

Businesses in Cascadia

Seeking Ways to Help Pacific Northwest Businesses Lower Their Earthquake Risk

CREW Business Roundtable Series
September 2012



CASCADIA REGION
EARTHQUAKE WORKGROUP
CREW
AHEAD OF THE WAVE



CREW (Cascadia Region Earthquake Workgroup)

CREW is a non-profit coalition of business people, emergency managers, scientists, engineers, civic leaders, and government officials who are working together to reduce the effects of earthquakes in the Pacific Northwest.

Cover Illustration: Images from Christchurch, New Zealand, after a magnitude 6.1 earthquake on February 21, 2011, caused severe damage throughout the city. This earthquake, which seriously impacted many businesses, was part of the aftershock sequence following the magnitude 7.0 Darfield earthquake in September of 2010.

Clockwise from top left: Examples of the many signs posted throughout Christchurch to restrict or prohibit access to damaged buildings (photo by Ross Becker, CERA photo gallery); examples of local businesses with severe structural damage (photo by Cale Ash, Degenkolb Engineers); detail of damage to the historic Old Public Library building, circa 1901 (photo by Ross Becker, CERA photo gallery); emergency responders and volunteer structural engineers checking in at the Christchurch Emergency Operations Center before conducting safety patrols and post-earthquake building evaluations (photo by Cale Ash, Degenkolb Engineers).

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Approved by the CREW Board of directors in September 2012. The views contained herein do not necessarily represent the Federal Emergency Management Agency, Department of Homeland Security, or the other agencies and companies whose members participated in the roundtable discussions.

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CREW'S BUSINESS ROUNDTABLE SERIES

Cascadia is a region of vibrant communities, abundant natural resources, and diverse businesses and industries. Because of its unique geology, it is also a region vulnerable to damaging earthquakes. The Cascadia Region Earthquake Workgroup (CREW) was created to help address this challenge. The resilience of communities and businesses alike depends on people understanding and mitigating their earthquake risk: CREW's role is to provide the information and assistance they need to accomplish this.

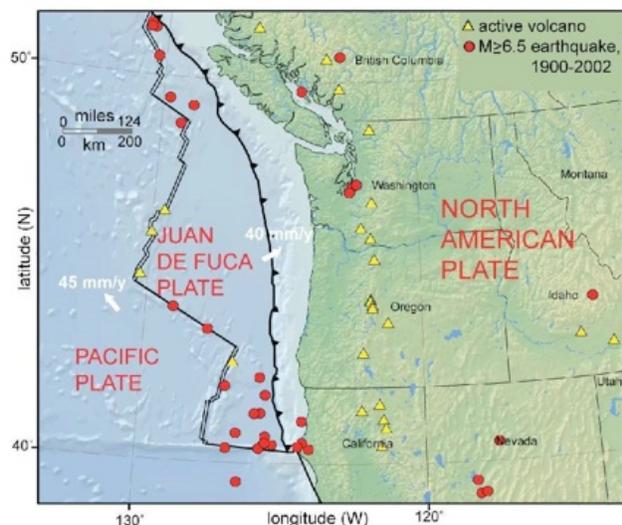
CREW's business roundtable series is part of its mission to increase earthquake preparedness, lower earthquake risk, and improve resilience throughout Cascadia. CREW hosted three regional business roundtables in 2012: one in Oregon, one in Washington, and one in British Columbia. The objectives of the roundtables were to:

- Further develop interaction between CREW and the business community.
- Provide a setting in which business people could discuss their concerns and current level of preparedness.
- Allow CREW to learn from the participants what types of tools and information CREW can supply that would be of greatest use to businesses.

The discussions that evolved during these meetings provided insights not only into the state of readiness of participating businesses, but also into the particular challenges and obstacles that can make the planning, implementation, and practice of earthquake preparedness difficult for many of the region's businesses. CREW intends to use the results of the roundtables to develop and improve the focus of the information and other resources it offers to the business community. The more prepared businesses are to withstand and recover quickly from the next big earthquake, the greater will be the resilience of the regional economy and of every community that depends on it.

Figure 1. Map of Cascadia. Geologically, Cascadia is defined by the Cascadia subduction zone where the Juan de Fuca Plate meets and descends beneath the North American Plate (shown on the map as a thick black line marked with arrowheads). The two plates are continually pushing against each other along this 800-mile (1,300-kilometer) zone, causing intense pressure to build up along the line of collision (where the plates are currently stuck), along fractures or faults in the North American Plate that have formed as a result of the collision, and in the subducting edge of the Juan de Fuca Plate. This pressure is periodically released in the form of an earthquake.

(For more information, see CREW's website: <http://crew.org/earthquake-information>)



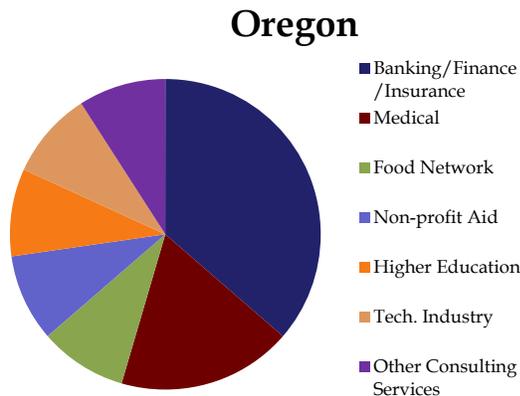
The Roundtables in Profile

Although the discussions at the three roundtable meetings revealed a number of common issues and themes, the meetings varied in several ways, including setting and context, types of businesses represented, and particular interests addressed or emphasized by each group of participants. (Detailed accounts of each roundtable are appended to this paper.)

OREGON

The first roundtable took place in Portland, Oregon. Unlike the subsequent two roundtables, it had a dual focus: In addition to serving as one of CREW’s business roundtables, it was part of an all-day conference that launched the Oregon Resilience Plan. In this context, it served as the first work session of the *Oregon Business Resiliency* task group. This gave the meeting a different structure than the two subsequent roundtables and altered the direction of the discussion somewhat. Geographically, the group’s discussion focused on the City of Portland and the communities and infrastructure in its immediate vicinity.

The participants represented a diverse assortment of businesses, from an international technology company (Intel) to a local grocery store chain (New Seasons Market). This roundtable also included representatives from medical facilities, one state university, and the Red Cross. The



banking and finance sector was particularly well represented. A significant number of those present represented large national or international corporations with the ability to maintain redundant systems and dedicate personnel and resources to disaster and continuity planning. On the whole, this meant that the level of disaster preparedness among the participating businesses was quite high.

Figure 2. Types of Businesses at the Oregon Roundtable. The chart at left gives a general idea of the types of businesses and other organizations that were represented by the participants.

WASHINGTON

This roundtable, held at the University of Washington, was a stand-alone meeting organized and facilitated by CREW. Geographically, this group’s discussion tended to focus more broadly on western Washington, but gave particular attention to Seattle and the ports and communities of the Puget Sound region.

A significant percentage of this group’s participants were representatives of private companies that provide utilities and municipal services (e.g., Puget Sound Energy and CleanScapes). Also represented were major providers of services related to ports and shipping, and members of the

banking and finance sector. At least half of the participants expect to play a direct role in the larger emergency response and restoration effort immediately following an earthquake: the discussion therefore included this public aspect of disaster planning in addition to the businesses' own continuity planning and mitigation.

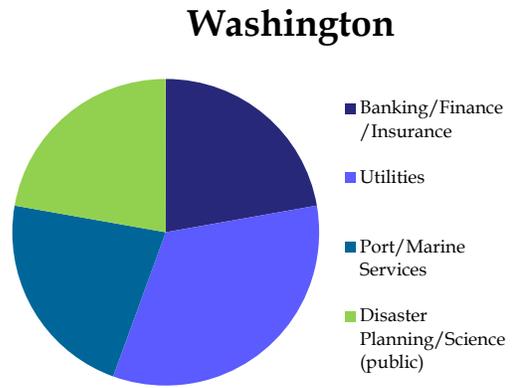


Figure 3. Types of Businesses at the Washington Roundtable.

BRITISH COLUMBIA

This roundtable took place in Vancouver, British Columbia, and was organized and facilitated by CREW with the assistance of the British Columbia Institute of Technology and the Board of the Emergency Preparedness for Industry & Commerce Council (EPICC). Geographically, this group's discussion focused primarily on the City of Vancouver and the communities and infrastructure in its immediate vicinity.

The composition of this group of participants was unique in that a large percentage of those present were professionals in the field of disaster planning services and products. Also numerous were representatives of government ministries. The conversation of this roundtable correspondingly tended to focus on issues such as how best to communicate the earthquake hazard to business administrators, elected officials, and the public in order to motivate them to engage in effective planning and mitigation.

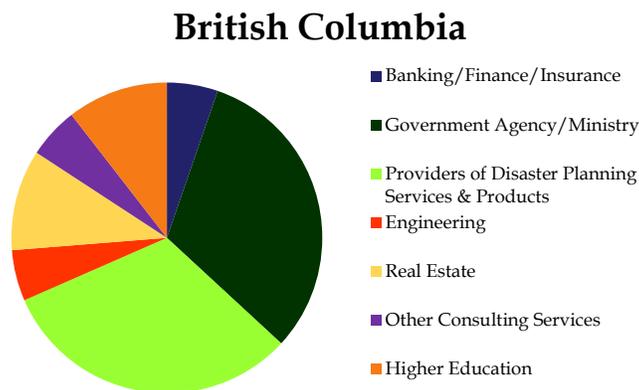


Figure 4. Types of Businesses at the British Columbia Roundtable.

Common Issues and Themes

The discussions at all three roundtables touched on a number of the same issues and identified several common interests and needs, as well as significant obstacles to disaster preparedness and continuity planning among Cascadia's business community.

KNOWLEDGE OF THE EARTHQUAKE HAZARD AND RISK

The participants all agreed that businesses need to have access to accurate, up-to-date, realistic information and models aimed at helping them understand the area's seismic hazard, their own risk, and (in some cases) the hazards and risks of their clients and suppliers.

At the roundtable in British Columbia, participants were in favor of a disaster scenario library to be created and maintained by Natural Resources Canada. The participants in Washington's roundtable stressed the need for geographically precise information about the ground motions that are likely to affect their individual facilities. Such information will allow businesses to choose the most effective mitigation measures. In addition to detailed mapping of the region's geology (including soil types), the group in Washington also suggested the creation of a map-tool with options for layering so that the user can choose to show both the geologic hazard and other features that could affect a given business' planning process (such as the location of bridges and other critical features of the transportation system).

Many of the participants were interested in seeing lessons from other disasters (such as the recent earthquakes in New Zealand and Japan) made available as part of the toolkit for improving continuity planning and mitigation in Cascadia. Among other things, these real events:

- Illustrate the importance of factoring aftershocks into business continuity plans.
- Demonstrate the importance of having a well developed contingency plan in case the business is unable to return to its offices or facilities.
- Provide useful parallels for evaluating both the likely levels of damage to buildings and the performance of various types of construction and retrofitting.
- Pique interest and motivate action by showing what could happen to businesses and communities in Cascadia during the next big earthquake.

THE VULNERABILITY OF BUILDINGS

The participants in the roundtables observed that even among the better prepared businesses, the state of the building stock may be variable, with some newer structures built to a high seismic standard and some older structures retrofitted, but with a great many buildings constructed to older standards and so potentially very vulnerable to ground shaking. For example, it was observed that in Portland, many smaller businesses occupy unreinforced masonry buildings (URMs), a type of construction notorious for its poor performance in earthquakes. In Seattle, concern about URMs has prompted consideration of mandated retrofitting, a measure already adopted in San Francisco and other cities in California.

Businesses that occupy buildings constructed or retrofitted to meet a higher seismic standard have an advantage, but even in these cases, the standard is usually intended to address life safety only. Such a building may not be usable after the earthquake, either because it has been damaged or because the utilities which serve it (power, water, wastewater, and so on) are not functioning. Regardless, businesses cannot reoccupy the building until it has been inspected and approved. Because commercial buildings will be low on the list of priorities for building inspectors, businesses must either plan to operate without access to their facilities or must develop pre-disaster agreements with local jurisdictions to allow the business's own inspectors to approve the building for use. The latter option may be too expensive for many smaller businesses, and may not be feasible at all if the business is a tenant rather than the owner of the building.

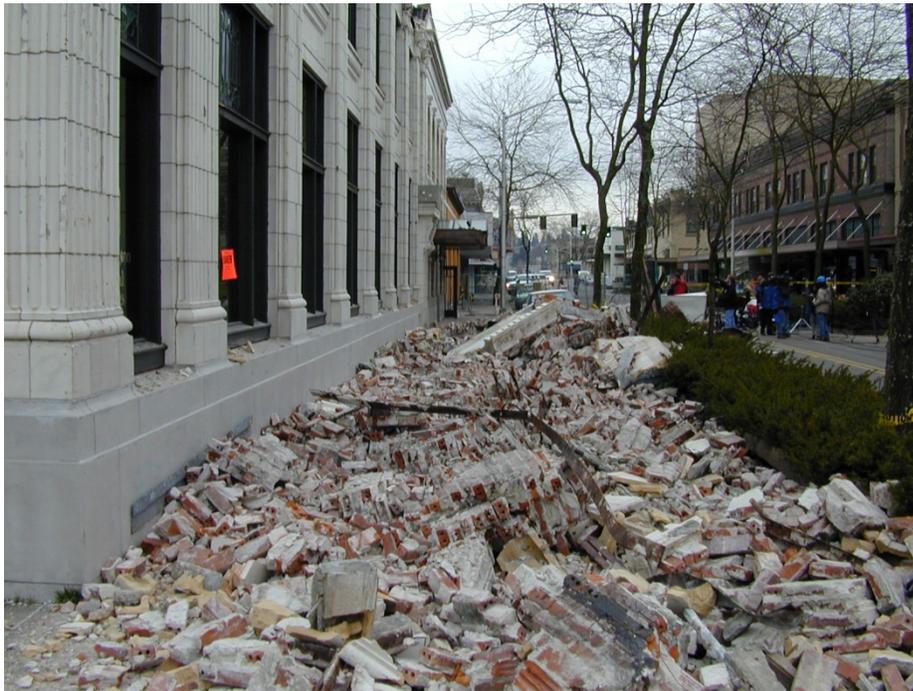


Figure 5. Damage Caused by the Nisqually Earthquake in 2001. The remains of a collapsed parapet buried a sidewalk in downtown Olympia, Washington. (Photo: University of Washington, Nisqually Earthquake Information Clearinghouse)

BUILDING OWNERS VS. BUSINESSES THAT LEASE

The roundtable discussions identified as a particular challenge the often conflicting priorities of building owners and tenants.

Retrofitting. As tenants, businesses have no control over whether the buildings they occupy are retrofitted to meet higher seismic standards. Because of their anxiety over the possible cost of retrofitting, owners may even put off doing other types of renovation and upgrading in order to avoid being compelled to retrofit as well. Tenants do have control over many of the nonstructural components of the spaces they occupy. For many businesses, nonstructural damage may be among the most significant obstacles to the resumption of business after an earthquake.

Emergency Response. Owners who assume control of the emergency evacuation of the building say they have had difficulty motivating some tenants to participate in fire drills and would like

tenant-businesses to assume greater responsibility for the life safety of their people. Other than seeing to the evacuation, owners generally make no plans and set aside no provisions for the occupants and see such preparations as the sole responsibility of the tenant/employer.

Continuity vs. Liability. While a tenant-business' priority is to get back into the building as soon as possible after the earthquake, the owner of the building is more likely to be motivated by concerns about liability. For example, it is not unusual for lease agreements to release the owner from any obligation to restore the building for use after a disaster such as an earthquake. Tenants who seek to develop continuity plans may therefore find it difficult to coordinate their objectives and recovery timelines with those of the owner of the building.

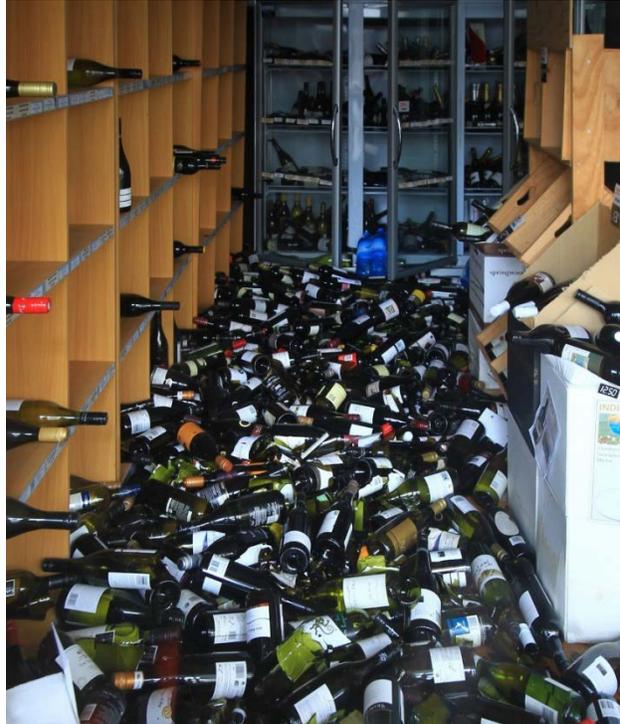


Figure 6. Damaged Inventory in Christchurch, New Zealand. As this photo demonstrates, an earthquake, such as the magnitude 6.1 earthquake that struck Christchurch in February of 2011, can cause serious damage to a business' inventory and other unsecured nonstructural elements. (Photo: Ross Becker, Photographer, CERA photo gallery)

STRANDED WORKERS

The issue of who is responsible (and to what extent) for the people who are left stranded by the earthquake was one that came up in several contexts. As noted above, it was identified as a point of potential tension between owners of buildings and their tenants. It is also complicated by the status of buildings, many of which may be too damaged to serve as shelters, and in any case, would have to pass inspection before people could reoccupy them.

Depending on the time of day, the earthquake could leave thousands of people stranded at their places of work, at universities, or at large public venues. A few businesses have planned for such a contingency and have set aside provisions to last about three days. Even this, however, may not address the problem of providing shelter or be sufficient for the number of people or length of time involved. Many response and continuity plans assume the business' building will be usable, that few people will be stranded, and that most will be able to reach home within 72 hours.

The discussion in Oregon was particularly concerned about the extent to which public authorities, such as city governments, should assume responsibility for stranded people. The role of the Red Cross and other non-profit aid organizations was also discussed, but the time required to fully mobilize these resources may still necessitate that businesses prepare to be without assistance for two to three days. Some agencies now recommend that people have enough emergency provisions to last seven days.

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Figure 7. The Cordon near the Provincial Council Building in Christchurch, New Zealand. Due to the seriousness of the damage sustained by Christchurch's central business district during the M6.1 earthquake on February 21, 2011, a large part of the district was cordoned off while the damaged buildings and debris were cleared away. (Photo: Ross Becker, Photographer, CERA photo gallery)

LIMITATIONS ON RESOURCES FOR PLANNING AND MITIGATION

As they described and compared features of their disaster and continuity plans, the participants noted that in general, larger businesses tend to have engaged in more planning and made more preparations for disasters than smaller businesses. Not only do larger businesses have a greater ability to devote personnel and resources to planning and mitigation, they are more likely to have existing offices and facilities in other places—these can serve as backup centers for administration, data, communications, and other essential functions if an earthquake causes damage and disruption to the parts of the business that are located here. This resource does not exist for most small businesses, and even some of the larger regional businesses may not have located their backup facilities far enough away to escape being damaged in the same earthquake that damages their main facility. Creating and maintaining such backup facilities is expensive.

In addition to lacking backup facilities outside of the area, smaller businesses may also struggle with the costs involved in purchasing, storing, and maintaining disaster kits, backup generators, and any other equipment that is necessary for continuing their operations. Other options that may be available to very large businesses, such as the ability to self-insure, retrofit or build facilities to a higher standard, and maintain pre-disaster agreements with contractors for post disaster inspections and repairs, may not be feasible for small- to mid-sized businesses.

Solutions for smaller businesses include arranging to share out-of-area backup centers and storage facilities with other businesses in order to defray the costs. The challenge then is to find other businesses with similar needs and a willingness to form these types of partnerships. Community banks have developed a variation on this model: Thanks to partnerships with other similar banks, a bank whose building is damaged in an earthquake can continue to serve its customers within the impacted area by sharing the undamaged facilities of one of its partners. Those with fewer resources to commit to continuity planning and mitigation also need help accessing current research and identifying their risks and priorities.

THE ROLE PLAYED BY A BUSINESS' CULTURE

The type of business, its organizational structure, and its internal culture all have a bearing on the level of preparedness. For example, some organizations, such as universities, are decentralized to such a degree that the level of preparedness varies from department to department. Banks, in contrast, are more hierarchical, and they tend to be ahead of other businesses in disaster response and continuity planning in part because they must comply with federal mandates. Even within banks, however, the culture of the business has an effect on what will ultimately be done to prepare for an earthquake.

A prominent concern in the roundtable discussions was how to create a culture of preparedness. If such a culture does not exist, even businesses that have response and continuity plans may fail to keep them up to date, may never exercise them, and may not otherwise train employees in disaster response. In order to achieve results within businesses, participants agreed that the messages must reach the key administrators. Unless these people are persuaded of the need to take action, the business' level of preparedness is unlikely to improve.

PERSONAL PREPAREDNESS

Businesses that are more forward-thinking recognize that the level of personal preparation among employees directly affects the business' ability to recover from an earthquake and continue operations. To encourage robust preparations among employees, some employers provide disaster supply kits at work, provide training to teach people how to prepare at home, and arrange for discounts to encourage employees to purchase disaster supplies for themselves and their families. Employers may also provide easy access to disaster preparedness information on their websites. In Washington, Puget Sound Energy has adopted a policy whereby the company's initial focus following an earthquake will be to help its own employees and their families meet their basic needs. The objective is to make it possible for employees to return to work quickly and focus effectively on their jobs.

The amount of effort that business administrators are willing to put into this aspect of preparedness is dependent on the culture of the business and its corresponding priorities. Likewise, the employees themselves may be more or less engaged in developing and maintaining their own disaster plans and supplies.

MESSAGING AND THE MULTI-HAZARD APPROACH

Because of the need to persuade both the chief administrators of businesses and the employees that they should treat earthquake preparedness as a priority, a number of participants stressed the need for a well-funded, carefully targeted professional messaging campaign. It was also noted that adopting a multi-hazard approach, rather than focusing exclusively on the earthquake hazard, may be more persuasive and may make it easier to take advantage of existing policies and laws, such as those that address fire safety. If people can see that by preparing for earthquakes they will be prepared for other more familiar disasters, including fires, flooding, and storm-related power outages, they will be more likely to invest their time and resources.

INTERDEPENDENCIES

All of the discussions addressed the complex problem of interdependencies—the extent to which a business’ response to a disaster and ability to continue operations may be affected by its dependence on or interactions with people, systems, and infrastructure that are outside of the control of the business. The dependence of tenant-businesses on the decisions of building owners has already been discussed. Other facets of the interdependence issue include:

Public Emergency Management Plans. The business sector needs a better understanding of how the public sector will respond to an earthquake. Understanding the public sector’s plans—including the hierarchy of the command structure, the mechanics of the operations, and the priorities for distributing emergency supplies and restoring infrastructure—will help those businesses that assist in the recovery do so more effectively and will make business continuity planning more accurate. The success of all of this depends on a number of factors:

- The public sector, including individual communities, must maintain and exercise comprehensive emergency management plans.
- Such plans must include clearly articulated arrangements for coordination across multiple jurisdictions.
- There must be a designated liaison or some other consistent means of communication between businesses and the public emergency response coordinators.
- A list that identifies the priorities for the distribution of emergency supplies and for the restoration of services and infrastructure must be shared with the business sector. (Because many of the essential services are supplied by privately owned companies, some participants suggested that the government work with these companies to assess how their systems will perform in an earthquake and develop options and timeframes for restoring service.)

Essential Services and Infrastructure. Most businesses depend on the same set of basic services and infrastructure: power (chiefly electricity and natural gas), water, wastewater, and the transportation system. For the majority, power and the transportation system are the most critical in the short term and the most difficult to address in continuity plans. Even businesses that install backup power generators are usually unable to run all of their normal operations from them and typically store only enough fuel to last three days. In the case of large industrial operations, such as Intel in Oregon, it is impossible to store sufficient fuel to sustain the generators for more than about 10 hours. The transportation system, meanwhile, is the only means by which people can be evacuated and inspectors, repair crews, personnel, and supplies can reach businesses. While most businesses would like a better sense of the timeframe within which they can expect their services to be restored, some of the participants suggested that certain businesses—such as Intel, Microsoft, and Boeing—are cornerstones of the regional economy and should receive priority because of their importance to the economy’s overall resilience. In such cases, it may be appropriate to make firm commitments regarding the timeframe within which their services will be restored.

Communications. The options for back-up communication systems were another point of concern and received considerable attention at the roundtables in Washington and Oregon. Given the likelihood that normal communication systems will not be functioning within the region damaged by the earthquake, the participants discussed the various options for backup communications, including satellite phones and ham radios. The participants in Washington concluded that it would be useful to have more information about best practices and equipment.

Supply Networks, Neighboring Businesses, and Clients. Another factor that impacts a business' continuity strategies is the level of preparedness of the business' neighbors, suppliers, and clients. If neighboring businesses do not invest in retrofitting, for example, their damaged buildings may hinder access to the whole area. A business that depends on suppliers located within the same geographical area may find after an earthquake that these suppliers were not prepared for the earthquake and are unable to provide the parts or materials that the business needs to continue its operations. Some contractors may find that their clients can no longer hire them because the clients' resources are absorbed in coping with the disaster rather than resuming normal functions. These issues underscore the importance of questioning suppliers about their continuity plans, but lack of preparation among neighboring businesses and clients may only change with successful messaging and the development of a more widespread culture of preparedness.

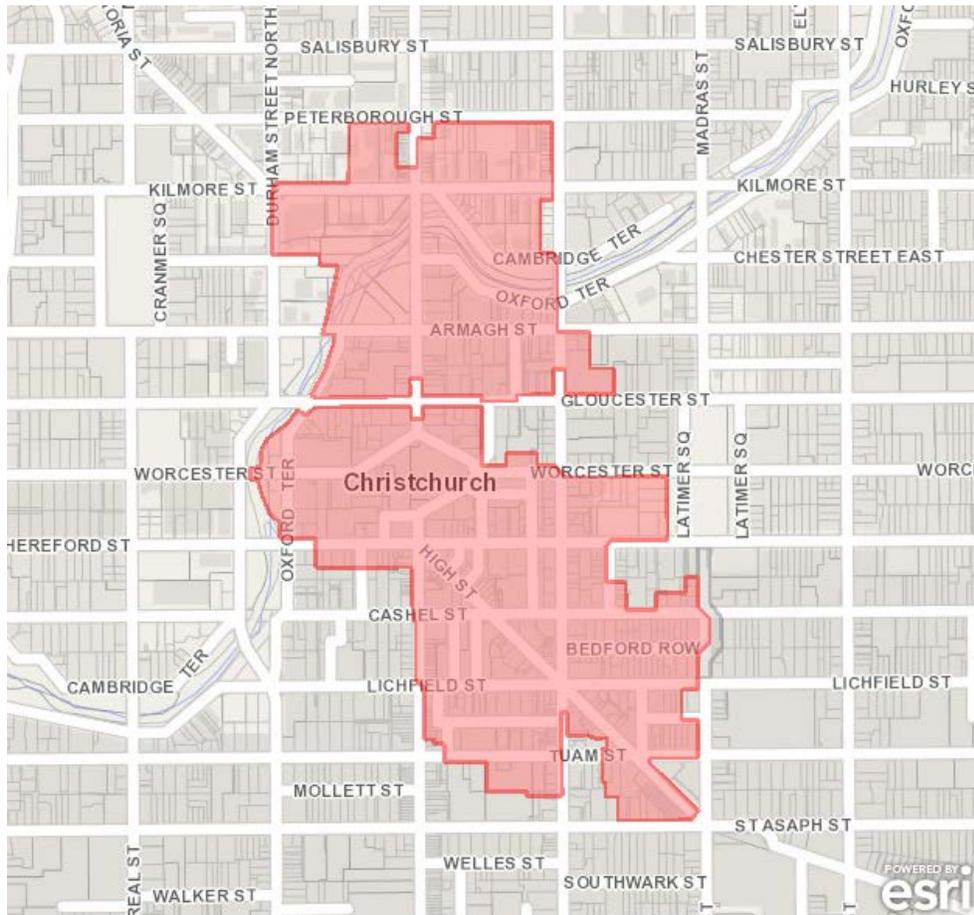


Figure 8. The Red Zone in Christchurch, New Zealand. The city's central business district, cordoned off due to severe quake damage, became known as the "Red Zone." Although this area continued to decrease in size over time, parts of the district were still shut down more than 16 months after the earthquake. This map shows the cordon as of June 18, 2012.

Map: Canterbury Earthquake Recovery Authority (CERA)

THE ROUNDTABLE IN PORTLAND, OREGON

This roundtable discussion took place on January 26, 2012, at the Oregon Seismic Resiliency Workshop on January 26, 2012. This one-day event was organized by the Oregon Seismic Safety Policy Advisory Commission (OSSPAC) to initiate development of the Oregon Resilience Plan.

The Cascadia Region Earthquake Workgroup (CREW) coordinated with OSSPAC to set up and facilitate the discussion as part of the *Business Resiliency* task group's first work session.

Participants

The facilitators of the Business Resiliency discussion were Gerry Williams (OSSPAC) and Susan Steward (OSSPAC/BOMA). CREW was represented by Cale Ash, Tamra Biasco, and Heidi Kandathil.

PARTICIPANT	AFFILIATION
Lori Chamberlain	Oregon Bankers Association
John E. Dodler	Portland VA Medical Center
Greg Herrenbruck	New Seasons Market
Francisco Ianni	American Red Cross
Mathew Rodgers	OSU Emergency Management
Michael Schwinghammer	Wells Fargo
Jeffery R. Soulages	Intel
Sally Trimpler	Bank of America
Rick Van Dyke	Cambia Health Solution
Bryce Ward	Econorthwest
Patrick Estenes	Standard Insurance Company

The discussion was documented by Kyra Nourse (writer & editor for CREW's Business Roundtable project).

Introduction

After general introductions, Cale Ash explained the purpose and objectives of CREW's Business Roundtable project. Gerry Williams then asked the participants to keep the following points in mind when considering a business's ability to resume operations following an earthquake:

- The resilience of the physical structures of the business.
- The resilience of the buildings surrounding the business.
- The business's dependence on municipal services, private utilities, and the transportation system.

- The ability of the work force to report to work, which is affected by factors such as the state of workers' homes, the physical well being of workers, and the access that workers have to medical facilities.

OPENING QUESTIONS

Do you have a plan to revive your business in the event of a disaster? What role does insurance play? As you consider your business's ability to recover, what are your biggest concerns?

National/International Businesses & Financial Institutions

WELLS FARGO

Like most major businesses, Wells Fargo has a business continuity plan and engages in drills. Most of our buildings have emergency equipment, such as backup generators. We also maintain emergency supplies for our employees. These are sufficient to last three days.

We depend on cell phones for communication. For example, as part of our emergency response process, an emergency team will use cell phones/text messages to contact employees. One of our first concerns is the effect the earthquake will have on the functionality of cell towers and other parts of this system.

What are some aspects of the business continuity plan? Each part of the business has a plan in place, and these are updated annually. This means that if one line of business is unable to perform its functions because of a disaster, it will have a plan for dealing with this (such as transferring functions to a site in another region). Some personnel can work from home. Redundancy is built into the organization of the business, so functions can be shifted geographically if necessary.

What about physical structures in the affected region? The retail branches all have business continuity plans. These consider questions such as how money will be delivered to ATMs, how employees will get to work, and whether or not the vault can be accessed. Physically, the administrative buildings are fairly robust—these were built to zone 3 earthquake code. The retail outlets are numerous, and many are located in older structures (built in the 1930s, 40s, and 50s)—probably many are Category E structures. Some of the older buildings have been retrofitted.

OTHER PREPARATIONS OF BANKS

Each part or branch of the organization has its own recovery plan. Plans address things such as how to access secure vault locations and how to get money to organizations and government. National banks maintain off-site back up facilities in other regions. They also have regional teams that back each other up. Much of this is federally mandated. Banks are required by federal

law to restore functions within three days. In addition, security protocols are included as part of emergency planning and training of employees.

What about community banks? Many of these banks have partnerships with other community banks. For example, two or three different community banks may arrange to operate temporarily out of one building.

STANDARD INSURANCE COMPANY

The Standard Insurance Company has high-rise office buildings in downtown Portland. City water pressure only works up to the fourth floor, so electricity is needed to run the pumps that take the water up to the upper floors. If an earthquake cuts the power, the upper floors will not have water/wastewater service. Our business continuity plans do place a lot of emphasis on remote access (shifting functions to another geographical location or having people work from home). For national companies, continuity can also be safeguarded by posting information on an external website that is hosted in another geographical region. This website can be accessed via the Internet by employees with passwords.

The City of Portland has just released the *Earthquake Appendix*. This publication indicates that significant losses are expected across the entire metro area, so for businesses located downtown, a serious problem will arise if an earthquake happens during the business day: Thousands of workers will be trapped downtown, unable to travel home and unable to return to their places of work until buildings are inspected for safety and cleared for use. Commercial buildings are low on the priority list for inspections.

One temporary solution for businesses is to arrange for trailers to be brought in to serve as temporary offices. If they have to rely on generators for power, however, they will need to be supplied with fuel. The transportation system would have to support refueling.

Does your contingency plan include consideration of tenants as well as employees? In the case of tenants, we assume control only of the emergency evacuation of the building. Otherwise, tenants are responsible for themselves. A senior executive on-site is responsible for each building and will manage the immediate response to an event.

INTEL

To address the need for inspections following an earthquake, some cities (such as Portland and Hillsboro) support pre-disaster agreements that allow businesses to hire their own structural engineers to do the inspections. Intel has signed such an agreement with the City of Hillsboro; this agreement is renewed annually.

While mutual aid agreements may allow local jurisdictions to bring additional inspectors into the disaster area, these inspectors will use the same priority list (critical facilities, such as hospitals, at the top and commercial facilities much lower down). It is therefore better if businesses set up agreements to have their own inspectors take care of post-earthquake inspections. Intel also has

other contractors on retainer to respond to emergency needs. To ensure that these contractors can reach Intel's facilities, Intel does depend on the functionality of the transportation system.

Intel's continuity plan states that Intel will be operational in 2–4 weeks following an earthquake. In reality, such a timeframe depends on infrastructure and services that Intel cannot control. Currently, many of these services are unlikely to be restored in 2–4 weeks. Loss of power, for example, is disastrous for Intel. Power cannot be shut off, and while Intel does have 30 diesel generators for emergency backup power, this solution is only temporary. The backup period is usually supposed to be 72 hours—but for that length of time, we'd need our own refineries. We have about 10-hours-worth of fuel stored on-site.

Water is also critical; Intel uses a great deal of it. Other dependencies include natural gas and the transportation system, which supports just-in-time delivery. It would be impossible for Intel to store everything on site.

Intel does not have earthquake insurance; no insurance company would consider offering such a policy because the potential economic losses are so high. Intel is self-insured.

At what point would damage compel Intel to leave? Intel has had to close facilities elsewhere (e.g., the Philippines), but doesn't expect that here. Intel might switch over some functions to other campuses temporarily, but it is difficult to imagine the scenario that would drive Intel elsewhere. This is where all our developers are, the ones who develop future processes. This function can't be shifted elsewhere without great economic loss to the company.

[Gerry Williams observed that Intel's commitment to Oregon makes the state more resilient.]

Regional Businesses and Contractors

Many smaller businesses lack the resources to maintain backup facilities elsewhere or to have contractors on retainer. They also cannot afford to self-insure.

ECONORTHWEST

Given the type of consulting that we do, our offices are easy to move: we'll go wherever we can use a laptop computer. We haven't developed contingency plans. The recovery of our business depends on the resilience of our clients. We need them to resume normal business operations quickly so that they have the resources to pursue the projects for which they hire us.

NEW SEASONS MARKET

What will grocery stores do with food supplies if the stores lose power? There is a very small window for this food. We will probably have to give much of it away. The stores have no backup generators, although we are insured for this kind of power loss. We need to look into backing up electronic data off-site. The store is working on a business continuity plan to address these issues.

What about the structural aspects of your building? It's single-story, cinder-block construction. The Hawthorne building is new, so it is in pretty good shape. Some of the older buildings probably are not.

Universities

OREGON STATE UNIVERSITY (OSU)

OSU's main products are (1) students who graduate (or at least have a positive experience and become positive contributors to society) and (2) research.

One of the goals of OSU Emergency Management is to shift from response mode into planning mode. Because OSU is compartmentalized, it has no top-down continuity plan. We have hundreds of "businesses" on campus, from individual researchers to larger labs. Some of the colleges are better prepared than others. The university would benefit from planning at the higher level. OSU Emergency Management needs a better handle on where all the campus' resources are.

Currently, the buildings typically meet minimal seismic codes: life safety during the earthquake, not usability afterwards. OSU houses about 4,000 students. Residential halls have had seismic assessments (using ASCE-31). These buildings have received more attention than others.

Where will students go if buildings lose power and water? OSU Emergency Management has good working relationships with the county and the city. The plan is to work with local emergency management to get the students home. Beyond this, the plan does not clearly specify what to do during the first 72 hours—that is, nothing is spelled out concerning *how* we are to get students home. Moreover, OSU could have more than 30,000 people stranded on campus, and with just-in-time inventories, we are not equipped to provide for all these people for 72 hours. (If the earthquake occurs during a game, an even larger number of people could be temporarily trapped on campus.)

[Bryce Ward of Econorthwest noted that the University of Oregon recently hired a contractor to help identify university-wide priorities and set up a continuity plan for the restoration of business following a disaster.]

Healthcare Facilities

Following the earthquake, the first step will be to close clinics and pull everybody back. In this mode, our backup measures will allow us to function for about 10 days. During this time, doctors won't have access to the data center which houses patients' records. (This is an IT issue).

We house federal caches of medicines for much of the region (including southeast Washington); we can only access these with permission, but these stores of medicine are a potential resource in

an emergency. The city has always given priority to clearing the transportation corridors into key medical facilities.

Discussion of Special Topics

HAZARDOUS MATERIALS

For those whose business may involve hazardous materials (e.g., Intel, OSU), how do your plans address safety issues?

An earthquake is less of a concern in this case than is fire, explosion, or accidental release. In any case, hazardous materials are highly regulated by the state, and the state does regular audits.

Intel has its own fire department and its own hazmat teams—we are very prepared. Since 1995, Intel has also been constructing its critical facilities to a higher building standard than the code requires.

SECURITY

Portland does not have enough police to cover everything in the event of an earthquake or other disaster. One possibility is that marshal law will be declared. For example, the business district of Christchurch was completely shut down following the big earthquake there.

Intel has its own security force and has done physical security reviews. We have three campuses in Israel, and have used a lot of their expertise to review our security here.

OSU has a contract with the police to make troopers available if needed on campus. OSU is in the process of building relationships with the city and county. While the university's first concern is how to get people home, OSU Emergency Management is trying to further define the university's approach to recovery. [Some of the other participants suggested looking at the post-disaster recovery experiences of universities impacted by Hurricane Katrina (e.g., Tulane) or by the Northridge earthquake.]

STRANDED EMPLOYEES, CASUALTIES, AND EMERGENCY MEDICAL TREATMENT

As noted earlier, one of the difficult problems arising from a large earthquake will be the number of people who may be stranded at their places of work if the earthquake occurs during the business day. Some businesses will be more affected by this than others. Due to its location in Hillsboro, Intel's employees will probably have little trouble commuting home. Many transportation corridors into and out of Portland, however, will probably be shut down due to damage.

The Red Cross has prepositioned supplies and shelter agreements; however, after an earthquake, the Red Cross will need to get its personnel into the disaster area to inspect and approve facilities before they are opened up to people. The Red Cross has no tents (though it does have agreements

with other states for various supplies). Also, the Red Cross is not responsible for water, which must be supplied by the city.

Schools are often designated as shelters, but many school buildings may not be structurally sound for this use after an earthquake.

What is the casualty-count that we should expect for a M9.0 earthquake? The worst case scenario has the earthquake occur in the middle of the day. In this case, an estimated 10,000–30,000 people could die.

Hospitals are already functioning at capacity; what are we to do with the people injured in the earthquake?

Does Intel have on-site medical facilities? Yes, but the facility is a small clinic intended for limited emergency response—that is, occupational injuries, not the need for mass care following a disaster. The facility has eight rooms and is staffed by nurses and one doctor.

PERSONAL PREPAREDNESS OF EMPLOYEES

For the Red Cross, an organization’s human capital is its most important asset. It is necessary to consider how the people in the organization (the employees) are going to react to the earthquake. Intel, for example, has done a lot of work on communication and takes a 360-degree view of its employees by considering factors such as their commute, home safety, and so on. People will worry first about their loved ones. The well being of an organization’s people goes hand-in-hand with the other types of physical resiliency. The business continuity plan of the Red Cross takes into account all of the volunteers and whether or not they have emergency plans for their homes and families. To get a business up and running again, the first thing to address is the human element.

Last fall, the Standard Insurance Company offered seminars on family preparedness. These were well attended. The company also gave employees discounts on emergency equipment (ordered from a website) that employees could use to prepare their families and homes.

The Red Cross has found such an approach to be very successful.

On the other hand, people are more likely to address and maintain their own emergency preparedness after a notable earthquake event. As time goes on, their interest fades, and they tend not to keep their supplies current. It is necessary to remind people at least once per year.

Particular companies (such as those represented in this discussion) may be unusually well prepared to bring their employees back to work. It may not be realistic to see general commercial and industrial employees ready to return to work within a week of a major earthquake event.

COMMUNICATIONS

If a seismic event, such as the M9.0 Cascadia earthquake, destroys the whole bank facility in downtown Portland, a contingency plan is in place for shifting functions and leadership. For communications, we maintain our own communication system—that is, we have our own frequency. We do drills to test these systems. The vulnerabilities of this telecommunication system are not known, but lack of power may be an issue.

In a disaster, satellite phones may be the only form of reliable communications. Some now have solar recharge capacity, which allows them to keep functioning even if the power grid is down. These phones are quite expensive.

The Department of Homeland Security offers cards known as GETS wallet guides. These are designed to facilitate critical communications. Intel has these cards and tests them regularly. The experiences of some (*e.g.*, Red Cross) suggest the GETS system may not be useful in all circumstances.

For telecommunications, OSU has found ham radios to be pretty reliable.

Final Questions

What is your biggest concern? The state depends on businesses to get people back to work and keep the economy going. What do you as businesses need the state to do to facilitate your recovery?

For OSU, the greatest concern is the length of the recovery time-period and the university's ability to attract students after the event. How do we keep the students here? How do we make sure they come back instead of choosing to go elsewhere? Another priority in the immediate aftermath of an earthquake will be search and rescue operations. The functionality of the transportation system will be critical to our ability to mobilize people and access resources. The campus has response plans and resources that could be used to aid the community, too.

For Cambia Health Solution, the biggest concern will be the welfare of employees (the need for shelter, food, etc.). We have some facilities and supplies for the first three days. Communications are also a top priority. After 9-11, everyone overloaded the phone system trying to check on family members. Our next priorities will be water and power. We're also concerned about getting good, accurate information from the city/state regarding the status of the transportation system and the routes we should use to evacuate people.

Because of Intel's experiences elsewhere (*e.g.*, Intel's Tokyo facilities during the recent subduction zone earthquake in Japan), we're less worried about our people. We are also prepared to take care of our buildings ourselves. In order to get back to work, however, we'll need the infrastructure to be ready when we are. Intel will have a lot of clean up to do; we'll need to check lines and systems and recalibrate equipment. We'd like the state to commit to a 2–4 week

timeline for the restoration of power, water, natural gas, and transportation (supply routes). If the restoration of this infrastructure takes nine months, it will destroy the company. (Another of Intel's concerns is damage to tools, but this is a bit beyond our control.)

For membership organizations, the top priority will be the people. The functionality of the transportation system is critical.

For Bank of America, the top priorities are (1) the employees, (2) the redundancy of systems, (3) the physical structures—the facilities.

For many sole proprietors and very small businesses, the biggest concern may be the state of the buildings that house them. There are approximately 1,800 unreinforced masonry buildings (URMs) in downtown Portland. Many small businesses are located in buildings that are likely to collapse.

For a consulting business such as Econorthwest, the big concern is the recovery of other businesses and government: the demand side. We need our customer base (our clients) to recover so that their attention and their funds are not so focused on the demands of recovery that they are unable to resume normal business and hire contractors.

For grocery stores, such as New Seasons Market, the priorities are (1) the restoration of power and other utilities that are needed to run freezers and facilitate electronic transactions; and (2) the restoration of transportation to restock supplies.

For the Red Cross, the human element is the core. In the state of Oregon, the Red Cross has 56 paid employees and many more volunteers. Shelter supplies are staged throughout the region. The Red Cross needs good communication with local authorities regarding where to set up the shelters. It will also need access to transportation routes (including the ability to bring in supply trucks from other states and to send personnel into the disaster area to inspect and approve shelter facilities) and fuel for mobile kitchens and delivery trucks. The city will be responsible for supplying water.

Overall Issues and Concerns

For businesses overall, the biggest concern is the infrastructure: We need this to be functioning in order to do business. It is acceptable now, but how much redundancy is built into it? Most of the utilities infrastructure is provided by private suppliers. The state should work with them to assess the current status of these systems, their redundancies, and the options for providing service after a major disaster event.

It is the policy of the Red Cross to ask its supply partners: *What is your business continuity plan?* The Red Cross recommends that all businesses communicate with their supply partners about their continuity plans.

Businesses also need the city to address the issue of transient workers who are trapped downtown as a result of the earthquake. Provisions for assisting these people (including specific arrangements for shelter, water, food, and sanitation) should be included in city plans.

The economic impact of Intel losing power for longer than 10 hours or of the university being slow to recover from an earthquake would be very high. Extreme measures might be needed to address particular cases (for example, setting up special contracts to bring in essential supplies (such as fuel) by air or to provide temporary facilities for employees).

THE ROUNDTABLE IN SEATTLE, WASHINGTON

This roundtable discussion took place on May 8, 2012, at the University of Washington Club and was organized with the assistance of Bob Freitag, Director of the Institute for Hazard Mitigation Planning and Research at the University of Washington's College of Architecture and Urban Planning. This is the second roundtable in the series.

Participants

The facilitators of this business roundtable discussion were Cale Ash (CREW President) and Bob Freitag. CREW was also represented by Tamra Biasco, Heidi Kandathil, Tim Walsh, and Bill Steele.

PARTICIPANT	AFFILIATION
Priscilla Armstrong	CleanScapes
Charles Davis	Washington Federal
Marvin Ferreira	APM Terminals
Bob Freitag	University of Washington
Keith Kenway	Puget Sound Energy
Matthew McBride	Boeing Employees Credit Union
Ross McDonald	Foss Marine
Bill Steele	Pacific NW Seismic Network
Mark Wesolowski	Puget Sound Energy

The discussion was documented by Kyra Nourse (writer & editor for CREW's Business Roundtable project).

Introduction

Cale Ash welcomed the participants and explained the purpose and objectives of CREW's Business Roundtable project. He and the other CREW representatives stressed that CREW is seeking to:

- Increase CREW's interaction with private industry.
- Encourage businesses to join CREW and provide their input.
- Learn from the participants how CREW can provide useful information and assistance to help businesses understand and mitigate their earthquake risk.
- Provide tools and ideas to help businesses mitigate their earthquake risk.

The participants were then asked to introduce themselves and either share what they hope to take away from this meeting or identify a concern or issue. The results are summarized in the following table:

<i>Expectation, Concern or Issue</i>	<i>Expressed by:</i>
We would like to get a clearer understanding of the risks and receive the latest updates to this information.	Ross McDonald (Foss Marine) Keith Kenway (Puget Sound Energy) Charles Davis (Washington Federal) Mark Wesolowski (Puget Sound Energy) Marvin Ferreira (APM Terminals)
We would like to get a clearer idea of people’s needs so that we are prepared to meet them after an earthquake.	Ross McDonald (Foss Marine) Keith Kenway (Puget Sound Energy)
We would like a better sense of the challenges we might be facing so that we are better prepared to keep working through the event.	Ross McDonald (Foss Marine) Keith Kenway (Puget Sound Energy) Charles Davis (Washington Federal) Mark Wesolowski (Puget Sound Energy)
We approve of preparedness efforts (such as the Evergreen Quake Exercise, PNWER events, and Resilient Washington State Initiative) that involve partnerships and dialogues between businesses, organizations, and local, state, and federal agencies; we look forward to the further development of the results and the dialogues.	Mathew McBride (BECU) Mark Wesolowski (Puget Sound Energy) Marvin Ferreira (APM Terminals)
We would like to hear about the different tools that people are using.	Pricilla Armstrong (CleanScapes)
We would like to learn more from FEMA about how to track our work as first responders so that we are prepared to help and eligible for reimbursement.	Pricilla Armstrong (CleanScapes)
Both CREW and the Pacific Northwest Seismic Network (PNSN) would like to learn from businesses how PNSN and CREW can better serve their needs and ensure that the business community is strong and able to function after an earthquake.	Bill Steele (PNSN) and CREW

Cale Ash concluded the introduction by reviewing the agenda and providing a brief overview of CREW, including its goals, ongoing projects, current partnerships, and board of directors. (See www.crew.org for details.)

Presentation: Lessons from Christchurch

CALE ASH

The recent experience of Christchurch in New Zealand illustrates why businesses in Washington need to prepare for earthquakes. This city is smaller than Seattle, but similar in many ways.

The February 2011 earthquake in Christchurch was a magnitude 6.1 event and occurred right under the city's downtown. Although the magnitude of this earthquake was smaller than that of the Nisqually earthquake in 2001, the earthquake in Christchurch was shallow where the Nisqually earthquake was deep. This means that the intensity of the ground shaking was greater at Christchurch and the level of damage was correspondingly more significant. In Christchurch, they had to cordon off the downtown so that all the damaged buildings within this "Red Zone" could be safely cleaned up. The cordoned area is smaller now than when they started, but eight blocks were still cordoned off as of March 2012. The original zone covered one square mile.

Among other lessons, the experience of Christchurch shows how important it is for businesses to think about what would happen if they were not able to get back into their buildings after an earthquake. This event illustrates the importance of having contingency plans in place beforehand. CREW seeks to help businesses engage in this type of planning and preparation.

Presentation: Key Earthquake Scenarios for Puget Sound

TIM WALSH

Tim Walsh, Chief Hazards Geologist at the Washington State Department of Natural Resources, outlined Washington's three critical earthquake sources:

- Subduction zone earthquakes
- Deep (Benioff zone) earthquakes
- Shallow (crustal) earthquakes

He then described four earthquake scenarios with significant impacts for western Washington and explained how geologists first discovered these fault zones and assessed their potential for generating future earthquakes.

- Cascadia subduction zone: M9.0 scenario
- Southern Whidbey Island fault (SWIF): M7.4 scenario
- Seattle fault: M7.2 scenario
- Tacoma fault: M7.1 scenario

Hazard maps for these scenarios can be found at <http://earthquake.usgs.gov/hazards/products/scenario/>

CREW has developed and published earthquake descriptions and scenarios for the Cascadia subduction zone, shallow earthquakes, and deep earthquakes: <http://crew.org/products-programs>

(Printed copies were distributed to the participants along with USB thumb drives containing all of CREW's publications.)

Roundtable Discussion

OWNING VS. LEASING THE BUILDING

Does your company own or lease its office buildings and facilities?

Many businesses, such as Degenkolb, Puget Sound Energy, and CleanScapes, lease the buildings in which their offices are located. Others, such as Foss Marine, own the buildings. For those that lease, the decisions of the owners usually determine how well the building is prepared structurally for an earthquake, as well as how quickly businesses are likely to reoccupy the structure (if at all) after the event.

It was noted, however, that in the Chilean earthquake in 2010, it was nonstructural internal damage that seriously affected many businesses, regardless of whether they leased or owned their buildings.

MULTIPLE BUSINESS LOCATIONS AND BACKUP FACILITIES

Does your company maintain backup facilities?

Foss Marine has offices all over the west coast. Our business model assumes that we will lose the use of our buildings in the disaster area (*e.g.*, in a Seattle fault earthquake scenario), but our boats will still operate. We can also bring in additional boats and crews from Portland or even California if needed. The administrative center will be shifted to our Portland office.

Puget Sound Energy maintains backup command centers in Bellevue and Redmond. When these locations were chosen, the company was focused on single-risk scenarios, such as a fire at one of the centers. We now recognize that to address a large-scale regional risk, we need to push for a third backup facility located out of the area. These backup control centers are extremely expensive.

Boeing Employees Credit Union (BECU): As part of our structure for business resiliency, we have a fully built-up center in Spokane as well as the ability to run our data center from there. We also have a backup facility in Everett for non-regional events, but if something like a big Seattle fault earthquake occurs, we can switch to the Spokane center.

ISSUES RELATED TO SERVING AS A FIRST RESPONDER

Foss Marine has been working with the U.S. Coast Guard and participating in their plan to restore commerce and marine trades after an event. This includes prioritizing cargo and starting to bring it in after an earthquake. Precisely where the cargo will be brought will have to be determined after the event. We run very large steel boats with hulls that can push through any debris floating in the water. Our normal operations assume our boats will encounter some debris (*e.g.*, floating logs) on an everyday basis, so we are equipped to deal with any difficulties or damage. We expect to get our orders from the Coast Guard; the Coast

Guard will interface with other entities and jurisdictional authorities. Nevertheless, it seems likely that in the hours immediately following an event, the lines of jurisdictional authority will not be entirely clear. This could pose challenges, as local sheriffs and other authorities may order us to do things for them.

APM Terminals: The U.S. Coast Guard assumes it will be the lead authority in maritime-based Puget Sound and that it will manage the response. The Coast Guard has done some groundwork to establish connectivity to other entities.

HOW PREPARED ARE THE COMPANY'S EMPLOYEES?

Do the businesses here have a plan or program to support employees' preparedness?

Foss Marine: The first hour after the disaster will likely be spent working things out individually and trying to discover what is going on. The second hour will be spent figuring out what the corporation's actions are going to be. We haven't exercised for a catastrophic loss.

APM Terminals: The key first step is to make sure the company's employees are prepared at home: The employees need to know that their families are safe and able to ride it out. Most big corporations do provide information about disaster preparedness. APM Terminals, which is global, maintains a website, providing online resources that employees and their families can access. If a company's HR department has disaster-specific policies, the company is more likely to have conversations with its employees about personal preparedness. Most of APM Terminals' employees live in Puget Sound's seismic bad zone. Those that don't might still have trouble reporting to work after an earthquake. The problem with most corporations is that they focus their attention on the functionality of their administrative centers; they need to look at training their people—where are your people and how can you help get them get back in business locally?

CleanScapes is currently working with a contractor on preparing employees' families.

CleanScapes also has a website that employees and their families can access. This is located out of state, but updated in-state. (Pricilla Armstrong also plans to get in touch with their San Francisco office to see about serving as out-of-area support.)

Puget Sound Energy has looked to hurricane-ravaged states for models. After a disaster, corporations need to change their focus briefly and work on helping employees and their families meet their basic needs following the event. This allows employees to focus on their jobs. PSE has adopted this strategy.

When developing response plans, companies should also identify in advance which employees will be needed at what stage of the response and recovery. There will be a percentage that can be sent home and will therefore be free to focus on the needs of their families.

BECU doesn't have disaster-specific HR policies. The culture of an organization is more likely to influence whether there is such a policy. At BECU, the focus simply hasn't been on the potential negative impacts.

Washington Federal: The culture of the company is a major factor in the preparedness of employees. Charles Davis noted that he worked previously at a company that provided survival kits at each person's desk. Washington Federal doesn't currently do this, and Charles is working on developing a greater level of preparation. The challenge is twofold: How to propel preparation efforts without scaring the employees and how to persuade employees to do things like retrofit and prepare for events that may not happen in their lifetime. We need to encourage people to take personal responsibility and prepare. Hurricane Katrina was the best model that we could ask for because it made so clear the challenges that the government faces during the response. It also raised our understanding of the challenges and the risks involved in living and working in this particular area.

STRATEGIES FOR MESSAGING

Value-based Messaging: The way in which information about earthquakes and mitigation is conveyed is really important. California is working on assessing how people respond to different approaches and has found that the most successful messaging is action-oriented and implies a positive outcome.

Also, one of the things that can spur people to become personally prepared is their awareness of their responsibility for the safety of other people, such as their children or their parents.

Taking a Multi-hazard Approach: Because western Washington's environment routinely offers smaller challenges (*e.g.*, winter storms and power outages), it should be easier to develop a culture of resilience and self-sufficiency here. Winter storms and power outages are also opportunities to demonstrate the success of many of our preparations. Such a multi-hazard approach should make it easier to persuade people to prepare, because a lot of their preparations will be applicable in a variety of contexts.

Communicating the Earthquake Hazard and Level of Risk: People may look at the recurrence-interval statistics for an event like the Cascadia subduction zone earthquake and think that there is no urgent need to prepare for an event that happens once every 500 years; but 500 years is only the average: The actual time between subduction zone earthquakes in the past has varied a great deal, with intervals as short as 140 years. It may be more useful to think comparatively about the odds of experiencing such an event. For example, the odds that a Cascadia subduction zone earthquake will occur in any given year are *1 in 500*; the odds that an individual will be killed in a traffic accident are *1 in 6,029* (statistics for the year 2001). Although not directly comparable, this does help illustrate the relative probabilities.

PLANNING FOR THE RESPONSE: OVERALL ORGANIZATION & INTERDEPENDENCIES

Questions raised by participants:

- In the matter of authority and jurisdiction after an event, how much of our current planning, preparation, and response is “siloes” through particular agencies?
- What is the plan among agencies for distribution of goods and services following an earthquake? Has a business impact analysis (BIA) been done for a big earthquake event to help prioritize who will receive goods and services first?
- Have the critical interdependencies of the state’s businesses, services, and infrastructure been assessed to help determine where recovery efforts and supplies should be focused first?

Marvin Ferreira of APM Terminals observed that interdependencies are being examined and planning is going on: the state of Washington is ahead on this. Most of this work is being done by government agencies, although there is an effort to develop relationships with business liaisons.

Cale Ash noted that CREW could also serve as a facilitator of connections between people and organizations.

CREW’s Role & Potential Products

How can CREW tailor some of our projects and products to suit the needs of business and industry? Also, what kinds of business-specific workshops or conferences would you like to see happen?

SUMMARY OF ANSWERS

- We would like to get a clearer understanding of the earthquake hazards and risks and receive the latest updates to this information.
- We would like to know what lessons have been learned about earthquake impacts and economic recovery in other places around the world.
- We would like a better understanding of the potential ground motions our facilities are likely to experience, and we would like information about the type of mitigation (especially nonstructural retrofitting and engineering) that is most likely to be effective.
- We would like a better understanding of how the emergency response is likely to work and how this response is coordinated with FEMA and other public entities. (A presentation/workshop on how a disaster will work.)
- We would like better information about the existing priority list for the distribution of goods and services (such as the restoration of power or the delivery of fuel) in the days

immediately following an earthquake. We need to know how this will work so that we can plan effectively.

- We would be interested in finding ways to share resources and storage space in order to make the costs of backup facilities more manageable.
- We would like to know what tools work best for communication backup systems. What are the best practices?
- From a financial investment perspective, businesses in the financial sector would like to learn how to help the community rebuild intelligently after the earthquake. (Best practices.)
- We would like to have access to hazard maps with layering options. For the purposes of planning and the development of mitigation strategies, it would be most useful if we could add our own layers.
- We would like to have CREW (or some other entity) act as the bridge between the public and private sector for regional preparedness exercises and other similar events and initiatives.

DISCUSSION

Washington Federal has locations in eight states, all of which have earthquake hazards. It would be useful to have more information about this. Also, it would be great if CREW could provide lessons about disaster impacts and economic recovery from other places around the world that have experienced destructive earthquakes. This information should be presented in multiple formats (*e.g.*, webinar, shared repository on a website, in publications). From a financial perspective, we could also use information about how to help the community rebuild intelligently after the earthquake. For example, how does the earth movement affect the structures?

Puget Sound Energy: As a means of assessing the potential impacts on PSE's facility (internal as well as external), we hired a consultant to come in and do a comparison to show what happened in other disasters. We learned that some of the retrofitting that we had done at PSE has failed in other earthquakes (*i.e.* in Christchurch, New Zealand), but we also learned about the types of retrofitting that did work.

Also, in terms of emergency management and response after an earthquake, it is important for businesses and organizations to know how the public sector will work in a disaster situation. Emergency response planning is really separate from business continuity planning. It is important to understand the model. Part of the problem that business people have is that they don't know what they don't know. They need to understand the mechanics to know how to coordinate.

For businesses not involved in the actual response efforts, business continuity planning is the essential piece.

CleanScapes: We would like a better understanding of how to work with FEMA so that we are prepared if we are called in by the City of Seattle to help haul debris. How do we track and document that for reimbursement? *Tamra Biasco briefly reviewed the way FEMA coordinates Emergency Support Functions (ESFs) and recommended that contractors work closely with their counties and, in the case of CleanScapes, the City of Seattle. This was followed by some discussion about how contracting with various public entities may work during post-earthquake clean-up efforts.*

CleanScapes also needs space somewhere for a backup facility. We are currently looking for something in Shoreline. We would like to examine the possibility of sharing space with some other organization—it would be useful to find ways to share resources and storage space in order to make the costs of backup facilities more manageable.

We would also like to know what communication backup systems people are using. I have ten satellite phones, but it would be good to know what works and what doesn't work—the best practices.

BECU: If our planning efforts are to be meaningful and productive, we need to know what we're planning for. There may be things that we really need to do by Day 2, but it's possible those things are not even on our radar right now. If we're in an area where the power isn't going to be up for five days, or if there comes into being a plan that directs the distribution of diesel, it would really be helpful to know this in advance—to know the priorities and who is likely to be at the top of the list for critical resources and services.

BECU would also be interested in learning about what works best for communication backup systems—the best practices.

We would like to have access to hazard maps with layering options—we would like to be able to add our own layers. For planning and mitigation purposes, it would help to have the ability to outline where the known hazards are, which hazards can be mitigated, which areas to avoid completely, where critical bridges and transportation components are, and so forth. This map would need to be a really good product to be useful (i.e. sufficiently detailed and accurate). A PDF would be great. You may want to charge a nominal fee so that the product has a greater perceived value among users.

(Charles Davis of Washington Federal added that such information could also help financial institutions develop strategies for sharing facilities or temporarily sending the customers of one bank to another to ensure that people's needs are met following an earthquake.)

The Washington Emergency Management Division and the state Department of Natural Resources (DNR) are putting together a database that presents Washington's earthquake scenarios. It will be accessible through DNR's website. This project may provide some of the features and information that Mathew McBride of BECU just described. Tamra Biasco of

FEMA added that if participants are working on planning and have a specific question or concern, they can contact her, and she will see if it is possible to generate a map to help provide answers. Tim Walsh also mentioned the Washington State Geologic Information Portal (on DNR's website) as a potential resource.

For the Evergreen exercises, one of the national labs was brought in to compile and present the scenario. As there are so many different agencies currently involved, it would be beneficial to have CREW (or some other entity) act as the bridge between the public and private sector for this type of thing.

Concluding Presentation: Tools for Businesses

TAMRA BIASCO AND CALE ASH

ON-LINE RESOURCES

Online resources include tools such as *Be Quakesmart*, *Red Cross Ready Rating*, *EMD Business Portal*, *DRB Toolkit*, *Ready Business*, and publications and products on CREW's website, such as *Just-in-Time Inventory: Effects on Earthquake Recovery*.

FEMA PROGRAMS

FEMA offers a variety of training sessions to the states (these are usually coordinated through the states). FEMA is working on offering these as Webinars in the future. FEMA also does a variety of courses, including a class on how to reduce the risks of nonstructural earthquake damage. The Emergency Management Institute has online courses: www.training.fema.gov/emi/

UNDERSTANDING THE MITIGATION PROCESS

- **Understand your risk:** Where is your facility? What is the hazard? Where are your suppliers (or customers), and what preparation have they done?
- **Define target seismic performance:** Performance-based seismic design means some buildings may be engineered or retrofitted for life-safety, while others are designed for immediate occupancy after an earthquake. Many other types of buildings will not perform well at all and may collapse or be near collapse as a result of an earthquake. Be aware that buildings designed for life-safety could still take months to repair after an earthquake. It may not be feasible to repair buildings that are near collapse.
- **Conduct an evaluation:** Consider both structural and nonstructural performance. FEMA has a nonstructural guide; ASCE has publications on structural standards & retrofitting (these also address nonstructural elements).
- **Determine Current Performance Levels and Mitigate to Improve Resiliency.**

THE ROUNDTABLE IN VANCOUVER, B.C.

This roundtable discussion took place on July 10, 2012, in Vancouver, British Columbia, and was organized with the assistance of Glen Magel of the British Columbia Institute of Technology (BC IT) and the Emergency Preparedness for Industry & Commerce Council (EPICC) Board. This is the third and final roundtable in the series.

Participants

The facilitators of this business roundtable discussion were Cale Ash (CREW President) and Glen Magel. CREW was also represented by Heidi Kandathil. CREW board members Kathryn Forge and Teron Moore were in attendance representing their respective agencies.

PARTICIPANT	AFFILIATION
Doug Araki	WPS Disaster Management Solutions
Steven Bibby	BC Ministry of Housing
Terry Bruns	WPS Disaster Management Solutions
Kathryn Forge	Public Safety Canada
Carmen Funk	F.A.S.T. (First Aid & Survival Technologies) Limited
Dennis Gam	Read Jones Christoffersen Ltd. / EPICC Board
Glen Magel	British Columbia Institute of Technology / EPICC Board
Edward Matley	KPMG / EPICC Board
Teron Moore	Emergency Management B.C.
Andy Nieman	Braidner Survival Kits Ltd.
John Oakley	Emergency Management B.C. SWE
Larry Pearce	Pearces 2 Consulting Corp / EPICC Board
Suzanne Peralta	Vancity (credit union)
Teresa Sharp	British Columbia Institute of Technology / EPICC Board
Victor Smart	The Cadillac Fairview Corp. / EPICC Board
Kevin Soltani	Bentall Kennedy (Canada) LP
Bert Struik	Geological Survey Canada – Natural Resources Canada
Heather Tomalty	Ever Resilient Consulting, DRI Canada Education Commission
Bill White	BC Ministry of Housing

The discussion was documented by Kyra Nourse (writer & editor for CREW's Business Roundtable project).

Introduction

Cale Ash welcomed the participants and explained the context, purpose, and objectives of CREW’s Business Roundtable project. He stressed that CREW is seeking to:

- Use discussions with the participants to help CREW’s board determine CREW’s future direction, with particular attention to how CREW can best help businesses to understand and mitigate their earthquake risk.
- Use input from the three business roundtables to develop a white paper that identifies key themes and issues. (This paper will be made available to the participants.)

The participants were asked to introduce themselves and to share their primary interests and what they hope to take away from this meeting. The results are summarized in the following table:

Interest or Issue	Those who shared this included:
We’re interested in issues related to seismic evaluation and retrofitting and assessment of buildings (including rapid damage assessment).	Cale Ash (Degenkolb / CREW) Bill White (BC Ministry of Housing) Steven Bibby (BC Ministry of Housing) Dennis Gam (Read Jones Christoffersen Ltd.)
We’re interested in further developing collaboration and potential partnerships between CREW and EPICC. We would like to see more collaboration between all relevant organizations.	Cale Ash (CREW) Heidi Kandathil (CREW) EPICC Board members Steven Bibby (BC Ministry of Housing)
We’re interested in learning and conveying the lessons from recent earthquakes in Japan and New Zealand.	Steven Bibby (BC Ministry of Housing) Cale Ash (CREW)
We’re interested in the calculation of seismic risk and how to bring this to Canada and to our clients.	Bert Struik (National Research Canada) Dennis Gam (Read Jones Christoffersen Ltd.)
We’re interested in learning more about emergency preparedness and business continuity management in relation to this region’s earthquake hazard and risk in order to make our program/work/product more robust.	Suzanne Peralta (Vancity) Heather Tomalty (Ever Resilient Consulting) Dennis Gam (Read Jones Christoffersen Ltd.) Andy Nieman (Braidner Survival Kits Ltd.) Doug Araki (WPS Disaster Management Solutions) Terry Bruns (WPS Disaster Management Solutions)
We’re interested in methodologies for developing continuity plans (for clients) based on simulation exercises—in particular, we’d like to learn more in order to make these simulations as realistic as possible.	Ed Matley (KPMG)
We’re interested in learning how to make our business more resilient and how to help our customers/clients do the same.	Carmen Funk (F.A.S.T. Limited) Dennis Gam (Read Jones Christoffersen Ltd.)
We’re interested in this roundtable discussion as an opportunity to learn more in general and to hear what other participants have to share.	Larry Pearce (Pearces 2 Consulting Corp) Teresa Sharp (BC IT)

(It was noted that the group participating in this discussion includes a lot of consultants and representatives from government agencies, which makes it rather different from the two previous roundtable discussions in Washington and Oregon.)

INTRODUCTION OF CREW

Cale Ash provided a brief description of the Cascadia Region Earthquake Workgroup (CREW), including its board of directors, goals, ongoing projects, and role in fostering partnerships.

Presentation: Lessons from Christchurch

CALE ASH

The recent experience of Christchurch in New Zealand illustrates why businesses in Vancouver should prepare for earthquakes.

The February 2011 earthquake in Christchurch was a magnitude 6.1 event. Although this was not a mega event, the earthquake and its aftershocks were shallow and occurred close to the city's central business district. Because of the extent and severity of the resulting damage, they cordoned off the downtown until the damaged buildings within this zone could be safely cleaned up. A large number of the buildings were unreinforced masonry structures: many were historic and beautiful, but they were extremely prone to damage from ground shaking.

The cordoned area is smaller now than when they started, but eight blocks were still cordoned off as of March 2012. The original zone covered one square mile. If we superimpose Christchurch's cordoned area onto Vancouver's downtown, we can see that a similar earthquake here has the potential to impact a significant portion of Vancouver's business district. It is also worth noting that only a small proportion of the firms surveyed in Christchurch had formal continuity plans in place; less than 10% had written response plans.

Among other lessons, the experience of Christchurch shows how important it is for businesses to think about what would happen if they were not able to get back into their buildings after an earthquake. This event illustrates the importance of having contingency plans in place beforehand. CREW seeks to help businesses engage in this type of planning and preparation.

Presentation: Earthquake Scenarios for Vancouver, B.C.

BERT STRUIK (NATURAL RESOURCES CANADA) AND TERON MOORE (EMERGENCY MANAGEMENT BC)

Bert Struik gave a general description of plate tectonics in the region and explained the three primary sources of earthquakes in British Columbia:

- Subduction zone earthquakes (= interplate)
- Deep (Benioff zone) earthquakes (=intraplate)
- Shallow (crustal) earthquakes (= intraplate)

(The two plates that converge along the Cascadia subduction are locked at a depth of about 30–40 km along the entire length of the zone. The slip in a megaquake will begin at one point, but will then continue along the whole zone—the ground shaking from the resulting earthquake will therefore move along the zone and may continue for several minutes.)

A number of terms are used to discuss earthquakes in relation to communities, including:

- *Hazard*—the geological potential for earthquakes in a given area, including the conditions related to potential secondary effects of earthquakes (e.g., landslides, liquefaction).
- *Exposure*—the structures and other human elements that we put in harm’s way.
- *Consequences*—the actual losses that occur as a result of an earthquake (a function of hazard and exposure).

The three earthquake scenarios for Vancouver, B.C., are:

- **The Fraser Valley scenario:** This scenario is based on a rupture of the Kendall fault zone in northern Washington. Such an earthquake is not expected to be as damaging for Vancouver as it is for other communities located closer to the fault.
- **The Cascadia subduction zone scenario:** Although the magnitude of such an earthquake is expected to be great, for Vancouver it is expected to constitute a “Yellow Alert.” The ground shaking will be worse nearer the coast.
- **The Georgia Strait fault zone scenario:** The projected rupturing of the fault zone in this scenario would be most similar to the recent earthquake and aftershocks in Christchurch. The projected magnitude of the Georgia Strait event is M7.3. For downtown Vancouver, this would constitute a “Red Alert” (damage is likely to be severe).

EARTHQUAKE RISK & HAZUS

Earthquake risk is measured by calculating exposure, probability, and consequence. Natural Resources Canada is currently working with FEMA to bring a risk-assessment tool called *Hazus* to Canada. This tool helps us to model the resilience capability of a community—it creates loss estimates by considering in combination the hazard event, what is exposed to the hazard, and how vulnerable the exposed structures and elements are to the hazard.

To make Hazus work, one needs good, detailed inputs about transportation and utilities networks, building stock, essential facilities, population, and critical facilities. You can generate Hazus data for a single structure or for a whole city. The outputs of Hazus can be used in other tools as well, such as cost-benefit analysis tools.

Natural Resources Canada did an early run with Hazus to generate calculations for Vancouver: most of the data inputted pertained to residential structures because we did not have other data sets. (The data that were inputted were drawn from the Census Canada national data set, which did not include some of the industrial complexes and high-rises. For the district of Vancouver,

the data were drawn from the district/municipality. BC Assessment data were used to input the cost of replacement of homes.)

The projected scenario for the run was an earthquake on the Georgia Strait fault zone. Hazus estimated that approximately 130,000 buildings would be moderately damaged by such an earthquake, but 8,000 buildings (27% of the total number of buildings) would be damaged beyond repair. Total building-related losses amounted to about \$15 billion (CD); 21% of these estimated losses related to business interruption. By far the largest loss was residential occupancies (68%); a projected 41,000 households would be displaced, with about 22,000 people in need of temporary shelter. Debris from the event amounted to about 9 million tons—375,000 truckloads (26% of this debris was projected to be brick and wood; the rest was reinforced steel and concrete).

BUSINESS PREPAREDNESS, MITIGATION, RESPONSE, AND RECOVERY

Teron Moore provided a brief history of recent damaging earthquakes in British Columbia, including the magnitude 9.0 Cascadia subduction zone event in 1700 and the magnitude 8.1 earthquake in the Queen Charlotte Islands in 1949.

The majority of Canada’s seismic hazard and risk is in the west. The “Big One” that most people talk about is Cascadia, but this is not the worst-case scenario for Vancouver. The event that is most likely to be the worst for Vancouver is an earthquake like the M7.3 quake in the Georgia Strait scenario (similar to the recent earthquakes in Christchurch).

The probabilities of a very strong (MMI VII) earthquake in Vancouver are:

- 10 years = 2.5%
- 50 years = 12%
- 100 years = 22%

These probabilities are very high considering the lifespan of buildings (50–60 years).

What to Expect:

- Supply-chain delays (transportation routes disrupted, etc)
- Worker absenteeism (if the infrastructure is disrupted, people can’t get to work); many people may also develop psychological issues: Christchurch is a good case study of the psychological impacts and social issues that result from earthquakes and aftershocks during recovery.
- Facilities issues (communication & IT facilities)
- Damage from secondary effects, such as flooding if damaged dikes fail (*e.g.*, those in the Fraser Valley)
- Infrastructure issues
- Aftershocks (again, Japan and Christchurch are good case studies for the impacts of aftershocks both on the physical environment and on the mental health of people)

LEARNING WHAT TO DO: BEFORE, DURING, AND AFTER (TOOLS)

Again, looking at Christchurch as a case study, it is clear that your neighbors' business continuity plans can affect the continuity of your business.

- **Preparedness:** Identify your business's continuity needs and conduct exercises to test and practice your continuity and response plans: Ensure that your Emergency Response Team (ERT) has developed and exercised a plan; ensure that the Occupation Health and Safety committee is engaged; conduct earthquake drills and rapid damage assessment training; have "work from home" days to develop and test flexibility so you know beforehand how your business would work in a post-earthquake setting.
- **Mitigation:** This includes structural issues (retrofitting, etc.) and nonstructural issues (furniture, IT systems, data resources, dependent systems). Retrofit, secure, and develop redundancies.
- **Response:** *Drop, Cover, and Hold:* Participate in the Great BC ShakeOut on October 18, 2012 at 10:18 a.m.; practice; plan to avoid injury; plan to recover quickly. It is important to know what your next step will be after the shaking stops.
- **Recovery:** Before—be ready, standardize processes, replicate capacities; After—be creative and flexible (attempt to envision before the event what this may be like).

For more information: www.pep.bc.ca (Teron Moore, Seismic Specialist, Emergency Management BC, Teron.Moore@gov.bc.ca)

COMMENTS & RESPONSES TO QUESTIONS

What are the relative probabilities for the scenarios presented?

- Cascadia subduction zone—The average return interval is 500 years (plus or minus 200–300 years). The last one was in 1700. In reality, however, the intervals between earthquakes are variable and unpredictable. The actual intervals between subduction zone events have been as great as 1,000 years and as small as a couple of hundred years. The next quake could be in 50 years, or next week, or five minutes from now. Even if the earthquake occurred next week, it wouldn't mean that you could be certain that the next one would be 500 years in the future, so you wouldn't want to relax seismic standards in building codes just because one significant earthquake has already occurred.
- Kendall fault—This has a 100 year timeframe.
- Georgia Strait fault zone—The full extent of this fault is not yet known, and the probability is currently unknown; it is possibly a 100–200 year return period event.

There are two approaches involved in calculating the likelihood of an earthquake. One is to look at the history of activity on a particular fault—we can use this history to factor the probability of and average intervals between earthquakes on that fault. The other approach is to do a probabilistic assessment based on all earthquake hazards within a region.

The three scenario maps presented today assumed only one type of soil (NEHRP Type C). This is because we didn't have detailed soil data for all of Vancouver. For the district of North Vancouver, more data does exist: They have areas of liquefiable soils. As a delta, Richmond likewise has some liquefiable soil. In general, Vancouver sits on a ridge of glacial till, which is pretty solid. We need a better (more detailed) soil map.

In 2005, the seismic standards of the codes in Canada were increased (bringing them more into line with similar codes in the U.S.).

Discussion: Business Resiliency

FEMA/NEHRP definition of resilience: A disaster-resilient nation is one in which its communities, through mitigation and pre-disaster preparation, develop the adaptive capacity to maintain important community functions and recover quickly when major disasters occur.

COMMUNICATING EARTHQUAKE RISK

How do we communicate risk to business owners so that they are motivated to take action? (Scenarios, outcomes, impacts, probabilities?)

When it comes to explaining earthquake hazard and risk to people, the scenario data is often more valuable than the probability data. People seem not to respond seriously to probabilities. Scenario data is more motivating.

We can say that we are 100 percent certain that we are going to have an earthquake here, and we're 100 percent certain that most earthquakes will yield aftershocks. There is only a 4% cost increase to make a building not just survivable (the life-safety standard inherent in current building codes), but operational following an earthquake.

Liability reduction is a huge motivator for a lot of companies. They will adopt and implement best practices to achieve this.

Conveying risks by relating the numbers can be very effective. People do respond to quantitative measures of impacts, although it is hard to get solid numbers, especially numbers that are localized to a particular business rather than broadly applicable to the wider community. It helps to have a framework to demonstrate low, medium, and high impacts (the red, amber, green thing). Nevertheless, the human aspects are what really bring it home—that is, the potential for loss of life or injury often have greater weight than a purely numbers-based approach.

Although earthquakes are a pivotal hazard in this region, for business continuity professionals, the focus is on helping businesses prepare for all hazards. An earthquake is only one of the reasons that businesses should engage in continuity planning. Because an earthquake is a worst case scenario, businesses that are prepared for it will also be prepared for other events. Businesses should plan for no access to their facilities, regardless of the cause.

The risk needs to be explained and people need to be informed, but this needs to be done in a way that doesn't sensationalize—or scare and overwhelm the audience.

DEFINING THE ROLE OF GOVERNMENT

What role should the government or government agencies play? What would be most useful?

Many organizations and businesses are unable to invest a lot of resources or commit staff to studying and identifying their risks. It would be useful to have a single place—an independent organization—that provides a reliable, prioritized list of risks based on current research.

Currently, it is mandated in every province of Canada that everyone shall have a fire safety plan. This could be changed to an all-hazard plan. Businesses and building owners could be required to have such a plan.

There is nothing in existing legislation (Work Safe BC) that says employers must have emergency plans. The law says only that if you have people go back into a damaged workplace, you have to have a plan for evacuating them.

EPICC or another large group of stakeholders needs to communicate these needs to the government—put it in writing and communicate it (“lobby”). Among the elected officials of communities, there is a real lack of understanding regarding emergency preparedness and management. Generally, these officials are also not well informed about the issues of the business community.

On the whole, communities are better prepared than in the past (*e.g.*, measuring this by flood response), but there is still work to do. Concerning emergency management law: Every community in B.C. has a plan, but in many cases these are too old and have not been exercised or updated. One of the concerns is that there is currently insufficient enforcement—no teeth behind existing legislation. Often, there is also push-back because municipalities lack resources.

Hurricane Katrina demonstrated that the amount of time for which an individual needs to be prepared to get along without assistance is longer than 72 hours. The government needs to take on extending this timeframe so that it is more realistic; the government should also be responsible for informing the public.

By law, K-12 schools must have 6 fire drills; with participation in ShakeOut, the schools should now have one earthquake drill, but this still isn't much when compared to the number of fire drills.

RAISING AWARENESS

The ShakeOut campaign has been very effective at raising awareness in British Columbia and elsewhere. (Washington is engaging in ShakeOut for the first time this year.) Children in grades

K-12 who have experienced ShakeOut have in turn been raising awareness by educating their parents.

ShakeOut also triggers more thinking about what should happen or what you should do after you've crawled out from under the desk. As in New Zealand, many schools will be evacuated after the initial earthquake; the students won't return to the building until engineers certify that the building is okay. But even after students return to the building, they are likely to experience aftershocks. In Christchurch, there have been as many as 11 aftershocks per week. If you extend this to the business community, it is clear that the reality of business resumption is different when you consider the aftershock issues.

Property managers have found that the earthquakes in Christchurch and Japan, in addition to the ShakeOut campaign, have really affected awareness and interest. The recent earthquakes in Christchurch and Japan have also provided some useful examples of what is actually likely to happen to a building (that is, the states of damage to expect).

Both Fire Smart and ShakeOut have been effective, but we still need to be more proactive about earthquake: we can't wait for it to happen. A large number of people still don't know about or understand the earthquake hazard and risk here—they're not aware, because it hasn't yet happened. Moreover, the messages often don't get back to the CEO or other person with authority in a business or organization. Emergency Preparedness Week happens every year, but the message simply isn't reaching the people who need to see it (small businesses, etc.). The education that has occurred has had an effect, so there are "success stories"—nevertheless, many still haven't addressed the basics (*e.g.*, first-aid attendant).

Even when free preparedness training is offered to companies, many will still do nothing. The executives of the company must be persuaded to buy in or nothing will happen.

Go to chambers of commerce to reach small to mid-size businesses.

MARKETING

It really comes down to marketing. Ideas for this include:

- Getting a star athlete or someone with sex appeal to promote it.
- Taking advantage of educational opportunities (such as ShakeOut) as they emerge.
- Promoting ShakeOut among the business community: The number of schools participating in ShakeOut is high, but the number of participating businesses is low. There is a ShakeOut website for B.C., but it probably needs a greater push (advertisements, a media campaign, a poster that businesses can put up to announce that they are participating in ShakeOut) in order to build interest among those not already hooked.
- Getting WCB to be a proponent of (not just a participant in) ShakeOut.

- Developing a media campaign comparable to the Smokey the Bear campaign. Such a campaign would engage the younger population, especially kids in schools, and the schools themselves could help promote it. (Note: an earlier effort to get the school system to include earthquake education in the curriculum was not successful).
- Emulating other past campaigns: Emergency Preparedness Canada once had four cartoons that were widely circulated; this was part of a successful public awareness campaign. Fire safety was brought into the schools and was very successful. (Road safety and bike safety campaigns also existed at one point).
- Take advantage of social media both to get the message out and to instigate public participation.

To do marketing successfully, you have to put some money into it. Elected officials are short-term in their response and reluctant to commit money, so it is difficult to launch an effective marketing campaign.

Studies have shown that people must hear something about 12 times before they really comprehend and react to what they hear. What do we want from businesses in the event that an earthquake occurs? Maybe we're focusing on too full a process and need to focus more narrowly on a message about 48–72 hours of preparation, then work on steps for achieving it. Also, it might be best to work first on individual preparedness, then on businesses, especially as individual preparation impacts businesses (employees are only able to report to work if they are prepared at home).

Following the events in Japan and Christchurch, the mainstream media were focused on reporting what they defined as important and sensational; it was difficult to get them to report on issues such as preparedness. During a recent flood event, popular social media often proved more reliable and timely than the regular media.

ADDRESSING ISSUES BETWEEN BUILDING OWNERS AND TENANTS

There is a huge divide between the interests and attitudes of building owners (the real estate industry) and the tenant businesses that lease space within the buildings. The owners tend to focus on liability reduction. The tenants seem to focus on business continuity and to think of life-safety as the responsibility of the building's owner. As a result, tenants/business owners are often a bit complacent about life-safety. Education is needed to persuade tenants that resiliency is achieved through preparedness and that they must take responsibility for the safety of their own people.

It is challenging to get building owners to bring things up to code as the standards are raised. Owners are already reluctant to do any upkeep for fear that the minute they apply for a permit, they will be compelled to do additional upgrades. The codes relating to retrofits and upgrades probably do need to be tightened, but it is necessary to consider the economic implications.

(Note, for example, California’s approach to URM: San Francisco has decided to make retrofitting mandatory. Seattle is contemplating a similar approach.)

Consider also the insurance provider piece of the dynamic between tenant-business owners and property owners. There is often a lack of connection or communication between an individual business’s continuity program and the building owner. Businesses may find it difficult to bring in the owner. The owner typically writes something into the lease agreement that says that in the event of an “act of god,” the owner is not legally obliged to get the building back in use. Owners typically don’t look at reactivating the building after an earthquake; they look at limiting their liability by keeping people out of the building.

Tenants/business owners are now more focused on examining purchases and supply-chain issues; this focus could be widened to include a pro-active role in lease agreements.

Small businesses (49 people or less), don’t have the resources to dedicate personnel to these continuity issues or to invest in the increased cost of a lease that would address this. While the key to success is education—raising awareness and emphasizing that you need some kind of continuity planning that involves looking at what could happen and what things you can do to anticipate potential problems and address them—it is important that such educational efforts take into account the audience (including size and resources).

EPICC’s Tools for Businesses

The Emergency Preparedness for Industry & Commerce Council (EPICC) has developed a number of publications for businesses, including an *Earthquake Planning for Business* guide. (The second edition of this guide is about to be developed, and EPICC welcomes comments or suggestions for this revision.) EPICC also does presentations for small to mid-sized businesses and occasionally chambers of commerce.

Closing Discussion

MANDATORY DRILLS

Before a cruise ship leaves the harbor, everyone on board always participates in a drill. Remarkably, everyone appears to do precisely what they are supposed to. On land, drills for evacuating buildings are much less effective and most adults are less willing to participate.

In a business context, you must get the CEO to buy-in and participate—you must have top-down support. For example, one business declined to participate in the fire drill at the high-rise where their offices were located until the building’s owner asked that the head of the business put this refusal in writing. Rather than do so, the head of the business agreed to participate.

We need to have mandated participation in drills and similar exercises.

After the 9-11 bombings in New York, a book was published that showed how one manager had taken it upon himself to develop an evacuation plan for his building. This plan saved a lot of lives when the bombing occurred.

If we think all businesses should have these plans, it really must be legislated.

Japan's population is trained to respond to an emergency tone (transmitted via T.V. and phone) that precedes warnings and other emergency announcements. It might be a good idea to reintroduce this here.

EARTHQUAKE SCENARIOS AS TOOLS

Would having disaster scenarios at your fingertips be of value to you? For example, Natural Resources Canada could create a disaster scenario library to help people facilitate discussions or perform analyses. The goal would be to make these the best models possible: that is, the most realistic.

Yes, this would be a very valuable tool for discussing and presenting on seismic risk. If this is put together by Natural Resources Canada, it would also enhance the credibility of the information we use and present.

SOCIAL MEDIA

The importance of social media should be emphasized: In Japan, someone created an app to take readings of nuclear radiation levels. Everyone downloaded this app; it told them to buy a \$20 device at the hardware store, use it to take measurements, and then input their data to the app. The coverage was more widespread, localized, and timely than the information being distributed by the government. By creating new app tools, we as a group could facilitate a useful interface between people on the ground and scientists. Also, this would be something popular that people can take up and run with. ShakeOut is successful at least in part because it was well designed and well thought out in this respect—it emerged as something people could just take up and run with.

MAKING USE OF PERSONAL EXPERIENCES

Our challenge is that we're trying to get people to take seriously something that most have not experienced personally. We might have more success communicating with people here if we use stories of people's real experiences.

You won't get organizations prepared if you don't get individuals and families prepared. We also need to find an individual advocate within each business or organization—someone who has personal experience that motivates.