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Report to the Hutt River Floodplain Management Advisory Committee
from Daya Atapattu, Project Engineer/Leader Hutt River Floodplain Management Plan

# Hutt River Floodplain Management Plan : The Path To The Design Standard

## 1. Purpose

To inform the Advisory Committee of the process for achieving a design standard for the Hutt River.

## 2. Background

A requirement of the accelerated Hutt River Floodplain Management Plan (HRFMP) is to adopt a design standard for the Hutt River by June 1999. The Design Standard will enable a programme of improvement works for the Hutt River to be considered in the next Wellington Regional Council (WRC) Long-term Financial Strategy, which spans 1 July 2000–30 June 2010.

A 26 kilometre length of the river extending from the Estuary to Gemstone Drive in Upper Hutt is considered in this study.

## 3. What is a Design Standard?

The design standard is defined as the maximum flood that can pass with acceptable security through the flood protection system. It is also called the design flood.

The design flood has a nominal probability of occurrence, often called the return period (e.g. the 2 percent or "50 year flood"). The return period of the design flood generally indicates the "level of protection" the flood protection system can provide to floodplain occupiers.

The flood protection system itself, consists of the channel edge protection, berm and the stopbank each side. They, combined, provide the required level of protection for the floodplain.

## 4. What is the capacity of the existing system?

The review of Hutt River flood protection system in the late 1940s to 1950 intended a design to contain a maximum flood of 2800$m^3$/sec. Recent investigations have shown that the stopbanks upstream of Kennedy Good Bridge, except for a few reaches, are high enough to have a capacity of 2800$m^3$/sec. However, security through that part of the system does not always match the capacity. Failure of flood defences can occur before overtopping due to breach of stopbank, e.g. bank edge or foundation failure.

The lower reaches of the river have much lower capacity and security and there are sections of stopbanks, which may breach during a flood of magnitude less than a 50 year event.

## 5. What are the available options to be considered?

Adopting an overall design standard will require the comparison of costs, plus the economic, and environmental and social effects for several options to select options acceptable to the community.

To facilitate that, four options have been selected for the Hutt River for detailed investigations:

- Maintain status quo
- Upgrade to 1900$m^3$/sec. (100 year event)
- Upgrade to 2300$m^3$/sec. (300 year event)
- Upgrade to 2800$m^3$/sec. (rare event)

Option 1 is to maintain the existing system without any upgrade but with reinstatement as and when damages occur.

Option 2 is to upgrade the system to provide acceptable security in a “100 year” flood. The discharge of 1900$m^3$/sec shown under this option is the “100 year” flood at Taita Gorge in the Hutt River. “100 year” protection level is the minimum standard generally used for rivers even in smaller and less developed floodplains, e.g. Waikanae, Otaki, and Waipaoa in Gisborne.

Option 3 is to upgrade the system to provide acceptable security in a “300 year” flood. The discharge of 2300$m^3$/sec shown under this option is the “300 year” flood at Taita Gorge in the Hutt River and it is the design standard used for the Ewen Bridge construction.

The 2800$m^3$/sec flood is a rare event but one that can occur in the Hutt River. This standard was considered as most of the stopbanks in the upper reaches of the river are already constructed to contain this flood.

To provide an upper benchmark, the estimated probable maximum flood for the Hutt River is 7000$m^3$/sec. This is the highest flood that can occur in the Hutt River.

## 6. What is the process for developing upgrade measures?

The upgraded flood protection system for any of the above design options should be able to convey the relevant design flood with an acceptable level of security (i.e. with a low chance of failure). The development of upgrade measures for each of the selected design options will be carried out in several stages as described below.

a. Identify deficiencies of the existing river channel and stopbank system.
b. Determine stable channel alignments and minimum berm widths.
c. Estimate the flood levels for the design flow considered.
d. Develop bank edge protection measures for the design flow considered.
e. Identify sections of stopbanks where overtopping can occur.
f. Develop solutions for stopbanks raising and strengthening where necessary.

The above process will be repeated for the three design floods considered. A flow chart showing the procedure for developing the upgrade measures is attached (**Attachment 1**).

Other methods for reducing flood flows and flood levels in the river will be considered separately. They will include detention reservoirs in upper catchment and raising or widening of bridges.

As noted previously, security on the floodplain cannot be totally guaranteed. In the event of a failure, some areas may be particularly vulnerable. For example, deep ponding can occur behind railway embankments. Methods for reducing the flood levels on the floodplain in the event of a failure will also be investigated.

## 7. Options Evaluation

The selected options for the design standard will be compared against a number of criteria, which include:

- Capital costs of improvements
- Operation and maintenance costs over the design life
- Expected flood damage repair costs to the system over the design life
- Saved and residual flood damages on the floodplain
- Environmental effects
- Social effects

Some of the following tools will be used for comparing the economic efficiency of the options:

- Saved flood damages less costs (Net Present Value)
- Ratio of saved flood damages to costs (Benefit/Cost)
- Total expected costs over the design life
- Costs per unit property value
- Internal rate of return

## 8. What is the process for approving the design standard?

The target for completing the upgrading options, cost estimates and the assessments of residual damages, and environmental and social effects is late April 1999. The options evaluation will be completed by early May 1999. The outcomes of the evaluation will be presented at the 26 May meeting of the Advisory Committee.

The second newsletter, which will be published during early May, will summarise the evaluation for public comment. Public comments will be received through to early June. A recommendation on the design standard will be made by the Advisory Committee at the 28 June meeting.

The recommendation will include the following:

- A design standard for the Hutt River Flood protection system
- A schedule of works with costs to upgrade the system
- A priority list for works

The Landcare Committee will consider the Advisory Committee's recommendation on a design standard at its meeting on 7 July 1999. A flow chart showing this process is attached (**Attachment 2**).

## 9. Recommendation

*That the Hutt River Floodplain Management Advisory Committee receive this report and note its contents.*

Report prepared by:

DAYA ATAPATTU
Project Engineer/Leader

Approved for submission:

BRENDAN PAUL
Manager, Flood Protection (Strategy and Assets)

ANDREW ANNAKIN
Divisional Manager, Landcare

Attachment 1 : Flow Chart for a Design Standard
Attachment 2 : Process for Approving a Design Standard