large-scale, prolonged disasters;
- Level of resiliency and interoperability of regional communications and telecommunications in a large-scale disaster;
- Existence of legal, security, and other barriers and impediments to response and recovery activities and how organizations deal with those barriers;
- Level of understanding of participants on needs associated with citizens and particularly special needs groups;
- Assessment of the role(s) and contribution of the media and related challenges;

- Challenges associated with identifying and securing necessary resources from government, private sector, and non-profits for disaster response and restoration;
- Constraints posed by jurisdictional interests, environmental and land use regulations;
- Business continuity challenges and needs associated with long-term disruptions of critical infrastructures;
- Challenges associated with determining restoration priorities;
- The level of public awareness, understanding, and expectations about disaster preparedness and management; and
- Role of the media in major disasters.

3.2 Findings and Recommendations

The findings and recommendations reflect the integrated written comments provided by the more than 330 participants on note cards and on attendee evaluation forms, as well as detailed evaluations of more than five dozen practitioners, infrastructure personnel, and experts from industry, national laboratories, universities, and other research institutions.* Many of these participants were veterans of previous Blue Cascades exercises and represented organizations active in the Puget Sound and broader Pacific Northwest Partnership, including state/provincial, local, and federal government agencies. These key stakeholders have made significant strides in the last four years in developing an unprecedented level of cooperation, working collectively to improve regional preparedness. They can take well-deserved credit for many accomplishments, best practices, and solutions that are not recorded in this exercise report.

These public and private stakeholders are also intent on identifying the challenges they need to address to make the Puget Sound Region and the broader Pacific Northwest resilient to extreme disasters that put the region at risk. As a result, BLUE CASCADES III participants came to the exercise enthusiastic and prepared to contribute, share, and learn. They were candid in their observations and thoughtful and innovative in their recommendations on how to deal with the shortfalls they saw during in the exercise.

3.2.1 Understanding of Interdependencies in an Extreme Disaster

3.2.1.1 Findings

1. The large magnitude subduction zone earthquake scenario was particularly challenging, even for those participants who had attended previous Blue Cascades exercises and had an appreciation of high-level regional infrastructure interdependencies. Most of the participants had no real idea of what would be the physical impacts on their facilities,

* The BLUE CASCADES III Final Report was reviewed by the Scenario Design Team, revised, and then reviewed by all participants to ensure that their views were accurately represented.

operational and business systems and components—particularly those that were underground, e.g., power and communications cables, and water, wastewater, fuel, and natural gas pipelines.

2. Earthquake experts present to provide technical information on effects of the quake stated that tall, long structures (certain older high-rise buildings and bridges; water, power transmission, distribution, and microwave towers) could be at risk, particularly those structures that were older or in areas where there was soil liquefaction, possibility of landslides or flooding. Likewise underground assets in some areas could be shifted and damaged due to soil liquefaction. An example provided was the Tacoma water system, which like many other large systems in the Puget Sound region, relies on transmission mains which cross liquefaction zones.
3. Other than to say that “impacts would be “spotty”, the experts—given the current state of earthquake research—could not provide a good picture of the extent of damage other than to provide maps showing where soil liquefaction could be an issue. The impact on dams and levees was not addressed but should receive further study. Although the issue was not raised in the exercise, a few participants on their note cards inquired on whether a large subduction zone quake could “set off” the region’s volcanoes. One fact presented on a number of occasions was the reality that no one really knows what the extent of damage would be from a major subduction zone quake.
4. Although the exercise included a long-term regional power outage, the extent of the consequences was not apparent to participants beyond some of the obvious high-level interdependencies. Many individuals appeared not to understand how cascading and simultaneous infrastructure failures and physical destruction of critical assets could paralyze portions of the region for weeks or even months. One participant observed that although the exercise was designed to demonstrate interdependencies, “We just don’t get it.” There was a lot of denial about just how bad the scenario would be or how long the recovery would take.
5. There was a good deal of discussion among participants, including the many electric power representatives present, about whether there would be “pockets of darkness” or a broader regional outage with “pockets of light”, and the length of time needed to restore much of the region’s power. One person observed that locations where power was restored could experience brownouts for some period of time that would impede the start-up of certain industries and businesses.
6. More importantly, participants and experts alike generally lacked knowledge or understanding of how infrastructure interdependencies could greatly exacerbate the effects of the quake. Participants did not fully appreciate secondary dependencies such as need for control services, IT systems, fuel delivery, and alternate sources of necessary supplies and products. One participant observed that “understanding of interdependencies is one layer deep and stove-piped”.
7. Many participants likewise did not take into account how localized damage to, or destruction of critical infrastructure assets (e.g., a electric power substations, dams, and

bridges essential to regional transportation) could lead to catastrophic consequences and long-term curtailment of essential services. It was pointed out that the City of Seattle has over 120 bridges and there are around 1000 in western Washington. A state official expressed the view that existing disaster planning for this type of scenario was “high-level” and that earthquake disaster plans needed reassessment and improvement.

8. With some exceptions, participants also appeared to have difficulty visualizing how such regional impacts could greatly impede response, recovery, and longer-term restoration activities. An earthquake expert observed that although the scenario portrayed a worst case event, discussions “skirted the worst case”. Some government officials and private sector representatives explained how they would manage the disaster and establish priorities based on their respective response and business contingency plans. There was little recognition that these plans would be compromised by the extensive regional long-term power outage; absence of most communications capabilities; major transportation constraints from damaged bridges, tunnels, and roads; water disruption; sewer backup; shutdown of fuel and natural gas distribution; and fires around the region caused by ruptured gas pipelines. Utility managers began to understand they would have difficulty locating and transporting needed materials to rebuild their systems and would be competing with other sectors for limited heavy equipment and operators.
9. Many participants failed to appreciate the monumental issue of rescuing thousands of individuals either injured or trapped in affected buildings, the need to provide shelter to, or resettle tens of thousands of others, and dealing with the dead in the middle of chaos and regional paralysis. The issue of how to bring in response and recovery resources from outside the Puget Sound region to help was addressed, but glossed over was the need for staging areas in the eastern part of Washington State for resources and relocation of large numbers of people there from the western region of the state.
10. On prioritization of service restoration, some government and private sector participants referred to official priority lists. There was general recognition, however, that in an extreme disaster there needed to be a systematic way to prioritize based on changing response and restoration needs of critical infrastructures and essential service providers. At the same time, as one participant remarked, the question remained on “who establishes restoration priorities, and who resolves the conflict over competing priorities?”
11. Several participants raised concerns that Emergency Operations Centers (EOC) and organizational command posts would most likely be located within areas impacted by the quake. A number of organizations had no well-defined Emergency Operations Center or lacked any backup EOC.
12. Cross-national border interdependencies were acknowledged by the participants but not explored to any extent. Such interdependencies, which are extensive, include the energy sector, which is composed of electrical power, natural gas and other petroleum products, dams, and reservoirs. To varying degrees, all other sectors, such as transportation, telecommunication, food and agriculture, banking and finance, etc., all

share this cross border relationship. A Bonneville Power Administration official gave as an example the water releases from Canadian dams and reservoirs that are needed to generate power at 10 downstream US hydro projects on the Columbia River. These water releases are needed to generate the energy required to meet load throughout the Pacific Northwest, to include the transmission of a portion of that energy back to Canada in exchange for the water moved across the border for generation.

3.2.1.2 Recommendations

1. Develop a means to identify and assess the importance of regional interdependencies. (The Puget Sound Partnership with the Science and Technology Directorate of the U.S. Department of Homeland Security (DHS) is about to undertake a project to complete an interdependencies template and develop a database framework to house the information for organizations' use.)
2. Seek federal support for detailed research along the lines of the Project Impact Partnership with King and Pierce Counties sponsored by FEMA in the late 1990s to assess the effects of a major subduction zone earthquake on interdependent infrastructures (*Lifelines* study) and identify cost-effective mitigation measures to assure critical infrastructure resilience.
3. Encourage the further development of analytic tools to assess the health and human safety and economic impacts of a major subduction zone earthquake. Explore what assessment tools might be available that address interdependencies (e.g., HAZUS and capabilities of the DHS National Infrastructure Simulation and Analysis Center and other National Laboratories and research institutions), with particular focus on those that utilize Geographic Information Systems (GIS) that could be used for regional preparedness and disaster response.
4. Revise and improve existing federal, state/provincial, and local preparedness and disaster management plans to address interdependencies in a major earthquake scenario.
5. Incorporate interdependencies into vulnerability and emergency response/reconstitution and business contingency plans to take into account interdependencies-related restoration needs, including mitigation strategies, priorities, and service restoration sequencing.
6. Encourage critical infrastructure owners and essential service providers to, where possible, establish alternative sources for essential products and services—e.g., for water systems, alternative sources of drinking water and alternative methods of water distribution. State environmental regulators appear unprepared to allow water utilities to access emergency water sources without a timely permitting process.
7. Develop a regional agreement of service restoration priorities for all lifeline services e.g., electrical, water, oil and gas, and address the issue of who makes that decision and

which organization or organizations can re-prioritize service restoration during the course of response, recovery, and restoration.

8. Develop and conduct additional workshops and exercises, both sector-specific and regional, including field exercises, involving public-private organizations to examine interdependencies at deeper levels, assess assumptions, and identify gaps and solutions.
9. Examine evacuation and sheltering or shelter-in-place plans to make them realistic, taking regional interdependencies into account as well as sheltering facility limitations, and vulnerabilities, using the extreme earthquake disaster scenario as a baseline.

3.2.2 Resilient, Reliable, Interoperable, Compatible Communications and Information Systems

3.2.2.1 Findings

1. Many exercise participants had difficulty coming to grips with the fact that damage and disruption of telecommunications and critical information technology assets left much of the Puget Sound Region without emergency and general communications capabilities and business systems. Public safety infrastructure in the region is dependent on telecommunications carriers and the 800 MHz network; SCADA and other process control systems in a wide range of infrastructures would also be damaged/disrupted. As a health insurance representative noted, “Our plans do not account for total loss of communications.”
2. While previous Blue Cascades exercises demonstrated the need for interoperable communications, in BLUE CASCADES III at issue was the impact of the loss of telecom and critical IT systems and how these systems and particular emergency communications could be made more resilient (able to withstand a subduction zone quake and expeditiously recover with minimal damage). Some participants pointed to mitigation measures, including building more systems redundancy and developing alternative, mobile, and easily deployable wireless-based communications.
3. There was need for “situational awareness”—knowledge of what was happening throughout the region—as the disaster unfolded to enable optimal decision-making on response (e.g., dispatching personnel and other resources where needed, prioritizing service restoration, determining evacuations routes and sheltering locations, etc.).
4. Telecommunications assets are often co-located in the same building which increases vulnerability. Also, although each may have backup systems including generators and fuel, company policies or other restrictions may impede them from sharing these resources during a disaster.
5. There is a need for alternative ways to communicate with key stakeholders as well as first responders in addition to the general public. Some participants cited GETS (Government Emergency Telecommunications Service) as a solution while others said that GETS was not guaranteed to be accessible in a significant disaster.

6. The City of Seattle in the exercise scenario was forced to suspend operations of its computer-based services, along with those of other organizations, cutting off essential IT-associated city services until the structural integrity of buildings housing the systems could be certified, essential services (e.g., power, water, telecommunications) were restored, equipment repaired, and systems were back on line—a prolonged period of time.
7. It was unclear what state and federal agencies had to offer regarding assistance to public and private sector organizations to respond to loss or damage to operational or business systems. It was pointed out that under the National Response Plan (NRP) the National Communications Service in DHS has this role for telecommunications; for critical IT infrastructure, the lead agency is not designated.
8. Emergency response and business contingency plans generally assume the existence of communications channels and lack provisions to take into account the absence of telecommunications, cellular communications, and critical IT infrastructure, or its disruption, damage, or destruction.
9. The media during a major disaster functions as a critical communications infrastructure and should be treated as such.

3.2.2.2 Recommendations

1. Develop a regional risk assessment system/methodology for telecommunications/critical IT infrastructure resiliency, along with criticality criteria to prioritize telecom and IT infrastructure assets. This methodology should include a vulnerability assessment of regional telecommunications from a disaster resilience perspective (probability of certain scenarios) to ascertain shortfalls. Project should entail a baseline inventory of government, private sector, and other essential primary communication systems, including those used for emergencies and include mitigation alternatives to address identified vulnerabilities and alternate communications links if disrupted.
2. Develop a public-private sector plan for a Resilient Regional Telecommunications/Critical IT Infrastructure System that assures interoperability and compatibility among stakeholder communications and information systems. Incorporate this plan into an updated state NRP Emergency Support Function 2 (telecommunications/IT systems). Include key private sector and other stakeholders in ESF-2 discussions.
3. Develop capabilities to ensure situational awareness through resilient regional telecom and critical IT capabilities during a disaster.
4. Encourage all organizations to include within their contingency plans provisions for backup systems to assure redundancy to deal with outages of phone, cell phone, and internet access.
5. Where appropriate, key stakeholder representatives should share phone numbers, radio frequencies, and other contact alternatives, within sectors, and cross sector with critical

customers, service providers, contractors, and others deemed necessary to meet contingency planning requirements for their organization

6. Investigate greater use of high speed Internet voice and data, customer contact, hotline numbers, satellite phones, text messaging for disaster response.
7. Develop collaborative public-private sector procedures for flexible prioritization of telecom and critical IT infrastructure service restoration.
8. Identify sources of necessary emergency equipment, such as power generators; extended life batteries and batteries that are standardized and can be easily changed, also standardized charger connections. Investigate feasibility of stockpiling in certain cases. Consider how to enlarge emergency fuel supplies for generators and emergency vehicles. Also, encourage telecommunications companies to explore with co-located companies sharing stockpiled resources not allowed by current contracts. Secure means to provide low or no-cost technical expertise for telecom/critical IT infrastructure assessment and disaster preparedness/management.
9. Provide access for interested public and private sector organizations to the:
 - GETS (Government Emergency Telephone System) priority communication system and any other government emergency network;
 - Wireless Priority Service (WPS);
 - Telecommunications Service Priority Program (TSP);
 - Puget Sound Regional Portal within the DHS/US-CERT Portal for information sharing, tools, and expertise in a regional disaster.
10. Link regional Emergency Operations Centers and command centers, including utility EOC's through a regional communications network based on resilient, reliable interoperable systems such as radio, satellite phone, and IT capabilities.
11. Investigate ways to link first responders and local and private sector Emergency Operations Centers to local radio stations to provide to the public notification of outages, threat information, and general information when phone lines, common networks, and email are not available.
12. Encourage organizations to establish a schedule to ensure routine testing of existing communications systems and incorporate into regional and in-house organization exercises.
13. Develop a telecom/critical IT infrastructure response/restoration resource management system (possible joint project with DHS to leverage their envisioned NET Guard) that links free expertise and donated equipment with organizations in need.

3.2.3 Risk Assessment and Mitigation

3.2.3.1 Findings

1. In Phase I (the Workshop within the exercise) that focused on prevention and mitigation, many participants said that their respective organizations had conducted physical and cyber vulnerability assessments and some said they had risk assessment approaches to determine where to focus resources. At the same time, most had not addressed an earthquake scenario and in particular a subduction quake.
2. Regional organizations are undertaking mitigation measures to deal with large-scale disasters. For example, the Seattle Fire Department and the City of Seattle have been developing alternative water supply, including temporary above ground water mains, improved ability to pump from fireboats on fresh water lakes and reservoirs or Puget Sound. They have procedures for adjusting water use depending on priority water needs.
3. Participants saw the need to look at risk in the context of extreme disasters, but as one participant noted, it would require a “quantum leap in widening the parameters for disaster response, mitigation, and planning, because such disasters are high impact but low probability events.”
4. There was general recognition that some older high-rise buildings and many bridges, rail lines, and the Alaskan Viaduct would be damaged or destroyed in the quake in the scenario. Although there have been some general studies of these impacts (e.g., a study of major bridges and the CREW Report), no regional risk assessment has been conducted on impacts and particularly those caused by interdependencies, either for this scenario or for other types of large-scale regional disasters.
5. Certain participants, in looking at interdependencies, pointed out that transportation was “the most critical infrastructure” and not electric power, which was their other candidate for most essential infrastructure. Several participants cited this as an “Aha!” moment for them. This judgment was subjective, however, derived from the scenario, not based on a systematic study of the relative importance of particular dependencies, which would vary with what system was affected, the type of impact, and the conditions under which the disruption occurred.
6. Likewise, the relative importance of regional critical infrastructures and key resources (CI/KR) was in the eye of the beholder, based on participants’ knowledge of their infrastructure or organization and at most an understanding of only high-level interdependencies.
7. It was not clear to what service levels that banks could be functioning in a large-scale disaster that is characterized by prolonged power and communications outages. It was, however, felt that in all probability all electronic banking, transfers, and accounting would be severely impacted. This includes the use of bank cards and ATMs. A cash economy would most likely exist for a prolonged period of time.

3.2.3.2 Recommendations

1. Develop a common set of assumptions on worst case scenarios to enable organizations to have a common foundation on which to base their risk assessment plans and exercises.
2. Develop requirements for and implement a regional risk-assessment methodology focused on interdependencies and associated physical and cyber vulnerabilities and all-hazards threats, and which takes into account economic impacts. The model for this methodology could be developed by DHS in concert with regional stakeholders, the State of Washington, province of British Columbia, and Public Safety and Emergency Preparedness Canada (PSEPC), and would focus initially on developing criteria to identify and rank critical infrastructure assets and key resources (CI/KR). (The concept for this project is currently under development.) Some participants note they have concerns about a standard risk assessment methodology across sectors, proving as an example RAMCAP (Risk Analysis & Management for Critical Asset Protection), developed for DHS by the American Society of Mechanical Engineers. These participants believe it is better to develop a regional standard that requires sectors to perform risk assessment, using a recognized and acceptable methodology.

3.2.4 Cooperation and Coordination

3.2.4.1 Findings

1. The exercise revealed that key stakeholders in the Puget Sound Region have a high level of public-private cooperation already developed over the past four years, working together to establish a regional Partnership, holding a major infrastructure interdependencies exercise (Blue Cascades II), and meeting regularly in a number of forums as well as holding other exercises and workshops to improve preparedness. Many of the representatives of these key stakeholders know each other well and on an informal basis regularly share information. All are particularly interested in advancing their knowledge of interdependencies. The counties within the region work closely together. King County has spearheaded the development of a regional preparedness plan that addresses infrastructure interdependencies. There is a Business Emergency Network unique to the City of Seattle, which is activated along with the City EOC for emergencies that focuses on interdependencies and cross-organization collaboration and communication. Academic institutions in the Washington area are participating in the Washington State Critical Incident Mapping and Planning System (CIMPS). The State of Washington and the National Guard are directly involved and proactively supportive of regional collaboration and readiness initiatives. A state-coordinated Critical Infrastructure Protection Committee representing the range of infrastructure sectors and essential service providers meets monthly. The lead role played by the Pacific NorthWest Economic Region ensures that the Puget Sound Partnership stakeholders collaborate closely with their counterparts in the neighboring states and Canadian provinces that are member jurisdictions of PNWER, and cross-border interdependencies are a major focus of attention.

2. The exercise at the same time revealed that much work remains to be done in coordinating local and state government disaster preparedness plans and contingency plans of private sector organizations for a major disaster. One participant said his biggest “Aha!” was what he termed “the enormous challenge and work it will take to consolidate and organize the disaster plans across all sectors for a large region and population base.”
3. Private sector and other non-government organizations emphasized the need for their inclusion in regional preparedness planning, not just with the state or provinces, but with municipalities. One water systems representative stated that he would like to hear from government less of “I got you covered—don’t worry” and have more cooperation. An energy official noted that “cooperation is a two way street and public and private sector representatives must be willing to meet and participate in the many infrastructure and planning initiatives currently underway, and not just at the exercises that come along every now and again.”
4. It was noted that electric power providers are increasingly working together on contingency planning.
5. Many participants called for more Mutual Assistance Agreements and Memorandums of Agreement among states, provinces, cities, and counties, and with and among private sector organizations. It was pointed out that Washington State and BC have an “excellent working relationship”. At the same time, a City of Seattle official noted that “there is too much reliance/assumption that MOAs will save the day.” It was also noted that these agreements need to be developed outside the Pacific Northwest region to include sector members in areas outside the potential earthquake impact region. This is especially important when considering a region-wide contingency could render many such agreements ineffective. In an event of this scale the traditional mutual aid agreements with neighboring infrastructures will not be sufficient.
6. Local, state, and key stakeholder EOCs and command centers need to be virtually linked and drills conducted to test cooperative plans and procedures and work out decision-making processes and roles and mission issues.
7. How to include regional and national defense assets in regional preparedness planning for major disasters received limited focus in the exercise other than recognition of the need to somehow integrate the military into regional preparedness planning.
8. Regional emergency planners, the public and private sectors, the media, and the general public, need to clearly understand the limits, delays, and constraints that may impact the immediate receipt of federal and or military assistance (National Guard and Active military assets).

3.2.4.2 Recommendations

1. More concerted effort needs to be undertaken by federal, state, and local governments to improve cooperation and coordination from the grass roots to the national level,

including integrating EOCs and command centers to facilitate public-private coordination vertically and cross-sector regionally.

2. Where possible, response and business contingency plans should be shared, coordinated, upgraded, and tested with regional exercises.
3. An up-to-date list of key stakeholder POCs responsible for disaster preparedness and management should be maintained at state/provincial and local EOCs and be made accessible to all key stakeholders.
4. There should be a list of federal, state, and local agency names to assist in providing points-of-contact for government resources.
5. Key stakeholder POCs responsible for disaster preparedness and management should incorporate into their PDAs the numbers and emails of their counterparts.

3.2.5 3.2.5. Information Sharing and Alert and Warning

3.2.5.1 Findings

1. While information sharing was not addressed specifically during the exercise, in Phase 1 (the Workshop), the issue was discussed among breakout groups. A telecommunications representative reflected sentiments of other participants that companies are reluctant to share information directly with government. Through participating in “lots of exercises”, however, they can determine what information they need and what needs to be shared. As one participant put it, “Trust relationships are paramount in creating an environment where it is felt that information can be shared safely, and in confidence.”
2. Cross-sector information sharing is still in its infancy but acknowledged as vital to disaster preparedness and management. A power company official cited the need to know what the critical loads are for the other sectors and that without this knowledge it would be difficult to establish restoration priorities. Non-electric sectors need to learn more about how power is capable of being restored and work with utilities to make modifications to their systems so restoration of power to critical infrastructure can be accomplished quicker.
3. The exercise scenario of an earthquake—an unexpected act of nature—precluded the need for participants to address alert and warning in the Puget Sound Region. (An Alert and warning system already exists—the NWWARN.) A major issue, however, was the tsunami warning system. Participants questioned whether the many thousands of individuals along the coast from British Columbia to San Francisco would have ample warning time to reach higher ground, or even receive a warning given the widespread regional power outage and telecommunications failures generated by the earthquake.

3.2.5.2 Recommendations

1. Create an Information Sharing Working Group within the Puget Sound Partnership to work on approaches and mechanisms to improve information sharing. Along these lines, investigate creating a non-profit organization to serve as the secretariat for the Partnership to enable the secure sharing of information and to keep it from public disclosure under state and local “sunshine laws”.
2. Explore expanding the capabilities of NWWARN and making it more resilient to disruption from power or telecommunications outages.

3.2.6 Roles and Responsibilities/Incident Management (Physical and Cyber)

3.2.6.1 Findings

1. Among all the issues explored in the exercise, none was more challenging than the “Who’s in charge?” question and the related problem of sorting out organizational roles and responsibilities in a major disaster when these roles are changing from the initial response through recovery and into the restoration phase. Participants were not confident that there would be, as one expressed it, a “smooth line of authority” among government agencies at different levels and across jurisdictions. Different participants brought up the point that “leadership is important and matters”. As one participant noted, “Organizations don’t lead, but individuals do. The quality of those with senior responsibilities and their ability to share in decision-making on priorities will determine how well disaster response is executed.”
2. Many participants either were not familiar with the National Response Plan or they did not believe that it would function or be executed as written. A private sector participant observed that local and state plans are not written to “complement” the NRP and vice versa. Another participant observed that “Plans are paper; leadership is people—not a plan,” adding that effective leadership is “what will make or break a crisis.”
3. Representatives from civilian entities, state and local governments, and federal government agencies, cited the National Response Plan and the National Incident Management System as the solution to the roles and missions issue. They saw it as only a matter of training state, local, and private sector stakeholders in NRP and NIMS procedures and the Unified Command concept.
4. While exercise participants overall were in agreement on the need for NRP and NIMS training, it was noted that local jurisdictions, utilities, businesses, and other organizations have their own disaster response or business contingency plans and responsibilities to employees, customers, and in the case of corporations, their shareholders. Some participants raised the importance of ensuring that plans are flexible guidelines and do not impede response and recovery with bureaucratic or legal obstacles.

5. State officials pointed to the fact that the state was in charge and would call in the federal government when state resources and the National Guard were overwhelmed. Other participants observed that the catastrophic nature of the earthquake scenario and the tsunami would spur the federal government to take action nearly immediately without waiting for the formal process to take place for the President to declare a national disaster.
6. In the exercise, after the President's declaration, it was not clear how localities, the state, and the federal government would interface in an extreme disaster where lines of authority were blurred, and officials in charge were unavailable or unreachable to make needed decisions on deploying/managing personnel, equipment, and other resources.
7. It was unclear how decisions would be made on response or recovery/restoration issues where trade-offs are needed to be made within a short time frame. An example was the issue of whether to use scarce water for putting out the fires from gas leaks and pipe ruptures or to save it for human consumption.
8. The role of the military and how military assets would be incorporated into the response and recovery were not meaningfully addressed. The official procedures for involving defense assets in a major disaster were raised. What would actually happen in the real world, and how these assets would be deployed, utilized, and participate in response and recovery activities were not explored.

3.2.6.2 Recommendations

1. The Puget Sound Partnership should hold an interactive workshop focused on the "Who's-in-Charge" issue to explore roles and responsibilities, and mission challenges.
2. As a follow-on to this workshop, and with the appropriate state leadership, create a Working Group to begin to delineate roles and missions, thereby leveraging existing federal, state, and local response plans and knowledge of response, response, and restoration needs from lessons learned.
3. Conduct a targeted exercise to explore roles and missions challenges (can utilize a scenario in a previous regional exercise such as the Blue Cascades series).
4. Once regional incident management procedures are established, conduct education of not just key stakeholders but the general public and hold regional and targeted exercises to work through chain of command issues.

3.2.7 3.2.7 Response Challenges

3.2.7.1 Findings

1. There is a need for procedures on how and when a "virtual" EOC would be established that would link the state, county, major municipalities, and the command centers and EOCs of other key public and private organizations.

2. Several participants pointed out that citizens in the affected states would be on their own for days at a minimum, given the level of regional disruptions and outages and the fact that there would be competing need for federal resources throughout all impacted states and provinces.
3. Evacuation challenges were largely overlooked during the exercise.
4. There was no evidence of a regional evacuation plan that could move large numbers of individuals from homes and businesses in a chaotic situation of transportation gridlock, no power, and limited communications on a cold, rainy day.
5. Participants were reminded by a King County Metro manager that there would be a large number of buses with an estimated 20,000 passengers who would need shelter.
6. Some participants noted there were certain “special populations”, including tribal nations and individuals in nursing homes and assisted care facilities and prisons who would or could not evacuate unless provided realistic procedures and education on what to do.
7. Sheltering large numbers of individuals was acknowledged to be a major problem. Schools would have only a day’s worth of food and many potential shelters could lack heat and potable water, or would soon exhaust available resources and face sanitary problems.
8. Dealing with large numbers of abandoned vehicles was seen to be an unanticipated significant problem, along with debris removal to enable emergency response.
9. The large number of casualties exceeded the surge capacity of hospitals that were not damaged or suspected of having structural damage and forced to evacuate.
10. Utilities and other essential service providers (banks, financial institutions, hospitals, etc.) would be greatly hampered in resuming or maintaining operations because of inability to bring staff in or to keep personnel from leaving to be with their families. In other instances, organizations would need to shelter individuals who could not return to their homes.
11. Participants spent a considerable portion of the exercise on “people issues”, although the scenario focused chiefly on critical infrastructure resilience. Several participants in their evaluations believed the exercise discussions should have focused only on critical infrastructure-related issues. However, others noted that personnel are integral to the ability of an infrastructure or organization to function. A state official said it surprised him how many comments were about individual, family, and employee preparedness, and that it was “almost like a realization that if we don’t ensure the individual/family is prepared, then any other high level activities may not occur.”
12. Another “people issue” raised was that personalities and egos of decision-makers can “make or break a collaborative effort” and impede effective disaster management.

- 13.** Several participants pointed out that response plans must be kept simple and flexible, and that “complex plans will not work”. A USPS manager noted that the “challenge is to develop plans which are thorough and detailed yet simple enough that anyone can follow them and use them effectively.” Another participant pointed out that organizations are “married” to their plans and have a hard time revising plans and their expectations.
- 14.** Participants generally agreed that the local media do have an essential role in response activities—providing crucial information to citizens on response procedures, hazards, and conditions in the region. One participant stated that continued exclusion of the media from exercise planning and execution was a “mammoth mistake”. Broadcast stations will be used by the public to reach emergency assistance if 911 is unavailable. The media can also supply first responders with information to improve situational awareness and provide services such as helicopter over-flights of damaged areas.
- 15.** There needs to be staging locations for out-of-area responders and resources in the eastern part of the state of Washington. There was no indication that this need had been seriously addressed as yet.
- 16.** Many participants emphasized the need for a certification process to enable emergency medical, utility maintenance, and key stakeholder essential personnel to have access to buildings and get past roadblocks.
- 17.** The US Postal Service has developed emergency response procedures and undertaken training to address all hazards. Services provided to the public in a disaster would include providing information when other communications services are not available, ascertaining the health and safety of residents, delivering essential supplies, and helping ensure continuity of small communities and businesses by assuring the delivery of products, social security checks, customer payments, etc.
- 18.** The importance of schools for providing shelter and a safe location for children and parents during a disaster response was another eye-opener for many participants—a benefit of having area schools well-represented at the exercise.
- 19.** It could take at least two to three days for the National Guard to fully mobilize for the disaster, considering that mobilization would be delayed because of the regional paralysis. Also, the fact that the impacts of the quake would be so widespread means that the Guard forces would be spread thin and sent to high-priority areas. Lastly, interdependencies-related factors could well increase the length of time for deployment.
- 20.** It was pointed out that the Defense Department is not a contingency organization to support disasters within U.S. borders and that DOD commanders’ first priority is to focus internally to maintain critical functions before looking “outside the fence”. The exception is when defense installations have Memorandums of Agreement with service providers and suppliers for DOD mission assurance purposes. The President may direct military assets to perform emergency preparedness if life and property are threatened, but can do so for a period not to exceed ten days prior to a formal declaration of an

emergency or disaster. Requests for assistance from civil authorities must be forwarded up the chain of command.

21. Several participants noticed that the exercise did not address the need for mortuary facilities for casualties.
22. The issue of civil unrest was never seriously addressed, leading one participant to observe, “we need to remember that after many hurricanes and after the Northridge quake, within three days the populations were either rioting or unruly.”

3.2.7.2 Recommendations

1. The federal government is currently working on a credentialing system for potential national application. In the meantime, a simple credentialing process needs to be developed by the state in concert with DHS and with input from county and municipal officials, private sector and other key stakeholder organizations. This process also must be coordinated with neighboring states and Canada to allow critical resources (people and materials) to access restricted areas.
2. State/provincial and local governments should work with private sector and other organizations to develop a process and capabilities to insure what a representative from the insurance industry described as “a well-defined situational analysis” to increase the success of response efforts.
3. The regional key stakeholders should include the local media in exercises and work with them to define their role and how to utilize their resources for disaster response.
4. Localities should consider including the U.S. Postal Service in response planning and the use of the USPS fleet as an emergency transportation resource.
5. Localities should work with local businesses to see what resources they have available to sustain first responders (food, bathroom facilities, equipment such as blankets, tools, and flashlights.)
6. There should be further study on how the ports and marine/naval services could be used to assist in response efforts.
7. Staging areas and transportation routes to get to the disaster area should be identified and assessed for potential interdependencies-related vulnerabilities.
8. Community Emergency Response Teams (CERT) should be factored into local emergency planning so they can provide needed depth to first responder activities.
9. Getting schools back into operation as quickly as possible should be made a high recovery priority in local disaster plans. Also, certain schools should be designated in advance as potential shelters and provided with stockpiled supplies.

10. Local law enforcement, the Federal Bureau of Investigation, and the National Guard need to work in concert with key stakeholders to develop a contingency plan to deal with civil unrest.

3.2.8 Recovery and Restoration

3.2.8.1 Findings

1. Many participants did not recognize the extent of recovery and restoration challenges, or how long it would take to remove debris and to restore and rebuild structures and critical assets such as electric power transmission and distribution systems. A representative of an engineering firm observed that participants were not “prepared psychologically” to address a disaster in which infrastructure was damaged and destroyed and they lacked necessary recovery plans.
2. Most organizations appeared prepared for low level emergencies but do not have what one participant referred to as a “comfortable level of planning”.
3. While there are mutual assistance agreements in place (e.g., among utilities, local governments, and states) there would be no guarantee that these would be honored given the wide-spread impact of the disaster. Organizations would need to be as self-reliant as possible and arrange for mutual aid agreements with organizations *outside* the area that would not be affected by a disaster in the region.
4. Restoring electric power resulting from a prolonged regional outage requires cooperation, contingency planning, and exercise and training among regional power companies.
5. Availability of transportation infrastructure is necessary for restoration of critical infrastructure operations and other essential services. Impediments to road and rail travel could be compensated by use of marine transportation, and or medium and heavy lift helicopter, if such assets are available.
6. Organizations had no way to gain information on what resources were available. For example, Cingular noted that it has “loaner” cell phones, portable cell phone sites, and cellular phones that plug into laptop computers to create internet connectivity. The federal government was said to be working on a process to channel private sector assistance to government authorities in a crisis
7. There was no management system to prioritize, allocate and ensure transportation of resources to areas of most need.
8. There was much discussion on priorities regarding service restoration in an environment when there would be great demand and competition for being towards the top of the prioritization list. Some participants pointed out that states, localities, and utilities had already established priority lists, and these should be followed. Other participants, such as the Postal Service, expressed concern that they were far down on

the list and would not gain services for “some period of time”. Still others noted that priority restoration should be flexible depending on need. At the same time, most participants appeared to understand that in a major disaster priority lists would likely “go out the window”, and that infrastructure interdependencies should play a role in which services were restored and in what sequence. As one participant put it, “priorities are different depending upon where you sit.” In addition, there was also some discussion related to what is most critical. Participants questioned whether it is the water supply system, hospital, transportation, food and agriculture operation, or life safety such as emergency services. As an electric power representative observed, “understanding what ‘critical load’ is will help establish restoration priorities.”

9. How to manage the influx of volunteer aid (people, food, clothing, materials, equipment, etc.) from outside the region was not apparent. Also unclear was what organization would be in charge of managing such donations or how organizations or jurisdictions that needed these resources would be identified, prioritized according to criticality of need, or how the donated service of materials would be dispatched to where it was most needed.
10. A major challenge identified by participants was the shortage of personnel needed for restoration activities, particularly construction workers, structural engineers to certify buildings, bridges, and tunnels as safe to enable businesses, utilities, and other key service providers to resume operations and to allow people to leave shelters, return to their homes, or to return to work.
11. Relighting pilot lights after a widespread and prolonged natural gas, propane (LPG), and power disruption was a major problem from a safety standpoint and particularly because of the large numbers of trained technicians and the time required. Water utilities, like natural gas utilities, could cause significant damage to buildings should they restore water service to buildings prior to checking the integrity of the plumbing systems installed in those buildings.
12. It would take a minimum of two weeks to put together storage and distribution of fuel, and this could be assisted by Navy tankers if necessary. For oil refineries that had not sustained significant damage, it would take two-to-seven days to resume operations if electric power was restored.
13. Debris removal and disposal emerged as a major issue. In certain cases debris removal would need to take place before repairs to resume essential operations could be completed. Environmental and public health issues would need to be addressed.
14. Certification of workers brought into the region for restoration purposes was raised as a key need. Also needed were relief from, or streamlining and simplification of, permitting processes that are difficult and time-consuming. A utility representative noted it was “easier to get assistance from British Columbia than from other states.”

15. Security of infrastructures during the restoration process was also a concern; there would be a need to protect critical assets and resources such as fuel, power generators, and other equipment.
16. The role of the U.S. Military in restoration was not a focus of the exercise. As one participant noted, “It is not clear what the military could/would bring to the ‘fight’.” It was noted that in Canada the military is tasked with moving people and materials. A DoD representative said, “our hands are tied,” with regard to providing assistance.
17. It was noted that organizations will need to be constantly re-assessing their requirements against capabilities, available resources, and how much they will need to invest to restore operations. This will demand significant resources

3.2.8.2 Recommendations

1. Develop a cooperative long term regional post-recovery restoration strategy that takes into account all key stakeholder interests and which recognizes that the post-disaster status of the impacted communities will be different than pre-event.
2. Procedures should be developed to encourage and assist small businesses as part of restoration plans.
3. Develop a model Resources Management Clearinghouse to enable providers and requestors to register their respective supplies, products, services, and their needs.
4. Establish criteria and a plan for conducting system and structural certification inspections as part of disaster preparedness.
5. Develop a debris management plan.
6. Organizations should work together to determine the need for out-of-region workers and develop a plan for accessing, certifying, and bringing in personnel resources from outside the area if required.
7. Procedures should be developed to enable businesses to contribute resources without fear of liability.
8. Good Samaritan laws need to be adopted or improved to facilitate volunteer assistance.
9. The Puget Sound Partnership, or the broader Pacific Northwest Partnership, should hold a workshop for key stakeholders that focuses on what both civilian and defense federal authorities can “bring to the table” in terms of services and resources for recovery and restoration. The workshop would also examine issues associated with access to these services and resources and their effectiveness, including impediments, and recommend ways for improvement.

10. State, local government, and regional military facilities should develop guidelines to use military vessels to transport basic necessities and essential components and equipment to areas that are impassable to land transportation.
11. Sectors reliant on obtaining materials from manufacturers and distributors in other parts of the country to reconstitute their systems need to plan with their local suppliers as to how those resources are to be located and transported to the place they are needed and how the movement of these items is to be tracked and accounted for.

3.2.9 3.2.9. Business Continuity and Continuity of Operations

3.2.9.1 Findings

1. Most businesses and organizations with the exception of larger companies have neither the time nor the personnel to focus on disaster response planning. They are inward focused and generally do not interface with government or other organizations on preparedness issues.
2. Businesses such as retail, manufacturing, distribution, and service organizations are rarely directly involved in local or regional preparedness planning.
3. Certain businesses, such as information technology firms, indicated they were in the planning stages of remote siting of critical data and providing backup systems, while others either were not taking steps to protect their data or failing to realize that their remote or redundant locations could fail because of interdependencies.
4. It was noted that long term restoration would be dependent on residents remaining in, and or returning to the region, and that government assistance would be needed to “jumpstart” with financial assistance and other incentives particularly small businesses in the disaster area.
5. Businesses don’t pay enough attention to “people issues” in their contingency planning and need to find ways to ensure that essential personnel are provided incentives; including assurance their families will remain safe. As one participant noted, “if families are not safe or not provided for, it may delay the return of essential personnel to their jobs.”

3.2.9.2 Recommendations

1. All organizations should be encouraged to examine and reassess their contingency plans based on the findings and recommendation in this Exercise Final Report and other lessons learned.
2. All organizations should be expected to create an internal incident management structure and guidelines for their staff to follow in a major disaster.

3. Organizations should put in place procedures to ensure that they have identified all essential personnel that would be required to support the business or government agency in a major disaster.
4. Organizations should investigate designating a single location (alternate site) with sufficient resilience; they should locate an area or facility outside the region from which to conduct business in a major disaster.
5. Water and wastewater utilities impacted by Katrina lost their as-built drawings and system plans/maps. All utilities should investigate digitizing and backing up important system information outside the geographic area to a site or sites that would not be impacted by earthquake or other disasters striking their facilities.

3.2.10 Logistics and Supply Chain Management

3.2.10.1 Findings

1. The exercise showed, as one participant put it, that the region is “woefully unprepared to implement a logistic system/resupply following a large-scale disaster.”
2. Organizations need to recognize that a contract in hand for limited critical services, supplies and equipment, may not be valid if another organization holds a similar contract for the same type of assistance during emergencies. As one participant stated, “he who gets to the supplier first gets the needed resources.”
3. A healthcare representative noted, “Everyone seems to think that hospitals can take care of themselves—we can’t—just in time inventory allows for less than 24 hours of supplies for a disaster of this magnitude.”
4. Populations of major cities depend on grocery stores, pharmacists, and other essential service providers that customarily have no more than a few days supply of product.
5. The state of Alaska is dependent on continued supply of food, other goods, service and materials from the lower 48 states, particularly the Pacific Northwest.
6. In a prolonged infrastructure disruption scenario, maintaining integrity of the food supply, which is highly dependent on power, clean water, waste treatment, refrigeration, transportation, etc, is essential.

3.2.10.2 Recommendations

1. Organizations should identify critical suppliers, products, and material. (The previously cited interdependencies template, once completed, can be used for this purpose.)
2. Organizations should work with their suppliers to identify and assess supply chain vulnerabilities/interdependencies and disruption impacts.

3. Develop and share cooperative arrangements for use with key suppliers and customers that enable assessment of cost-effective security and resiliency needs for supply chains.
4. Develop a management strategy to assure availability of and access to critical equipment, materials, components and products, including from off-shore sources.
5. Develop contingency plans for commercial and other organizations addressing supply chain disruption.
6. Educate key suppliers on interdependencies and to conduct on-site assessments that focus on critical services, e.g., energy, water systems, etc, and establish high-order priorities for risk reduction.

3.2.11 Public Information/Risk Communications

3.2.11.1 Findings

1. The general public needs to be aware that they should be prepared for being on their own in a disaster for 72 hours or longer. (Many participants cited at least seven days.)
2. The public needs education on what a major earthquake or other cascading disaster would cause in terms of disruptions to basic services and awareness of health and safety concerns (e.g., not turning on the electricity before gas fumes are dissipated to avoid igniting fires, and not immediately flushing toilets when water is restored to prevent sewage backup). As one participant said, “the community at large is still unaware of what to expect and what it will take to survive and recover.” A water systems representative added, “many believe government is prepared to prevent, mitigate, or protect them in events such as this. This misunderstanding will complicate preparing them to care for themselves.”
3. The general public in a disaster needs continued assurances and useful information from government to maintain public confidence. There needs to be someone in authority seen by all as in charge, although this individual will be representing the collective key stakeholders and should be tasked with coordinating/facilitating the regional disaster management effort.

3.2.11.2 Recommendations

1. Publicize the need for at least a seven-day “Ready-Kit”. (One participant recommended having “Oprah encourage all her viewers to be prepared for seven days of food, water, medicine, and a family emergency plan, gas, and cash.” Another participant noted that “constituting ‘Ready-Kits’ could be beyond the financial ability of many people to create and maintain,” and recommended that there could be “either government or private production and sale of inexpensive kits for the general public.”
2. Provide multilingual emergency announcements and preparedness information to insure access to all population.

3. Provide the public general information on “non-structure hazard mitigation” (e.g., tying down computers, using nonskid mats, bookcase retention cords, securing tall cabinets. This has been done by WA State Emergency Mangement Division).
4. Provide targeted information to special needs groups (people needing certain medications, on respirators or handicapped, or financially disadvantaged without access to transportation).

3.2.12 Exercises, Training and Education

3.2.12.1 Findings

1. State, local government, private sector and other organizations need to be familiar with the National Response Plan and the National Incident Management System.
2. It was noted that most exercises focus on response and that there should be more drills on recovery and restoration, both sector-specific and regional.
3. Political and industry leaders need to be made aware of regional disaster resilience needs, and they need to participate in discussions and exercises.
4. There needs to be education for the general public including children K-12 to understand disasters, what to expect, and what they need to do under certain circumstances.
5. The media need to have access to training courses to enable them to understand the challenges of regional disasters, what to expect from government, utilities and other key stakeholders, as well as have knowledge of local, state and federal disaster preparedness and management plans.
6. There is a need for a “life cycle approach” to preparedness—plan, train, exercise to test plans and procedures and then improve them; then train, exercise and improve again. As one participant noted, “failure to apply exercise lessons learned is measured in lives lost and property cost.”

3.2.12.2 Recommendations

1. Provide education and training opportunities in disaster preparedness and management to government and non-government senior managers, political leaders, the media, and general public.
2. Include the above groups in regional and sector-specific exercises.
3. Federal agencies should conduct training and exercises on all-hazards disaster, including terrorist attacks, with all key stakeholder groups--private sector organizations, including commercial businesses; non-profits, community institutions and academic institutions.

4 Exercise Utility

Participants had a lot to say about the utility of the exercise and how they would improve upon it for the next regional interdependencies exercise. Overall, attendees found BLUE CASCADES III significantly beneficial. Following are statements provided on participant evaluation forms, signed and unsigned note cards on what they saw as the benefits to them of the exercise:

“I consider this exercise successful because at least one representative of the Water/Waste Water Sector identified something that his company could do to re-instate services in a limited fashion until primary services are fully restored. (Halleluiah!)”

“This was a great event and critically important for our participants and our region. Most common quote I heard from the various participants was ‘this is amazing/hard/complex. It is a challenging scenario/difficult problem/a huge eye opener.’ I stopped writing it down since I heard it so much.”

“Recommend that the BLUE CASCADES III final report be distributed to every county emergency planner, county executives, and state officials in the Northwest.”

“Overall, I think the exercise was great and made others see that their organization isn’t the only important one.”

“Individual sector exercises focus on individual operations. At Blue Cascades-type events, we focus on strategy planning across sectors; more important for where we are now.”

“The whole Blue Cascades series has been super.”

“The interaction between attendees couldn’t have been better. This brought out just how much impact each organization has on the other.”

“A very good exercise. I have a feeling that it will be a watershed—a critical mass of engagement has been achieved and that the next exercise will take the region to new levels of understanding interdependencies that we are still only beginning to fathom.”

Views on Improving the Exercise

Some participants felt that while the exercise enabled people to share perspectives on their respective concerns and priorities, they wanted also to discuss solutions to many of the challenges raised. Others saw the exercise in latter stages as a bit rushed and important topics not adequately addressed. Some observed that the afternoon of the first day flagged somewhat but the second day discussions were energizing. Some liked the experts’ presentation on the first morning and a few others felt the time better spent on participant interaction. A few participants remarked that there were too many questions to answer.

Several participants remarked that the exercise scenario and quality of discussion would have been even better if specific infrastructure assets, e.g., bridges, buildings, quantitative data on damages incurred and impacts would have been included. Likewise, they believed that specific numbers of casualties and people affected by outages should have been provided. (Because there was a conscious decision by the Scenario Design Team to omit much of this information from the scenario for perceived security considerations, this issue needs to be addressed in designing future regional exercises.)

Some participants said they wanted more time to focus on various challenges (e.g., response, evacuation, impact of the Tsunami) while others wanted more time to network. Likewise, several preferred the mixed group discussions over the sector breakout groups, while others wanted more sector discussions. Two officials (both from federal government) observed that there were too many objectives for the exercise, making them difficult to achieve.

Participants were asked to identify which organizations they felt were missing from the exercise. Those organizations cited as needing to be included in future regional exercises were: architects and transportation engineers; builders; dam operators; representatives of food safety, property insurance organizations; officials from agriculture and environmental government agencies (USDA, FDA, and EPA); representatives from other state governments—particularly Oregon; and from cities; natural gas and petroleum pipeline operators; the local media; landline telecommunications companies; transportation (rail—Burlington Northern Sante Fe railroad--and shipping companies, state Department of Transportation officials); Eastern Washington and coastal public and private sector organizations; also senior government and industry officials and political leaders; and small to medium-size businesses, shopping malls, grocery stores, pharmacies, and other retail outlets.

Although representation from Canadian provinces and the federal government were good, because of the large presence of Puget Sound organizations and focus of the scenario chiefly on the Puget Sound Region, Canadian and cross-border issues did not receive as much attention as they could have. One participant noted that the tsunami in the scenerio could cause tremendous damage to Victoria, BC.

5 Path Forward

The many findings and recommendations in this Report are a top-level subset of all that BLUE CASCADES III participants provided and that emerged from the two-day event that examined regional resilience in an extreme disaster. This list presents a daunting set of challenges—but they are objectives that are nonetheless achievable.

Towards an Action Plan

The next step is for exercise participants and other interested stakeholders to meet to prioritize the recommendations and develop an Action Plan of short, medium and longer term projects and activities. The BLUE CASCADES III Action Plan should be incorporated with the two previous Blue Cascades exercise plans and local and state

plans. As with previous Action Plans, the new projects and activities where appropriate will be the focus of Partnership working groups tasked with developing requirements, including determining lead organizations and funding needs.

Virtually all of the recommended projects and activities will require public-private cooperation to implement. Many will need local and particularly state government leadership, support, and oversight. Others may require federal technical assistance and funding.

“A Seminal Event”

Terming BLUE CASCADES III as a seminal event is an apt description. It has taken the need to deal with the unthinkable to a new level and has emphasized the importance of moving forward to prioritize the preparedness shortfalls in this report. Most are relevant to any major disaster scenario—whatever the cause, including a terrorist attack.

BLUE CASCADES III demonstrates the significant amount of work that needs to be done to prepare for extreme disasters. The exercise identified a large number of shortfalls that should be prioritized, and then corrected or mitigated, depending on the perceived level of risk. This requires an approach to assess that level of risk, improve plans, develop new procedures, undertake research on interdependencies and earthquake impacts, harden structures and systems, build in redundancies, establish backup systems, and conduct education and training to minimize casualties and damage. To do all this will require resources that will require financing, in part from tax increases, rate hikes, and other sources. This means that productive public support will be necessary, and underscores why education and support of the media and political leaders will be particularly important.

The exercise also underscores the necessity to look at preparedness for major disasters in a regional context. The 330 participants made it clear that regional disaster resilience is very much a communal experience and collaborative effort. Because of interdependencies, public and private critical infrastructures and essential service providers cannot develop, test, and train for their disaster response and business contingency plans in isolation, but must prepare with all other key stakeholders in the region. Along with this *horizontal integration* of organizations at the regional level, managing extreme disasters requires *vertical integration* of every level of government from grass roots to the federal level. This close cooperation will require all organizations with roles and missions in disaster preparedness and management to look beyond the way they do business and seek innovative, flexible, and productive approaches and solutions to develop a disaster resilient Puget Sound Region and the greater Pacific Northwest.

Appendix A

Scenario Design Team Members

King County Office of Emergency Management	Washington Department of Health
Snohomish County Division of Emergency Management	Washington Department of Agriculture
Microsoft	Washington State Association of Police Chiefs
Bonneville Power Administration	Washington Military Department
Puget Sound Energy	Washington Office of Emergency Management
British Columbia Transmission Corp.	Washington Association of School Principals
BC Hydro	University of Washington
Cingular	Pacific Northwest Seismograph Network
Sprint	City of Everett
Premera Blue Cross	CH2M HILL
Boeing	Setracon, Inc.
Port of Seattle	Seahawks/Qwest Field
City of Seattle	US Army Corps of Engineers
Bank of America	US Coast Guard
Washington Mutual	US Postal Service
Washington Association of Sewer and Water	Public Safety and Emergency Preparedness Canada
Navy Region Northwest	Pacific Northwest National Laboratory

<p>Public Health--Seattle & King County</p> <p>Federal Bureau of Investigation</p> <p>Northwest Warning, Alert & Response Network</p> <p>The Scalingi Group</p> <p>Washington Department of Information Services</p> <p>Washington Emergency Management</p>	<p>S-R Broadcasting Co., Inc.</p> <p>Washington State Association of Broadcasters</p> <p>Parsons Brinckerhoff</p> <p>U.S. Department of Transportation, Region 10</p> <p><u>Technical Advice:</u></p> <p>Cascadia Region Earthquake Workgroup (CREW)</p> <p>ESRI</p> <p>US DHS National Cyber Security Division/US-CERT</p>
---	---

Appendix B

BLUE CASCADES III Supporters

Microsoft®

