

EXECUTIVE SUMMARY

The Auckland Engineering Lifelines Project was initiated in 1996 by the Auckland Regional Council, New Zealand, and involves some 40 organisations comprising local government, utility service providers, and other interest groups. Over the past four years several projects have assessed the vulnerability of Auckland's lifelines to volcanic hazards. These studies have identified volcanic ash falls as a significant hazard and highlighted the complex set of issues that need to be addressed. Past eruptions have also shown us the vulnerability of utilities and facilities to volcanic ash (e.g. Ruapehu 1995-1996). The Auckland Engineering Lifelines Group is now interested in assisting utilities and local authorities to produce contingency plans for the disposal of any volcanic ash covering the Auckland Region so as to enable lifeline service to be re-established as quickly as possible with minimum long-term environmental effects. The effects of volcanic ash on utilities and public facilities are summarised in this report.

The specific effects on utilities and facilities will depend on the quantity of ash, weather conditions at the time and, in some cases, mitigation measures undertaken during ash fall. The potential quantities of ash requiring collection and disposal are estimated to range from 131,000 m³ to over 6,000,000 m³ for a number of different local and distal ash fall scenarios. In the case of a small depth of ash fall the quantities removed will also depend on whether all land, or just roads, paved surfaces and roofs require ash removal. Recommended methods for collection of ash that are likely to be appropriate in Auckland are summarised, based on suggested methods compiled by the United States Federal Emergency Management Agency (F.E.M.A.) for:

- buildings and structures;
- roads;
- sewage and stormwater systems;
- airports;
- electricity distribution systems;
- water supplies; and
- residential properties.

The following common issues, which should be addressed in all instances, were identified:

- Co-ordination and prioritisation. Public agencies and private companies associated with lifelines should co-ordinate and prioritise cleanup both within and between their organisations to ensure that resources are used most effectively and cleanup activities do not adversely affect other lifelines;
- Personal protection equipment. All staff and volunteers involved in cleanup activities should be supplied with appropriate personal protection equipment;
- Minimise double handling. Cleanup activities should be planned and executed to minimise the requirements for double handling;
- Frequent servicing of plant and machinery. As ash can be abrasive, corrosive and can cause blockages, all plant and machinery used for cleanup activities should be subject to more frequent servicing.

However, suggested clean up methods will need to be considered in more detail on a sector, agency, and site specific basis during the preparation of contingency plans.

The time required to clean up ash deposits will depend on the extent and depth of ash deposits, and may take from several weeks to several months. Factors that may affect the ease of, and time required for cleanup include:

- rain, which can wash ash into stormwater drains and wastewater systems, lead to short circuiting on power distribution systems, and cause build-up of ash in depressions;
- wind, which can spread lighter particles of ash around creating a dust nuisance and causing additional damage to mechanical plant and equipment; and
- additional ash deposition, prior to completion of cleanup activities.

Given the quantities of ash that may require disposal and its associated potential problems, it is imperative to clean up ash and remove it to an appropriate disposal location as quickly as possible.

Existing engineered landfills and/or cleanfills would provide insufficient capacity as well as being costly for all but the smallest ash fall scenarios, in which case they may be the most expedient disposal location.

The most obvious disposal option is disposal to land. The most suitable disposal locations are likely to be quarry sites and gullies to the north and south of Auckland. A number of different disposal locations may be necessary to provide sufficient capacity. Potential disposal locations should be identified, on a regional basis, as part of the contingency planning process, for use by all organisations and public agencies undertaking clean-up operations.

The desirable features of disposal locations include:

- close proximity to ash cleanup area(s);
- existing access from the main road for heavy vehicles;
- situated away from waterways;
- availability of soil for cover;
- end use of disposal site; and
- meet resource consent requirements.

In respect of the provisions of the Resource Management Act (1991) (RMA), the disposal of ash resulting from an ash fall would be covered under Section 330, 'Emergency works and power to take preventative or remedial action'. This would allow the immediate deposition of ash onto land without the usual requirement to first obtain any resource consents that may ordinarily be necessary. If consent application(s) were made within the next 20 days then the activity could continue until the application for a resource consent and any appeals had been determined. However, suitable disposal sites should be determined prior to an emergency, and where possible, resource consents for ash disposal should be attained in advance.

Site specific resource consent requirements would need to be considered in identifying potential sites. In addition, other legal and ownership issues would also need to be taken into consideration.

It is estimated that the total cost of transport and disposal could be between \$2,400,000 and \$108,000,000 for the ash fall scenarios considered.

More detailed qualitative and quantitative observations of the impacts of actual volcanic ash falls are required to better understand the effects on engineering lifelines. This will require appropriate researchers, utility engineers and managers visiting ash-impacted communities in New Zealand and overseas to investigate the wide range of issues highlighted in this report.

The report concludes with the following recommendations:

- Individual organisations should develop contingency plans for the removal of ash from their facilities.
- A regional strategy for the efficient co-ordination of volcanic ash removal and disposal in Auckland should be developed.
- Continuing research should be encouraged to address the wide range of unresolved issues identified in this report. It will be necessary to establish mechanisms to include new research findings in the planning process.
- A priority area for research should be the identification of suitable ash disposal sites and clarification of the legal and ownership issues related to their uses.
- Information exchange, research, and discussions undertaken between AELG and other lifeline groups would contribute to addressing issues related to ash disposal and assist in devising solutions.
- The AELG members are encouraged to participate on reconnaissance visits and support exchanges with other ash-affected communities.