Symposium on Enhancing Tsunami Warning Along North America's Northwest Coast: Reaching the Last Mile

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Final Summary Report

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Acknowledgements

On behalf of the Symposium Organizing Team, we would like to thank the Cascadia Region Earthquake Workgroup, Institute of Ocean Sciences, Emergency Management British Columbia and Simon Fraser University for their generous support in making the symposium a success.

All of the participants invited to the event are involved in one way or another in public warning initiatives and/or associated support arrangements, and all took time away from their busy schedules to be part of the symposium. We thank them for sharing their knowledge and experience with a commitment to improving public safety and advancing the state of knowledge concerning enhancing tsunami warning and emergency communication along the northwest coast of North America.

We would also like to acknowledge Jennifer Garton, Mike Stanger and Mika McKinnon for their efforts in helping with symposium organizing, logistics and recording arrangements.

Peter Anderson
Simon Fraser University

Maiclaire Bolton
Emergency Management British Columbia

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Introduction

In many rural and remote Northwest Pacific coastal areas, especially in British Columbia, emergency communication with populations remains challenged due to a number of physical, socio-economic and technical factors, including: rugged mountainous terrain and widely dispersed populations; restricted transportation (few roads and dependency on expensive marine and air transport); social and economic status; education and community development opportunities; transient populations that fluctuate according to seasonal variations and economic circumstances (tourism, fishing, logging, aquaculture), etc. From a communication perspective, outside of urban areas, there is uneven access to communication services, including basic fixed telephone, cellular, Internet and local broadcasting, due to high infrastructure development cost and physical distance from centres. Even where two-way radio (marine, commercial and public safety) and satellite telephone services are used, access to and quality of service is often affected by poor line-of-sight coverage due to mountainous coastal terrain. Consequently, current emergency and warning communication arrangements must draw upon a broad combination of traditional and contemporary systems, but with limited opportunity to integrate and ensure effective and timely communication with all potentially affected populations during emergencies.

While new advances in information and communication technology (ICT) offer a number of options for addressing some of these issues, many have never been designed or tested specifically for coordinated use in extreme emergency conditions. Among the potentially more useful ICTs are satellite-based mobile systems that are not dependent upon large terrestrial infrastructures, that are addressable, that are becoming more affordable and widespread in use and that offer cross-border service coverage throughout the Northwest Region. New data exchange formats such as the Common Alerting Protocol (CAP) offer opportunities to better manage, integrate and target warning messages simultaneously across a wide variety of dissemination systems. Further, considerable experience is being gained in innovative community-based last-mile ICT projects in other locations, especially in the post-2004 Tsunami regions of South Asia, which could help to inform the development of new initiatives in the Northwest Region.

Within this context, it was envisioned that a window of opportunity existed to invite a limited number of experts from the stakeholder community to contribute to a discussion on opportunities to improve ‘last-of-the mile’ warning not only for specific locations, but also for the entire region.

Consequently, a one-day symposium was organized and held on June 8, 2010 at the Institute of Ocean Sciences near Sidney, British Columbia. The Symposium had three primary objectives:

1. To bring experts and key stakeholder groups together to build relationships, share knowledge and encourage long term thinking about coastal public warning and emergency communication systems;
2. To identify strengths and weaknesses of current and ‘next-generation’ emergency communication options, and

3. To improve applications of these systems through generating some new pilot projects.

The symposium was limited to 35 participants who represented a broad cross-section of the tsunami warning community-of-interest within British Columbia and Washington, including representatives from rural and remote communities and regional districts, First Nations and provincial, state and federal emergency, public warning, communication infrastructure and research programs. Due to tight scheduling for organizing and hosting the event (just post-Vancouver 2010 Winter Olympics), a number of invited participants from Alaska, B.C., Washington and Oregon were unable to attend, but did express interest in participating in any symposium follow up activities. A list of attendees is contained in Appendix B.

Workshop Organization

The symposium consisted of a small number of brief overview presentations followed by a series of breakout and full-group discussion sessions.

The morning sessions were directed towards summarizing current coastal communications issues and options, beginning with overview presentations by Peter Anderson (SFU) and Maiclaire Bolton (EMBC) and followed by a breakout session in which 3 groups were asked to respond to specific sets of questions:

GROUP A

- What are the current strengths and most significant challenges of the existing warning systems in reaching the last mile/person segments?
- What populations are the most difficult to reach and why?

GROUP B

- What non-technical factors are critical to the effective implementation and sustainability of last mile warning systems?
- What roles can institutional arrangements (governance/policy/legalisation/budget, etc.) play in effecting strengthening of end-to-end warning systems and community capacity building?

GROUP C

- What are key technical attributes that warning systems should possess?
- What other emergency communication requirements need to be considered?

The afternoon sessions were kicked off with a presentation by Peter Anderson on building on existing and emerging systems, followed by a breakout session on envisioning next-generation last mile public warning and group discussions on the following sets of questions:

GROUP A

- What is reasonable and practical to expect from next generation public warning systems in a rural context?
- Which regions/areas would be the most suitable clients for pilot projects?
- What role will non-warning authority operated systems, including new social media, play?

GROUP B

- Which organizations are important to include?
- What are potential sources of support?
- What role will non-warning authority operated systems, including new social media, play?

GROUP C

- Which types of systems would be most appropriate to examine and pilot?
- What is a practical scale and time frame for pilot projects?
- What role will non-warning authority operated systems, including new social media, play?

The final afternoon session consisted of summarizing and synthesizing breakout group results and other observations, and indentifying potential new projects and participants. A brief summary of the breakout and final discussions is presented below.

Summary of Discussions

Below is an attempt by the author to summarize comments and observations recorded during the breakout and general group discussions. While breakout groups were mostly given different sets of questions, many questions were tied to common issues and factors that were linked to other breakout questions. Consequently, in many cases, there was often considerable cross-pollination of ideas and discourse. Attempts have been made to document and position this commentary within the most closely related question. Also, since results were presented in point form, attempts have been made to add some further explanation for contextual purposes. A special thank you is extended to Tim Webb who provided additional personal notes recorded in general sessions as well as participating in breakout Group A.

Breakout Session A - Challenges in the Coming Decade

A1 What are the current strengths and most significant challenges of the existing warnings systems in reaching the last mile/person segments?

A lot of discussion centred on the challenges presented by: geography and identification of populations and infrastructures both at-risk and not-at risk, timeliness of message dissemination, message phrasing, and resiliency of critical infrastructure.

It was acknowledged that not everywhere along the coast is actually at-risk from tsunamis but presently it is difficult to determine specific risk at every location. However, it was pointed out that the 1964 tsunami resulting from the Alaska earthquake likely represents the worst-case scenario from a telegenic tsunami perspective and that this historic event provides a benchmark upon which to build impact studies. Improvements in microzonation and modelling techniques will help communities to further refine these analyses. Examples include the studies carried out in the Ucluelet/Tofino areas.

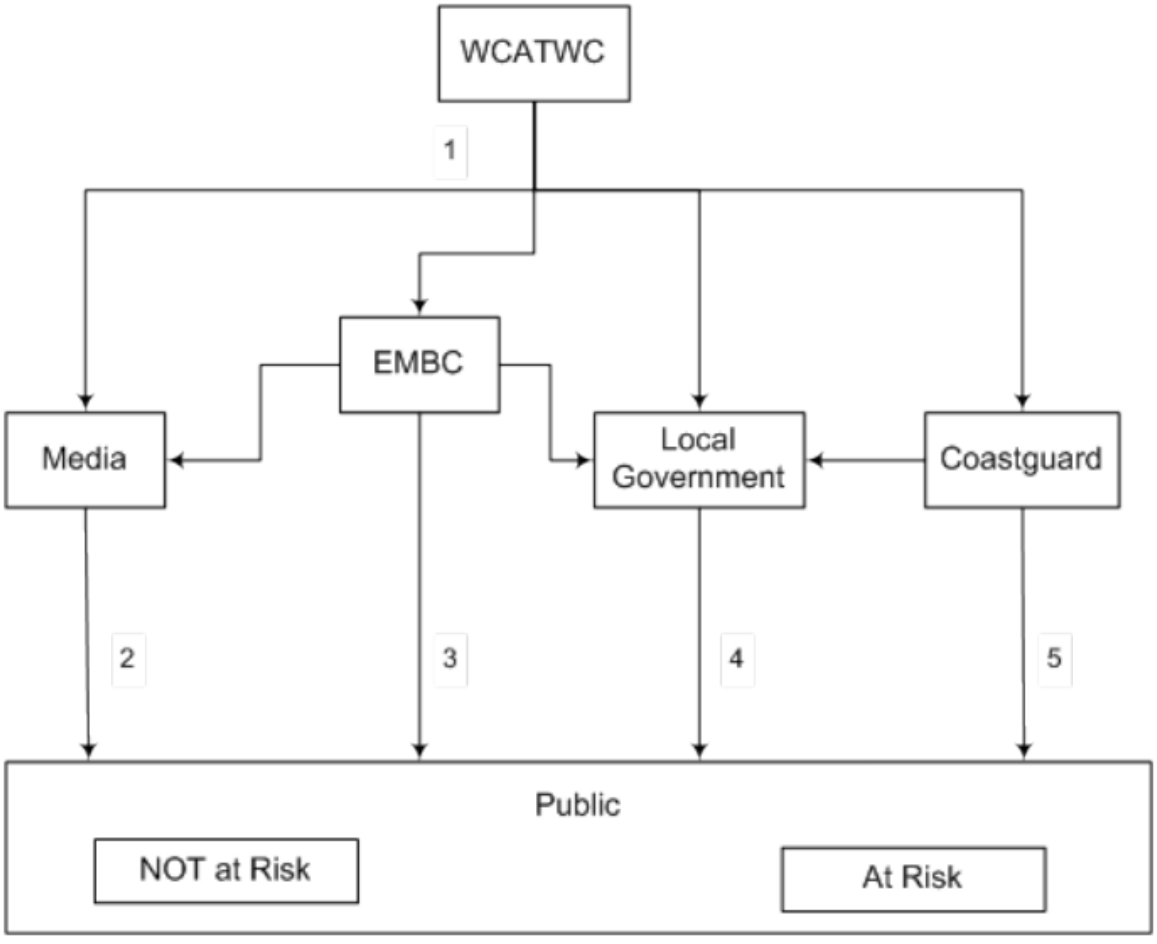
In terms of message dissemination, while there is no single system that reaches all populations, increasingly there is greater diversity of dissemination techniques, driven largely by commercial and consumer multipurpose communication applications and new rural broadband communications extension programs which are helping to bring down user costs and provide better integration of services. Increasingly, emergency managers are able to use consumer level devices for most, if not all, the functions they require. This has the advantage that there will be existing commercial structures in place to support the development and maintenance of services.

In examining single versus multipurpose systems, it was observed that designing single purpose emergency systems is not likely to work well for last mile communication to the public because they are often too expensive and difficult to sustain. There appeared to be consensus that it would be more prudent either to help create new applications or piggyback on existing systems that are already in widespread use and have support arrangements. Examples cited of existing systems that appear to work well and that are

multipurpose include Marine Channel 16, voice phone, email and broadcasting. New applications discussed included SMS and new emerging social networking applications such as FaceBook and Twitter.

A challenge is to ensure that these systems are physically and environmentally robust and sufficiently technically reliable, especially those that are intended to replace older techniques (e.g., use of satellite and terrestrial digital technologies to replace older analog two-way radiotelephone systems). Other factors that may affect future service provision include deregulation of telecommunication services and the phasing out of universal access and quality of service telecommunications carrier obligations, convergence and greater interdependency among critical infrastructures. Some of the most common and persistent underlying weaknesses that affect reliability of local message reception and dissemination in rural locations are frequent electrical power and transportation disruptions.

From a messaging perspective, for British Columbia, several paths now exist for tsunami messages to reach the public.



Courtesy: Tim Webb

For each of these links it is important to consider the different message functions:

1. Spreading the initial alert:
    a. Waking up and getting people's attention
    b. Message content telling people what to do at a broad coastal level
    c. Message content that is locally refined and relevant to specific areas
2. Repeat messaging as the event unfolds
3. Messaging at the end of the event or as area status go to all-clear status.

Some comments/observations recorded on the different links:

1. Getting the message out from the West Coast Alaska Tsunami Warning Center (WCATWC) to key emergency management stakeholders was not perceived as a problem. It is already pervasive and appears to work well and it was felt that there shouldn't be any worry about this segment. Secondary spreading of this message also appears to work well - from Emergency Management British Columbia (EMBC) to local government/authorities via the Provincial Emergency Notification System (PENS) (although there were comments about lags in the system); and from Coastguard to Local Government (via Channel 16).
2. Media start sending information to the public quite quickly – CNN, CBC, www.westcoaster.ca, regional television, etc. However, their local reception may not always be reliable. For example, the Tofino area was issued a Tsunami Watch that coincided with a power outage and loss of local CBC service.
3. EMBC to the public direct. Much of EMBC's public communication is mediated through traditional media. Discussion ensued about supplementing this through use of Internet-based social media. These media might be focused on the repeat messaging during an event more so than on the initial wake up alert.
4. Local authority to the public is the one that is most challenging because of varying communication infrastructures, coverage and local response capacities. Rural areas must use a broad range of techniques (including marine radio, local radio, telephone, personal notification, email, etc.) that are difficult to standardize and integrate, making it time consuming to issue and update notifications.
5. Marine Channel 16 remains a significant source of information on the coast, especially for remote First Nations communities and transient populations.

Despite an increasingly more diverse mix of warning methods, two key problems were identified that persist on the West Coast:

1. How to get a disruptive/wake up alert to a diffuse population;
2. How to regularly get authorized, locally targeted messaging to mass populations through multiple popular modalities.

A2 What populations are the most difficult to reach and why?

Several population groups were identified as being difficult to reach. These groups include remote First Nations and non-native fixed location, transient and tourist populations.

Fixed location remote populations are often dispersed over large and/or physically access-challenged coastal areas with limited communication and other technology infrastructures. New residents are often unaware of local hazards and there may be minimal mitigation planning.

It was suggested that these areas could be better identified by level of risk and vulnerability for education, risk planning, infrastructure protection and investment, and mitigation purposes. In particular, it was suggested that current and future rural broadband and communication improvement initiatives should include hazard risk and public warning needs as criteria for prioritizing community investment and service rollouts.

Transient populations include floating fishing, logging, eco-tourism camps, boaters, cruise ships, cargo and other commercial vessels, etc. Much discussion took place about the roles and responsibilities of individuals and employers to be better educated and equipped to respond to tsunami and other coastal and marine hazards. Options discussed ranged from voluntary registration for notification to mandatory inclusion of tsunami risk reduction practices in organizational emergency plans. In the case of paid activities, the B.C. Workers Compensation Board, through it's WorkSafe regulations, requires all employers to have communication methods in place to enable work-alone employees and/or employees working in high-risk locations to regularly check-in and/or to notify or be notified of unsafe conditions. Consequently, considerable infrastructure already exists to help extend tsunami notification to large segments of the transient population, but it remains largely undocumented and unconnected to local/regional notification systems.

A significant population sub-group is tourists. Concern was expressed that many tourists have limited awareness of local or regional hazards, unless specifically informed by local communities or tourism programs. It was suggested that hazard awareness and preparedness, properly integrated into tourist services, could be a strong marketing tool. Tourists travel to the West Coast to enjoy new, unfamiliar experiences, but also want to be safe. Suggestions for improving awareness and notification effectiveness included working more closely with tourism operators and accommodation providers, modifying local business licensing/bylaws to encourage/mandate risk reduction and developing a voluntary tourist registration program for notification and search and rescue purposes.

Again, for commercial tourism purposes, employers already have emergency communication responsibilities. The most challenging groups to reach are self-reliant tourists who bypass commercial services. These include private boat and RV, as well as back-packer tourists (although the latter is generally younger and more likely to be better connected via social media where available).

A3 What non-technical factors are critical to the effective implementation and sustainability of last mile warning systems?

It is postulated that tsunami warning should not be viewed as a technology, but rather should be viewed as a social system that includes both technical and non-technical attributes. In particular, discussions about meaning and personal relevance of messaging garnered a lot of attention. Some of the key factors discussed were:

- Clarity of messaging – what information is critical and how well is it conveyed? Methods of dissemination vary and many restrict the amount or form of content. All recipients do not rely on the same methods.
- How well people understand the message content and know what actions to take. A variety of factors can affect meaning and relevance of messages including language and cultural background, familiarity with local environments.
- How credible is the message? Messages can be sent via numerous methods and by a variety of government and non-government organizations. Is the content from sources consistent, verifiable and trusted? To improve effectiveness and acceptability of warning, greater leadership in information sharing and integration needs to be encouraged within and among all jurisdictions – national/regional/local/First Nations, especially in coordinating dissemination of core event content.
- Personal accountability and choice. What motivates people to accept greater personal responsibility for their own safety and how can this be captured in messaging and local planning and preparedness efforts?
- Long term strategic planning. Incorporating communication methods and planning as core elements.
- Funding – being cost-effective and affordable - building upon existing programs as well as locating new sources (e.g., rural broadband initiatives).

A4 What roles can institutional arrangements (governance/policy/legalisation/budget, etc.) play in effecting strengthening of end-to-end warning systems and community capacity building?

In terms of strengthening community capacity building, much discussion centred on generating a policy framework that is not restrictive in ways that prevent local action. As new national and regional/provincial/state initiatives emerge, it is important to empower local governments/authorities to have flexibility in tailoring programs to local circumstances, while remaining faithful to their principles.

A major partner in both last-mile and local capacity building is the private sector. It was recognized that in some cases, populations reside in many coastal locations solely because of employment opportunities (resort management, fish farming, logging, etc.). In other cases, businesses provide the support base for local and outlying economic activities.

In this regard, it was acknowledged that greater effort must be made to work with the private sector to help:

- identify and acknowledge its risk reduction roles and responsibilities, and even jurisdictional boundaries.
- identify what resources (human, technical and financial) it can contribute to support local warning and capacity building efforts.
- facilitate its participation in local/community emergency management programs.

A5 What are key technical attributes that warning systems should possess?

Six key technical attributes were identified that were considered especially important for rural and remote applications. They are:

- Dynamic. The system must be able to send, modify, update and terminate warning messages in a flexible and timely manner (in as real or near real-time as possible) within an expected timeframe.
- Scalable. The systems must be able to target different size audience groups from regional to local.
- Addressable. Due to the varying geographic characteristics of the West Coast, not all local areas possess the same tsunami risk characteristics or expected wave arrival times. For example, the B.C. Tsunami Warning System is divided up into five warning notification zones for telegenic tsunamis. Even within each zone, wave behaviour and associated on-shore risk may vary considerably. Warning systems, therefore, should be able to target populations according to different requirements.
- Scope. Given the regional/international nature of tsunamis, warning systems must be able to be integrated on a regional basis, but tailored to local needs.
- Resilient. Extreme weather, remote and/or widely dispersed populations and infrastructures, and limited local technical support make warning system maintenance especially difficult. Special care must be taken to ensure that equipment is designed and properly installed for these environments, repairs can be carried out by local expertise or given priority for outside support, and that power supplies are not solely dependent upon standard local utility service.
- Redundant. To ensure that there is no single weak link, every location should have enough methods of communication to ensure that the warning system will function, even if the event destroys/disrupts some infrastructure.

New systems should be Common Alerting Protocol (CAP) compliant.

A6 What other emergency communication requirements need to be considered?

Participants identified a number of additional emergency communication requirements that need to be considered, especially given the diverse range of stakeholders and skill sets. In particular, it was observed that communications systems should:

- be compatible so they can interoperate across systems, regions and borders.
- not override but enhance existing well functioning solutions.
- where possible, be backwards compatible to ensure maximum inclusion of users.
- reflect ease-of-use considerations such as:
    - using stock messages and automated mailing lists.

    - enabling remote activation.
    - being simple to train non-experts.
- be localized to take into account cultural and language diversity by:
    - supporting messaging in languages beyond English and French.
    - employing recognizable graphics and symbology.
- be supported by education about and training in the use of communication techniques.

Breakout Session B - Envisioning Next Generation Last Mile Public Warning

B1 What is reasonable and practical to expect from next generation public warning systems in a rural context?

A number of factors were discussed that could affect the type and quality of future warning services in rural areas. In particular it was observed that, based on current trends in technology development and implementation, most new public warning systems will be overlaid on commercial consumer-driven internetworks. These developments will enable:

- increased interoperability among warning system operators, emergency managers and message recipients.
- new applications to be imbedded in or simple modifications made to consumer devices to add warning functionality (e.g., CAP enabled GPS based smartphone applications, mobile social media clients, etc.).
- less dependency upon special/single purpose warning devices.
- more methods to reach the public.
- most of the distribution networks to be consumer/user supported and updated.
- greater coverage and household and industry penetration as market acceptance grows.
- greater diffusion of media/technology literacy skills (people personally know how to use the technology).
- multiple community contact points.
- greater targeting and localization of messaging.

However, being market driven, some of these developments may also lead to:

- digital divides between greater and lesser populated regions as new services favour more urbanized areas.
- greater congestion during emergencies if telecommunications networks and systems are poorly scaled.
- wider spread disruptions in rural areas during emergencies if all services are carried over single trunk networks. In many rural regions all of the telecommunications services (voice telephone, Internet, etc.) are carried over single trunk lines often strung on telephone poles – representing single points of failure. This suggests the need for using a combination of satellite and land-line/wireless infrastructure where possible.

- delays in or loss of local message distribution and reception .

Other considerations explored for future rural public warning and emergency communications included:

- enhancing the use of existing public and private two-way radio systems by adding warning functionality to existing repeater systems, including an interface to EC Weatheradio/NOAA Weather Radio.
- establishing basic communications standards for local and regional emergency operations centres.
- compiling an inventory of services by geographic region.

B2 Which regions/areas would be the most suitable clients for pilot projects?

A lot of discussion took place about how vulnerability should be included in the criteria used to determine suitable locations for pilot projects, including classifying potential locations by level of vulnerability. Specific areas considered most suitable for pilot projects included:

- on-coast and inlet places with high hazards, including populated locations permanent or seasonal work camps
- high-risk locations with critical infrastructure
- boundary locations (joint jurisdiction and response) especially with multiple funding sources.

B3 Which organizations are important to include?

Numerous organizations were identified as being key to the development and carrying out of a mix of pilot projects. The following are organizations initially identified.

- Local First Nations and non-native authorities.
- Emergency Management British Columbia
- RCMP
- Universities
- Department of Fisheries and Oceans
- Indian and Northern Affairs Canada
- Natural Resources Canada
- Environment Canada
- Parks Canada
- Public Safety Canada
- Canadian Radio-television and Telecommunications Commission
- Industry Canada
- Rural infrastructure support programs
- Telecommunications and other private industry
- Professional associations
- U.S. Northwest region counterparts

B4 What are potential sources of support?

It was observed that any support requests need strongly to emphasize local and regional economic and social benefits and opportunities that can result from improved last-mile warning and emergency communication. Multipurpose systems that are used regularly for both emergency and non-emergency purposes are likely to be the most sustainable as they will draw support from a wider spectrum of support including service providers, users and regional development programs.

With the exception of marine radio, much of the coastal communication infrastructure in current use is supported through some form of commercial arrangement where the costs of service provision are recovered by subscription and other user fees. However, not every coastal area has the same commercial market potential, and care must be taken to recognize the need to incorporate broader social and other programs that can help to cross-subsidize costs. Examples cited were education programs that fall within and extend beyond local school systems, "entry point" borders for cruise line and other tourist activities, etc.

B5 Which types of systems would be most appropriate to examine and pilot?

A number of ideas were generated about which types of systems to examine and pilot. Most deemed appropriate were those:

- with underpinning funding already in place – the least expensive.
- with infrastructure already in place.
- that could encompass all hazards warning needs.
- that could build upon existing systems and partnerships to share costs, experience and knowledge (e.g., community sirens, the Washington State All-Hazards Alert Broadcast System, Environment Canada Weatheradio and NOAA Weather Radio enhancements and expansion).
- that could use a diversity of transmission media to reduce single points-of-failure.
- that could serve as building blocks for next-generation systems (e.g., supporting development and use of the Common Alerting Profile, new smartphone technology and satellite radio systems).

B6 What is a practical scale and time frame for pilot projects?

It was suggested that a practical strategy for framing and initiating pilot projects would be first to research and confirm project locations, stakeholder groups, governance structures, costs and support programs. Some of this work could be completed within a 6 month process (at the time of the June workshop, December 2010 was suggested as a target date).

Initial focus of pilot projects could involve replicating existing programs and projects that work well in other locations and focus on common regional problems, such as last-mile communications in remote Alaskan and B.C. communities. Another area for

consideration is encouraging greater West Coast standardization that could reinforce public awareness and reduce individual agency public education development costs.

B7 What role will non-warning authority operated systems, including new social media, play?

As social media becomes an increasing part of our daily lives, people are turning to its use during emergencies, as well. The rapid expansion and increasing pervasiveness of new social media (such as Twitter, Facebook, blogs and YouTube), supported through use of the Internet and mobile communication devices, has enabled citizens and emergency managers and responders to share information, communicate, and coordinate activities during warning and response. There is a growing body of research evidence that indicates people are likely to use social media in emergencies to post information, communicate with friends and relatives and request assistance when other communication channels are unavailable.

In order to consider the implications of this phenomenon for the last-mile segment of warning and emergency communication, all of the Session B breakout groups were asked to discuss social media's emerging emergency communication role.

Overall, during breakout summations there was widespread consensus that new social media are valuable, probably unstoppable in terms of societal penetration, immediate in impact and provide a multitude of new pathways to reach and interact with populations affected by pending or actual tsunamis and other hazards occurrences. It was also observed that social media rest outside the direct management and control of emergency organizations and their influence can extend well beyond that of the traditional media. Further, the younger population is more likely to utilize social media during emergencies than older generations and rely less on traditional media and public warning systems for timely receipt of tsunami event and warning notifications. It was also acknowledged that the emergency management community generally lacks a detailed understanding of the use and influence of these new media in order to effectively communicate with all segments of the public in a relevant and timely manner.

Some of the concerns voiced were that:

- increasingly, segments of the public expect emergency agencies to use these techniques to communicate with them.
- in order to reach all at-risk population groups, existing methods to provide tsunami notifications may no longer be adequate.
- unlike traditional media practices, during emergencies, use of new social networking requires immediate and regular interaction of emergency managers with the public and, to remain relevant and credible, will require human resources necessary to feed constantly new information into the social networks.
- during hazard events there is a need to have staff trained and dedicated to monitoring social media sites for immediate and post-impact situational awareness.

- it is extremely important that social networking be integrated into the existing tsunami notification processes through existing inter-agency working arrangements.

Concluding Session – Recommendations for Next Steps

The final session of the symposium allowed participants to synthesize the key findings of earlier sessions and to explore and recommend a set of initial follow up activities that could contribute to longer-term regional cooperation and collaboration. To stimulate these discussions further, Mr. John Schelling, from the Washington State Military Department Emergency Management Division, presented a comprehensive overview of the Washington State All-Hazards Alert Broadcast System (AHAB) and protocols. There appeared to be widespread consensus that the symposium fulfilled one of its principal objectives of bringing together a broad spectrum of stakeholders to share knowledge and encourage long term thinking about coastal public warning and emergency communication systems. To carry this momentum forward, participants formulated and recommended the following projects and follow-up actions.

- Carry out a comprehensive study to inventory and assess existing coastal warning and communication networks and last-mile segments, including service coverage, attributes and state of interoperability. The study should extend along the entire West Coast and include public and private sector resources.

- Develop a system to classify coastal communities and other key locations by level of vulnerability to guide prioritization of pilot projects and future risk reduction investment.

- Encourage more sharing and adoption of neighbouring state/provincial best practices (e.g., Washington State's AHAB system and NOAA's TsunamiReady program).

- Consider adoption of a simple colour coded scheme to help notified populations discern warning states and timeframes (e.g., green – information/all-clear; yellow or amber – watch; red – warning)

- Carry out more workshops and symposia similar to this event to expand engagement and cross-jurisdictional/disciplinary/community collaboration.

- Building on results of this symposium, establish an ongoing last-mile working group beginning with a mailing list and website for documents.

- Encourage collaboration with other related programs such as Cascadia Region Earthquake Workgroup, WorkSafeBC, DHS-FEMA Integrated Public Alert and Warning System, Canadian Association for Public Alerting and Notification, community and rural infrastructure programs, etc.

- Evaluate and pilot new techniques and technologies that can support region-wide and localized needs. Examples include satellite-based broadcast (e.g., XM and Sirius) and two-way radio (e.g., MSAT), GPS-based location reporting and CAP

messaging systems, rural wireless and fixed-wire broadband systems, mobile social media, etc.

- Carry out workshops to:
  - inform emergency managers about the technical nature of new social media applications such as Twitter and Facebook and their implications for public warning.
  - examine the use of social media in recent disasters and formulate lessons and best practices.
  - provide training in social media techniques.

- Revise and expand the SFU Tsunami Warning Methods Tool Kit Guide to include:
  - new innovations and best practices.
  - regions outside B.C. (California, Oregon, Washington and Alaska).
  - a workbook and set of templates for community self-assessment and communications planning.

Appendix A - Symposium Agenda

Symposium
Enhancing Tsunami Warning Along North America's Northwest Coast: Reaching the Last Mile
June 8, 2010

Institute of Ocean Sciences
Fisheries and Oceans Canada
9860 West Saanich Road
Sidney, B.C.

Organized by
Simon Fraser University in Partnership with Emergency Management British Columbia, Cascadia Region Earthquake Working Group and the Van Horne Institute

08:30 Welcome
Housekeeping remarks
Introduce planning committee
08:45 Introductions
09:00 Overview of the symposium process – Maiclaire Bolton, EMBC
09:10 Session A (Tsunami Warning in the Pacific Northwest Today)
- Overview presentation – Peter Anderson, SFU
- February 27 Chile earthquake and WCATWC advisories - Maiclaire Bolton

10:10 Coffee break

10:30 Comments to set context for first breakout session

10:35 Breakout Session A (Challenges in the Coming Decade)
- Outline of focus questions and clarification – Maiclaire Bolton
- Breakout groups (3)
  - *What are the current strengths and most significant challenges of the existing warning systems in reaching the last mile/person segments?*
  - *What populations are the most difficult to reach and why?*
  - *What non-technical factors are critical to the effective implementation and sustainability of last mile warning systems?*
  - *What are key technical attributes that warning systems should possess?*
  - *What other emergency communication requirements need to be considered?*

11:35 Reports from breakout groups [audio recording]
- Discussion [audio recording]

12:15 Lunch break

12:45 Session B Overview Presentation (Building on Existing and Emerging Systems)
Peter Anderson

13:30 Breakout Session B (Envisioning next generation last mile public warning)
- Outline of focus questions and clarification - Maiclaire Bolton
- Breakout groups (3)
    - *What is reasonable and practical to expect from next generation public warning systems in a rural context?*
    - *What role will non-warning authority operated systems, including new social media, play?*
    - *Which types of systems would be most appropriate to examine and pilot?*
    - *Which regions/areas would be the most suitable clients for pilot projects?*
    - *Which organizations are important to include?*
    - *What are potential sources of support?*
    - *What is a practical scale and time frame for pilot projects?*

14:30 Coffee break

14:45 Session C (Framing an Action Plan for a Series of Pilot Projects)
- Reports from breakouts [audio recording]
  Group discussion [audio recording]
    - Pulling together breakout group results and other observations
    - Indentifying projects and initial participants and areas of support
    - Establishing a planning/working group and follow-up timetable
    - Final discussion [audio recording]

16:30 Closing remarks
- Key observations and thoughts of the day
- Thank participants for their contributions

17:00 Adjourn

Note: Audio recording of main sessions is intended solely for the purpose for checking accuracy of note taking.

Appendix B - List of Attendees

Peter Anderson	Simon Fraser University
Wilf Bangert	Network BC
Tamra Biasco	FEMA Region X
Alison Bird	Pacific Geoscience Centre
Maiclaire Bolton	Emergency Management British Columbia
Andrew Bryan	Emergency Management British Columbia
John Cassidy	Pacific Geoscience Centre
Randy Cox	RCMP
Denis D'Amours	Canadian Hydrographic Service
Chris Duffy	Emergency Management British Columbia
Cam Filmer	Emergency Management British Columbia
Clare Fletcher	Emergency Management British Columbia
Kathryn Forge	Public Safety Canada
Lindsay Funk	Canadian Coast Guard
Khalil Hayek	Natural Resources Canada
Kelli Kryzanowski	Emergency Management British Columbia
Laurie L'Hereux	City of Port Alberni
Anne McCarthy	Environment Canada
Mika McKinnon	University of British Columbia
David Mitchell	University of Calgary
Paddy Murphy	Canadian Coast Guard
Aja Norgaard	Emergency Management British Columbia
Garry Rogers	Pacific Geoscience Centre
Andreas Rosenberger	Pacific Geoscience Centre
John Schelling	Washington Emergency Management Division
Denny Sinnot	Canadian Hydrographic Service
Mike Stanger	Simon Fraser University
Jamie Sterritt	Sa'hetxw Consulting
Neil Sutherland	Canadian Hydrographic Service
Peter Wallis	Van Horne Institute
Stephen Waugh	Central Coast Regional District
Mike Webb	Emergency Management British Columbia
Tim Webb	Westcoast Inland Search and Rescue Society
Stan Willow	Canadian Forces
Sonia Woolford	Emergency Management British Columbia

Appendix C - Overview Presentations and Background Documents

Copies of all presentations and background documents are available at:
http://www.sfu.ca/tsunami