



The eleventh issue of Hazardous Times provides new information on the risk to Auckland from volcanic ash inundation and looks at the potential for accidental hazardous substances to be released by natural hazards. It also updates the activities of the Civil Defence Emergency Management Group and the Auckland Engineering Lifelines Group.

Quiet Times? Auckland's ashfall threat

Joy Hoverd, an Auckland University Masters student supported by the Auckland Regional Council, has recently completed her Masters thesis which 1) investigated the occurrence of ash deposits in Auckland, and 2) classified tephra inundation events into Hazard Classes, depending upon their ability to affect key infrastructure, humans and live stock.

Thickness	Class
< 5 mm	Class I
6 - 50 mm	Class II
51 mm - 500 mm	Class III
501 mm - 5000 mm	Class IV
> 5000 mm	Class V

Table 1: Ashfall hazard classification system proposed by Hoverd thesis.

Class of Hazard	Frequency
Class I	1 per 800 yrs
Class II	1 per 1800 yrs
Class III	1 per 6000 yrs

Table 2: Frequency of ash fall hazard, based upon data from the Onepoto core and four cores taken from the south eastern sector of the Auckland Volcanic Field between 9 500 and 36 700 years before present.

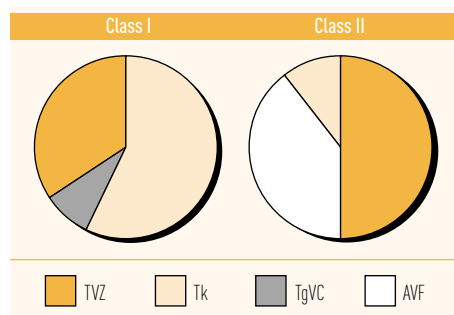


Figure 1: Class of hazard and volcanic source, as observed in the Onepoto core between 9 500 and 36 700 years before present. Taupo Volcanic Zone (TVZ), Taranaki volcano (Tk), Tongariro Volcanic Centre (TgVC), Auckland Volcanic Field (AVF).

The Auckland region is not only threatened by local events from the Auckland Volcanic Field, but also by distal volcanic sources including the Taupo Volcanic Zone (TVZ), Tongariro Volcanic Centre (TgVC) and Taranaki volcano (Tk).

In November 2000 a c. 61 m core was recovered from Onepoto Domain in North Shore City, Auckland. The high-resolution tephra (volcanic ash) record of this core reveals at least five volcanic sources that have frequently dispersed ash in Auckland throughout the last c. 140 000 years.

Geochemical analysis of tephra from the Onepoto core has identified 27 ash fall layers derived from the TVZ, source of some of the largest eruptions the earth has produced. The 1995-96 eruptions of Mt Ruapehu have shown that the Tongariro Volcanic Centre is also capable of dispersing ash into the Auckland region, and the Onepoto core records three ash fall events from this centre. The Onepoto core reveals 41 tephra layers from Taranaki volcano, making it a significant producer of ash fall in the Auckland region.

By estimating the age and measuring thickness of tephra observed in the Onepoto Core, this study provides new data for ash fall hazard assessments in Auckland. Onepoto core data was combined with information from other

tephra studies undertaken at four Auckland locations, stretching from Remuera to Pukaki in South Auckland. The combined information suggests that within these locations, which are primarily located in the south eastern sector of the Auckland Volcanic Field, one ash fall event is likely every 500 years. It is hoped that further tephrostratigraphic studies will be undertaken for other parts of the region so that this return period can be further refined to provide a return period estimate for the wider Auckland region.

The study has devised a classification system which relates ash fall thickness and the likely impacts on lifelines, infrastructure, humans and livestock. Classes range from I-V, where V is the most severe hazard (refer to Table 1). A Class I hazard could potentially cause closure of airports, contamination of water supplies and minor respiratory problems. A Class II hazard has the potential to completely immobilise all forms of transport, destroy electricity reticulation systems, disrupt sewage and drainage systems, and damage commercial food crops. A Class III hazard is capable of causing failure of all lifelines, building collapse, serious injury and death.

Table 2 specifies the likely return period for Class I, II, and III events, as defined by data collected from the Onepoto Core and four cores from the South eastern sector of the Auckland Volcanic Field. It does not represent the likely tephra return period for the entire region, as eruptions from the Auckland Volcanic Field will not necessarily inundate the entire Auckland region with ash. Therefore, data collected from five locations can only capture some of the ashfall events that have affected the Auckland region.

The Onepoto core records a number of Class I and II hazards over the last 36 700 years, and the sources of these events are summarised in Figure 1. Small (thin) ash fall events from Taranaki are most frequent.

This thesis can be viewed at the University of Auckland Library.

Tsunami research

– Where is it at?

News in brief

Auckland Earthquakes - 2001

During 2001 only one earthquake occurred in Auckland. This Magnitude 1.6 event was too small to be felt, but was recorded by the Auckland Volcano-Seismic Monitoring Network.

The earthquake occurred on September 28th, and was located at 5 km depth, just offshore of Waiheke Island, about 5 km North east of Onetangi. As this earthquake occurred outside of the Auckland Volcanic Field and had a tectonic earthquake signature, it is not considered to be associated with potential volcanic activity.

ARC Hazard Website

On the 2nd of April, ARC's brand new web site will launching into cyber space.

As well as containing plentiful environmental information, on-line consent application forms, and a wide range of other tools, it will also provide information on natural and technical hazards that could affect Auckland. You'll also be able to find maps of Earthquake, Flooding and Volcanic Hazards and answers to frequently asked questions. You can use this site to download the latest version and back issues of Hazardous Times and to find out information on current hazard research being undertaken by the Auckland Regional Council.

Just visit: www.arc.govt.nz.

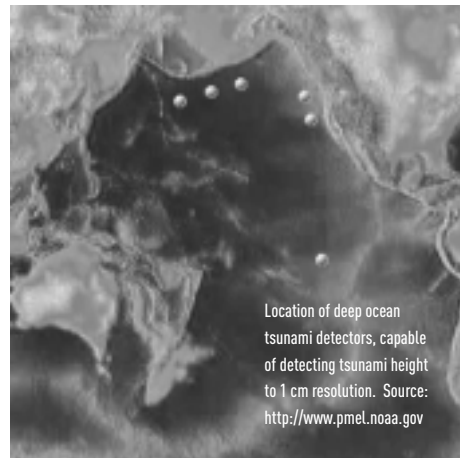


On the 7 & 8th February, many of New Zealand's leading tsunami researchers convened just outside Wellington to review the current state of knowledge of tsunami and tsunami effects in New Zealand.

The meeting's purpose was to identify the gaps in knowledge, capability, and resources that need to be filled if future research is going to facilitate tsunami awareness, preparedness and mitigation, and hence save lives.

Presentations were given by a wide range of researchers and provided insight into local tsunami sources and source modelling, tsunami impact databases, paleotsunami, propagation modelling, hazard assessment techniques and mapping, and a variety of tsunami mitigation solutions. Newly discovered offshore faults, paleosubmarine slides and submarine cauldrons provide increasing evidence of high risk from locally generated tsunami sources. This risk is continuing to be verified by discoveries of paleotsunami deposits in locations such as Great Barrier Island and Kapiti Island.

Insight into mitigating the impact of tsunami, was given by visiting guest speaker, Professor Lori Dengler, a member of the Steering Committee for the US Tsunami Hazard Mitigation Program. Lori discussed how the USA is using tsunami warning systems, evacuation maps and public education to reduce the impacts of future tsunami on coastal communities. New Zealand can learn from the USA's experiences and we are already reaping some of the benefits of their initiatives. Recently deployed deep ocean tsunami detectors offshore of the Alaskan, Washington, and Oregon States, and in the Central Pacific will improve warning of tsunami generated



from the Aleutian Seismic Zone and the Cascadia Subduction Zone (see figure).

A small working party, with representatives from all tsunami research sectors and local and central government, is working collaboratively to take ideas from the Tsunami Symposium and recommend projects that will help to meet New Zealand's tsunami mitigation requirements and research needs.

For further information on the tsunami symposium and its outcomes, please contact one of the symposium convenors: **Gaye Downes (GNS)** on (04) 570 1444; email: g.downes@gns.cri.nz **Roy Walters (NIWA)** on (03) 348 8987; email: r.walters@niwa.cri.nz **James Goff (GeoEnvironmental Consultants)** on (03) 329 9533; email: geoenv@xtra.co.nz

AELG update

Auckland Engineering **Life Lines** UPDATE

The AELG has just finished working on its business plan for 2002 - 2004 and has identified a number of new projects. These will require research into reducing the hazard impact on lifeline utilities, as well as identifying solutions of how Auckland lifeline utilities can better coordinate response and recovery during and following a disaster.

The first of these projects will identify the best system and processes to enable lifeline to lifeline communication following a major regional emergency event. Over the next few months the AELG will be working with CDEM Groups and Emergency Management committees to ensure that the systems adopted are compatible with CDEM communication systems. The identification of priority utility sites for recovery is another important project commencing this year. This is phase 2 of the "Safe Routes" project, which identified roads that are a priority for recovery. Rather than just looking at lifelines needs for rapid recovery (which was the objective of the Auckland Engineering Lifelines Project) this project will consider community needs and

priorities as well. The AELG has a new Steering Committee Chair, Brian Potter of Telecom. The AELG is also pleased that Cr Gwen Bull has confirmed her intention to continue as political patron, particularly given her new increased responsibilities as ARC Chair. While the AELG concentrated last year on developing its website as a means of communication (www.aelg.org.nz), it is also about to get moving on a six monthly newsletter.

If you're interested in being on the mailing list, contact the project manager Lisa Roberts on (09) 379 1261; email: lisa.roberts@meritec.org.

Hazardous

There is always a risk that hazardous substances can be accidentally released. This can happen through poor handling and storage, or by extreme events such as earthquakes or structural failure.

Substance release from natural disasters

Explosions, fires, toxic exposure or spills caused by accidental hazardous substance releases can cause injury and death, and damage to property, infrastructure and the environment. The Auckland Regional Council is currently undertaking a study which will assess the number of hazardous substance storage facilities that have the potential to cause regionally significant impacts within the Auckland region. Then, using GIS, the study goes a step further and asks how many of these facilities have the potential to be affected by natural hazard events such as earthquakes and flooding.

Territorial authorities have been generous in their support of this project, providing the majority of data on hazardous substance location, type and quantity, and some hazard information. Although the project is not expected to be completed until later this year, preliminary results suggest that approximately 76% of hazardous substances in the Auckland region are stored in hazard zones. Of these, relatively few of them are stored in sufficient quantities to present a large hazard (Fig 1). Figure 2 illustrates that of those hazardous substances that are stored in quantities at least 50 times greater than the Hazardous Facilities Screening Procedure baseline thresholds, 39% are located in areas prone to ground shaking, 44% are located in areas prone to ground shaking and liquefaction, and only 17% are in locations that are not vulnerable to natural hazards.

For more information please contact Adam Paterson, Hazard Analyst, Ph: (09) 366 2000 extn 8449; email: adam.paterson@arc.govt.nz

Hazard Facts

Auckland Regional Council's Hazard Facts are a series of free factsheets written to provide the public with hazard information.

- > H01 Auckland's Volcanic Field
- > H02 How do Auckland's volcanoes form?
- > H03 Rangitoto: Auckland's Youngest Volcano
- > H04 Auckland's Volcanic Hazards
- > H05 Auckland Volcano Seismic Monitoring Network
- > H06 Measuring Earthquakes
- > H07 Earthquakes in Auckland
- > H08 Earthquake Hazards
- > H09 What is a Tsunami?
- > H10 Volcanic Eruption in Auckland - How to Survive
- > H11 Hazards in Auckland

Hazard Facts are available from ENVIROLINE: 0800 80 6040 or online: www.arc.govt.nz.

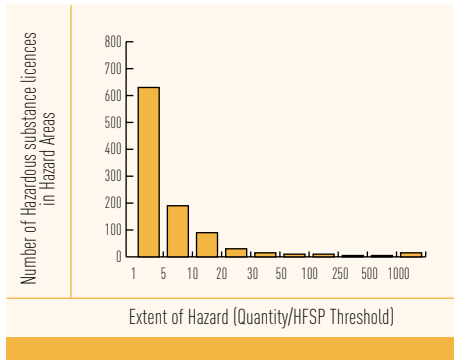


Figure 1: Graph illustrating the number of hazardous substance licences that are located within hazard zones in Auckland, for a range of hazardous substance hazard levels. The Hazardous Facilities Screening Procedure (HFSP) Threshold is a quantity of a hazardous substance that is used to define a dangerous quantity of a substance for planning purposes.

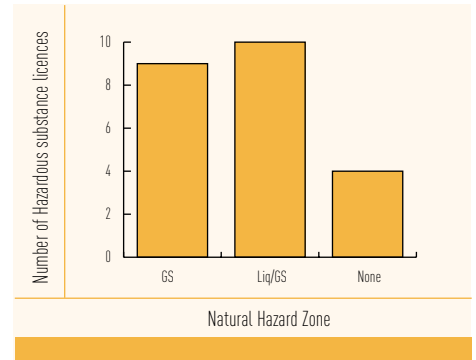


Figure 2: Graph illustrating the number of hazardous substances stored in natural hazard zones, for those hazardous substances stored at quantities at least 50 times greater than the HFSP baseline thresholds.
> GS = Ground shaking
> Liq/GS = earthquake Liquefaction and ground shaking hazard



Civil Defence Emergency Management Group Plan - Update

Work on the Civil Defence Emergency Management Group Plan continues, and two new supporting projects have recently kicked off.

The first project involves taking a closer look at the Building Act and how consistently it is being used across the region. The Building Act and building codes are key tools in reducing the impact of hazards such as flooding, high winds and earthquakes on property. Early work highlighted a potential problem with the consistency in implementation, understanding, and interpretation of the Building Act. This project will determine if this is the case, and if so, whether the issues can be addressed by the Plan.

The second project is looking at the extent of emergency management planning within 90 organisations throughout the Auckland region. A preliminary investigation conducted in July 2001 looked at the mechanisms used by local authorities to manage natural and technological hazards. A further investigation is currently under-way which

will extend the knowledge on the range of emergency management planning already being undertaken throughout the region by a wide range of organisations.

These include:

- > Local Authorities
- > Emergency Services
- > Public Health and District Health Boards
- > Telecommunications
- > Energy Sector (Oil, Gas, Power)
- > Water Supply and Sewerage
- > Defence Forces
- > Transport (Air, Road, Water, Rail)
- > Social Services
- > Central Government Departments
- > Professional Institutions
- > Salvation Army
- > Red Cross
- > Media (Print, TV, Radio)

Key management personnel within about 90 organisations are being asked what written plans their organisation has in place in the areas of reduction, readiness, response, and recovery. Comments on perceptions of the level of planning, gaps, and inter-relations with other industries are also invited.

Plan confidentiality is protected as only plan titles will be listed in the regional CDEM Plan, whilst other outcomes may be commented on generically. This Project is being undertaken by Geoff Ward who has a long association with Local Authorities and Emergency Management in the Auckland region.

More than 50 organisations have already been approached and have demonstrated a high level of interest and co-operation. This project will not only provide insight into the level of industry planning, but will identify synergies, improve communication, and increase awareness of the need for effective emergency management planning.

All organisations providing input to 'The Extent of Emergency Management Planning' will have an opportunity to comment on the draft report before it is published in May.

Anyone interested in learning more about this project can contact Geoff Ward on (021) 275 5324; email: g.p.ward@xtra.co.nz.

Resource List

<p>Coastal Hazards</p> <p><input type="checkbox"/> > Auckland Regional Council, Coastal Hazard Strategy and Coastal Erosion Management Manual, Auckland Regional Council Technical Publication No. 130, July 2000. (\$129.00 Hard copy) (\$49.00 CD Rom)</p>	<p><input type="checkbox"/> > Hessell, J.W.D., Hazards in the Auckland Region due to Meteorological Extremes: An Initial Assessment. Auckland Regional Council, Working Report No. 68, January 1996. (Free)</p>
<p>Earthquake</p> <p><input type="checkbox"/> > Alloway, B., Lyall, J and Kozuch, M., Mapping and Characterisation of the Drury Fault, Auckland Regional Council Technical Publication No.96, September 1998. (includes A1 map of fault geology) (\$25.00)</p> <p><input type="checkbox"/> > Stephenson, W., Baguley, D., Kozuch, M., Assessment for Amplification of Earthquake Shaking by Soft Soils in Central Auckland, Auckland Regional Council Technical Publication No. 94, July 1998. (includes A1 map of site locations) (\$25.00)</p> <p><input type="checkbox"/> > Stephenson, W., Townsend, T. & Hull, A., Assessment for Amplification of Earthquake Shaking by Soft Soils in South Auckland. Auckland Regional Council, Technical Publication No. 87, August 1997. (Free)</p> <p><input type="checkbox"/> > Fellows, D.L., Preliminary Paleoseismic Assessment of the Wairoa North Fault. Auckland Regional Council, Technical Publication No. 75, September 1996. (includes A1 map of fault [1:25,000]) (\$40.00)</p> <p><input type="checkbox"/> > Hull, A.G., Mansergh, G.D., Townsend, T.D. & Stagpoole, V., Earthquake Hazards in the Auckland Region. Auckland Regional Council, Technical Publication No. 57, April 1995. (includes two A3 maps: fault hazard and preliminary ground shaking hazard) (\$25.00)</p>	<p>Tsunami</p> <p><input type="checkbox"/> > de Lange, W.P. & Hull, A. G., Tsunami Hazard for the Auckland Region., Auckland Regional Council, Technical Publication No. 50, November 1994. (Free)</p>
<p>Education</p> <p><input type="checkbox"/> > Ronan, K.R., Johnston, D.M., Childrens Risk Perceptions and Preparedness: A Hazards Education Survey. Auckland City Council and Auckland Regional Council, Auckland, March 1997 (Available on loan from ACC Library)</p>	<p>Volcanic</p> <p><input type="checkbox"/> > Auckland Regional Council, Contingency Plan for the Auckland Volcanic Field, Auckland Regional Council Technical Publication No. 165, January 2002. (\$45.00)</p> <p><input type="checkbox"/> > Paton, D. et. al., Auckland Volcanic Risk Project - Stage 2, Auckland Regional Council Technical Publication No.126, November 1999. (\$25.00)</p> <p><input type="checkbox"/> > Johnston, D.M., Nairn, I.A., Thordarson T., Daly M., Volcanic Impact Assessment for the Auckland Volcanic Field. Auckland Regional Council, Technical Publication No.79, April 1997 (\$35.00)</p>
<p>Flooding</p> <p><input type="checkbox"/> > Auckland Regional Council, Dam Safety and Surveillance Guidelines for Safe Practice Auckland Regional Council Technical Publication No. 109, June 2000. (\$20.00)</p> <p><input type="checkbox"/> > Auckland Regional Council, Low Impact Design Manual for the Auckland Region, Auckland Regional Council Technical Publication No. 124, April 2000. (\$20.00)</p> <p><input type="checkbox"/> > Auckland Regional Council, Guidelines for Stormwater Modelling in the Auckland Region, Auckland Regional Council Technical Publication No. 108, April 1999. (\$25.00)</p>	<p>Infrastructure Failure/Auckland Engineering Lifelines Group Publications</p> <p><input type="checkbox"/> > Auckland Regional Council, Auckland Engineering Lifelines Group Priority Emergency Routes Auckland Region, Auckland Regional Council Technical Publication No. 145, November 2001. (\$25.00)</p> <p><input type="checkbox"/> > Auckland Regional Council, Auckland Engineering Lifelines Group Volcanic Ash Review, Part 1: Impact on lifeline services and collection and disposal issues Auckland Regional Council Technical Publication No. 144, May 2001. (\$25.00)</p> <p><input type="checkbox"/> > Auckland Regional Council, Auckland Engineering Lifelines Project, Final Report - Stage 1, Auckland Regional Council Technical Publication No. 112, November 1999. (Includes CD-ROM) (\$100.00)</p> <p><input type="checkbox"/> > Auckland Regional Council, Part 3: Risk Management: Looking Forward from the Auckland Power Crisis, Auckland Regional Council Technical Publication No. 100, January 1999. (\$25.00)</p> <p><input type="checkbox"/> > Auckland Regional Council, Auckland Engineering Lifelines Project, Stage 1 Report. Auckland Regional Council, Technical Publication No. 116, July 1997. (\$90.00 Hazard and Network information (project participants only)) (\$80.00 Hazard information only (non-project participants))</p>
<p>Land Instability</p> <p><input type="checkbox"/> > Williams, A., Slope Instability Hazards in the Auckland Region: A Preliminary Assessment. Auckland Regional Council, Technical Publication No. 71, June 1996. (includes four A3 maps [1:500,000]: soil/rock mass distribution, slope grade distribution, areas of slope instability, instability hazard) (\$35.00)</p>	<p>Miscellaneous</p> <p><input type="checkbox"/> > Daly, M. & Hull, A., Natural Hazards Management Workshop 95: Workshop Summaries. Auckland Regional Council, Technical Publication No. 70, May 1996. (the Workshop Proceedings are available from the Institute of Geological & Nuclear Sciences, PO Box 30 368, Lower Hutt) (Free)</p> <p><input type="checkbox"/> > Auckland Regional Council, Civil Defence Disabilities Planning Guide, Auckland Regional Council Technical Publication No. 98, September 1998. (Free)</p>
<p>Meteorological Extremes</p> <p><input type="checkbox"/> > Salinger, M.J., Porteous, A.S., Reid, S., Thompson, C., Snelder, T., Meteorological Hazards in the Auckland Region: A Preliminary Assessment. Auckland Regional Council, Technical Publication, No. 76, November 1996. (Free)</p>	

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