



BRITISH COLUMBIA EARTHQUAKE RESPONSE PLAN (2008)



Provincial Emergency Program
Emergency Management British Columbia
Ministry of Public Safety & Solicitor General

This plan identifies the intended actions to be taken in the management of the consequences of an earthquake.

November 17, 2008

Foreword



Effective consequence management involves planning for, responding to and controlling an event to minimise risk and reduce the negative effects from that event.

In British Columbia, lives, homes, businesses, property and infrastructure can be threatened by earthquakes. Earthquakes are unpredictable events. While scientists have a good knowledge of where and how often earthquakes occur, the precise time, location, and magnitude cannot be predicted. Therefore, being prepared to respond is critically important to public safety.

This British Columbia Earthquake Response Plan, describes the Provincial Concept of Operations for responding to and managing the consequences of a damaging earthquake. This plan specifically relates to earthquake consequence management, although some of the same responses and actions may be used for other emergency events. (See the Provincial Emergency Program Web site (www.pep.bc.ca) for other hazard-specific plans.)

This document represents a component of the British Columbia Emergency Response Management System, a comprehensive all-hazards emergency response management structure. The British Columbia Emergency Response Management System provides a framework for organising and managing a coordinated and integrated response to emergencies and disasters in British Columbia.

This plan is approved by the Seismic Integrated Response Planning steering committee and replaces all previous versions, including the British Columbia Earthquake Response Plan 1999 Edition.

The Seismic Integrated Response Planning steering committee comprises the following organisations:

- Provincial Emergency Program
- Public Safety Canada
- Natural Resources Canada
- Canada Command
- Indian and Northern Affairs Canada
- Public Affairs Bureau
- Ministry of Health Services
- Capital Regional District
- Metro Vancouver
- Joint Emergency Liaison Committee
- California Governor's Office of Emergency Services

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Section 1.0

Introduction



1.1 Background

Earthquakes rank among the most severe hazards threatening British Columbia. Damaging earthquakes can occur anywhere in British Columbia, but the highest hazard is in the coastal regions.

Southwest British Columbia lies over the active Cascadia subduction zone in an earthquake environment similar to the coasts of Japan, Alaska, and Central and South America. The Queen Charlotte Fault, similar to the San Andreas Fault, lies along the west coast of the Queen Charlotte Islands presenting that region with an earthquake environment similar to parts of California.

Historically, British Columbia has experienced some of the world's largest earthquakes: a magnitude 9.0 event along the Cascadia subduction zone in 1700 and a magnitude 8.1 along the Queen Charlotte Fault in 1949. The 1918 magnitude 7.0 and 1946 magnitude 7.3 earthquakes on Vancouver Island were amongst the largest earthquakes in North America in the 20th century.

Annually, a few thousand earthquakes occur in and adjacent to British Columbia. A small number of these are large enough to cause damage if they occur in populated areas.

Compared to some other hazards threatening the province, earthquakes are a lower risk, but could potentially have high consequences; therefore British Columbians need to be prepared.

This British Columbia Earthquake Response Plan presents the provincial government framework for providing support to local authorities and First Nations in responding to earthquakes impacting British Columbia. As such, it joins other hazard-specific response plans that supplement more generic emergency response plans for the Province.

history of large earthquakes in British Columbia

the British Columbia government framework

1.2 Purpose of Plan

This Plan describes a high level concept of operations for an integrated provincial response to a damaging earthquake impacting British Columbia. The Provincial Emergency Program serves as the coordinator, enabling cooperation and collaboration among multiple organisations active in earthquake response, including local authorities and First Nations, provincial ministries and crown corporations, federal agencies, regional services, non-government organisations, and businesses.

As a provincial document, this Plan augments existing all-hazard emergency response plans among British Columbia ministries and crown corporations. All organisations with roles in earthquake response are encouraged to draw principles and guidance from the concepts presented here for their own planning.

1.3 Scope and Applicability

The British Columbia Earthquake Response Plan addresses earthquake events severe enough to require the coordination of an integrated provincial response. The scope also includes any geographic area in the province that may be affected by an earthquake, keeping in mind that damaging earthquakes can occur anywhere in British Columbia, but the highest hazard is in the coastal regions.

The Plan addresses two general action phases needed to respond to earthquake impacts:

- Immediate Response activities, such as search and rescue for immediate life safety, that must be coordinated within the initial few hours or days following a damaging earthquake.
- Sustained Response actions needed to counter the consequences of an earthquake, such as continuing to provide emergency social services and ensuring the reestablishment of critical infrastructure.

Recovery measures, including general infrastructure repair and community reconstruction, may require months or years of effort, and are beyond the scope of this Plan. The Provincial Emergency Program is collaborating with all emergency management stakeholders to address provincial coordination of disaster recovery efforts. It is noted that the initial steps in recovery often occur simultaneously with response actions following a damaging earthquake.

approach enables cooperation among organisations

focus on provincial roles

focus on damaging events impacting British Columbia

two action phases

recovery is important but addressed in other plans

1.4 Legal Authority to Plan

Authority for the Province to plan for earthquakes resides within the *British Columbia Emergency Program Act*. The *Act* and regulations established under the authority of the *Act* also specify the roles of British Columbia ministries, as well as the responsibilities of local authorities in British Columbia for overall emergency preparedness, response, and recovery. An unofficial copy of the *British Columbia Emergency Program Act* is available on the internet: http://www.qp.gov.bc.ca/statreg/stat/E/96111_01.htm

1.5 Plan Description

The Plan contains four descriptive sections.

Section 1.0 identifies the project background, purpose, and scope of this document and the authorities to engage in the planning process.

Section 2.0 presents the core planning assumptions considered in developing the guiding principles, central policies, and response framework.

Section 3.0 illustrates the organisational design for integrated response by describing the Concept of Operations for use following a damaging earthquake. This section identifies the management of the provincial government response effort in collaboration with local authorities, First Nations, federal agencies, international support organisations, and other stakeholder agencies.

Section 4.0 outlines the Integrated Operations and Response for individuals, local authorities, First Nations, regions, federal agencies, and other stakeholders.

1.6 Keeping the Plan Current

The Provincial Emergency Program leads the provincial planning effort for earthquake response on an ongoing basis, working with representatives at all government levels, First Nations, and with other stakeholder agencies.

The Provincial Emergency Program will regularly review and refresh the British Columbia Earthquake Response Plan, as required.

Section 2.0

Planning Assumptions



To build on direct earthquake experience in British Columbia, the planning team used evidence-based research to identify the issues and requirements that may arise in a damaging earthquake impacting the province.

The assumptions used in planning for a British Columbia earthquake response acknowledge the unique geographic, structural, and social conditions within the province. While the province may be exposed to significant earthquakes, we also benefit from some of the highest building code standards in the world. These and other factors have been considered in preparing this Plan.

A summary of impacts experienced in past earthquakes from which these planning assumptions are based is detailed in Appendix A.

2.1 Anticipated Earthquake Impacts in British Columbia

The primary effect of an earthquake is shaking of the ground surface. Depending on the magnitude, location, and depth this can lead to a wide range of secondary effects, including soil liquefaction, landslides, ground subsidence, and tsunamis. If an earthquake affects populated areas, it can cause subsequent impacts:

- Injuries and fatalities
- Trapped persons
- Displaced persons
- Psychosocial implications for both responders and impacted individuals
- Fire, hazardous materials release, and flood events
- Structural damage including falling debris and glass
- Disruption of critical infrastructure, including health services, communications, energy and utilities, and transportation
- Other damaged infrastructure

Aftershocks, which may be nearly as large as the original earthquake, can compound these impacts. Aftershocks can occur

lessons can be learned from past events

examples of major consequences from earthquakes

for several weeks following the initial event. Although the frequency and magnitude of aftershocks will decrease over time, their unpredictability will affect the safety and ability of residents and responders, and require additional precautionary measures during response.

2.2 Response Assumptions

The British Columbia Earthquake Response Plan is based on the following assumptions.

individuals take actions to protect themselves

Individual Responsibility – British Columbia residents should know what to do in an earthquake to protect themselves and their families. All families in earthquake prone areas of the province should have emergency kits, family reunification plans, and the ability to sustain themselves for a period of time until help is available.

local authorities will lead response

Local Authority Responsibility – Local British Columbia authorities exposed to earthquakes have emergency response plans that include hazard, risk and vulnerability analyses. The majority of local authorities in British Columbia have adopted the British Columbia Emergency Response Management System. Local authorities have business continuity measures in place and will survive to coordinate local response and recovery efforts. (See [http://www.pep.bc.ca/management/Guide to New Emergency Program Act 2005.pdf](http://www.pep.bc.ca/management/Guide%20to%20New%20Emergency%20Program%20Act%202005.pdf) for a definition of a local authority.)

The impacts in British Columbia of a catastrophic earthquake may temporarily overwhelm local response capacity, but local authorities will retain primary authority and responsibility for overseeing emergency response within their jurisdiction at all times.

First Nations response

First Nations Responsibility – First Nations exposed to earthquakes should have emergency response plans and ideally mutual aid agreements with neighbouring local authorities.

As with local authorities, a damaging earthquake may temporarily overwhelm the response capacity of a First Nation. The Chief and Band Council, with the assistance of Indian and Northern Affairs Canada and/or the First Nation Emergency Services Society if requested, will retain primary responsibility for overseeing emergency response within their jurisdiction at all times..

Regional Responsibility – There may be regional coordination on the local authority level of response activities where impacts are multi-jurisdictional, either through regional district support to local authorities and First Nations, or through another body.

Coordination activities could include:

- Situational awareness
- Critical resource identification
- Public messaging
- Mutual support operations
- Disaster Response Routes
- Disaster debris removal
- Potable water

Provincial Responsibility – All Provincial Regional Emergency Operations Centres have response plans based on the British Columbia Emergency Response Management System, as well as hazard-specific procedures that address the integration of emergency management personnel from multiple agencies who will respond and liaise in an earthquake event.

Federal Responsibility – Should a provincial government require resources beyond their own in an emergency disaster response, the federal government will respond to a request for assistance from the Province. The federal *Emergency Management Act* designates federal responsibilities, including the Minister of Public Safety, to exercise leadership relating to emergency management in Canada.

2.3 Phases of Earthquake Response in British Columbia

Public safety activities following a damaging earthquake will vary, and requirements will change over time. Concern for persons trapped in damaged structures and the danger of potential numerous fire outbreaks will be resolved early in the response effort. Efforts to provide temporary food, clothing and shelter in meeting humanitarian needs will thereafter take precedence. Over the long term, coordinated response efforts will be needed to house those who continue to be displaced from their homes, to collect spilled hazardous materials, and to control the outbreak of disease.

some regional coordination will be essential

provincial response will integrate multiple agencies

federal government provides support as required

two response phases and one recovery phase

immediate response actions are urgent in nature

Although there may be many ways of viewing post-earthquake actions, the Province recognises three basic phases, described below. Some phases may occur simultaneously.

2.3.1 Immediate Response Phase

The Immediate Response Phase may extend for a matter of hours or a few days depending on the severity and location of the damage. Immediate actions by first response and local support organisations may be needed to save lives, protect property, and safeguard the environment subsequent to a damaging earthquake.

In this phase, it is critical to gain situational awareness by observing the type and extent of impacts from the earthquake. Relaying this information is essential in planning coordinated response efforts at all government levels.

2.3.2 Sustained Response Phase

This phase represents coordinated and sustained support for humanitarian aid at the local government level, as well as emergency repairs to critical infrastructure. Much of the effort in this phase focuses on the impacts of the primary or secondary effects of an earthquake. The challenges that may be faced include the need for:

- Temporary communications equipment to coordinate response activities at multiple sites.
- Temporary repairs to transportation systems, including roadways and bridges to support emergency response.
- The activation of secondary modes of transportation, such as marine, air, and rail to circumvent congested or otherwise impassable roads and bridges.
- Emergency supplies of food, water, essential goods, and pharmaceuticals until normal distribution systems are re-established.
- Repair of critical infrastructure.

Evidence from past earthquakes indicates that some response activities will take time due to the nature of the work required, or because of impacts to critical infrastructure. Although most of the impacted area will soon return to an acceptable state of normalcy, the hardest hit locations may continue with critical and important needs. Examples include:

sustained response efforts are important for public safety but may not be urgent

- Residents may require temporary shelter and/or housing due to a various challenges (for example, awaiting debris removal in neighbourhoods or homes needing repairing or rebuilding.)
- Temporary water and wastewater systems may be needed in some locales while damaged systems are reconstructed.
- Enhanced disease monitoring may be needed to safeguard the public from the effects of damaged infrastructure and close living quarters in temporary shelters.

Overall, damage will be unevenly spread across the affected region, with some communities experiencing a high demand for sustained and concentrated response efforts, and others having fewer needs.

Local authorities are responsible for managing Emergency Social Services response within their jurisdictions. During the response phase local Emergency Social Services activities may be supplemented by mutual aid from outside communities. It is recognised that Emergency Social Services resources at the local level will likely need provincial assistance during major emergencies or disasters. Provincial Emergency Social Services support plans will coordinate assistance from non government and government agencies with provincial and national resources as required. Sustained response to a damaging earthquake may require humanitarian assistance beyond the Emergency Social Services program capacity available in many British Columbia communities.

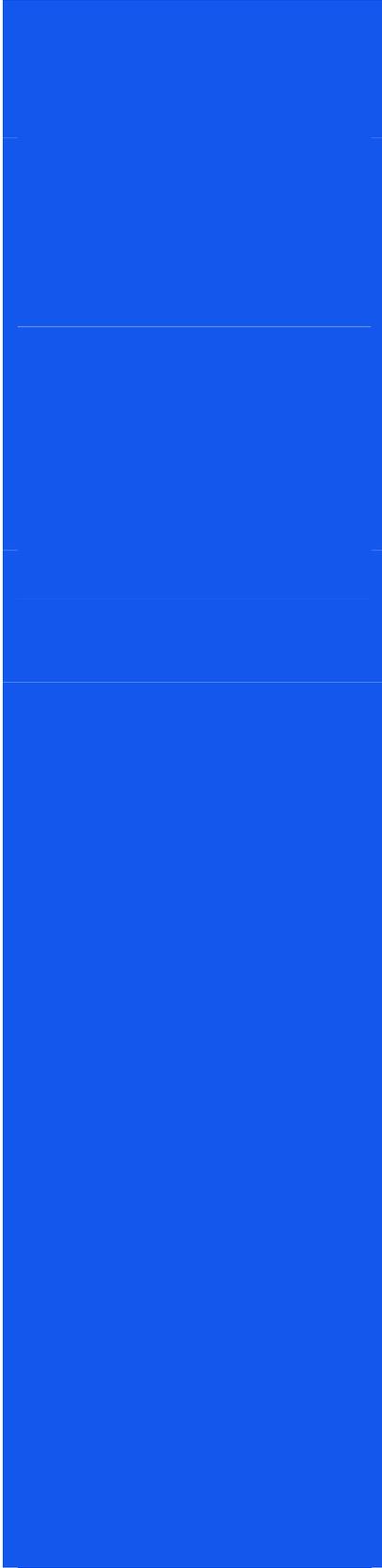
2.3.3 Recovery Phase

Recovery includes a wide range of activities, including debris disposal, infrastructure repair, reconstruction, and the restoration of social and economic activities to rebuild affected communities. Recovery activities can begin immediately following an earthquake while response is underway and may take years to complete, depending on the severity of the earthquake damage.

The Provincial Emergency Program works in cooperation with local authorities, other provincial ministries, and non-government organisations, to provide a coordinated approach to the delivery of community recovery efforts across the province. The local authorities in British Columbia are responsible for the recovery efforts within their jurisdiction. The Provincial Emergency Program and the British Columbia Integrated Disaster Recovery Council work together to provide support to local authorities in

examples of sustained response phase

recovery repairs, rebuilds, and returns infrastructure to a sustainable status



their efforts to help people recover after being affected by a disaster or an emergency. In consultation with local authorities, the Provincial Emergency Program has developed a *Community Recovery Guide for Local Authorities and First Nations*.

The British Columbia Disaster Financial Assistance program helps those impacted by a disaster cope with the cost of uninsurable repairs and recovery from disaster-related property damage. Disaster Financial Assistance is a provincial program that is administered by the Provincial Emergency Program. Those impacted by a disaster may apply to the Province for Disaster Financial Assistance where the losses could not be insured or where other programs are not available. It must be noted that earthquakes are an insurable hazard and homeowners are expected to insure themselves.

More information on Disaster Financial Assistance and the Community Recovery Guide is available on the Provincial Emergency Program website:

<http://www.pep.gov.bc.ca/Community/recoverytk.html>

Section 3.0

Provincial Concept of Operations



3.1 Purpose of Concept of Operations

The term concept of operations in this plan refers to the framework and mechanics of integrated response in support of local authorities and First

Nations adopted by the Province to address damaging earthquakes.

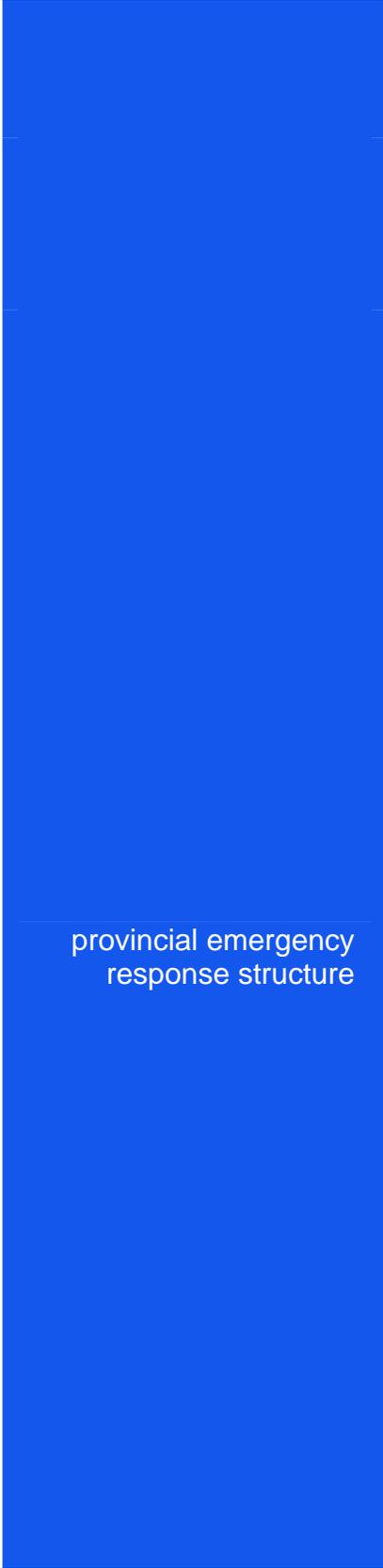
The concept of operations sets out how decisions about provincial coordination will be made and communicated, and how information and resources will flow to support impacted local authorities and First Nations, and provincial ministries and programs. It identifies how organisations, at all levels, will exchange vital information, coordinate regional decisions, and access critical resources when needed.

This section identifies provincial response roles, highlights the organisational structure needed for integrating a multi-agency response, and emphasises methods for sustaining the movement of information. Figure 1 illustrates the anticipated response structure under the British Columbia Emergency Response Management System.

Provincial Central Coordination – The Provincial Emergency Coordination Centre, normally located at the Provincial Emergency Program Headquarters in Victoria, provides information and support to Provincial Regional Emergency Operations Centres, coordinates provincial response activities, assigns provincial critical resources, provides provincial messaging, and implements policy directives received from the Central Coordination Group.

Provincial Regional Coordination – A Provincial Regional Emergency Operations Centre provides support and coordination to one or more emergency operations centre, as needed. Provincial Regional Emergency Operations Centres coordinate regional response activities, assigns regional (provincial and federally assigned) critical resources, provides regional messaging in cooperation with local authorities, and provides situational awareness to the Provincial Emergency Coordination Centre.

the concept of operations explains how things work



provincial emergency response structure

Site Support – An emergency operations centre, representing the local authority is activated to oversee and coordinate all non-site activities in support of Incident Commanders at the Site Level.

Site Level – One or more Incident Commanders control site activities from Incident Command Posts. In some situations, the site level could include the “Area Command” feature of the Incident Command System.

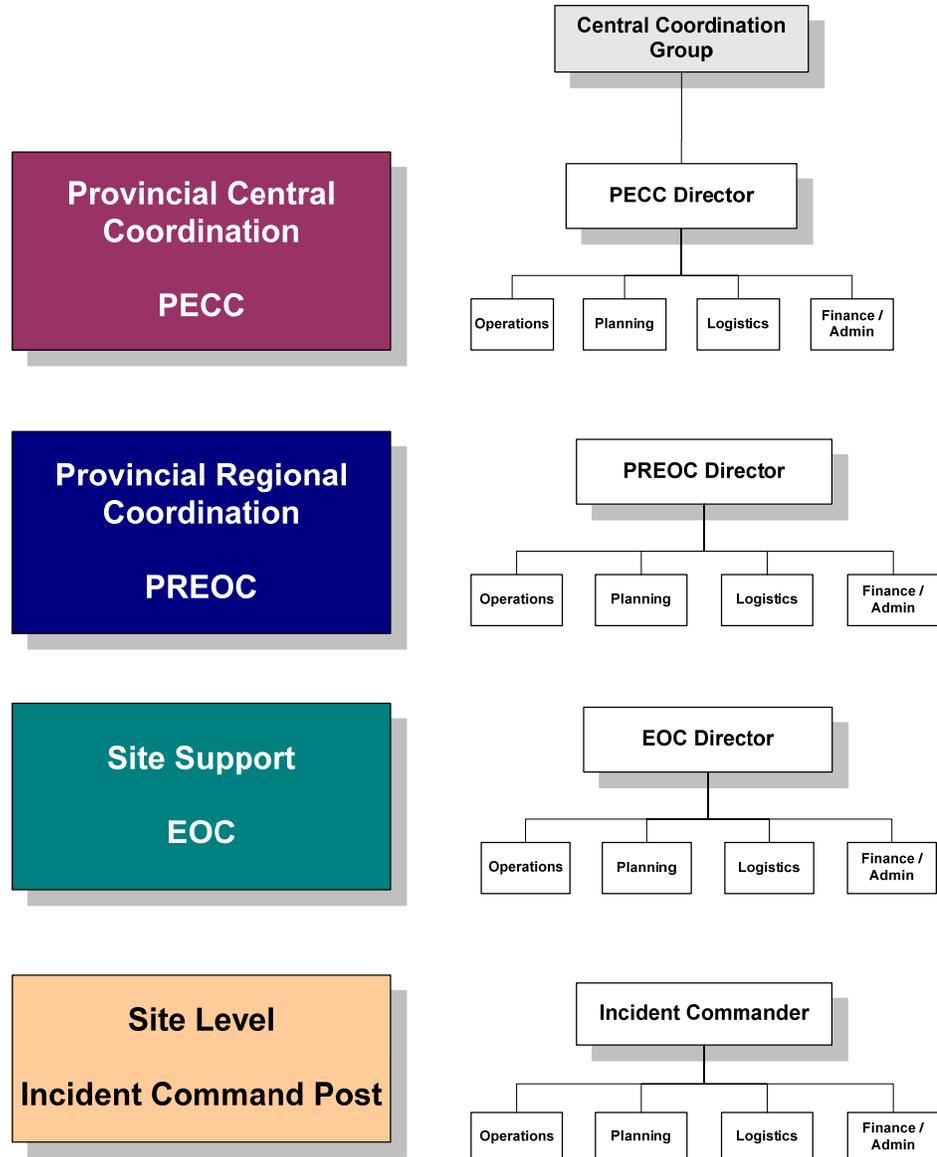


Figure 1. Four Response Levels Under the British Columbia Emergency Response Management System

3.2 Provincial Government Response

The provincial government provides support to local authorities and First Nations, including overall regional coordination of provincial and federal resources committed to the response.

An earthquake with significant structural damage and human consequences will most likely require response actions authorised under the legislated powers that accompany a Provincial State of Emergency. A provincial declaration grants the Province up to twelve specific extraordinary powers. (http://www.qp.gov.bc.ca/statreg/stat/E/96111_01.htm#part3_division2)

The Provincial response capacity is enhanced by the activation of Temporary Emergency Assignment Management System members. This is a staffing system with an established resource pool of highly skilled provincial employees from various ministries who have the appropriate training and experience to manage emergency operations. These members primarily fill operational roles in the Provincial Emergency Coordination Centre and the Provincial Regional Emergency Operations Centres.

Figure 2 summarises the provincial government response to a damaging earthquake affecting British Columbia communities.

Senior officials may serve either in the Ministers–Deputies Emergency Committee or in the Central Coordination Group.

3.2.1 Ministers-Deputies Emergency Committee

The Ministers–Deputies Emergency Committee comprises the key ministers and deputies involved in the management of the provincial response to a damaging earthquake.

The Ministers–Deputies Emergency Committee provides high-level policy decisions. It ensures that the full complement of British Columbia government human and material resources, from all ministries, crown corporation and agencies, are committed in support of the overall government response.

3.2.2 Central Coordination Group

The Province activates a Central Coordination Group to ensure cross-government and multi-agency coordination of response activities. Co-chaired by the Provincial Emergency Program Executive Director and the Public Safety Canada Regional

provincial support to local authorities and First Nations

Provincial State of Emergency

Temporary Emergency Assignment Management System

the role of senior British Columbia officials

enhance cross-government coordination

a single provincial
organisation assists
regional response

Director, it provides strategic and policy direction to the Director of the Provincial Emergency Coordination Centre, and oversees the implementation of the British Columbia Government Communication Plan.

The composition of the Central Coordination Group following a damaging earthquake will include provincial senior officials representing affected ministries and program operations devoted to public safety as well as federal representatives and stakeholders. The Public Safety Canada Regional Director is a standing member of the Central Coordination Group and is responsible for coordinating the federal response.

3.2.3 Provincial Emergency Coordination Centre

The Provincial Emergency Coordination Centre coordinates the integrated provincial emergency response according to strategic directions received from the Ministers–Deputies Emergency Committee and the Central Coordination Group and the requirements of the Provincial Regional Emergency Operations Centres. The Provincial Emergency Coordination Centre, through the Central Coordination Group, ensures that provincial government senior officials are kept apprised of provincial response activities and ongoing situational awareness.

The Provincial Emergency Coordination Centre serves as a central point for the collection, analysis, and dissemination of provincial earthquake consequence information, and for making operational decisions according to provincial policy.

The Provincial Emergency Coordination Centre will include agency representatives from other provincial ministries and federal departments, as well as Temporary Emergency Assignment Management System members and Provincial Emergency Program staff.

In the event of a damaging earthquake, the Provincial Emergency Coordination Centre has primary responsibility for the provision of emergency message centre services for senior government officials. In the event the Provincial Emergency Coordination Centre (located in Victoria) is incapable of post-disaster operations, the Provincial Emergency Program will activate its Business Continuity Plan. Alternate facilities have been identified if relocation is necessary.

3.2.4 Provincial Regional Emergency Operations Centre

Each of the geographic regions of the Provincial Emergency Program have facilities and capacity to operate a Provincial Regional Emergency Operations Centre. When activated, Provincial Regional Emergency Operations Centres can include agency representatives from other provincial ministries and federal departments, as well as Temporary Emergency Assignment Management System members and Provincial Emergency Program staff.

The Provincial Regional Emergency Operations Centre coordinates multi-jurisdictional response activities. While the response remains a local authority responsibility, the Provincial Regional Emergency Operations Centres provides support and coordination to one or more Emergency Operation Centre(s) as needed.

Each Provincial Regional Emergency Operations Centre coordinates regional response activities, assigns regional (provincial and federally assigned) critical resources, provides regional messaging in cooperation with local authorities, and provides situational awareness to the Provincial Emergency Coordination Centre.

Provincial Regional Emergency Operations Centres coordinate and deploy provincial, federal, and international resources according to regional requirements. Each Provincial Regional Emergency Operations Centre will liaise with the Provincial Emergency Coordination Centre to identify the availability of critical provincial resources.

Coordination of the provincial response will vary depending on the requirements and the scope of the event. Provincial ministries with response roles may choose to activate their own individual ministry operation centres. Collaboration between the ministry regional emergency operation centres and the Provincial Emergency Program will occur through agency representatives located in the Provincial Regional Emergency Operations Centre.

The Provincial Emergency Program Business Continuity Plan will activate should any Provincial Regional Emergency Operations Centre be incapable of post-disaster operations.

Provincial Regional
Emergency
Operations Centre
assist local authorities
and First Nations

Provincial Regional Emergency Operations Centres located outside an impacted area will be activated to provide additional support, if needed.

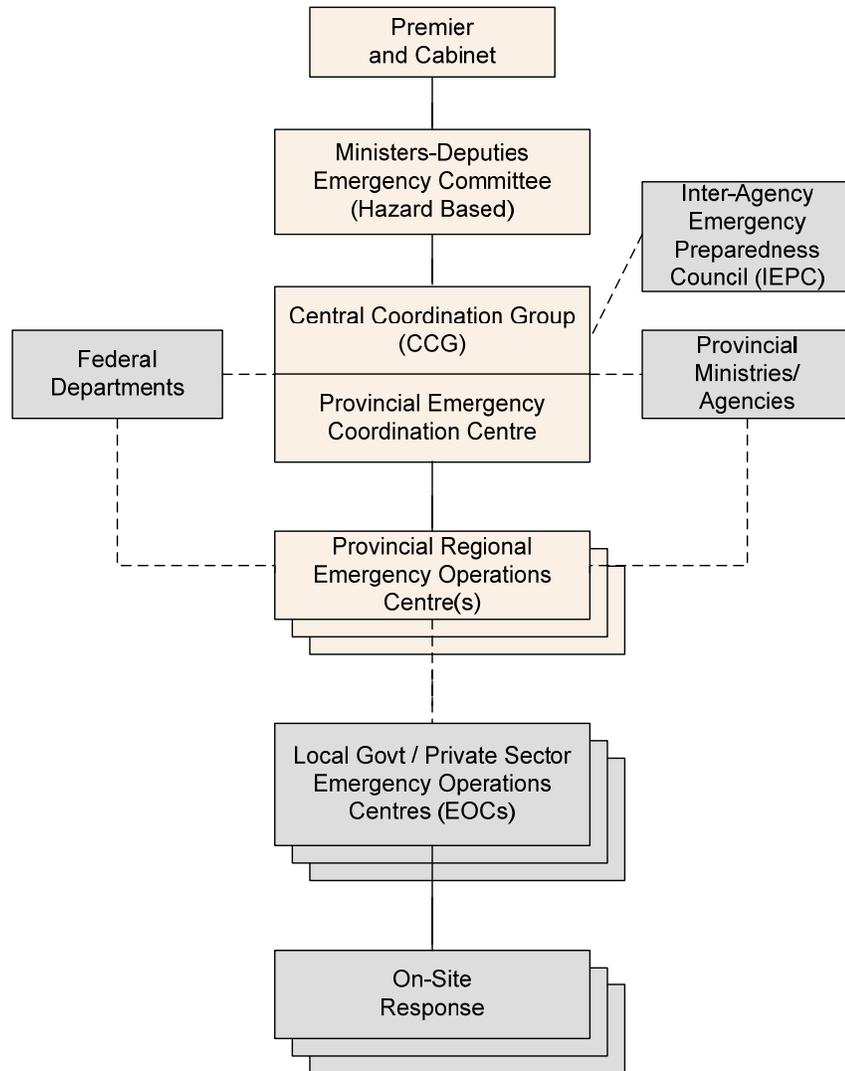


Figure 2. Provincial Organisation for Emergencies

3.3 Provincial Ministries / Agencies

Staff in provincial ministries will assist with maintaining public safety by participating in the British Columbia Emergency Response Management System. Ministry assignments are detailed in the *Emergency Program Management Regulations of the Emergency Program Act*.

http://www.qp.gov.bc.ca/statreg/reg/E/EmergencyProgram/477_94.htm

many provincial staff from multiple ministries may assist

Provincial staff may assist at incident command posts, local authority emergency operations centres, Provincial Regional Emergency Operations Centres, or at the Provincial Emergency Coordination Centre. Temporary Emergency Assignment Management System members will report to the Provincial Emergency Coordination Centre or a Provincial Regional Emergency Operations Centres for assignment to emergency facilities in need of support. Ministry responders supply their own communications equipment.

A separate concept of operations dealing with business continuity for the provincial government links to the British Columbia integrated emergency management structure. All British Columbia ministry operations centres will report to the Operations Section of the Provincial Emergency Coordination Centre for coordination of business continuity activities.

3.3.1 Role of Ministry of Health Services

The *Emergency Management Regulations* of the *Emergency Program Act* prescribes the duties of the Ministry of Health Services in the event of an emergency or disaster.

The Ministry of Health Services will assume an operational role to directly support and coordinate health emergency response capabilities for the Province in conjunction with health sector organisations and in a liaison capacity with federal, provincial, territorial and international emergency management organisations.

The ministry must also work to ensure the continuity of health services. Both the health response and the continuity of health services will be coordinated through operations centres in the health authorities, British Columbia Ambulance Service, Ministry of Health Services and other health sector partners.

Section 4.0

Integrated Operations and Response



4.1 Individual Response

Individual response begins with being prepared. The consequences of a damaging earthquake are such that initial response efforts will involve neighbours helping neighbours.

neighbours help neighbours

Families should be prepared to be self-sufficient for three to seven days, regardless of where they live. The following suggestions, which may be applicable to many different hazards, will help in the response to a damaging earthquake:

develop a family emergency plan

- Develop and practice an emergency plan, agree on a family meeting place and an out of area (out of province is best) contact person.
http://www.pep.bc.ca/hazard_preparedness/Personal_Safety.html
- Reduce potential damage around your home securing heavy appliances (for example, tie down water heaters), affixing shelves, mirrors, and picture frames to the walls, and locating beds away from windows, chimneys, and shelves.
- Establish an emergency supply kit with food, water, medications, clothing, and shelter for all family members and pets.
http://www.pep.bc.ca/hazard_preparedness/Emergency_Kits_Translations.html

Local emergency programs should be contacted for information on emergency preparedness and local emergency planning. Information can often be found on local authority websites.

business continuity plans help businesses resume operations

Businesses should have emergency plans and business continuity plans. In British Columbia, Emergency Preparedness for Industry and Commerce Council is a helpful resource to aid businesses in preparing to survive a disaster and in creating business continuity plans. Information is available on their website <http://www.epicc.org/>.

review your insurance coverage

Earthquakes are an insurable hazard and standard insurance policies may not cover damages due to an earthquake. Additional insurance for earthquakes is available.

The Province of British Columbia has adopted “Drop, Cover, and Hold” as the recommended response during an earthquake to reduce injury and death.

http://www.pep.bc.ca/hazard_preparedness/Drop_Cover_Hold.pdf

Further information on how to respond before, during, and after an earthquake is available through the Provincial Emergency Program:

http://www.pep.gov.bc.ca/hazard_preparedness/Directory_Earthquakes.pdf

http://www.pep.bc.ca/hazard_preparedness/prepare_now/prepare.html

4.2 Local Authority Response

Local authorities remain responsible for managing and conducting their own emergency operations. At the local level, initial response actions will be based on existing emergency management capacity. Many local authorities have adopted procedures for the automatic activation of emergency personnel when normal communications are disrupted.

Some local authorities and First Nations have pre-arranged aid from neighbouring jurisdictions. Under these circumstances, the responsibility for the management of all response actions and resources within its jurisdiction may rest with the local authority.

A local authority emergency operations centre should be activated when required to provide support to site level operations. While not all local authorities use the British Columbia Emergency Response Management System, the goals of this system should be paramount in all response activities.

http://www.pep.gov.bc.ca/bcerms/BCERMS_Goals_Handout.pdf

Functional responsibilities of an emergency operations centre include:

- Situational information collection
- External resource agency liaison
- Rapid damage assessment
- Urban search and rescue
- Emergency medical care, first aid and triage
- Fire suppression
- Management of hazardous materials incidents
- Emergency Social Services, including family reunification
- Security
- Engineering support for local authority owned utilities
- Establishment of emergency communications internally and externally

Drop, Cover, and Hold
during an earthquake

automatic activation

local authority
mutual assistance
with First Nations

emergency
operations centre

notification of hazards

State of
Local Emergency

Local authorities should immediately advise persons present in their jurisdiction of the secondary hazards that may follow a damaging earthquake, and what actions people can take to protect themselves.

Under the *British Columbia Emergency Program Act*, local authorities may declare a State of Local Emergency to gain access to any of nine extraordinary powers. In a damaging earthquake situation, for example, a local authority may apply powers that allow them to distribute essential supplies, trespass on private property to rescue people, and undertake other measures critical to public safety. See:

http://www.qp.gov.bc.ca/statreg/stat/E/96111_01.htm#part3_division3

A full description of the procedures involved in declaring a State of Local Emergency can be found at:

http://www.pep.bc.ca/community/guidelines_for_declaring_local_state_of_emergency_2006.pdf

Local authorities in an area may jointly manage an emergency operations centre to facilitate an integrated response with each other and/or their regional districts. When local capacity is exceeded, local authorities will request assistance from the provincial government by directing such requests to the Provincial Regional Emergency Operations Centre in the region.

4.3 First Nations Reserves Response

4.3.1 Provincial Emergency Program / Indian and Northern Affairs Canada Protocols

A Letter of Understanding between the Provincial Emergency Program and Indian and Northern Affairs Canada exists which acknowledges certain legal requirements concerning emergency response and recovery operations on reserve land. The Provincial Emergency Program is specifically named as the provincial agency that will assist, support, or arrange for required emergency measures on or involving reserve lands. This may include coordinating volunteer, local authority, provincial, federal, or other agency support. The Provincial Emergency Program must therefore be informed as soon as reasonably possible of any response requirements. Response and recovery costs for emergency management activities impacting reserve lands are the responsibility of the federal government. Other agreements between First Nations and neighbouring local authorities may also exist, however, all costs associated with a First Nation task number are the responsibility of the federal government.

Letter of Understanding
between the Provincial
Emergency Program and
Indian and Northern
Affairs Canada

4.3.2 Emergency Response

When immediate action is required to preserve life or property on reserve land, the Provincial Emergency Program will support, assist or arrange for such required emergency measures as stipulated under the existing protocol arrangement with Indian and Northern Affairs Canada.

If an incident is reported directly to the Provincial Emergency Program via the Emergency Coordination Centre, the Provincial Emergency Program will notify Indian and Northern Affairs Canada as soon as possible. Indian and Northern Affairs Canada may activate their own Temporary Emergency Assignment Management System members and to contact the First Nations Emergency Services Society. The role of First Nations Emergency Services Society is to assist and support First Nations communities through all phases of a disaster or emergency.

4.4 Regional Response

To facilitate a coordinated response, local authorities manage emergency operations centres. When it is anticipated that local authority capacity will be exceeded, assistance may be requested from the provincial government through the Provincial Regional Emergency Operations Centre in the region.

British Columbia has a variety of regional agencies, authorities, and service providers that will be part of a regional response. In anticipation of the need for regional coordination during response activities, where impacts are multi-jurisdictional, some regional district local authorities are carrying out planning activities that will provide support to other local authorities and First Nations during a response.

Local authorities will activate emergency operation centres to gather information, coordinate response, and liaise with residents as well as local and provincial response agencies following a damaging earthquake. In addition, local authorities may coordinate a regional response.

Regional organisations, such as health authorities, transportation authorities, and regional utilities conduct emergency planning and will respond following an earthquake. As with federal departments, these regional organisations will participate in coordination and information sharing services.

First Nations communities are ensured response and recovery assistance when required

multi-jurisdictional response

regional coordination

4.5 Federal Government Response

In any emergency event, the Province of British Columbia is able to request assistance from the federal government. All requests are coordinated by Public Safety Canada.

Figure 3 illustrates the relationship among federal and provincial coordination centres.

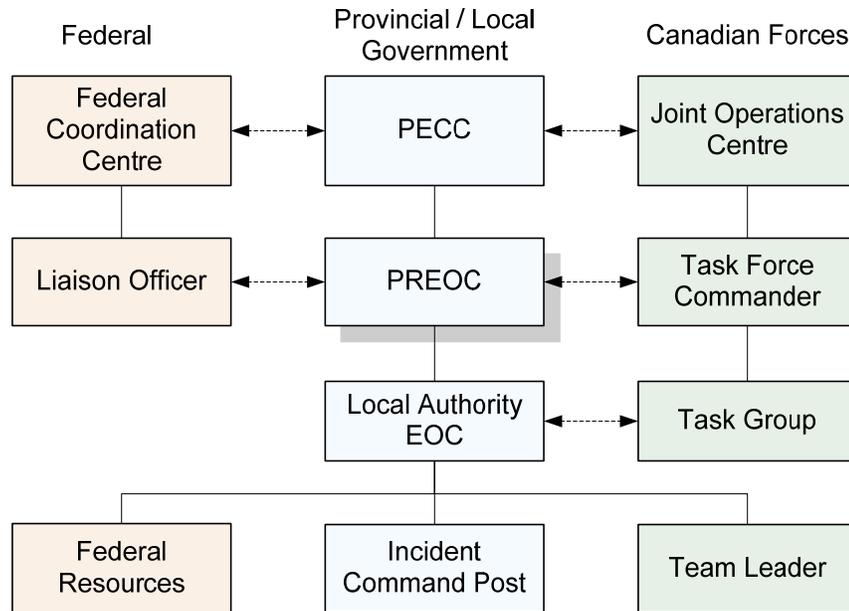


Figure 3 Coordination of Federal Response in Earthquake

4.5.1 Federal Coordination

Many federal departments/agencies will support earthquake response activities by the local and provincial governments as described in the draft Government of Canada Earthquake Contingency Plan for British Columbia.

Under the federal *Emergency Management Act*, the Minister of Public Safety is the federal Minister responsible for coordinating the Government of Canada response to an emergency. In support of this responsibility, Public Safety Canada has developed the Federal Emergency Response Plan, in consultation with other government departments/agencies, to facilitate an integrated Government of Canada response to any emergency including earthquakes. The Federal Emergency Response Plan is based on the tenets of the Incident Command System.

federal support for provincial response

role of Public Safety Canada

Additionally, Public Safety Canada coordinates requests for federal emergency management assistance through the mechanisms and processes outlined in the Federal Emergency Response Plan. In response to a request, Public Safety Canada will work to identify regional federal resources first, and then look to bring other resources from outside the region as needed.

Federal earthquake response will always support another government level, either the Province of British Columbia, a First Nations community, or a local authority in need of assistance. Regional coordination of support by federal departments will occur initially through a Federal Coordination Centre. A federal liaison officer from Public Safety Canada will be present in the Provincial Emergency Coordination Centre and in the Provincial Regional Emergency Operations Centres to facilitate coordination of federal and provincial information and operations.

4.5.2 Government Operations Centre

The Government Operations Centre is Canada's strategic-level operations centre. It is the hub of a network of operations centres run by a variety of federal departments and agencies including the Royal Canadian Mounted Police, Health Canada, Foreign Affairs, the Canadian Security Intelligence Service and National Defence. The Government Operations Centre also maintains contact with the provinces and territories as well as international partners such as the United States and the North Atlantic Treaty Organization. It operates 24 hours a day, seven days a week, gathering information from other operations centres and a wide variety of sources, both open and classified, from around the world. As Canada's strategic-level operations centre, the Government Operations Centre's primary function is to provide coordination and direction on behalf of the federal government.

4.5.3 Canadian Forces

Canada Command, represented in British Columbia by Joint Task Force Pacific, will coordinate with the Province of British Columbia to provide Canadian Forces support to affected communities in response to a damaging earthquake. Depending on the availability of military resources at the time, possible functions include:

Federal Coordination Centre

the Government Operations Centre is the federal integrated response coordination centre

role of Canadian Forces

- Situational Awareness – Initial reconnaissance and aerial surveillance may be available to assist provincial authorities in determining the scope of damage. In addition, Regional Liaison Officers have been designated to self-activate and deploy to affected Provincial Regional Emergency Operations Centres and the Provincial Emergency Coordination Centre to provide liaison and coordination between the Provincial Emergency Program and the Commander of Joint Task Force Pacific.
- Communications – Once Joint Task Force Pacific has re-established its own communications capabilities, there may be excess capacity to facilitate provincial government strategic communications with the Government of Canada.
- Logistics Management – The Canadian Forces has specialist materials handling and movement management expertise, and a strategic airlift capacity that may be available to support the movement of national supplies and personnel following an earthquake.
- Other Strategic/Specialist Capabilities – The Canadian Forces has other specific capabilities managed at the national level that may be made available if required. These include assets such as:
 - The Disaster Assistance Response Team, capable of providing limited emergency engineering and medical support;
 - Immediate Response Units, capable of providing personnel for general support tasks or Assistance to Law Enforcement Agencies; and
 - Canadian Joint Incident Response Unit, capable of providing support to the management of chemical, biological, radiological, nuclear, and explosive emergencies including accidents resulting from a damaging earthquake.

The Commander of Joint Task Force Pacific can order the initial deployment of local Canadian Forces resources in response to a damaging earthquake, or in any case where there is an immediate requirement to save human life, prevent serious injury, or protect property. The sustained and deliberate employment of Canadian Forces assets requires formal

approval, and is coordinated by Public Safety Canada as part of the integrated federal response. When Canadian Forces support is provided, Canadian Forces personnel remain under command of the designated military commander, but will be responsive to an Incident Commander from a local authority or the Province of British Columbia.

Some of these organisations will activate independent emergency operation centres to gather information, coordinate response, and liaise with local and provincial response facilities following a damaging earthquake. Others will send agency representatives to the Provincial Regional Emergency Operations Centre in the affected region to allow for the coordinated prioritisation of resource deployment.

4.6 Inter-Provincial Assistance

There are a number of agreements in place between British Columbia and other provinces. Individual ministries may have emergency response agreements for specific hazards with their peers in other jurisdictions (for example, Ministry of Health Services, Ministry of Forests and Range).

A Memorandum of Understanding has been established between British Columbia and Alberta for inter-provincial emergency management assistance. For further information see: http://www.international.gov.ab.ca/documents/MOUEmergencyManagementweb_000.pdf

The *Alberta – British Columbia Memorandum of Understanding for Public Health Emergencies* will be activated to respond to surge capacity demands on British Columbia health systems and health resources resulting from a damaging earthquake.

The Alberta Earthquake Response Plan for British Columbia outlines how Alberta will support British Columbia in the response to a damaging earthquake. The objective of the Earthquake Response Plan for British Columbia is to coordinate Alberta's provincial assistance to British Columbia in order that the Government of British Columbia can begin self-recovery. The plan will work in concert with the National Earthquake Support Plan and the British Columbia Earthquake Response Plan. <http://www.aema.alberta.ca/documents/EarthquakeResponsePlanJan08.pdf>

British Columbia
can call on
Alberta for
assistance

many other organisations would assist in earthquake response

4.7 Other Organisations

In addition to resources from the three levels of government, other organisations, such as health authorities, transportation authorities, school boards, and regional utilities, have immediate responsibility to provide services to victims of emergencies and disasters or are available to support response.

Organisations which are closely integrated, such as regional health authorities may be coordinated and supported by ministry operations centres and are required to manage Emergency Operations in a manner consistent with the British Columbia Emergency Response Management System.

As with federal departments, regional organisations will participate in coordination and information sharing services specified at the Provincial Regional Emergency Operations Centre level.

4.7.1 Provincial Health Sector of British Columbia

Following a damaging earthquake, the health sector will provide ambulance services, triage, treatment, transportation and care of casualties, as well as the provision of psychosocial services to responders and the public at large. In addition, the health sector is also responsible for the provision of community health services such as home care, as well as public health measures, including disease surveillance and inspection and monitoring of potable water supplies. The health sector must also work to ensure the continuity of health services.

4.8 International Assistance

Several Canada-USA agreements detail cross-border response activities during major emergencies, such as earthquakes. The *Agreement between the Government of The United States of America and the Government of Canada on Cooperation and Comprehensive Civil Emergency Planning and Management* addresses the need to share information and to provide for mutual cross-border assistance in disasters. International assistance is coordinated by Public Safety Canada with the Department of Foreign Affairs and International Trade Canada.

British Columbia, the Yukon, Washington, Oregon, Idaho, and Alaska are members of the *Pacific Northwest Emergency Management Arrangement* established to facilitate cross-border assistance in a disaster. All requests for assistance from *Pacific Northwest Emergency Management Arrangement* members will be coordinated between the Executive Director of the Provincial Emergency Program and the Chair of the *Pacific Northwest Emergency Management Arrangement* Executive Task Force. This mutual aid arrangement also allows for the mutual temporary acceptance of various licenses, certifications or permits granted by participating members to professionals and trades people within their jurisdiction.

British Columbia can also call on several western US states for assistance following an earthquake

Appendix A

Evidence Based Research for Planning Assumptions

Past International Earthquakes

Research offers lessons from earthquakes in geological and built settings similar to British Columbia. Some events relevant to current planning are summarised in Table 1.

Date	Location +	Magnitude	Deaths	Injuries	Damage *
January 17, 1995	Kobe, Japan	6.9	6,434	27,000	\$200 b
March 27, 1964	Prince William Sound, Alaska	9.2	128	Not available	\$1.8 b **
October 17, 1989	Loma Prieta, California	7.1	62	3,757	\$6 b
January 17, 1994	Northridge, California	6.7	57	9,000	\$25 b
October 23, 2004	Niigata Ken Chuetsu, Japan	6.6	48	511	Not available
December 26, 2006	Luzon Strait, Taiwan	7.1	2	42	Not available
February 28, 2001	Nisqually, Washington	6.8	1	407	\$4 b

Table 1. Selected earthquakes of relevance ranked by human impact

+ Earthquake location and magnitude details from the United States Geological Survey (<http://earthquake.usgs.gov/>)

* b represents billion

** Damage estimates in 2007 US Dollars

While full reports on these events are available, it is important to note the consequences, including the types of damage incurred in each case, as summarised below.

1995, Kobe, Japan

- Ruptured gas lines ignited, fuelled by wooden construction material
- Broken water mains hampered firefighters' efforts
- Ten spans of the Hanshin Expressway were destroyed
- Most railways in the region were damaged
- Artificial islands in the port suffered subsidence due to liquefaction
- Approximately \$200 billion US Dollars in damage
- The health care system suffered long term impacts

1964, Prince William Sound, Alaska

- Second largest earthquake recoded in history, largest in North America (subduction zone earthquake)
- Generated a major tsunami causing most deaths (113 of 128) and much damage in Alaska and elsewhere in the Pacific (including Port Alberni, British Columbia)
- Landslides in Anchorage caused heavy damage

past earthquakes highlight potential consequences in British Columbia

Kobe, Japan
January 17, 1995
Magnitude 6.9

Alaska
March 27, 1964
Magnitude 9.2

- Caused very strong shaking for 1.5 minutes and perceptible shaking for about 5 minutes
- Many large buildings and structures suffered some damage
- Water mains, gas, sewer, telephone, and electrical systems were disrupted throughout the area
- Over 10,000 aftershocks were recorded following the main shock. In the first day alone, eleven major aftershocks were recorded with a magnitude greater than 6.0

1989, Loma Prieta, California

- Double-decker portion of freeway collapsed, crushing the cars
- San Francisco-Oakland Bay Bridge collapsed, closed for repairs for month
- Collapse of Cypress Viaduct in west Oakland
- Liquefaction of soil used to fill waterfront properties, sand volcanoes, landslides, and ground ruptures
- 18,306 homes and 2,575 businesses were damaged
- Broken water mains hampered response to fires burning in some sections of the city
- Power was disrupted to most of San Francisco for several days
- The Goodyear blimp, in the air to cover the World Series baseball game, became the primary source of visual information, crucial to locating areas of greatest need

Loma Prieta, CA
(San Francisco)
October 17, 1989
Magnitude 7.1

1994, Northridge, California

- 1,600 people required hospitalisation
- Major freeway damage occurred up to 32 km from epicentre
- Several commercial buildings collapsed
- Loss of life was minimised because the earthquake occurred in the early morning of a federal holiday
- Most casualties and damage occurred in multi-story wood frame buildings
- Numerous fires started by broken gas pipes caused by houses shifting off foundations or by unsecured water heaters falling over
- Un-reinforced masonry buildings and houses on steep slopes suffered damage.
- Eleven hospitals were damaged or unusable after the earthquake

Northridge, CA
(Los Angeles)
January 17, 1994
Magnitude 6.7

2004, Niigata Ken Chuetsu, Japan

- Over one hundred thousand people evacuated their homes
- Trains derailed while in service; rail beds, bridges and tunnels were affected
- Landslides and other problems forced closure of two national highways

Niigata, Japan
October 23, 2004
Magnitude 6.6

- The earthquake broke water mains
- Extensive electric power, telephone (including cellular telephone) and Internet outages were reported

2006, Luzon Strait, Taiwan

- Damaged undersea cables, disrupting telecommunication and Internet services in various parts of Asia
- Telephone outages due to damaged lines
- Hotel guests trapped in elevators
- Six aftershocks greater than magnitude 5.0 occurred within 48 hours of the main earthquake, hampering response efforts

2001, Nisqually, Washington State

- Most of the damage in un-reinforced concrete or masonry buildings
- Air traffic control tower at Sea-Tac Airport heavily damaged
- Damage to the Alaskan Way Viaduct that runs along the Seattle waterfront
- Cracked dome atop the capitol building in Olympia

There are many other examples of earthquakes and their consequences, but the events described above are representative of the effects that may accompany a damaging earthquake in or adjacent to British Columbia.

Luzon Strait, Taiwan
December 26, 2006
Magnitude 7.1

Nisqually, WA
(Seattle)
February 28, 2001
Magnitude 6.8