



Report 05.288
Date 14 June 2005
File B/09/09/01

Committee Utility Services
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Exposure of the Water Supply Infrastructure to Flood Hazards

1. Purpose

To appraise the Committee of the risk of damage to the water supply infrastructure from extreme rainfall events, and to propose for adoption a range of design levels for return period rainfall or river flows.

2. Significance of decision

The matters in this report do not trigger the significance policy of the Council or otherwise trigger section 76(3)(b) of the Local Government Act 2002.

3. Background

Over the last 15 years or so, extensive physical work has been undertaken to create a water supply system that is more resilient to damage from natural events, particularly earthquakes. However over the past two years, there have been occasions when significant damage to the water supply infrastructure has arisen from high rainfall events. This has increased the awareness of the exposure of the water supply system to damage from these types of events. An analysis of these events, and a review of the likelihood of similar events occurring again has been carried out. A report "Flood Hazards to the Water Supply Infrastructure" dated April 2005 was prepared and distributed internally. This report is attached as Attachment 1.

4. Main conclusions from the report

The report analysed the damage caused in a variety of situations, including the following two major events:

- Orongorongo rainfall 30/31 March 2005. This event brought down huge quantities of scree material from steep unstable slopes into the Orongorongo River. The riverbed level was raised by about 3m downstream of the Orongorongo intake weir. A secondary flow path established itself from the resulting higher bed level through the adjacent short tunnel. The exiting of flow from the tunnel scoured support to the 600mm pipeline, which failed, severing supply from the Orongorongo catchment to the Wainuiomata water treatment plant.

- Wainuiomata February 2004 flood. In this event, the Wainuiomata River widened its channel where it had been artificially constrained when the 900mm diameter pipe from the intake to the water treatment plant was laid. About 30m of pipeline was displaced. In addition, the main treatment plant access bridge pier was undermined and dropped, making it unusable for vehicles.

5. Design standards

Damage from high rainfall events can be broadly classified in two general categories. Inundation occurs when water levels are raised and facilities are submerged. This is normally not a problem for water supply pipelines but can impact on pumping stations, valve chambers and similar structures.

Erosion on the other hand occurs when soil materials are displaced by the action of water currents, or landslides occur from saturation and loss of strength of slope materials. These earth movements have a significant impact, primarily on pipelines.

Of these two categories, inundation lends itself more easily to modelling and assessment of water levels in specific events. However, erosion has far more variable factors, some of which cannot be determined with any degree of certainty.

For previous design and construction work there may not have been consistent design standards, with the various design parameters being arrived at for different reasons. This paper is to set some guidelines for design, acknowledging that for the erosion case, it is difficult to have precision in the assessments.

6. Proposed return periods

The general return period for flood events adopted by the GW Flood Protection Department is 1 in 100 years. This period is based on the damage to life and property that could incur if for example a stopbank breached, causing widespread flooding and consequential damage. For the lower reaches of the Hutt River, a higher return period of 440 years has been adopted, following extensive public consultation and takes account of the overall costs and benefits of the scheme.

The Wellington City Council subdivisional standard has a hierarchy of return periods for different types of flood situations. The standard requires a 1 in 200 year level for major community facilities, which includes those related to the supply of water. This gives a benchmark against which to create an appropriate hierarchy.

The proposal for Water Supply facilities is as follows:

- Inundation of major buildings 1 in 200 years
- Inundation or erosion of water intake structures, causing damage or loss of functionality 1 in 100 years
- Erosion or ground instability affecting pipelines 1 in 100 years
- Inundation or erosion affecting significant access routes 1 in 50 years

7. Assessment and Capital Works Programme

The water supply infrastructure will be progressively reviewed against these standards. Any specific areas requiring attention will be investigated in detail and carried forward into the capital work programme as appropriate.

If the application of these standards results in potential excessive expenditure, an assessment of the consequences of damage will be made, and if minor, a lesser standard could be adopted.

To check out the vulnerability of the existing water supply facilities, the assistance of the GW Flood Protection Department and other experts will be sought.

8. Communications

No communication issues arise from this report.

9. Recommendations

That the Committee:

- (1) **Receive** the report.
- (2) **Note** the contents.
- (3) **Adopt** the return periods detailed in the report as a basis for the assessment of potential inundation or erosion affecting water supply facilities.

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Attachment 1: "Flood Hazards to the Water Supply Infrastructure" report, April 2005
(amended June 2005)